LD4-RTC

Real Time Clock
Large Digit Display
Operation and Instruction Manual

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1 Introduction

This manual contains information for the installation and operation of the LD4-RTC clock.

This instrument may be used as a 12 or 24 hour clock or may be set to display day/month/year. For example on a 6 digit display a total of seven display options are available, these are:

month.day.year
day.month.year
hours.min.secs
month.day
day.month
days
hours.minutes

The exact display choice will depend on the number of digits in the chosen display, see **dI SP rnGE** function in the “Explanation of functions” chapter.

Clock synchronisation can be set to be from either the units internal clock generator, the 50Hz mains frequency, the 60Hz mains frequency, an optional high accuracy 10MHz crystal or optional GPS satellite receiver.

Scaling and setup are 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.

Optically isolated serial (RS232 or RS485) communications is optionally available.

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 re-transmission output is provided by the LD4, thereby eliminating grounding and common voltage problems. This isolation feature makes the LD4 ideal for interfacing to computers, PLC’s and other data acquisition devices.

The LD4 series of 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.

1 .1 Simple time adjustment

For simple time adjustment use the **SEt rtc** function as described on page in the "Explanation of functions" chapter. This function allows to user to set the clock to the current time. Note that entry via **CAL** mode is required (see page 10) is required to gain access to this function.

Alternative methods of time adjustment are available via the **AJSt SECS** and **AJSt hour** functions. The **AJSt SECS** function allows the user to add or subtract a number of seconds and tenths of seconds from the current time. The **AJSt hour** function allows hours to be added or subtracted. These functions may be used **instead of** the **SEt rtc** function if required.

1 .2 Master/Slave clock operation

The LD4-RTC can be used with other model LD4-RTC, PM4-RTC (panel mount version) or RM4-RTC (DIN rail mount version) to form a master/slave clock system. The instruments used must be fitted with optional serial communications. Refer to the "Serial communications" appendix in this manual for details of LD4-RTC serial commands. When used in a master/slave system the master unit must have its **O.Put** function set to **UPdt** and the slave units must all have their **O.Put** functions set to **POLL**.

1 .3 Alarm operation

The LD4 is supplied with two alarms relays as standard . The alarm functions will not be seen and no alarm operation is possible unless the display is set to show hours.minutes or hours.minutes.seconds.

It is essential that the correct time, date and year is set for successful alarm operation. The LD4 uses the date and year settings to calculate the day of the week (Monday to Sunday).

The alarm operation mode in this instrument allows up to 32 separate alarms to be made, A 1 to A32. Each of these 32 alarm settings requires the choice of:

1. Choice of alarm number (SEt AL) - i.e. alarm A 1 to A32.

2. Alarm switch on time (Ax On) - i.e. the time at which the relay energises. Note: the "x" in Ax On and all the other settings below will be replaced by the number 1 to 32 when displayed, depending on the alarm number selected.

3. Alarm duration (Ax dur) - up to 23 hours 59 mins 59 secs. Note; longer duration's are possible by using overlapping times and more than one alarm to operate a chosen relay.

4. Days of the week on which the alarm will operate (dAY).

5. Choice of relay which will operate for that alarm number (Ax rLY)

When the operator enters the function or calibration mode and selects an alarm number at the SEt AL function the LD4 will automatically loop back to the SEt AL function at the end of the alarm setup sequence i.e. at the end of step 5 the display will return to step 1. This looping back allows the next alarm number choice to be made without having to pass through the other instrument functions. To exit this loop the user can either press the P button twice or, if the instrument has no P button, choose the option End at the SEt AL function and then press the F button. When the loop is exited the display will move on to the next function in the list outside the alarm setup loop i.e. Ax.o or Ax.c.

The process of setting up the alarms (alarm 3 will be used for example purposes in this explanation) is as follows (see also the flow chart illustration which follows):

A. Enter the FUNC mode or CAL mode (see page 13, "Explanation of functions" chapter, for method). The display should show FUNC followed by the first function AJSt SECS (if enabled, see rtC AJSt page 17).

B. Press and release F until the display shows SEt AL. If the F button is pressed at this stage it will be assumed that no alarms are to be set and the display will move to the A in.o or A in.c function. To select an alarm number press ▲ and ▼ simultaneously, the display will show A 1. i.e. alarm number 1. Use the ▲ or ▼ button to select the alarm number required i.e. A 1 to A32. If End is selected then it will be assumed that no new alarm settings are required. For this example A3 will be chosen.
Note: the alarm setting relates only to the alarm number and does not refer to the relay itself i.e. if A3 is selected at this point it simply means that alarm number 3 is the one currently being setup and does not mean that relay 3 is being selected.

C. Press F. The display will show A3 On. Use the ▲ or ▼ button to select the time of day at which the relay (which will be chosen later) is to be activated. This on time will be in 24 hour time display format even if the main display is in 12 hour time display format.

D. Press F. The display will show A3 dur. Use the ▲ or ▼ button to select the required duration of the relay activation.

E. Press F. The display will show dAY followed by MON (Monday) and either on or OFF. Use the ▲ or ▼ button to select either on or OFF for Mondays, if on is selected it means that the current alarm (A3) will operate on Mondays, if OFF is selected then the alarm (A3) will not operate on Mondays. Press F to move on to the next day (tUE) and again select on or OFF. Continue the process up to and including Sunday.

F. Press F. If more than one relay is fitted the display will move on to the A3rLY function. Use the ▲ or ▼ button to select the required relay to be assigned to the current alarm (A3). If only one relay is fitted the display will now loop back to the SEt AL function to allow another alarm number selection.

Example: Use alarm A 1 to make relay 2 activate for 2 hour 15 minutes on every week day (not weekends) starting at 10.00 pm use the following settings.

SEt AL A 1

A 1 ON 22.00

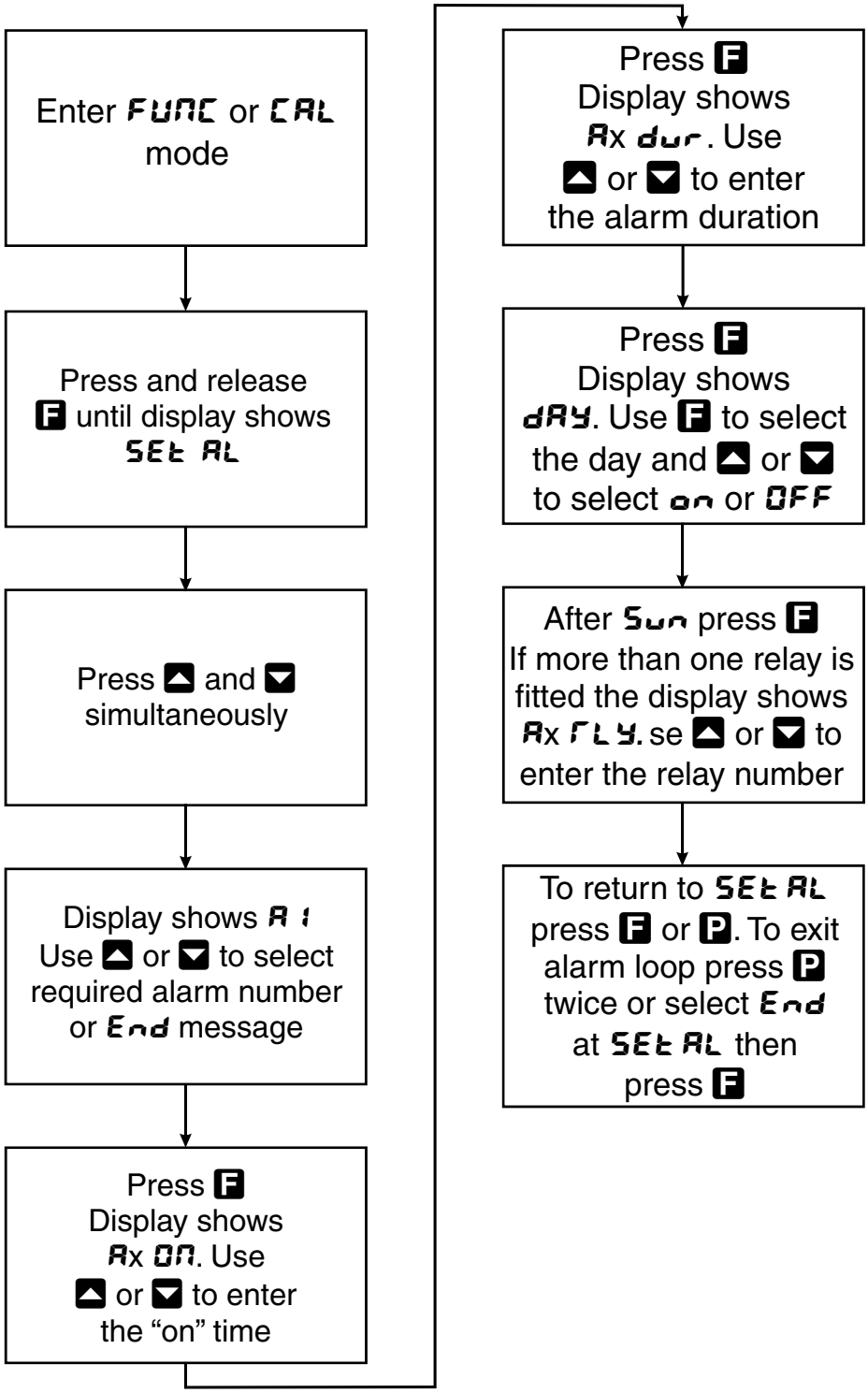
A 1 dur 2. 15

dAY ñON on
tUE on
ŭEd on
thu on
Fr, on
SAt OFF
Sun OFF

A 1 rLY 2

The alarm settings will cause relay 2 to activate on every Monday to Friday at 10.00 pm (22.00) and reset 2 hours and 15 minutes later. For example the relay will activate at 10.00 pm on Monday and reset at 00.15 am the next day (Tuesday), 2 hours 15 minutes after activating.

1 .4 Alarm loop flow chart



1 .5 Allocating more than one alarm number to a relay

A relay can be allocated to any number of the 32 available settings. For example if alarm numbers A 1, A2, A8 and A 10 all have relay 2 selected at the Ax rLY function then each of these alarm settings will control relay 2 operation. Each of the alarms need to be individually set up by passing through the alarm loop and making the required settings for each alarm number.

1 .6 Overlapping alarms

A relay can be allocated to more than one alarm number with overlapping times if required. A typical application for an overlapping alarm is in cases where an alarm longer than 24 hours is required. For example alarm number A 1 could be set to operate for 20 hours starting at a given time and alarm number A2 could be set to operate for a further 20 hours. If the A2 program on time occurs just before the A 1 duration ends then the relay will not de energise until the 40 hours from the initial A 1ON time is up.

2 Mechanical Installation

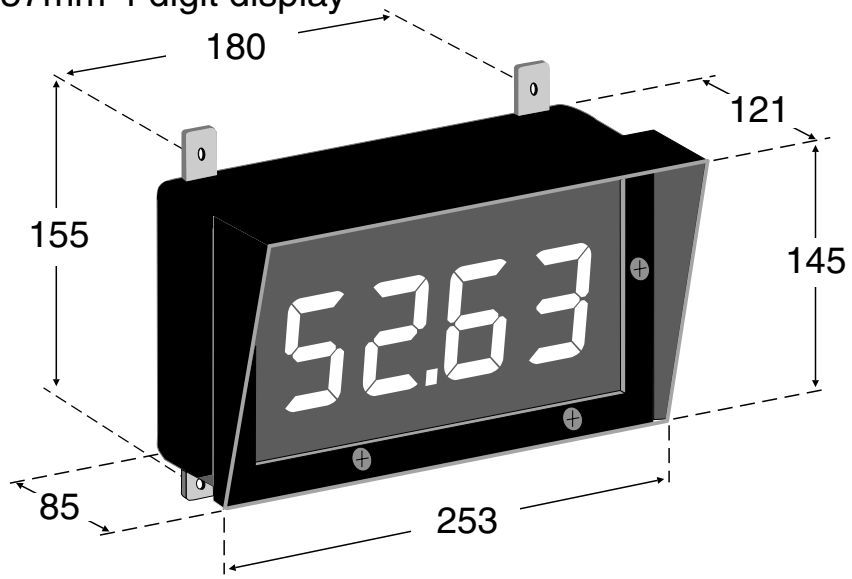
The instrument is designed be wall mounted.

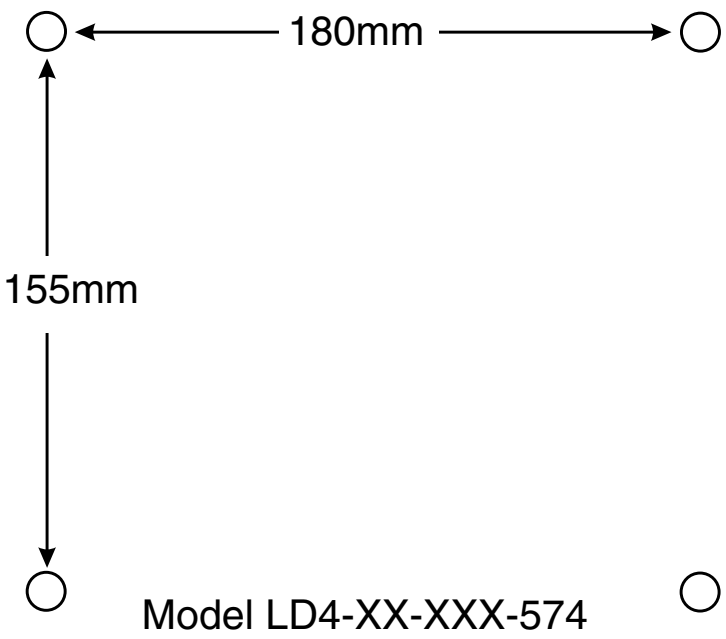
Carefully measure and drill holes, as shown below.

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)

57mm 4 digit display





Model LD4-XX-XXX-574

3 Electrical Installation

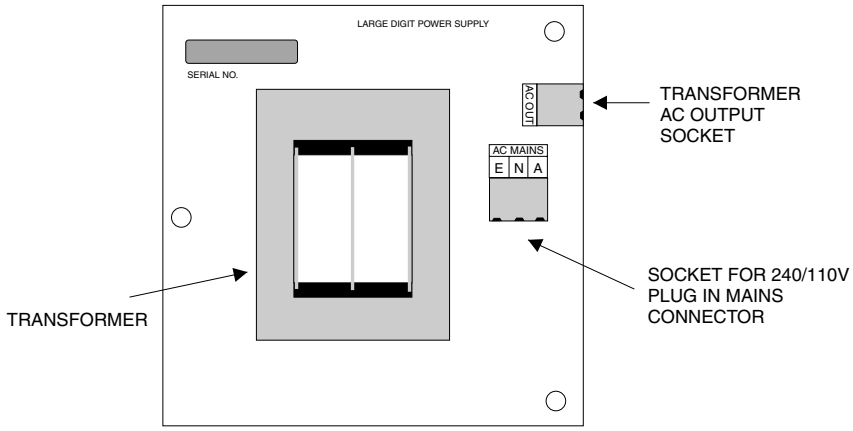
The LD4-RTC clock instrument is designed for continuous operation and no power switch is fitted to the unit. It is recommended that an external switch and fuse be provided to allow the unit to be removed for servicing. The only electrical connections required in this model are the power supply and optional serial communication (if fitted).

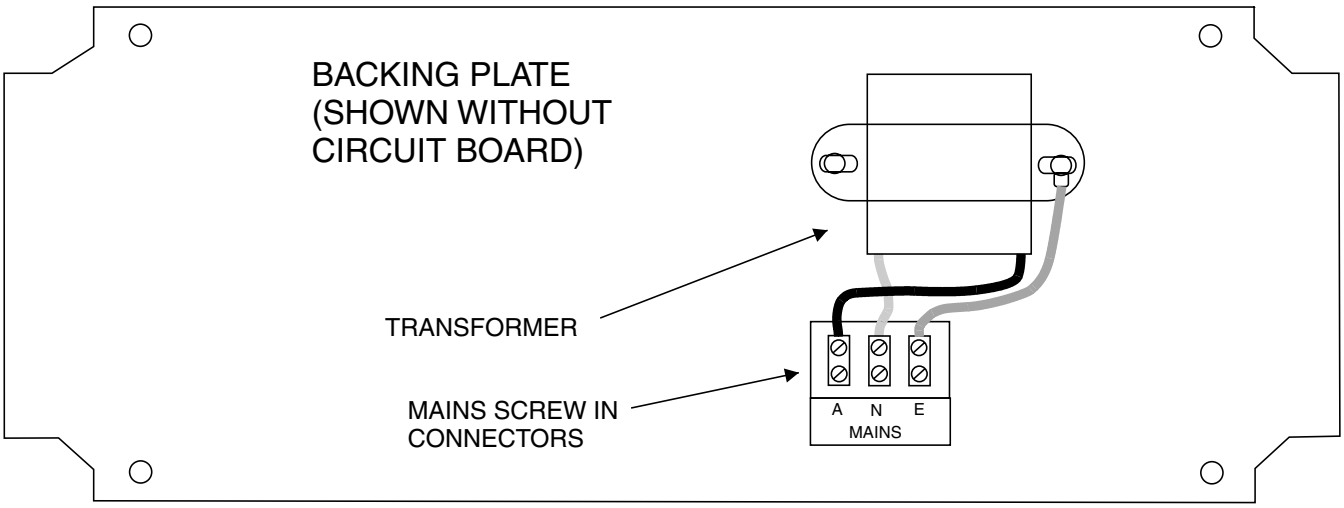
The terminal blocks, which are the plug in type for ease of installation, allow for wires of up to 1.5mm^2 (2.5mm for power connections) to be fitted. Connect the wires to the appropriate terminals as indicated below. Refer to other details provided in this manual to confirm proper selection of voltage, 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.

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.

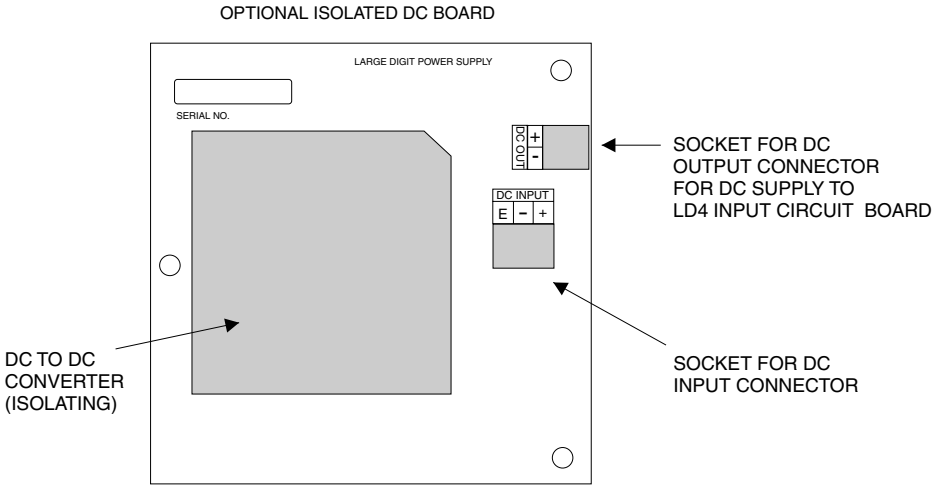




3 .2 DC Power supply connections

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

Isolated DC supplies use plug in terminals supplied on the power supply board as shown below. The output from the isolated DC supply board connects directly to the main circuit board power supply connector via the plug in connector (P1) terminals.



3 .3 Link settings

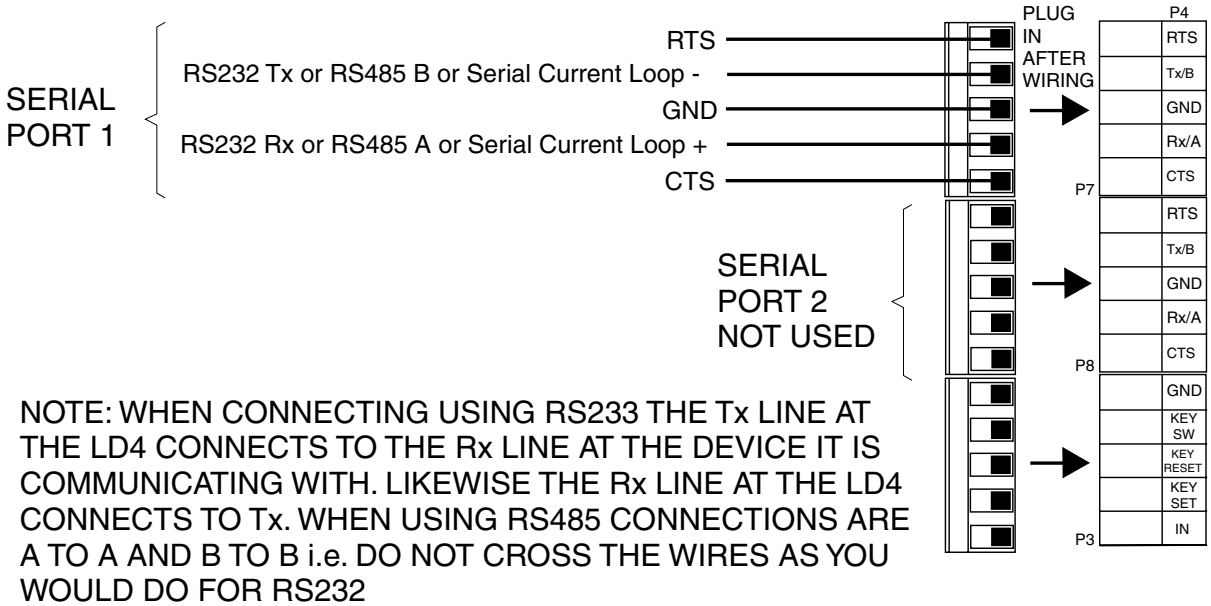
For 50 or 60Hz mains synchronisation or internal clock chip synchronisation configure the setup links on the main circuit board as:

Links in - LK5 (GND), LK6 (FREQ), LK10 (HYST), LK11 (set to EXT) and LK12 (MAINS). All other links are out.

For the high accuracy crystal option set LK11 to INT

3 .4 Serial communications connections

The diagram below shows the input/output connectors for the optional serial communications. Refer to the "Serial communications" appendix for details of serial output functions.



NOTE: WHEN CONNECTING USING RS233 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 i.e. DO NOT CROSS THE WIRES AS YOU WOULD DO FOR RS232

4 Explanation of Functions

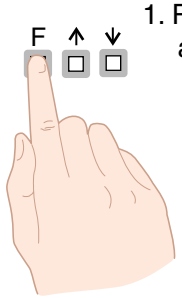
The LD4-RTC setup and calibration functions are configured through a push button sequence. Two levels of access are provided for setting up and calibrating:-

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

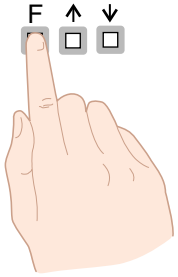
CAL mode (power up sequence plus push button sequence) allows access to all functions including calibration parameters.

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

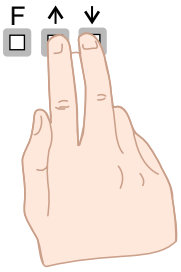
Entering CAL Mode



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



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

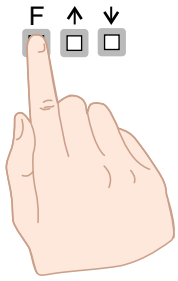


3. Within 2 seconds of releasing the F button press, then release the ▲ and ▼ buttons together. The display will now indicate FUNC followed by the first function.

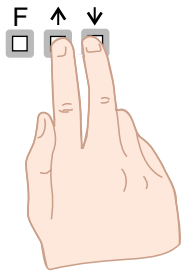
Notes: If step 1 above has been completed then the instrument will remain in this CAL mode state until power is removed. i.e. there is no need to repeat step 1 when accessing function unless power has been removed. The instrument should show all 8's on power up e.g. 8.8.8.8. if the instrument does not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

Entering FUNC Mode

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



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



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

ADJST SECS (adjust seconds)

This function allows simple adjustment in seconds of the time. The range of control is from -99.9 seconds to 99.9 seconds. e.g. if the clock is known to be 5 seconds fast then at the **ADJST SECS** function use the ▼ button to select **-5**, then press the **F** button to accept the change. When the display returns to its normal mode 5 seconds will have been subtracted from the time. See also **rtc ADJ** function.

ADJST hour (**adjust hour)**

This function allows simple adjustment in hours of the time. The range of control is from -9 hours to 9 hours. e.g. if the clock is known to be 1 hour slow then at the **ADJST hour** function use the ▲ button to select **1**, then press the **F** button to accept the change. When the display returns to its normal mode 1 hour will have been added to the time. See also **rtc ADJ** function. Note that the instrument will not allow the adjustment to occur if it would take the time beyond midnight this is to ensure that the date settings are not affected.

SET AL (set alarm number)

The set alarm function allows the user to select the alarm number for which the alarm settings which follow will apply. To view and select an alarm number the ▲ and ▼ buttons must first be pressed simultaneously, the ▲ or ▼ button may then be used to select an alarm number. The choices available are **A 1** to **A32** i.e. alarm number 1 to alarm number 32. The alarm numbers refer to the alarm only and not to a relay number. e.g. if **A3** is chosen then the on time, duration, day etc. alarm functions which follow will be for alarm setting 3. This function also allows the option to select **End**. The **End** option allows exit from the alarm setup loop (see "Introduction" chapter). **Note:** the alarm functions will only be seen if the **di SP rnGE** function is set to hours, minutes etc. It will not be seen if the function is set to display days, months etc.

Some of the alarm operation functions below are marked "x" in place of the relay number. The "x" indicates the alarm number.

Ax ON (alarm on time)

Displays and sets the time at which the chosen alarm will cause the relay will activate. When the alarm on time is reached the relay will activate and will remain activated for the length of time set at the **Ax dur** function if the alarm is set to operate on that day.

Ax dur (alarm duration)

The alarm duration is the period of time for which the relay will remain energised once activated. At the end of the alarm duration the relay will become de-energised unless this relay has an overlapping alarm setting i.e. more than one alarm setting is being used to control the relay. Alarm duration is set in the same units as the display range setting. e.g. if the display is in hours & minutes the duration setting is in hours & minutes.

dAY (day setting)

The day setting allows each day of the week to be selected as on or off. This means that a given alarm setting can be programmed to operate at any given day or days of the week. The options are:

Monday	MON	on or OFF
Tuesday	tUE	on or OFF
Wednesday	WEd	on or OFF
Thursday	thu	on or OFF
Friday	Fri	on or OFF
Saturday	SAt	on or OFF
Sunday	Sun	on or OFF

Ax rLY (choose relay for alarm number)

The functions allows a choice of relay to be used for the alarm number currently selected. Choices are **1** or **2** i.e. relay 1 or 2. For example if alarm number **A 12** has been selected via the **SEt AL** function then choosing **2** at the **A 12 rLY** function will mean that relay 2 will operate at the on time selected by the **A 12ON** function and will remain on for the duration selected via the **A 12 dur** function.

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

Displays and sets the alarm relay 1 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 relay 2 normally open or normally closed)**

Displays and sets the alarm relay 2 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.

br9t (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) - seen only if **F.1 nP** function set to **dULL**

Displays and sets the level for remote input brightness switching, see **F.1 nP** 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 **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.

F.1 nP (remote input function)

Terminals marked “KEY SW” and “GND” 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. Not applicable to LD4-RTC

d.HLd - display hold. Not applicable to LD4-RTC

Hi - peak memory. Not applicable to LD4-RTC

Lo - valley memory. Not applicable to LD4-RTC

Hi Lo - toggle between **Hi** and **Lo** displays. Not applicable to LD4-RTC

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

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

ACCS (access mode)

Access mode (**OFF**, **EASY**, **nONE** or **ALL**) - The access mode function **ACCS** has four possible settings. If set to **OFF** the mode function has no effect or alarm relay operation. The **EASY** option is not applicable to this instrument,. 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. If set to **ALL** then all functions will be accessible via **FUNC** mode i.e. there is no need to enter **CAL** mode. This function provides an alternative to using the **F1 nP** function for easy access or no access mode thereby allowing the remote input to be programmed for an alternative use.

rtc (real time clock display mode)

The real time clock may be set to 12 hour display mode, indicated by **12hr** on the display or 24 hour display mode, indicated by **24 hr** on the display. Use the ▲ or ▼ button to alter the mode if required.

rtc SYNC (real time clock synchronisation)

Displays and sets the clock synchronisation to be used.

Select **NONE** for internal clock chip use.

Select **50 H** to synchronise the clock to 50Hz mains frequency.

Select **60 H** to synchronise the clock to 60Hz mains frequency.

Select **CRYS** to synchronise to the optional 10MHz high accuracy clock crystal if this option is fitted (applies only when the high accuracy crystal option is fitted).

Select **GPS** for global positioning satelite synchronisation (applies only when the GPS option is fitted).

Utc OFSt (universal time offset for GPS synchronisation)

Sets the offset in minutes from universal time from -720 to 720 minutes. When using optional GPS synchronisation the signal transmitted uses a “universal time”. The offset function allows the local offset from this “universal” time to be input in minutes. For example if local time is 10 hours (600 mins.) ahead of GPS universal time then set **Utc OFSt** to **600**.

dSt AJSt (daylight saving time)

Daylight saving time automatic adjustment (**on** or **OFF**). If automatic daylight saving time adjustment is not required set this function to **OFF**. If automatic daylight saving time adjustment is required set this function to **on**. If set to **on** then the four **dSt ON** & **dSt OFF** functions below will appear and will need to be set.

dSt ON (daylight saving Sunday start (LASt . 1St . 2nd . 3rd or **4th))**.

Select 1st, 2nd, 3rd or 4th Sunday in the month to start daylight saving time adjustment. The hour will change at 0200 on the Sunday morning selected. This function will only be seen if **dSt AJSt** is set to **on**.

dSt ON (daylight saving month start).

Allows selection of the month to start daylight saving time adjustment (**JAN . FEb . MAr . APr . MAY . JUN . JLY . Aug . SEP . Oct . NoU** or **dEC**). This function will only be seen if **dSt AJSt** is set to **on**.

dSt OFF (daylight saving Sunday finish).

Select 1st, 2nd, 3rd or 4th Sunday in the month to end daylight saving time adjustment (**LASt . 1St . 2nd . 3rd** or **4th**). The hour will change at 0200 on the Sunday morning selected. This function will only be seen if **dSt AJSt** is set to **on**.

dSt OFF (daylight saving month finish).

Allows selection of the month to end daylight saving time adjustment. Select **JAN . FEb . MAr . APr . MAY . JUN . JLY . Aug . SEP . Oct . NoU** or **dEC**. This function will only be seen if **dSt AJSt** is set to **on**.

COLn (colon operation)

Not applicable to this instrument version.

SEt rtc (set real time clock)

Sets the current time for real time clock mode of operation. To alter the current time setting press, then release the ▲ and ▼ buttons simultaneously when the **SEt rtc** function is displayed. The display will show the time setting. Use the ▲ or ▼ button to alter the time as required.

SEt dAtE (real time clock, set the date)

Sets the current date for real time clock mode of operation. Use the ▲ or ▼ button to alter the date as required. The days will alter first followed by the month.

SEt YEAr (real time clock, set the year)

Sets the current year for real time clock mode of operation. Use the ▲ or ▼ button to alter the year as required.

dI SPrnGE (display range)

The display range function allows selection of various display modes. For example on a 6 digit display a total of seven display options are available, these are:

M.d.Y. to display month.day.year

d.M.Y. to display day.month.year

h.M.S. to display hours.minutes.seconds

MM.dd to display month.day

dd.MM to display day.month

ddd to display days

HH.MM to display hours.minutes

On 4 and 5 digit display models the M.d.Y, d.M.Y and h.M.S options are not available.

rtc AJSt (time adjustment access)

The functions AJSt SECS and AJSt hour are placed at the beginning of the function table to give easy access for basic adjustment. The rtc AJSt function allows the choice of on or OFF. When set to on the operator may gain access to the first two functions simply by entering via FUnC mode (see the first page of this chapter. When set to OFF the operator must enter via CAL mode to gain access to these functions.

Serial output functions

The following functions appear after the SEt OPEr function if the serial retransmission option is fitted. Refer to the “Serial output" appendix for further details.

bAUd rAtE

PrtY

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

Addr

SEr. 1tYPE

SEr.2 tYPE

Returning to the normal measure mode

When the calibration (CAL) mode has been entered and settings changed the instrument must be returned to normal display 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. Returning the instrument to normal display mode also ensures that the display is reset which ensures that any changes to settings made are correctly stored.

5 Function Table

Initial display	Meaning of display	Next display	Default Settings	Record Your Settings
ADJST SECS	Adjust seconds	-99.9 to 99.9	n/a	
ADJST hour	Adjust hour	-9 to 9	n/a	
SET AL	Set alarms	A 1 to A32 plus End	n/a	
Ax ON	Alarm on time	0.00 to 23.59	0.00	See following table
Ax dur	Alarm duration	0.00 to 23.59	0.00	See following table
dAY	Select alarm days	MON on or OFF tUE on or OFF UEd on or OFF thu on or OFF Fri on or OFF SAt on or OFF Sun on or OFF	All set to OFF	See following table
Ax rLY	Select relay to be used	1 or 2	1	See following table
A 1n.o/n.c	Alarm 1 normally open or normally closed	A 1n.o or A 1n.c	A 1n.o	See following table
A2n.o/n.c	Alarm 2 normally open or normally closed	A2n.o or A 1n.c	A2n.o	See following table
brGt	Display brightness level	0 to 15	15	
Function below are accessible only via CAL mode				
dULL	Remote input brightness control	0 to 15	0	
r.1 nP	Remote input	NONE, P.HLd, d.HLd, H, , Lo, H, Lo, SP.Ac, no.Ac or dULL	NONE	
ACCS	Access mode	OFF, EASY, NONE or ALL	OFF	
rtc	Display mode	12hr or 24hr	24hr	
rtc SYNC	Clock sync.	NONE, 50H 60H, CrYS or 9PS	NONE	
Utc OFSt	Universal time offset	-720 to 720 mins.	600	
dSt AJSt	Automatic daylight saving adjustment	on or OFF	OFF	
dSt On	Daylight saving starting Sunday	LASt, 1St, 2nd, 3rd or 4th	LASt	
dSt On	Daylight saving starting month	JAn, FEb, MAr, APr, MAY, JUn, JLY, Aug, SEP, Oct, noU or dEc	Oct	
dSt OFF	Daylight saving ending Sunday	LASt, 1St, 2nd, 3rd or 4th	LASt	
dSt OFF	Daylight saving ending month	JAn, FEb, MAr, APr, MAY, JUn, JLY, Aug, SEP, Oct, noU or dEc	MAr	
COLn	Colon operation	0, 1 or 2	OFF	
SEt rtc	Set clock	Time setting	nn.A	
SEt dAtE	Set date	Value in memory	n/a	
SEt YEAr	Set year	Value in memory	n/a	
di SP rnGE	Set display mode	MM.dd, dd.MM ddd, HH.MM (also M.d.Y, d.M.Y or H.M.S for 6 digit displays)	HH.MM or H.M.S	
rtc AJSt	Time adjustment access	on or OFF	on	

bAud rAtE	Baud Rate Select	300, 600, 1200, 2400, 4800, 9600, 19.2 or 38.4	9600	
PrtY	Parity Select	nonE, EUEn or odd	nonE	
O.PUt	Serial communications mode	UPdt, POLL, Cont or di SP	POLL	
Addr	Address	0 to 31	0	
SEr.1 tYPE	Serial Input 1 Type	nonE, r232, r485 or i 20	nonE	
SEr.2 tYPE	Serial Input 2 Type	nonE, r232 or r485	nonE	

Function shaded are accessible only if the option is fitted

Alarm settings - record your settings here										
Alarm no.	Ax On	Ax dur	dAY							Relay no.
			Mon	Tue	Wed	Thu	Fri	Sat	Sun	
A 1										
A2										
A3										
A4										
A5										
A6										
A7										
A8										
A9										
A 10										
A 11										
A 12										
A 13										
A 14										
A 15										
A 16										
A 17										
A 18										
A 19										
A20										
A2 1										
A22										
A23										
A24										
A25										
A26										
A27										
A28										
A29										
A30										
A3 1										
A32										

6 Specifications

6 .1 Technical Specifications

Function:	Real time clock
Display modes:	12 or 24 hour clock , date or number of days display
Clock Synchronisation:	50Hz mains, 60Hz mains, internal clock reference, optional high accuracy crystal or optional GPS satellite synchronisation
Retention:	Display will blank during periods of no power - battery backed clock chip keeps time during these periods
Accuracy:	50 or 60Hz mains sync. - accurate to mains frequency. Where mains frequency is controlled this gives a typical accuracy of ±1 second. Internal clock chip - ±30 seconds. per month. Optional high accuracy crystal - ±3 seconds. per month. GPS - accurate to GPS system ±0.1 second.
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
Power Consumption:	AC supply 15 VA max, DC supply, consult supplier (depends on display type & options)
Outputs:	2 x setpoint relays, form A, rated 5A @ 240VAC resistive load

6 .2 Options

Serial Communications:	RS232 input for synchronisation RS485 input for synchronisation
Clock synchronisation:	10MHz high accuracy clock crystal GPS satellite synchronisation

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)

Appendix - Serial communications

RS232/485 Operation and Commands

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

d. SP - Image Display Mode:

In image display mode the display value is sent via RS232/485 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.

This mode is used when the LD4-RTC is used as a master clock in a master/slave clock system. The master clock will automatically update any other slave clocks attached to it via serial communications. All slave displays must be set to operate in **POLL** mode.

POLL - Host Controlled Transmit Mode (ASCII):

This mode requires a host computer or PLC to poll the instrument to obtain display or other information. The format for the host command is as follows:-

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

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)

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 the display e.g. HOURS:MINUTES depending on the dI SP rnGE function setting.

Format of returned data is:-

<ACK>PA<SP>HH:MM:SS<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
<SP> is a space (32 Dec, 20 Hex)
HH: is the time in hours followed by a colon in ASCII
MM:is the time in minutes followed by a colon in ASCII
SS is the time in seconds in ASCII
<CR> is a Carriage Return (13 Dec, 0D Hex)

The actual transmitted data will depend on the display range selected at depending on the dI SP rnGE function setting and the number of display digits fitted.

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

Instructs unit to return the secondary display value. In the LD4-RTC the secondary display value returned will be the number of seconds elapsed during the current day (i.e. since midnight) to one decimal point.

Format of returned data is:-

<ACK>SAYYYY.Y<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
YYYYY.Y is the number of seconds since midnight value in ASCII
<CR> is a Carriage Return (13 Dec, 0D Hex)

Transmit Tertiary Display Value: <STX>TA<CR>

Instructs unit to return the tertiary display value. In the LD4-RTC the tertiary display value returned will be the date in YYYY-MM-DD format (YEAR-MONTH-DAY).

Format of returned data is:-

<ACK>TAYYYY-MM-DD<CR>

Where:<ACK> is Acknowledge (6 Dec, 06 Hex)
T echo command received 'T' (84 Dec, 54 Hex)
A is the responding unit's address
YYYY- is the year followed by a hyphen in ASCII
MM- is the month followed by a hyphen ASCII
DD is the day in ASCII
<CR> is a Carriage Return (13 Dec, 0D Hex)

Transmit Fourth Display Value: <STX>QA<CR>

Instructs unit to return the fourth display value. In the LD4-RTC the fourth display value returned will be the date in YYYY-MM-DD format (YEAR-MONTH-DAY) followed by a space followed by the time in HH:MM:SS format (e.g. HOURS:MINUTES: SECONDS depending on the dI SP rnGE function setting).

Format of returned data is:-

<ACK>QAYYYY-MM-DD<SP>HH:MM:SS<CR>

Where:<ACK> is Acknowledge (6 Dec, 06 Hex)
Q echo command received 'T' (81 Dec, 51 Hex)
A is the responding unit's address
YYYY- is the year followed by a hyphen in ASCII
MM- is the month followed by a hyphen in ASCII
DD is the day in ASCII
<SP> is a space (32 Dec, 20 Hex)

HH: is the time in hours followed by a colon in ASCII
MM:is the time in minutes followed by a colon in ASCII
SS is the time in seconds in ASCII
<CR> is a Carriage Return (13 Dec, 0D Hex)

The actual transmitted data will depend on the display range selected at depending on the **di SP rnGE** function setting and the number of display digits fitted.

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.

Serial output mode functions

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 **nonE** , **r232** or **r485**.

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.

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.