LD4-TMR

Timer

Large Digit Display

Operation & Instruction Manual

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1 Introduction

This manual contains information for the installation and operation of the LD4-TMR Monitor. The instrument may be set to operate as a period or scaled period timer. The **SEt OPEr** function allows selection of one of these two modes. A brief description of each mode is given below. The two modes of operation covered in this manual are:

S.Prd - scaled period display mode. This mode allows the measurement and scaling of the duration of an input pulse. Since time is being measured the display would typically be programmed and scaled to read in time (seconds, milli seconds etc.) or rate (metres/second, litres/hour etc.). It is equally valid to scale the display to read in any units which may be a function of time e.g. distance travelled in mm.

PEr d - period of the input pulse display. The period of the input pulse is measured and may be displayed in any one of 8 different time display modes (e.g. hours.minutes.seconds). Count up from zero or count down from a preset value modes of operation are provided. Typical applications for this mode include stopwatch and elapsed time displays.

Selection of operating mode, calibration and scaling are all accomplished by push button operation. "On screen" prompts are given for each function to assist in setting up the instrument. Some changes may require dismantling the instrument to alter PCB links.

Two inbuilt relays provide alarm/control functions, optically isolated serial communications (RS232 or RS485) may also be optionally provided.

Unless otherwise specified at the time of order, your LD4 has been factory set to a standard configuration, see the function table for your selected mode for default settings.

Full electrical isolation between power supply, input voltage and serial communications output is provided by the LD4, thereby eliminating grounding and common voltage problems. This isolation feature makes the LD4 ideal for interfacing to computers, PLCs and other data acquisition devices.

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

1 .1 Meter setup

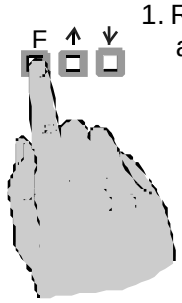
The LD4-TMR setup and calibration functions are configured through a push button sequence. Two levels of access are provided for setting up and calibrating:-

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.

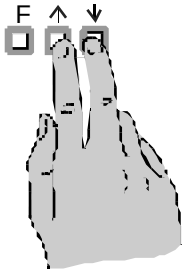
Three push buttons located on the main circuit board are used to alter settings. Once **CAL** or **FUNC** mode has been entered you can step through the functions by pressing and releasing the **F** push button until the required function is reached. Changes to functions are made by pressing the ▲ or ▼ push button (in some cases both simultaneously) when the required function is reached. Changes to function settings will not be accepted and stored in memory until the **F** button is pressed to accept the change.

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.

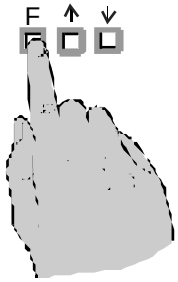


3. Within 2 seconds of releasing the **F** button press, then release the ▲ and ▼ buttons together. The display will now indicate **FUNC** followed by the first function.

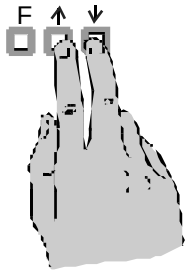
Notes: If step 1 above has been completed then the instrument will remain in this **CAL** mode state until power is removed. i.e. there is no need to repeat step 1 when accessing function unless power has been removed. The instrument should show all 8's on power up e.g. **8.8.8.8.** if the instrument 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

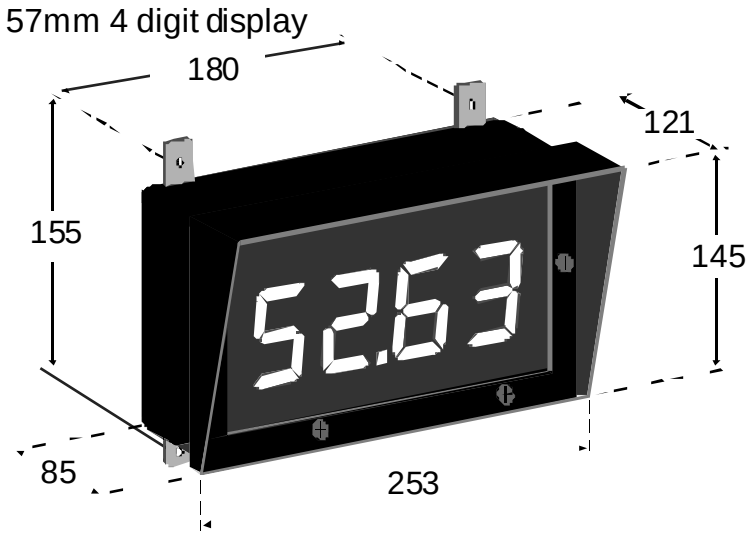
2. When the first function appears press and hold the **P** button until you see the message **FUNC** followed by **CAL** (the **P** button will have to be held pressed for approximately 2 seconds)

3. You should now return to the function you were in but have full access to **CAL** mode functions

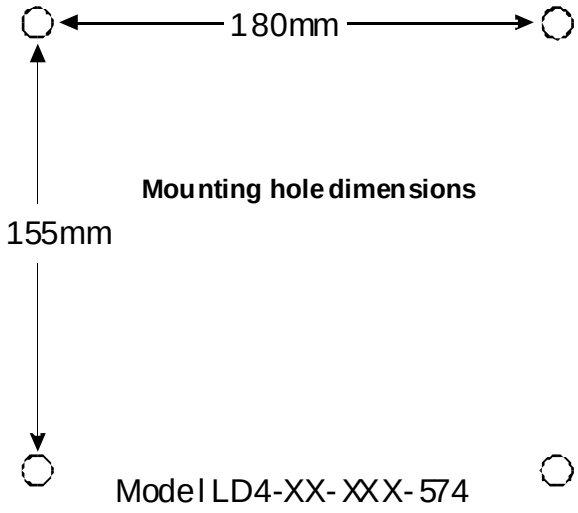
Note: when you exit back to live reading the display will remain in **CAL** mode for approximately 4 minutes, after this time you will need to repeat this process to enter **CAL** mode.

2 Mechanical Installation

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



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

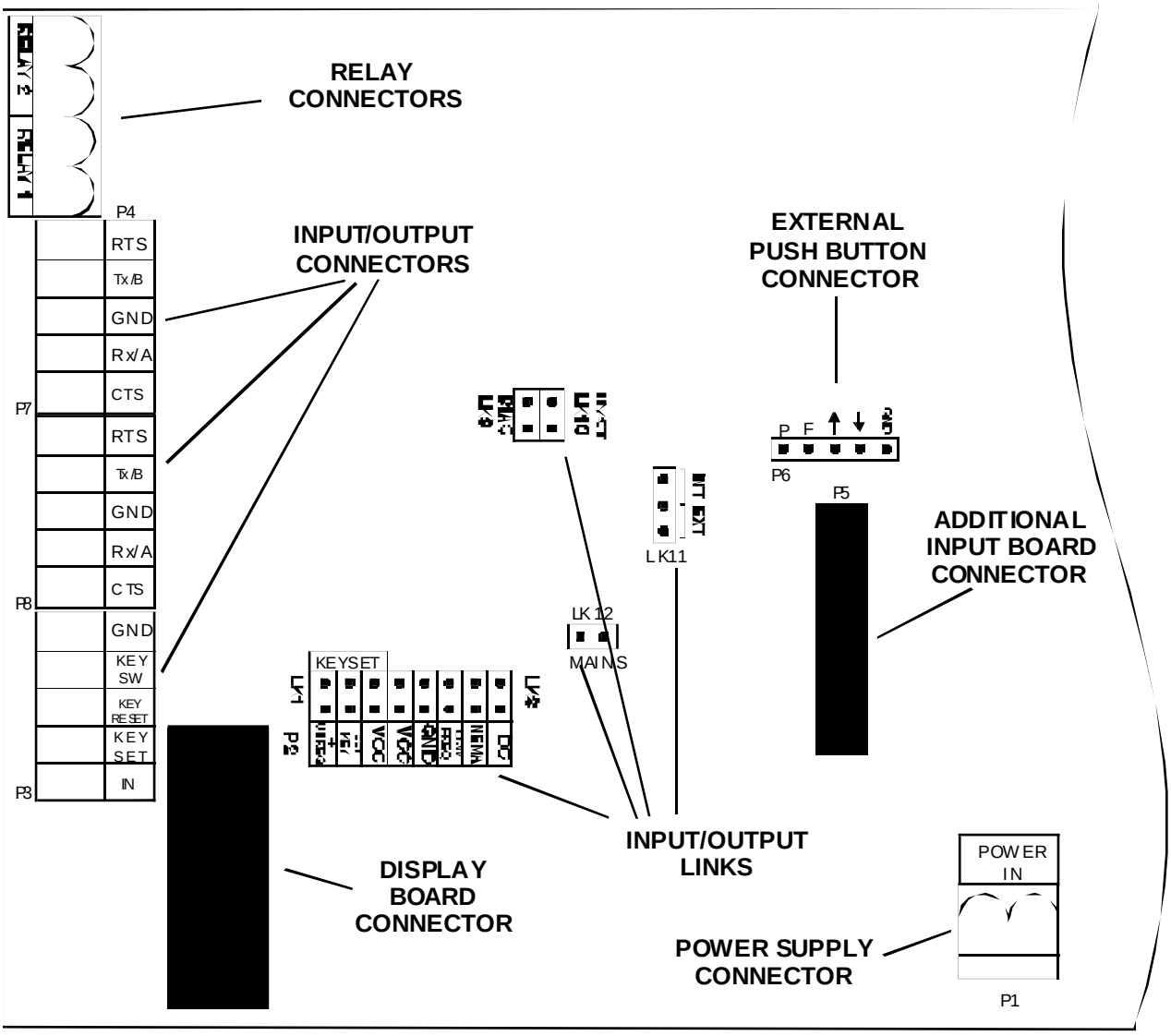


3 Electrical Installation

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

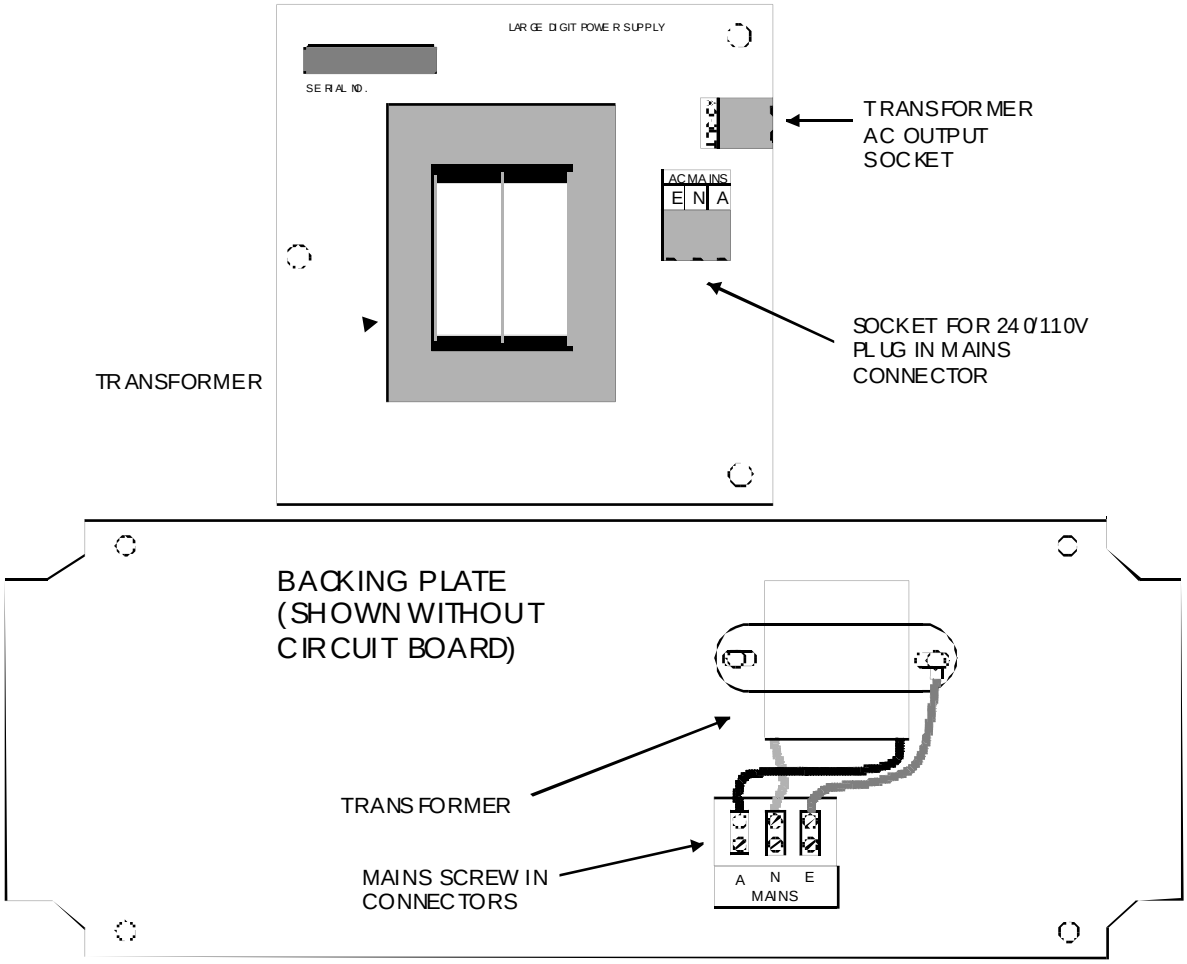
The terminal blocks, which are the plug in type for ease of installation, allow for wires of up to 1.5mm^2 (2.5mm^2 for relay and power connections) to be fitted. Connect the wires to the appropriate terminals as indicated below. Refer to other details provided in this manual to confirm proper selection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

MAIN CIRCUIT BOARD LAYOUT (PARTIAL VIEW)



3 .1 Power supply connections

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



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

DC supplies may be connected directly to the main circuit board power supply connector via the plug in connector terminal P1. The positive and negative supplies may be connected either way around.

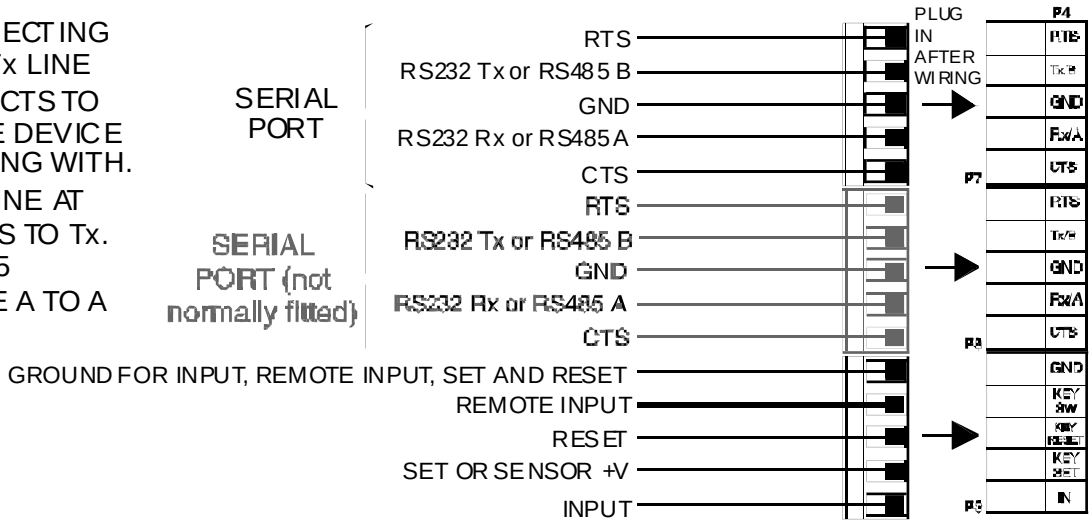
3 .2 Relay connections

The LD4 is supplied with two alarm relays as standard with connections on P4. The relays are single pole, single throw types and are rated at 5A, 240VAC into a resistive load. The relay contact is voltage free and may be programmed for normally open or normally closed operation.

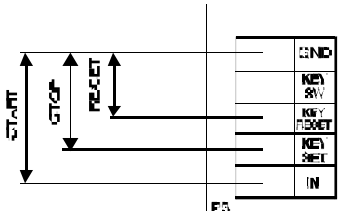
3 .3 Input/output Connectors

The diagram below shows the input/output connectors for the LD4-TMR. The input signal connection is between input and the ground shared with the set, reset and remote input lines.

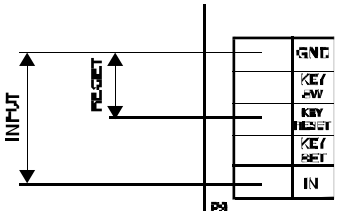
NOTE: WHEN CONNECTING USING RS232 THE Tx LINE AT THE LD4 CONNECTS TO THE Rx LINE AT THE DEVICE IT IS COMMUNICATING WITH. LIKEWISE THE Rx LINE AT THE LD4 CONNECTS TO Tx. WHEN USING RS485 CONNECTIONS ARE A TO A AND B TO B



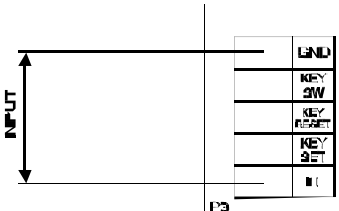
An internal power supply allows the KEY SET input to be used to give a transmitter supply output of either 5VDC regulated or 16VDC unregulated via links LK 1 or 3. When using this output as a transmitter supply ensure that only one link (LK1 or LK3) is in and that LK2 is out.



Input connections for *UP* and *dn* operation modes. Note: if STOP is not required the START and RESET inputs can be used on their own.

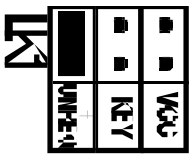


Input connections for *run*, *SnGL*, *SnG.H*, *A.dur* and *SnG.F* operation modes



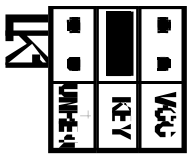
Input connections for *dur*, *PLSE*, *PLS.H* and *PLS.F* operation modes

The KEY SET input can also be used to stop a timing process in *UP* & *dn* mode. When used in this mode links LK1 and LK3 must be out and link LK2 must be in. **Note:** Only one of links LK1, 2 or 3 should be in at any time. Damage to the instrument could occur if more than one link is inserted at one time.



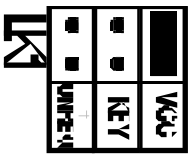
Unregulated DC selected

16VDC unregulated selected



"SET" key selected

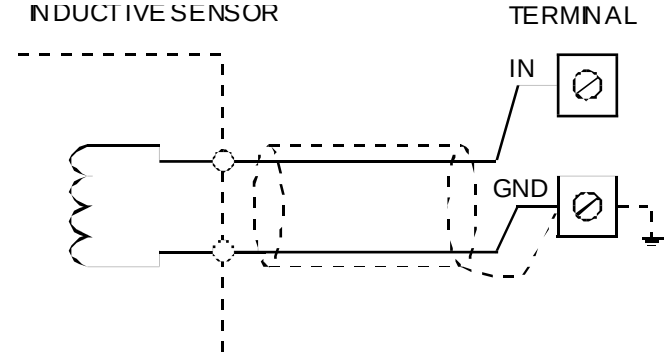
SET input selected



5VDC regulated selected

5VDC regulated selected

3 .4 Input Connection Details

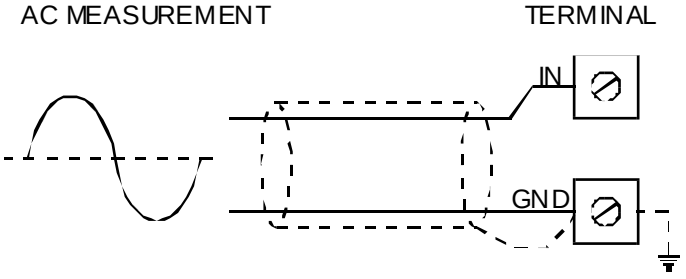


Inductive Sensor (48V RMS Max)

Typical Internal Link Settings

VCC up	Link 4	out
Ground	Link 5	in or out *
Low frequency	Link 6	out
NEMA	Link 7	out
DC couple	Link 8	in
Bias	Link 9	out
Hysteresis	Link 10	in or out *
EXT/INT	Link11	set to EXT

Note: the hysteresis link should be in for signals greater than 2V. Ground link should be out for voltages above 24V RMS.

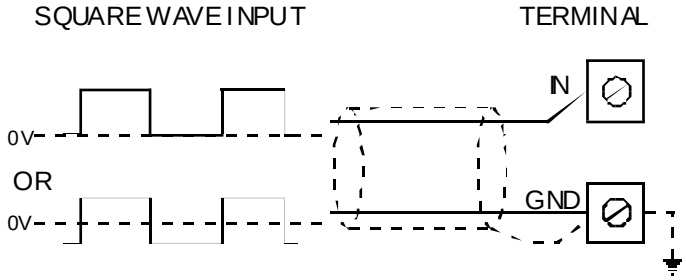


AC Measurement (48V RMS Max)

Typical Internal Link Settings

VCC up	Link 4	out
Ground	Link 5	in or out *
Low frequency	Link 6	out
NEMA	Link 7	out
DC couple	Link 8	in or out *
Bias	Link 9	out
Hysteresis	Link 10	in or out *
EXT/INT	Link11	set to EXT

Note: the hysteresis link should be in for signals greater than 2V. Ground link should be out for voltages above 24V RMS. The DC coupling link should be in for frequencies less than 10Hz

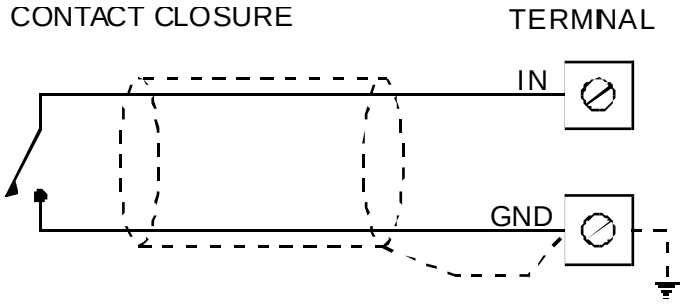


Square Wave (48V Max)

Typical Internal Link Settings

VCC up	Link 4	out
Ground	Link 5	in or out *
Low frequency	Link 6	out
NEMA	Link 7	out
DC couple	Link 8	in
Bias	Link 9	in or out *
Hysteresis	Link 10	in or out *
EXT/INT	Link11	set to EXT

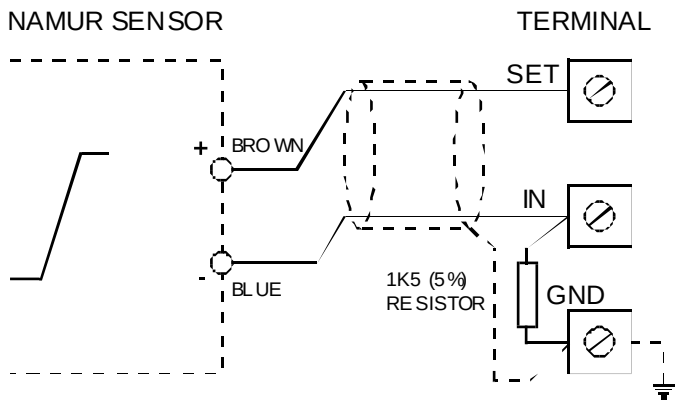
Note: the bias link should be in when input signal does not go below 0V. Ground link should be out for voltages above 24V RMS. The hysteresis link should be in for signals greater than 2V.



Switch Contact

Typical Internal Link Settings

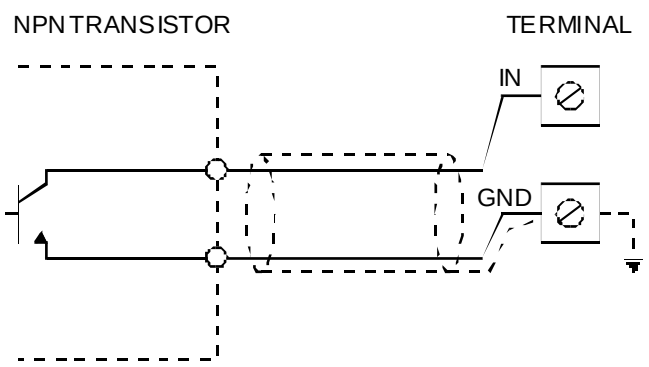
VCC up	Link 4	in
Ground	Link 5	out
Low frequency	Link 6	in
NEMA	Link 7	out
DC couple	Link 8	in
Bias	Link 9	in
Hysteresis	Link 10	in
EXT/INT	Link11	set to EXT



NAMUR Sensor

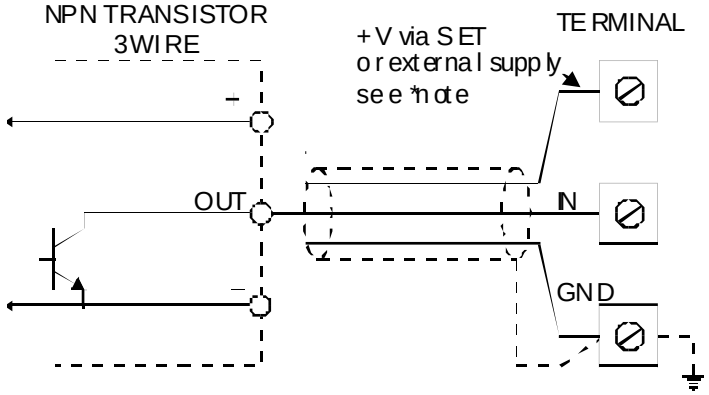
Typical Internal Link Settings

Supply V+	Link 1	16Volts in
VCC up	Link 4	out
Ground	Link 5	in
Low frequency	Link 6	out
NEMA	Link 7	in
DC couple	Link 8	in
Bias	Link 9	in
Hysteresis	Link 10	in
EXT/INT	Link11	set to EXT



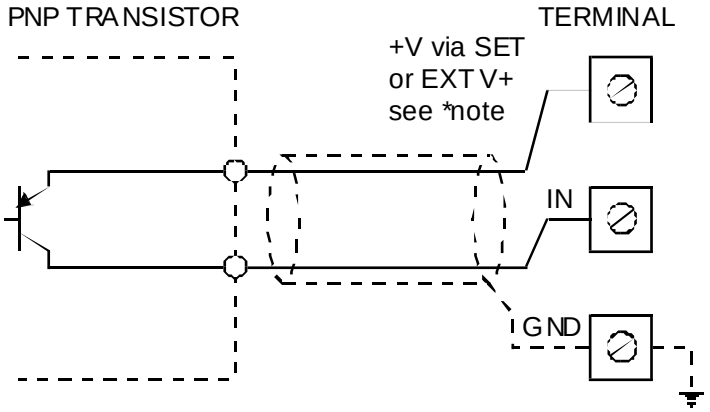
NPN Transistor

Typical Internal Link Settings
VCC up . . . . . Link 4. . . . . in
Ground . . . . . Link 5. . . . . out
Low frequency . Link 6. . . . . out
NEMA. . . . . Link 7. . . . . out
DC couple . . . Link 8. . . . . in
Bias. . . . . Link 9. . . . . in
Hysteresis . . . Link 10 . . . . . in
EXT/INT . . . . Link11 . . . . . set to EXT
Note: The transducer may require an external DC supply. See section 3.3 for internal DC supply link details.



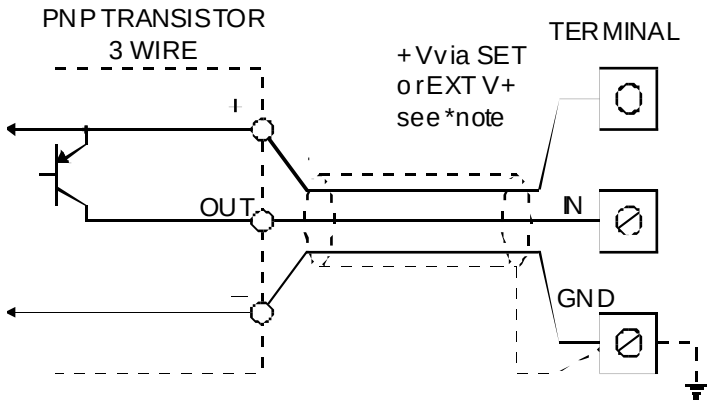
NPN Transistor 3 Wire

Typical Internal Link Settings
VCC up. . . . . Link 4. . . . . in
Ground . . . . . Link 5. . . . . out
Low frequency . Link 6. . . . . out
NEMA. . . . . Link 7. . . . . out
DC couple . . . Link 8. . . . . in
Bias. . . . . Link 9. . . . . in
Hysteresis . . . Link 10 . . . . . in
EXT/INT . . . . Link11 . . . . . set to EXT
Note: The transducer may require an external DC supply.



PNP Transistor

Typical Internal Link Settings
VCC up. . . . . Link 4. . . . . out
Ground . . . . . Link 5. . . . . in
Low frequency . Link 6. . . . . out
NEMA. . . . . Link 7. . . . . out
DC couple . . . Link 8. . . . . in
Bias. . . . . Link 9. . . . . in
Hysteresis . . . Link 10 . . . . . in
EXT/INT . . . . Link11 . . . . . set to EXT
Note: The transducer may require an external DC supply. See section 3.3 for internal DC supply link details.



PNP Transistor 3 Wire

Typical Internal Link Settings
VCC up. . . . . Link 4. . . . . out
Ground . . . . . Link 5. . . . . in
Low frequency . Link 6. . . . . out
NEMA. . . . . Link 7. . . . . out
DC couple . . . Link 8. . . . . in
Bias. . . . . Link 9. . . . . in
Hysteresis . . . Link 10 . . . . . in
EXT/INT . . . . Link11 . . . . . set to EXT
Note: The transducer may require an external DC supply. See section 3.3 for internal DC supply link details.

4 Scaled Period Measurement

This chapter refers to the “scaled period measurement” (**S.Prd**) mode operation. The scaled period mode allows an event to be timed and scaled to match the display units required rather than showing the true time. This mode may be selected via the **SEt OPEr** function. The scaled period mode has four different operating modes, namely **PLSE** (pulse), **SnGL** (single pulse), **PLS.r** (pulse reciprocal) and **SnG.r** (single pulse reciprocal). See the **OPEr** function for a description of each mode. The pulse reciprocal and single pulse reciprocal allow the display to be scaled with the result being inversely proportional to time, this allows scaling in units such as velocity e.g. cm/sec, km/hr etc.

You will need to enter via **CAL** or **FUNC** mode (see section 1.2) to gain access to functions, the function table for each mode shows which functions require entry via **CAL** mode.

The LD4-TMR has an easy alarm access facility which allows access to the alarm setpoints simply by pressing the **F** button at the front or rear of the instrument. 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 in order for the easy access to work:

1. Either the **ACCS** function must be set to **EASY** or the **r.inP** function must be set to **SP.AC**.

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

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

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

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

4 .1 Explanation of functions

A 1Lo (alarm 1 low setpoint)

Displays and sets the alarm low setpoint value for the designated alarm relay. The low alarm setpoint may be disabled by pressing the ▲ and ▼ pushbuttons simultaneously. When the alarm is disabled the display will indicate **OFF**. The alarm relay will trip when the displayed value is less than the **AxLo** setpoint value. Relays may be configured with both a low and high setpoint, so the relay may be tripped when the reading is outside the band set between low and high. e.g. if **A 1Lo** is set to **10.0** and **A 1H,** is set to **90.0** then the alarm output relay will trip when the display value is either below **10.0** or above **90.0**.

A2Lo (alarm 2 low setpoint)

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

A 1H, (alarm 1 high setpoint).

Displays and sets the alarm high setpoint value for the designated alarm relay. The high alarm setpoint may be disabled by pressing the ▲ and ▼ pushbuttons simultaneously. When the alarm is disabled the display will indicate **OFF**. The alarm relay will trip when the displayed value is greater than the **AxH,** setpoint value. Relays may be configured with both a low and high setpoint, so the relay may be tripped when the reading is outside the band set between low and high (see **A 1Lo** for example).

A2H, (alarm 2 high setpoint)

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

A 1HY (alarm 1 hysteresis [deadband]) - this function will not be seen if both the high and low setpoints are set to **OFF**.

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 alarm relay when the measured value stays close to the setpoint. Without a hysteresis setting (**AxHY** set to zero) the alarm will trip 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 tripped the input must fall below the setpoint value minus the hysteresis value to reset the alarm.

e.g. if A1H, is set to 50.0 and A1HY is set to 3.0 then the alarm output relay will trip 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 tripped the input must rise above the setpoint value plus the hysteresis value to reset the alarm.

e.g. if A1Lo is set to 20.0 and A1HY is set to 10.0 then the alarm output relay will trip when the display value falls below 20.0 and will reset when the display value goes above 30.0 (20.0 plus 10.0).

The hysteresis units are expressed in displayed engineering units.

A2HY (alarm 2 hysteresis) - this function will not be seen if both the high and low setpoints are set to OFF.

Displays and sets alarm 2 hysteresis, see A1HY for further description.

A1tt (alarm 1 trip time) - this function will not be seen if both the high and low setpoints are set to OFF.

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 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.

A2tt (alarm 2 trip time)

Displays and sets alarm 2 trip time, see A1tt for further description.

A1rt (alarm 1 reset time) - this function will not be seen if both the high and low setpoints are set to OFF.

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.

A2rt (alarm 2 reset time) - this function will not be seen if both the high and low setpoints are set to OFF.

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

A1no or A1nc (alarm 1 normally open or normally closed) - this function will not be seen if both the high and low setpoints are set to OFF.

Displays and sets the 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.

A2no or A2nc (alarm 2 normally open or normally closed) - this function will not be seen if both the high and low setpoints are set to OFF.

Displays and sets alarm 2 normally open/normally closed operation, see A1no/A1nc for further description.

brgt (display brightness)

Displays and sets the digital display brightness. The display brightness is selectable from 0 to 15, where 0 = lowest intensity and 15 = highest intensity. This function is useful for reducing glare in low light environments.

dULL (remote display brightness)

Displays and sets the level for remote input brightness switching, see rinP function. When the remote input is set to dULL the remote input can be used to switch between the display brightness level set by the brgt function and the display brightness set by the dULL function. The display brightness is selectable from 0 to 15, where 0 = lowest intensity and 15 = highest intensity. This function is useful in reducing glare when the display needs to be viewed in both light and dark ambient light levels.

drnd (display rounding)

Displays and sets the display rounding value. This value may be set from 1- 5000 displayed units (e.g. 0.001 to 5.000 if decimal point set to 3 places). Display rounding is useful for reducing the instrument resolution without loss of accuracy in applications where it is undesirable to display to a fine tolerance. (example: if set to 10 the instruments display will increment in multiples of 10).

dCPt (decimal point selection)

Displays and sets the decimal point for the scaled period or period display. By pressing the ▲ or ▼ pushbuttons the decimal point position may be set. The display will indicate as follows: 0 (no decimal point), 0.1 (1 decimal place), 0.02 (2 decimal places), 0.003 (3 decimal places) etc. up to the number of display digits.

PErd1 nPt (period input scale factor)

Displays and sets the period input scale factor to be used with the period scale function to generate the display scaling. In S.Prd mode the period input is measured in seconds.

PErdSCLE (period scale factor)

Displays and sets the scale factor to be used with the period input setting (see chapter 7 “Period Operation” for examples). To calculate the display value the input frequency and hence the period of this input needs to be known. Scale and input work together to produce a display as follows:

$$\text{Display Value} = \frac{\text{input period (seconds)} \times \text{PErdSCLE}}{\text{PErd1 nPt}}$$

Note: the displayed value is also affected by the decimal point and display range settings.

OPEr (scaled period operating mode)

Displays and sets the operation mode to be used in measuring the pulse period. The options are as follows:

PLSE (pulse) - When this mode is selected the period of the input pulse is displayed according to the scaling factors (PErd1 nPt, PErdSCLE and dCPt). When a new pulse is applied to the input the instrument will measure, scale and display the new period i.e. the old display will be overwritten.

Sn9L (single pulse) - This mode will display the period (again see PErd1 nPt, PErdSCLE and dCPt) of the first pulse and will hold this display value until reset via a contact closure across the reset lines i.e. the display will not be overwritten by any subsequent input pulses.

PLS.r (pulse reciprocal) - Functions in the same manner as the PLSE mode except that the display will show the inverse of the period. This is useful for displaying rate, velocity and other measuring units requiring a time reciprocal.

Sn9.r (single pulse reciprocal) - Functions in the same manner as the Sn9L mode except that the display will show the inverse of the period. This is useful for displaying rate, velocity and other measuring units requiring a time reciprocal.

r.1 nP (remote input function)

Terminals GND and KEY SW are the remote input terminals. When these terminals 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 hold value whilst the remote input terminals are short circuited

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

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

Lo - valley memory. The minimum value stored in memory will be displayed. Otherwise operates in the same manner as the Hi function. If the short circuit is held for 1 to 2 seconds then the memory will be cleared.

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. If the short circuit is held for 1 to 2 seconds then the memory will be cleared.

ZERO - zero the display. The total will be zeroed when 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.

di SP - display toggle. Not applicable to this manual.

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 brSt function and the brightness level set at the dULL function.

G.rSt - grand total reset. Not applicable to this manual.

P.but (P button function)

The P button may be set to operate some of the remote input functions, this button is located on main printed circuit board a connector is also provided to allow external connection of remote switches to the P, F, ▲ and ▼ buttons. With some functions, to prevent accidental operation, the P button must be held pressed for 2-3 seconds before the function will operate. If both the remote input and P button function are operated simultaneously the P button will override the remote input.

The functions below are as described in the r.i nP function above with the exception of the FUNC function.

Functions available are:
NONE, Hi , Lo, Hi Lo, ZERO, di SP, FUNC and G.rSt.

The P.SEt function allows the preset value used with the down (dn) timer (when in PErd mode, not for use in S.Prd mode) to be displayed and set without the need to enter CAL and FUNC modes. To alter the preset value press the P pushbutton, the display will indicate P.SEt followed by the current preset value. This value may now be altered via the ▲ or ▼ pushbutton. When the preset value is set as required press, then release, the F pushbutton, the display will indicate End and will return to normal measurement. The display will return to the new preset value only when the reset has been activated again.

ACCS (alarm relay access mode)

Access mode (OFF, EASY, NONE or ALL) - If set to OFF the mode function has no effect or alarm relay operation. If set to EASY the "easy alarm access" mode will be in operation, see page 18. 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 functions. This function provides an alternative to using the r.i nP function for easy access or no access mode thereby allowing the remote input to be programmed for an alternative use. If set to ALL then access to all functions can be made via FUNC mode i.e. there is no need to enter via CAL mode.

SPAC (setpoint access) - only seen if more than 1 relay fitted.

Sets the access to the alarm relay set points. The following choices are available: A 1 - Allows setpoint access to alarm 1 only. A 1-2 - Allows access to alarms 1 and 2 only. For this function to operate the remote input function (r.i nP) must be set to SP.AC.

Lo di SP, Hi GH di SP and di SP functions - not applicable to this model.

i nPt (input type)

Displays and sets the input type to be used for period measurement. If set to Lo then the instrument will measure the period of an input with a low going edge. If set to hi GH then the instrument will measure the period of an input with a high going edge.

c.rSt (reset value) - applicable to PErd mode only.

The reset terminal can be programmed to cause the display to reset to either zero or the selected preset value. Choose either ZERO or P.SEt to select the required operation.

c.rSt (reset mode)

Allows selection of reset level or edge to force a reset. If set to LO a low input level or closed switch on the reset line will force a reset. If set to HI a high input level or open switch on the reset line will force a reset. If set to LOE then a falling edge or switch closure on the reset line will force a reset. If set to HI E then a

rising edge or switch opening on the reset line will force a reset.

dbnc (debounce)

Displays and sets the debounce time. The debounce time can be set from 0 to 1000 displayed units. If the input pulse width is less than the debounce time setting then the input will be ignored and will not be displayed.

SEt OPEr (set operating mode)

Displays and sets the selected operating mode, e.g. select **S.Prd** for scaled period measurement. See the dedicated chapter in this manual for description of the required operating mode. Options are:

S.Prd - Scaled period measurement.
rtc - Not applicable to this manual
PErd - Period measurement
both - Not applicable to this manual
totL - Not applicable to this manual
FrEq - Not applicable to this manual

Serial Output Functions

The following functions appear after the **SEt OPEr** function. Refer to the "RS232/RS485" output appendix for further details.

bRUdrAtE
PrtY
O.PUt
Addr

Returning to the normal measure mode

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

4 .2 Scaled period measurement examples

Examples of using PErd1 nPt and PErdSCLE.

The actual period of the input pulse (seconds) is used with the PErd1 nPt and PErdSCLE functions to scale the display value. Normal and reciprocal modes are available. The formulae for each type are as below.

For normal mode (PLSE or Sn9L)

$$\text{Display Value} = \frac{\text{input period (seconds)} \times \text{PErdSCLE}}{\text{PErd1 nPt}}$$

i.e. the display value is proportional to the input period of the pulse and the display is scaled by the PErd1 nPt and PErdSCLE functions.

For reciprocal mode (PLS.r or Sn9.r)

$$\text{Display Value} = \frac{\text{PErdSCLE}}{\text{input period (seconds)} \times \text{PErd1 nPt}}$$

i.e. the display value is inversely proportional to the input period of the pulse and the display is scaled by the PErd1 nPt and PErdSCLE functions.

Example 1 - **Using normal mode**

The input pulse is the time an object takes to move over a distance of 100mm. Display is to show time taken in milli seconds with a resolution of 0.1 milliseconds.

Set the decimal point (dCPt) to 0.1. Set period scale to 1000.0 (one thousand milli seconds = 1 second) and period input to 1. The actual period in seconds will be multiplied by 1000.0 and divided by 1 to give a scaled result in milli seconds.

Example 2 - **Using reciprocal mode**

For the same inputs given in Example 1 it is required to display velocity in metres per second with a resolution of 0.01 metres per second.

Set the decimal point (dCPt) to 0.02. Set period scale to 1.00 and period input to 10 (100mm in 0.1 seconds = 1m/s). The period scale of 1.0 will be divided by the product of the input period in seconds and the period input to give a display scaled in metres/sec. So for 100mm travelled in 0.1 second the display value = 1.00/(0.1 x 10) = 1m/s.

Example 3 - **Using reciprocal mode**

For the same inputs as Example 2 it is now required to scale the instrument to read in kilometres per hour.

Set period input to 10000.00 (ten thousand times 100mm = one kilometre) and period scale to 3600 (three thousand, six hundred seconds in one hour). The period scale of 1000.00 will be divided by the product of the input period in seconds and the period input to give a display scaled in metres/sec.

Note: For all the examples above the period input and period scale factors may be reduced for simplicity if required e.g. in Example 3 a period scale setting of 100.00 combined with a period input of 36 would give the same result.

4 .3 Function table - scaled period mode

Initial display	Meaning of display	Next display	Default Settings	Record Your Settings
A1Lo	Alarm 1 low setpoint value.	Setpoint value or OFF	OFF	
A1Hi	Alarm 1 high setpoint value.	Setpoint value or OFF	OFF	
A2Lo	Alarm 2 low setpoint value.	Setpoint value or OFF	OFF	
A2Hi	Alarm 2 high setpoint value.	Setpoint value or OFF	OFF	
A1HY	Alarm 1 hysteresis.	Hysteresis value in measured units.	10	
A2HY	Alarm 2 hysteresis.	Hysteresis value in measured units.	10	
A1tt	Alarm 2 trip time.	No of seconds before relay trips.	0	
A2tt	Alarm 2 trip time.	No of seconds before relay trips.	0	
A1rt	Alarm 1 reset time.	No of seconds before relay resets.	0	
A2rt	Alarm 2 reset time.	No of seconds before relay resets.	0	
A1no or A1nc	Alarm 1 action N/O or N/C.	A1no or A1nc	A1no	
A2no or A2nc	Alarm 2 action N/O or N/C.	A2no or A1nc	A2no	
brgt	Digital display brightness	0 to 15 (15 = highest brightness)	15	
dULL	Remote input brightness control	0 to 15 (15 = highest brightness)	0	
The functions below are accessible only via CAL mode - see section 1.2 or if the ACCS function is set to ALL				
drnd	Display rounding, selects resolution	Value in memory	1	
r.inP	Remote input	nonE, PHLd, d.HLd, Hi, Lo, Hi Lo, 2Er0, SP.AC, no.Ac, di SP, duLL or 9.rSt	nonE	
P.but	P Button operation	nonE, Hi, Lo, Hi Lo, 2Er0, di SP, FUnC or 9.rSt	nonE	
ACCS	Relay access mode	OFF, nonE, EASY or ALL	OFF	
SPAC	Setpoint access	A1 or A1-2	A1	
Lo di SP	Not applicable to this model		OFF	
Hi 9H di SP			OFF	
di SP			FLSH	
P.SEt	Preset value	Value in memory	0	
dCPt	Decimal point setting	Value in memory	0	
OPEr	Set operating mode	PLSE, Sn9L PLS.r or Sn9.r	PLSE	
PErdinPt	Period input scale factor	Value in memory	1	
PErdSCLE	Period scale factor	Value in memory	1	
inPt	Input edge type	Lo or hi, 9h	hi, 9h	
c.rSt	Counter reset value	2Er0 or P.SEt	2Er0	
c.rSt	Counter reset mode	Lo, Hi, LoE or Hi, E	Lo	
dbnc	Debounce time (mS)	0 to 9999	0	
SEtOPEr	Set operating mode	S.Prd, rtc, PErd, both, totL, or FrE9	PErd	
SEr.i tYPE	Serial communications type	nonE, r232, r485 or i 20	nonE	

5 Period Operation

The period mode operation is used when a display of the actual time period of the input pulse is required (with no scaling). Eight different period display options are given, from a display in seconds to a display in days. These display options may be selected at the **dISP rnGE** function. You will also need to choose the required operation mode from the **OPEr** function There are nine different operation modes to choose from, allowing a wide choice of timing method.

The instrument will measure the period of the pulse width from either the low or high going edge of the pulse, selection of which edge to start measurement from is via the **I nPt** function.

For inputs such as relays with contact bounce problems which may lead to unstable readings, it may be useful to use the debounce (**dbnc**) function to filter out the contact bounce.

You will need to enter via **CAL** or **FUnC** mode (see section 1.2) to gain access to functions, the function table for each mode shows which functions require entry via **CAL** mode.

The LD4-TMR has an easy alarm access facility which allows access to the alarm setpoints simply by pressing the **F** button at the front or rear of the instrument. 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 in order for the easy access to work:

1. Either the **ACCS** function must be set to **EASY** or the **r.I nP** function must be set to **SP.AC**.

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

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

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

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

5 .1 Explanation of functions

A 1Lo (alarm 1 low setpoint)

Displays and sets the alarm low setpoint value for the designated alarm relay. The low alarm setpoint may be disabled by pressing the ▲ and ▼ pushbuttons simultaneously. When the alarm is disabled the display will indicate **OFF**. The alarm relay will trip when the displayed value is less than the **AxLo** setpoint value. Relays may be configured with both a low and high setpoint, so the relay may be tripped when the reading is outside the band set between low and high. e.g. if **A 1Lo** is set to **10.0** and **A 1H,** is set to **90.0** then the alarm output relay will trip when the display value is either below **10.0** or above **90.0**.

A2Lo (alarm 2 low setpoint)

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

A 1H, (alarm 1 high setpoint)

Displays and sets the alarm high setpoint value for the designated alarm relay. The high alarm setpoint may be disabled by pressing the ▲ and ▼ pushbuttons simultaneously. When the alarm is disabled the display will indicate **OFF**. The alarm relay will trip when the displayed value is greater than the **AxH,** setpoint value. Relays may be configured with both a low and high setpoint, so the relay may be tripped when the reading is outside the band set between low and high (see **A 1Lo** for example).

A2H, (alarm 2 high setpoint)

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

A 1HY (alarm 1 hysteresis [deadband]) - this function will not be seen if both the high and low setpoints are set to **OFF**.

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 alarm relay when the measured

value stays close to the setpoint. Without a hysteresis setting (AxHY set to zero) the alarm will trip 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 tripped 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 alarm output relay will trip 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 tripped 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 trip when the display value falls below 20.0 and will reset when the display value goes above 30.0 (20.0 plus 10.0).

The hysteresis units are expressed in displayed engineering units.

A2HY (alarm 2 hysteresis) - this function will not be seen if both the high and low setpoints are set to OFF.

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

A 1tt (alarm 1 trip time) - this function will not be seen if both the high and low setpoints are set to OFF

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 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.

A2tt (alarm 2 trip time)

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

A 1rt (alarm 1 reset time) - this function will not be seen if both the high and low setpoints are set to OFF.

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.

A2rt (alarm 2 reset time) - this function will not be seen if both the high and low setpoints are set to OFF.

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

A 1n.o or A 1n.c (alarm 1 normally open or normally closed)- this function will not be seen if both the high and low setpoints are set to OFF.

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

A2n.o or A2n.c (alarm 2 normally open or normally closed) - this function will not be seen if both the high and low setpoints are set to OFF.

Displays and sets alarm 2 normally open/normally closed operation, see A 1n.o/A 1n.c for further description.

brgt (display brightness)

Displays and sets the digital display brightness. The display brightness is selectable from 0 to 15, where 0 = lowest intensity and 15 = highest intensity. This function is useful for reducing glare in low light environments.

dULL (remote display brightness)

Displays and sets the level for remote input brightness switching, see F.INP function. When the remote input is set to dULL the remote input can be used to switch between the display brightness level set by the brgt function and the display brightness set by the dULL function. The display brightness is selectable from 0 to 15, where 0 = lowest intensity and 15 = highest intensity. This function is useful in reducing glare when the display needs to be viewed in both light and dark ambient light levels.

drnd (display rounding)

Displays and sets the display rounding value. This value may be set from 1-5000 displayed units (e.g. 0.001 to 5.000 if decimal point set to 3 places). Display rounding is useful for reducing the instrument resolution without loss of accuracy in applications where it is undesirable to display to a fine tolerance. (example: if set to 10 the instruments display will increment in multiples of 10).

dCPt (decimal point selection)

Displays and sets the decimal point for the period display. By pressing the ▲ or ▼ pushbuttons the decimal point position may be set. The decimal point function display shown will depend on the number of digits in the display and the diSPrnGE setting. The table below shows all the possible settings for a 4 digit display.

diSPrnGE	dCPt	Measured values
SECS	0	Seconds
	0.1	Seconds & tenths of seconds
	0.02	Seconds & hundredths of seconds
mm.SS	0.00	Minutes & seconds
	0.00.1	Minutes, seconds & tenths of seconds
	0.02	Seconds & hundredths of seconds
h.m.S	0.00	Minutes & seconds
	0.00.1	Minutes, seconds & tenths of seconds
	0.02	Seconds & hundredths of seconds
mmm	0	Minutes
	0.1	Minutes & tenths of minutes
	0.02	Minutes & hundredths of minutes
hh.mm	0.00	Hours & minutes
	0.00.1	Hours, minutes and tenths of minutes
	0.02	minutes & hundredths of minutes
hrS	0	Hours
	0.1	Hours & tenths of hours
	0.02	Hours & hundredths of hours
dd.hh	0.00	Days & hours
	0.00.1	Days, hours & tenths of hours
	0.02	Hours & hundredths of hours
dAYS	0	Days
	0.1	Days & tenths of days
	0.02	Days and hundredths of days

OPEr (period operating mode)

Displays and sets the operation mode to be used in measuring the pulse period. All of the modes are up timers with the exception of the dn mode.

The descriptions below use the terms "active inputs", "inactive inputs" and "reset". The reset operation is via a contact closure or control voltage input between the GND and KEY RESET terminals a reset can cause the display to go to zero or a preset value, see the two c.rSt functions for reset operating modes. An input can be a contact closure or control voltage type input depending on the circuit board link settings, the input mode is set via the I nPt function. For example with I nPt set to Lo a short circuit or 0V between the GND and IN terminals will be taken as an active input and an open circuit or control voltage between the GND and IN terminals will be taken as an inactive input. The available modes operate as follows:

Mode	Operation
run (run)	The run option allows accumulated time display. The mode operates in the following manner: **Input inactive:** The timer stops but holds the time display. **Input active:** The timer continues timing from the previous time i.e. the time accumulates.
dur (duration)	The duration option allows display of an input time with a reset at the end of the input. The mode operates in the following manner: **Input inactive:** The timer is automatically reset and the display shows zero or the preset value. **Input active:** The timer starts timing from zero or the preset value.
PLSE (pulse)	The pulse option allows timing of the duration of an input pulse. The mode operates in the following manner: **Input inactive:** The display will hold the time of the last pulse. **Input active:** The display resets to zero (preset does not apply to this mode) then starts timing the new pulse.
SnGL (single pulse)	The single pulse option allows timing of the duration of a pulse. The mode operates in the following manner: **Input inactive:** The display will hold the time of the last pulse. The display must be reset before a new pulse can be timed. **Input active:** If the previous time display has been reset then the timing process will start from zero or the preset value. If the previous display has not been reset the value displayed will not change when the input becomes active.
PLS.H (pulse held)	The pulse held option operates in the same manner as the PLSE option with the exception that the display indication only changes at the end of the active input i.e. the previous display is held until the new active input ends. Preset does not apply to this mode.
SnG.H (single pulse held)	The pulse held option operates in the same manner as the SnGL option with the exception that the display indication only changes at the end of the input pulse. As with the SnGL option the display must be reset before a new pulse can be timed.
UP (up timer)	The up timer option allows the instrument to be used as a timer with a start, stop and reset input (see I nPt and S.I nP functions for edge settings for these inputs). Note the c.rSt function must be set to ZErO if this mode is used. The mode operates in the following manner: Upon receiving an active input the display will show accumulated time. This timing will continue until a STOP input is received even if the input becomes inactive. This STOP input is operated via an edge between the GND and SET terminals. A reset input will reset the timer to zero. If the timer is stopped and then restarted without a reset the timing will continue from the previous time.
dn (down timer)	The down timer works in the same manner as the UP timer with the exception that the down timing will automatically start from the number set at the P.SEt function. The c.rSt function must be set to PSEt if this mode is used.
A.dur (accumulating duration)	The accumulating duration mode allows displays of current timing period and accumulated total. The mode operates in the following manner: **Input active:** Display starts timing from zero (preset does not apply to this mode). **Input inactive:** Display shows accumulated time from previous timing periods. A reset operation must be carried out when the accumulated total needs to be reset.

dISPrnGE (display range).

The display range function allows selection of various display modes. Eight different modes are available these are:

SECS for a display in seconds

nn.SS for a display in minutes and seconds.

h.n.S for a display in hours, minutes and seconds.

nnn for a display in minutes.

hh.nn for a display in hours and minutes

hrS for a display in hours

dd.hh for a display in days and hours

dAYS for a display in days

Note that the display is also affected by the decimal point setting.

Examples below show how a 100 second input is affected by the **dISPrnGE** and **dCPt** functions. Examples are shown for a 4 digit display type instrument.

dCPt	dISP rnGE	DISPLAY
0	SECS	100 i.e. 100 seconds with a no decimal points display
0.1	SECS	100.0 i.e. 100.0 seconds
0.02	nnn	1.70 i.e. 1 minute and 70 hundredths of seconds

rInP (remote input function)

Terminals GND and KEY SW are the remote input terminals. When these terminals are short circuited, via a pushbutton or keyswitch the instrument will perform the selected remote input function. Alternatively a control voltage of 0V & 5VDC could be used to activate and deactivate the remote input. 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 hold value whilst the remote input terminals are short circuited.

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

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

Lo - valley memory. The minimum value stored in memory will be displayed. Otherwise operates in the same manner as the **H,** function. If the short circuit is held for 1 to 2 seconds then the memory will be cleared.

H, Lo - toggle between **H,** 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. **PH,** or **PLo** will flash before each display to give an indication of display type. . If the short circuit is held for 1 to 2 seconds then the memory will be cleared.

2Er0 - zero the display. The total will be zeroed when 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.

dISP - display toggle. Not applicable to this manual.

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.

g.rSt - grand total reset. Not applicable to this manual.

P.but (P button function)

The P button may be set to operate some of the remote input functions, this button is located on main printed circuit board a connector is also provided to allow external connection of remote switches to the P, F, ▲ and ▼ buttons. With some functions, to prevent accidental operation, the P button must be held pressed for 2-3 seconds before the function will operate. If both the remote input and P button function are operated simultaneously the P button will override the remote input.

The functions below are as described in the **r.inP** function above with the exception of the **FUNC** function.

Functions available are:

NONE, **Hi**, **Lo**, **Hi Lo**, **ZERO**, **di SP**, **FUNC** and **S.rSt**

The **FUNC** function allows the preset value used with the down timer (when in **PErd** mode) to be displayed and set without the need to enter **CAL** and **FUNC** modes. To alter the preset value press the P pushbutton, the display will indicate **P.SEt** followed by the current preset value. This value may now be altered via the ▲ or ▼ pushbutton. When the preset value is set as required press, then release, the F pushbutton, the display will indicate **End** and will return to normal measurement. The display will return to the new preset value only when the reset has been activated again.

ACCS (alarm relay access mode)

Access mode (**OFF**, **EASY**, **NONE** or **ALL**) - If set to **OFF** the mode function has no effect or alarm relay operation. If set to **EASY** the "easy alarm access" mode will be in operation, see page 18. 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 functions. This function provides an alternative to using the **r.inP** function for easy access or no access mode thereby allowing the remote input to be programmed for an alternative use. If set to **ALL** then access to all functions can be made via **FUNC** mode i.e. there is no need to enter via **CAL** mode.

SPAC (setpoint access) - only seen if more than 1 relay fitted.

Sets the access to the alarm relay set points. The following choices are available: **A 1** - Allows setpoint access to alarm 1 only. **A 1-2** - Allows access to alarms 1 and 2 only. For this function to operate the remote input function must be set to **SP.AC**.

Lo di SP, **Hi 9H di SP** and **di SP** functions - not applicable to this model.

P.SEt (preset value)

This function displays and sets the preset value to be used when the **OPEr** function is set to down count timer (**dn**). Note that the P button may be programmed to allow access to the preset value also. The preset value is the value which will automatically be set when a timing process starts in down count mode. The preset can also be used in some other up counting modes if required, see **OPEr** function.

i nPt (input type)

Displays and sets the input type to be used for period measurement. If set to **Lo** then the instrument will measure the period of an input with a low going edge. If set to **hi 9h** then the instrument will measure the period of an input with a high going edge.

S.inP (SET terminal input)

Displays and sets the input type to be used to halt the timing process when using the up or down count timer. The KEY SET input is used as the stop input when using the up or down timer, ensure that LK2 is in and that LK1 & 3 are out. If set to **Lo** then the timing will be held when a low going edge is received, if set to **hi 9h** then the timing will be held when a high going edge is received.

c.rSt (reset value)

The reset terminal can be programmed to cause the display to reset to either zero or the preset value set via the **PSEt** function. Choose either **ZERO** or **P.SEt** to select the required operation.

c.rSt (reset mode)

Allows selection of reset level or edge to force a reset. If set to **LO** a low input level or closed switch on the reset line will force a reset. If set to **HI** a high input level or open switch on the reset line will force a reset. If set to **LOE** then a falling edge or switch closure on the reset line will force a reset. If set to **HI E** then a rising edge or switch opening on the reset line will force a reset.

dbnc (debounce)

Displays and sets the debounce time. The debounce time can be set from 0 to 1000 displayed units. If the input pulse width is less than the debounce time setting then the input will be ignored and will not be displayed.

SEt OPEr (set operating mode)

Displays and sets the selected operating mode, e.g. select **S.Prd** for scaled period measurement. See the dedicated chapter in this manual for description of the required operating mode. Options are:

S.Prd - Scaled period measurement.
rtc - Not applicable to this manual
PErd - Period measurement
both - Not applicable to this manual
totL - Not applicable to this manual
FrEq - Not applicable to this manual

Serial Output Functions

The following functions appear after the **SEt OPEr** function. Refer to the "RS232/RS485" output appendix for further details.

bAUdrAtE
PrtY
O.PUt - the update mode is used with the real time clock mode only.
Addr

Returning to the normal measure mode

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

5 .2 Period measurement examples

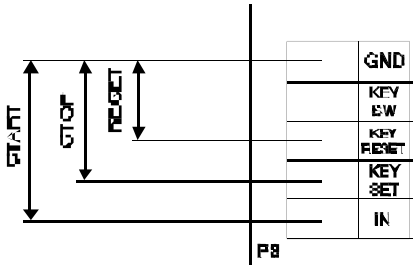
Examples below show three typical applications, see the **OPEr** function for a full description of these and other modes.

Example 1 - Stopwatch operation.

To operate as a up counting stopwatch (start/stop and reset inputs) and display in hours, minutes and seconds choose **hhS** mode at the **dISPrnGE** function. Choose **UP** at the **OPEr** function. The **c.rSt** function must be set to **2Er0**.

To operate as a down counting stopwatch (start/stop and reset inputs) and display in hours, minutes and seconds choose **hhS** mode at the **dISPrnGE** function. Choose **dn** at the **OPEr** function. The **c.rSt** function must be set to **PSEt** and a preset value to count down form entered at the **PSEt** function.

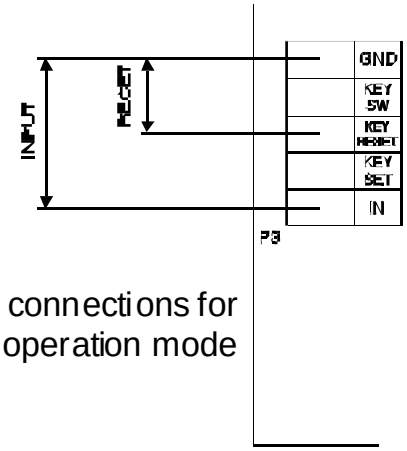
Note: if the STOP input is not required the **UP** and **dn** modes can be used with the START and RESET inputs only.



Input connections for **UP** and **dn** operation modes

Example 2 - Elapsed time operation.

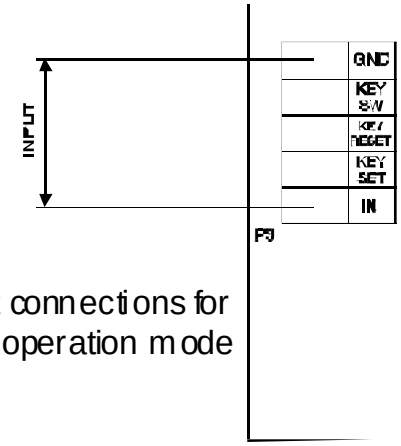
To operate as a simple elapsed time display with a start and reset input and a display in seconds choose **SECS** mode at the **dISPrnGE** function. Choose **SnGL** at the **OPEr** function. The **c.rSt** function must be set to **2Er0**. Whist the input is active the display will increment in seconds. When the input becomes inactive the time display will be held. To start from zero a reset input must be given.



Input connections for **SnGL** operation mode

Example 3 - Pulse timer operation.

To operate as a simple pulse timer display with a display in minutes & seconds choose **nn.SS** mode at the **dISPrnGE** function. Choose **PLSE** at the **OPEr** function. When the input becomes active the display will automatically reset to zero and start timing form zero. When the input becomes inactive the display will hold the time of the last pulse input.



Input connections for **PLSE** operation mode

5 .3 Function table - period mode

Initial display	Meaning of display	Next display	Default Setting	Record Your Settings
AxLo	Alarm low setpoint value	Setpoint value or OFF	OFF	
AxHi	Alarm high setpoint value	Setpoint value or OFF	OFF	
AxHY	Alarm hysteresis	Hysteresis value in measured units	10	
Axtt	Alarm trip time	No of seconds before relay trips	0	
Axrt	Alarm reset time	No of seconds before relay resets	0	
Axn.o or Axn.c	Alarm action N/O or N/C	Axn.o or Axn.c	Axn.o	
AxSP or Axti	Setpoint or trailing alarm	AxSP or Axti	AxSP	
brgt	Digital display brightness	0 to 15 (15 = highest brightness)	15	
dULL	Remote input brightness control	0 to 15 (15 = highest brightness)	0	
The functions below are accessible only via CAL mode - see section 1.2 or if the ACCS function is set to ALL				
drnd	Display rounding, selects resolution	Value in memory	1	
r.inP	Remote Input	NONE, PHLd, d.HLd, Hi, Lo, Hi Lo, 2ERO, SP.AC, No.Ac, di SP, duLL or 9.rSt	NONE	
P.but	Button operation	NONE, Hi, Lo, Hi Lo, 2ERO, di SP, FUNC or 9.rSt	NONE	
ACCS	Relay access mode	OFF, NONE, EASY or ALL	OFF	
SPAC	Setpoint access	A1, A1-2 etc.	A1	
Lo di SP	Not applicable to this model		OFF	
Hi 9H di SP			OFF	
di SP			FLSH	
P.SEt	Preset value	Value in memory	0	
dCPt	Decimal point setting	Value in memory	0	
OPEr	Operation mode	run, dur, PLSE, Sn9L, PLS.H, Sn9.H, UPdn or A.dur	dur	
di SPrn9E	Display range	dAYS, dd.hh, hrS, hh.mm, mmm, h.m.S, mm.SS or SECS	SECS	
inPt	Input edge type	Lo or Hi 9h	Hi 9h	
S.inP	Stop input edge type	Lo or Hi 9h	inp	
c.rSt	Counter reset value	2ERO or P.SEt	2ERO	
c.rSt	Counter reset mode	Lo, Hi, LoE or Hi E	Lo	
dbnc	Debounce time (mS)	0 to 9999	0	
SEtOPEr	Set operating mode	S.Prd, rtc, PErd, both, totL, or FrE9	PErd	
SEr.i tYPE	Serial communications type	NONE, r232, r485 or i20	NONE	

Functions marked * will only be seen if those options are fitted.

6 Specifications

6 .1 Technical Specifications

Input:	Link selectable internal pull up resistor, internal pull down resistor, biassed input, DC input and 2V added hysteresis. For inductive, AC and square wave inputs the maximum input voltage is 48VDC or RMS with appropriate link settings
Impedance:	10kΩ
Memory Retention:	Battery backed memory
Display Reset:	Remote reset via "RESET" input (contact closure to ground or 5VDC maximum)
Microprocessor:	MC68HC11 CMOS
Ambient Temperature:	-10 to 60°C,
Humidity:	5 to 95% non condensing
Power Supply:	AC 240V,110V 50/60Hz or DC 15 to 24V non isolated or DC 12V, 24V or 48V isolated Supply type is factory configured
Outputs:	2 x Setpoint relays, form A, rated 5A at 240VAC
Power Consumption:	AC supply 15 VA max, DC supply, consult supplier (depends on voltage & options)
Transducer Excitation:	+5V or +16V link selectable

6 .2 Options

Serial Communications:	RS232 or RS485 communications
Physical characteristics	
Model LD4-X-X-574	Case size (mm) = 255 x 145 x 125 Weight: = 1.3 kgs Mounting hole locations (mm) = 180(w) x 55(h)

7 Guarantee and Service

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

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

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

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

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

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

This product is designed and manufactured in Australia.

Addendum - RS232/RS485 Commands

RS232/485 Operation and Commands

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

diSP - Image Display Mode:

In image display mode the display value is sent via RS232/485 as raw data in the following format:

<ESC> IXYYYY

Where: <ESC> is the ESCAPE character (27 Dec, 1B Hex)
I is the character 'I' (73 Dec, 49 Hex)
X is the number of image bytes in ASCII (31 to 38 Hex)
YYYY is the raw, 8 bit display data.

This information is output every display update (approx. 4 times per second - depending upon baud rate). The number of image bytes sent depends on the number of display digits present.

The most common usage would be to provide output for 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, Bit 7 is decimal point etc.

Cont - Continuous Transmit Mode (ASCII):

In this mode the display value is continually sent via the RS232/485 interface every display update (approx. 4 times per second depending on the baud rate). The format for this is as follows:-

<STX> XYYYY<CR>

Where: <STX> is start of text character (2 Dec, 02 Hex)
X SPACE (32 Dec, 20 Hex) for a positive value.
X '-' (45 Dec, 2D Hex) for a negative value.
YYYY is the display value in ASCII (length depends on number of display digits).
<CR> is a Carriage Return (13 Dec, 0D Hex)

e.g.: If the display is showing 123456 then the instrument will send
'02 20 31 32 33 34 35 36 0D' (HEX) to the host.

UPdt - **Update Mode** (not applicable to this model)

POLL - Host Controlled Transmit Mode (ASCII):

This mode requires a host computer or PLC to poll the instrument to obtain display or other information or reset various setpoint parameters. The 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)
C is the command character (see list below)
A is the unit address (Range: 32 to 63 Dec, 20 to 3F Hex - address is offset by 32 Dec, 20 Hex)
<CR> is Carriage Return (13 Dec, 0D Hex)
N is the setpoint number in ASCII e.g.: 31 Hex would be alarm 1 etc.
X SPACE for positive and '-' for negative
YYYY is the setpoint value in ASCII

The POLL commands available and instrument responses are as follows:

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

Instructs unit to return the primary display value. The primary value is the main reading on a certain instrument such as pH on a LD4pH meter or Thermocouple temperature on a LD4TC. Format of returned data is:-

<ACK>PAXYYYY<CR>

Where: <ACK> is Acknowledge (6 Dec, 06 Hex)
P echo command received 'P' (80 Dec, 50 Hex)
A is the responding unit's address
X SPACE for positive and '-' for negative
YYYY is the display value in ASCII

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

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

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

Instructs unit to return the secondary display value. For example the secondary value would be Solution Temperature on a LD4PH or Cold Junction Temperature on a LD4TC. Format of returned data is:-

<ACK>SAXYYYY<CR>

Where:<ACK> is Acknowledge (6 Dec, 06 Hex)
S echo command received 'S' (83 Dec, 53 Hex)
A is the responding unit's address
X is SPACE for positive and '-' for negative
YYYY is the display value in ASCII
<CR> is a Carriage Return (13 Dec, 0D Hex)

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

If the instrument does not have a secondary display then the command will be echoed back with no display value (i.e.:<ACK>SA<CR>).

Transmit Special Function Value: <STX>K**A**<CR>

Instructs unit to return the special function value (if enabled). Will return the Display Hold, Peak Hold, Valley High, Valley Low or Tare value depending upon which is selected. Format of returned data is:-

<ACK>KAXYYYY<CR>

Where: <ACK> is Acknowledge (6 Dec, 06 Hex)
K echo command received 'K' (75 Dec, 4B Hex)
A is the responding unit's address
X is SPACE for positive and '-' for negative
YYYY is the display value in ASCII
<CR> is a Carriage Return (13 Dec, 0D Hex)

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

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

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

Instructs the unit to reset the special function value (if applicable). Will reset the stored value for Peak Hold, Valley High and Valley Low. 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).

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

Instructs unit to return value of low alarm setpoint. Format of returned data is:

<ACK>LANXYYYY<CR>

Where: <ACK> is Acknowledge (6 Dec, 06 Hex)
L echo command received 'L' (76 Dec, 4C Hex)
A is the responding unit's address
N is the setpoint number in ASCII e.g.: 31 Hex would be alarm 1 etc.
X is SPACE for positive and '-' for negative
YYYY is the setpoint value in ASCII
<CR> is a Carriage Return (13 Dec, 0D Hex)

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

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

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

<ACK>HANXYYYY<CR>

Where: <ACK> is Acknowledge (6 Dec, 06 Hex)
H echo command received 'H' (72 Dec, 48 Hex)
A is the responding unit's address
N is the setpoint number in ASCII e.g.: 31 Hex would be alarm 1 etc.
X is SPACE for positive and '-' for negative
YYYY is the setpoint value in ASCII
<CR> is a Carriage Return (13 Dec, 0D Hex)

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

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

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

<ACK>lANXYYYY<CR>

Where: <ACK> is Acknowledge (6 Dec, 06 Hex)
l echo command received 'l' (108 Dec, 6C Hex)
A is the responding unit's address
N is the setpoint number in ASCII e.g.: 31 Hex would be alarm 1 etc.
X is SPACE for positive and '-' for negative
YYYY is the setpoint value in ASCII
<CR> is a Carriage Return (13 Dec, 0D Hex)

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

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

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

<ACK>hANXYYYY<CR>

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

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

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

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

<ACK>TA<CR>

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

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

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

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

<ACK>IACCX.X<CR>

Where: <ACK> is Acknowledge (6 Dec, 06 Hex)
I is echo command received 'I' (73 Dec, 49 Hex)
A is the responding unit's address
CC a 2 character model identifier (e.g.: TC - thermocouple)
X.X is the version number (e.g.: '0.1')
<CR> is a Carriage Return (13 Dec, 0D Hex)

Invalid Command

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

<ACK>?A<CR>

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

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

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

SEr. 1 - Output mode for serial port 1

Displays and sets the output mode for serial port 1. Options are:

nonE - no serial input/output

r232 - RS232 serial input/output

r485 - RS485 serial input/output

I 20 - 20mA serial current loop

Where a serial input/output is being used the option must be set to correspond to the input/output hardware fitted. e.g. if the instrument was ordered with an RS232 output then **SEr. 1** (and/or **SEr.2**) must be set to **r232**.

SEr.2 - Output mode for serial port 2

Displays and sets the output mode for serial port 2. Options are as per **SEr. 1**.

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.