RM4-AI

DIN Rail Mount

Process Monitor/Controller
Inputs from 0-5Amps AC
True RMS Display

Operation & Instruction Manual

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Table of Contents

1 Introduction

This manual contains information for the installation and operation of the RM4-AI Din rail monitor/controller. The RM4 is a general purpose instrument which may be configured to accept inputs of 0 to 5 Amps AC. For larger currents a current transformer can be used to with the instrument then scaled to represent the larger current or in any engineering units. The RM4-AI displays in true RMS. A user selectable "DC" link allows the DC components of a waveform to be taken into account in the true RMS calculation or ignored.

One standard inbuilt relays provide alarm/control functions. Two separate sets of calibration scaling values can be stored with the display choice being made via the remote input.

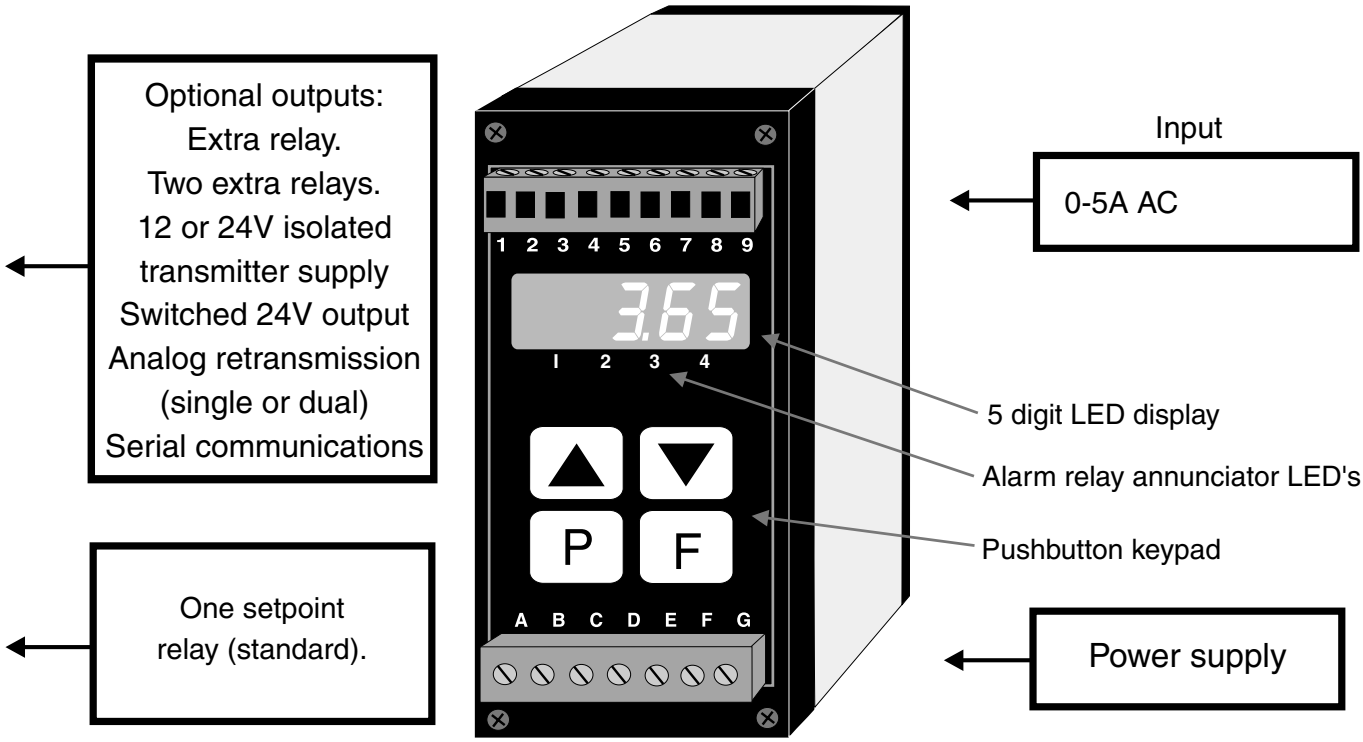
Various combinations of one or two optional extra relays, analog (4-20mA, 0-1V or 0-10V) retransmission/PI control or serial (RS232, RS485 or RS422) communications may also be provided as an option. Alarms and retransmission may be set to operate from the live input value, the display value or to follow either the tare, peak hold, display hold, peak memory or valley memory remote input operations.

Unless otherwise specified at the time of order, your RM4 has been factory set to a standard configuration. Like all other RM4 series instruments the configuration and calibration is easily changed by the user. Initial changes may require dismantling the instrument to alter PCB links, other changes are made by push button functions.

Full electrical isolation between power supply, input voltage or current and retransmission output is provided by the RM4, thereby eliminating grounding and common voltage problems. This isolation feature makes the RM4 ideal for interfacing to computers, PLCs and other data acquisition devices.

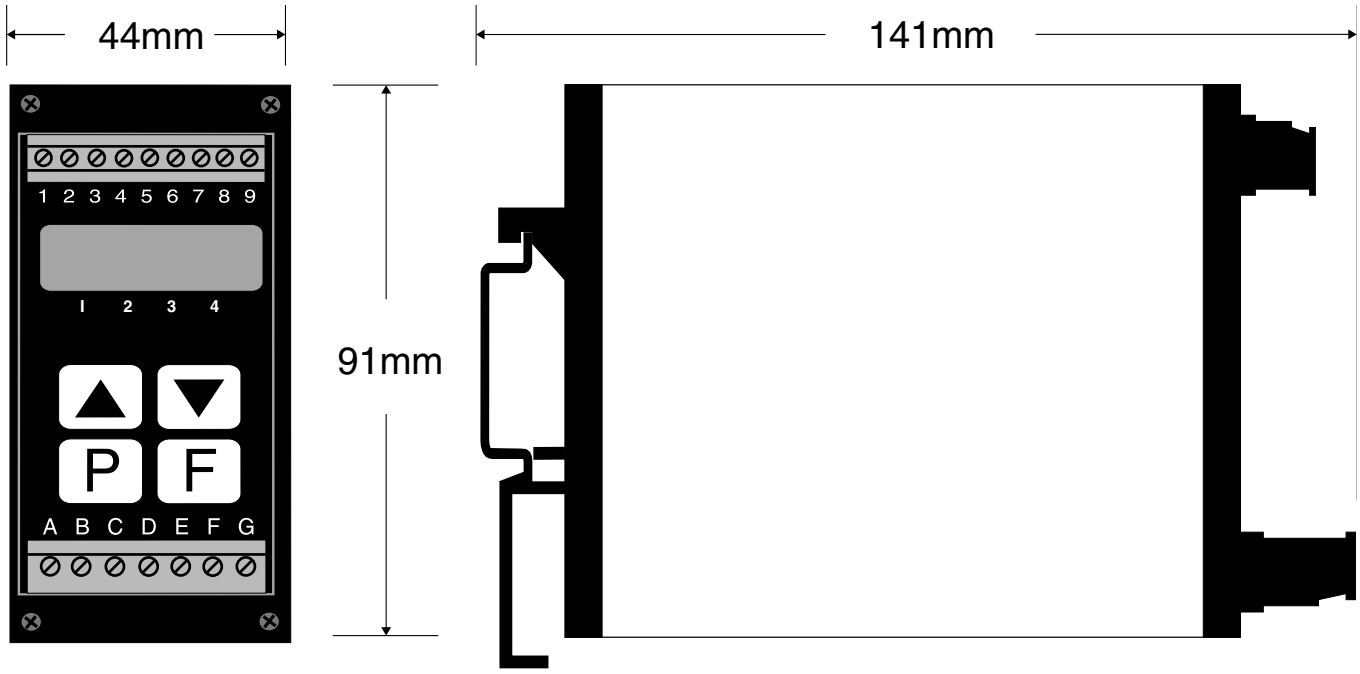
The RM4 series of DIN Rail Process Modules are designed for high reliability in industrial applications. The 5 digit LED display provides good visibility, even in areas with high ambient light levels. A feature of the RM4-AI is the programmable display brightness function, this allows the unit to be operated with low display brightness to reduce the instrument power consumption and to improve readability in darker areas. To reduce power consumption in normal use the display can be programmed to automatically dim or blank after a set time.

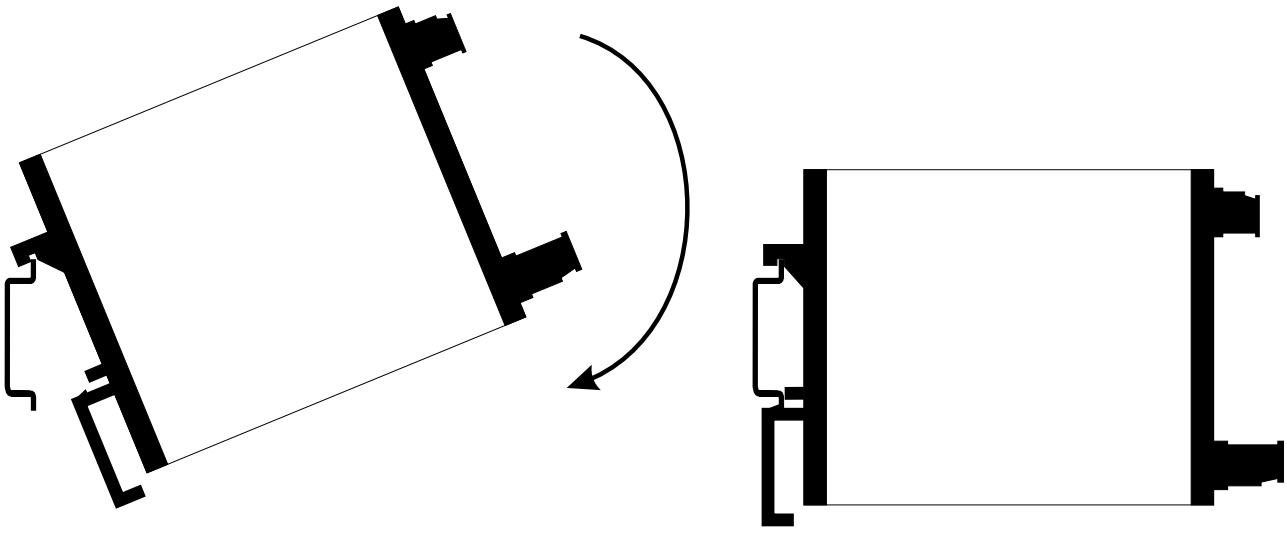
Inputs & outputs



2 Mechanical installation

The RM4 is designed for DIN rail, horizontal mounting. The instrument snaps on 35mm DIN standard rails (EN50022). Cut the DIN rail to length and install where required. To install the RM4, simply clip onto the rail as shown below. To remove the RM4 lever the lower arm downwards using a broad bladed screwdriver to pull the clip away from the DIN rail.





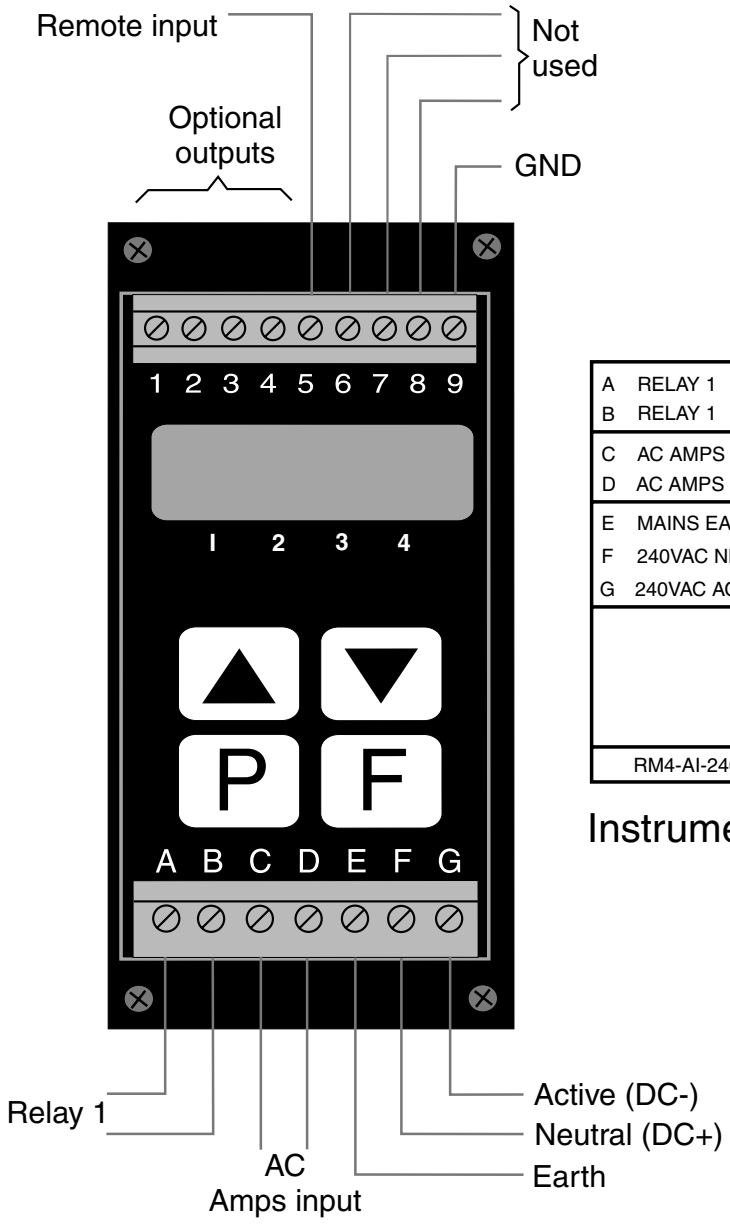
3 Electrical installation

The RM4 Meter 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 allow for wires of up to 2.5mm^2 to be fitted for power supply, input and relays 1 or 1.5mm^2 for remote input and optional outputs. 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. Acknowledgement of correct operation may be obtained by applying an appropriate input to the instrument and observing the resultant reading.

3 .1 Optional output wiring

If optional outputs are fitted to the instrument refer also to the separate “RM4 DIN Rail Meter Optional Output Addendum” booklet.

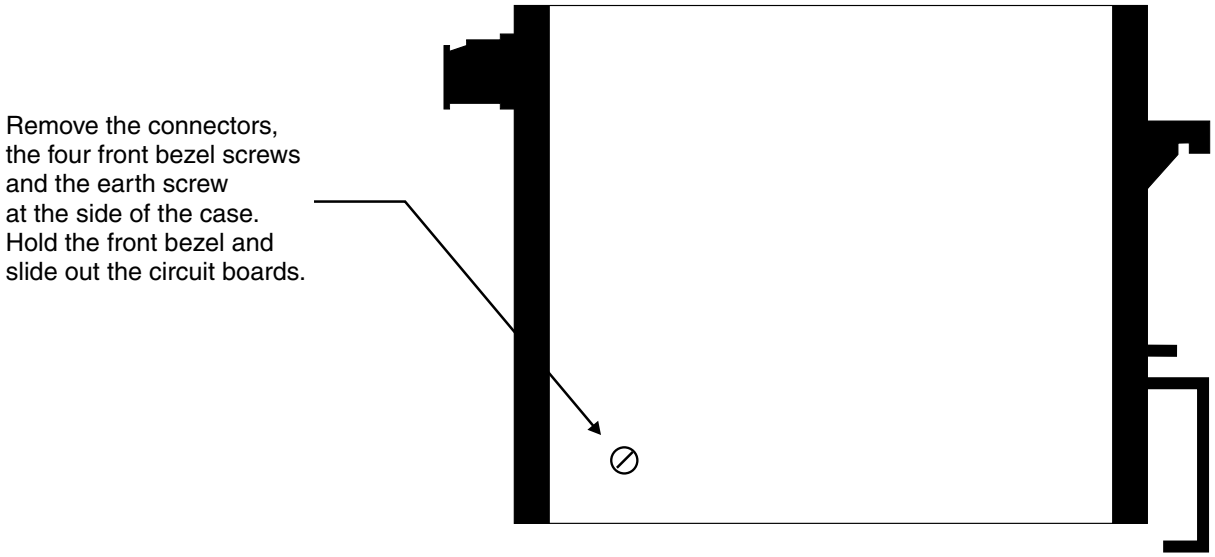


A	RELAY 1	COM	1
B	RELAY 1	N/O	2
C	AC AMPS INPUT		3
D	AC AMPS INPUT		4
E	MAINS EARTH		5 REMOTE INPUT
F	240VAC NEUTRAL		6 NOT USED
G	240VAC ACTIVE		7 NOT USED
			8 NOT USED
			9 GND
RM4-AI-240-5E			SERIAL No.

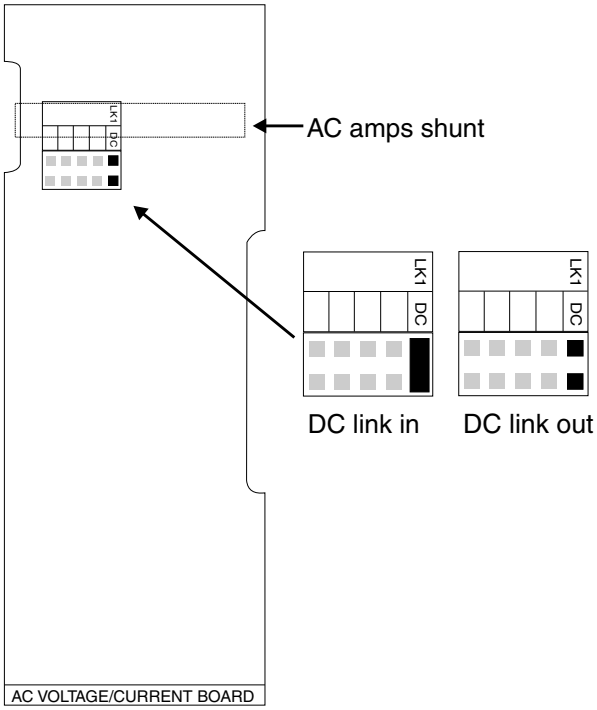
Instrument data label (example)

3 .2 Configuring the input board

Remove the circuit board from the case following the instructions below.



The main circuit board contains no user selectable links. The AC amps input board plugs into the main board at connector P2 which is marked "INPUT BOARD". Link settings for the AC amps input board are as shown below. Only one user selectable link is fitted to the AC amps board, this is the "DC" link LK1. If LK1 is in then any DC components in the waveform will be taken into account in the true RMS calculations. If LK1 is out then any DC components in the input will be ignored.



4 Explanation of functions

The RM4 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 alarm relay, preset value & display brightness functions.

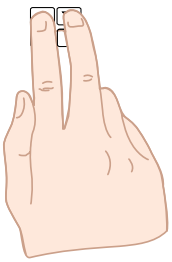
CAL mode (power up sequence plus push button sequence) allows access to all functions including calibration parameters.

Push buttons located at the front of the instrument 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. 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.

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



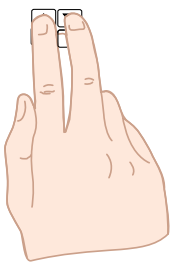
3. Within 2 seconds of releasing the F button press, then release the ▲ and ▼ buttons together. The display will now indicate FUNC followed by the first function.

Note: 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.

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.



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.

Function	Description
C.SEt	Analog control setpoint - seen only when the analog retransmission option is fitted and rEC ctrl is set to on. Refer to the separate “RM4 DIN Rail Meter Optional Output Addendum” booklet supplied when this option is fitted.
AxLo	Alarm relay low setpoint - see “Alarm relays” chapter. Displays and sets each alarm low setpoint value.
AxHi	Alarm relay high setpoint - see “Alarm relays” chapter. Displays and sets each alarm high setpoint value.
AxHY	Alarm relay hysteresis [deadband]) - see “Alarm relays” chapter. Displays and sets the alarm hysteresis limit. This value is common for both high and low setpoint values.
Axtt	Alarm relay trip time - see “Alarm relays” chapter. Displays and sets the alarm trip time in seconds/tenths of seconds. This value is common for both alarm high and low setpoint values.
Axrt	Alarm relay reset time - see “Alarm relays” chapter. Displays and sets the alarm reset time in seconds/tenths of seconds. This value is common for both alarm high and low setpoint values.
Axn.o or Axn.c	Alarm relay normally open or normally closed - see “Alarm relays” chapter. Displays and sets the alarm relay action to normally open (de-energised) or normally closed (energised), when no alarm condition is present.
Ax.SP, Ax.t 1, Ax.t2 etc.	Alarm relay operation independent setpoint or trailing - see “Alarm relays” chapter.
brgt	Display brightness - displays and sets the digital display brightness. The display brightness is selectable from 1 to 15 where 1 = lowest intensity and 15 = highest intensity. This function is useful for reducing glare in darkened areas.
duLL	Remote display brightness - displays and sets the level for remote input brightness switching, see "Remote input functions" chapter. See also d.OFF SECS function below.
d.oFF SECS	Auto display dimming timer - this function allows a time to be set after which the display brightness (set by the brgt function) will automatically be set to the level set at the duLL function. The auto dimming feature can be used to reduce power consumption. The function can be set to any value between 0 and 9999 seconds. A setting of 0 disables the auto dimming. The display brightness can be restored by pressing any of the instruments front push buttons. The display brightness will also be restored whilst one or more alarm relays is activated.
CAL mode functions. Entry via CAL mode (see first page of this chapter) must be made in order to view and adjust the functions which follow.	
rEC_	Analog recorder/retransmission output low value - seen only when the analog retransmission option is fitted. Refer to the separate “RM4 DIN Rail Meter Optional Output Addendum” booklet supplied when this option is fitted. Displays and sets the analog retransmission output low value (4mA or 0V) in displayed engineering units. e.g. for a 4-20mA retransmission if it is required to retransmit 4mA when the display indicates 0 then select 0 at this function via the ▲ or ▼ button.
rEC¯	Analog recorder/retransmission output high value - seen only when the analog retransmission option is fitted. Refer to the separate “RM4 DIN Rail Meter Optional Output Addendum” booklet supplied when this option is fitted. Displays and sets the analog retransmission output high value (20mA, 1V or 10V) in displayed engineering units. e.g. if it is required to retransmit 20mA when the display indicates 500 then select 500 at this function via the ▲ or ▼ button.

drnd	Display rounding - displays and sets the display rounding value. This value may be set to 0 - 5000 displayed units. Display rounding is useful for reducing the instrument resolution without loss of accuracy in applications where it is undesirable to display to a fine tolerance. (example: if set to 10 the instrument will display in multiples of 10).
dCPt	Decimal point selection - displays and sets the decimal point. By pressing the ▲ or ▼ keypads the decimal point position may be set. The display will indicate as follows: 0 (no decimal point), 0.1 (1 decimal point place), 0.02 (2 decimal point places), 0.003 (3 decimal point places) or 0.0004 (4 decimal point places)
FLtr	Digital filter - displays and sets the digital filter value. Digital filtering is used for reducing susceptibility to short term interference. The digital filter range is selectable from 0 to 8, where 0 = none and 8 = most filtering. A typical value for the digital filter would be 3. The digital filter uses a weighted averaging method of filtering which will increase the display update time at higher settings.
rEC ctrl	Analog control on or off - seen only when the analog retransmission option is fitted. Refer to the separate "RM4 DIN Rail Meter Optional Output Addendum" booklet supplied when this option is fitted.
C.SPn	Control span - seen only when the analog retransmission option is fitted and rEC ctrl is set to on. Refer to the separate "RM4 DIN Rail Meter Optional Output Addendum" booklet supplied when this option is fitted.
C.Pb	Control proportional gain - seen only when the analog retransmission option is fitted and rEC ctrl is set to on. Refer to the separate "RM4 DIN Rail Meter Optional Output Addendum" booklet supplied when this option is fitted.
C.Po	Control proportional offset - seen only when the analog retransmission option is fitted and rEC ctrl is set to on. Refer to the separate "RM4 DIN Rail Meter Optional Output Addendum" booklet supplied when this option is fitted.
C.I g	Control integral gain - seen only when the analog retransmission option is fitted and rEC ctrl is set to on. Refer to the separate "RM4 DIN Rail Meter Optional Output Addendum" booklet supplied when this option is fitted.
CI L.H	Control integral limit high - seen only when the analog retransmission option is fitted and rEC ctrl is set to on. Refer to the separate "RM4 DIN Rail Meter Optional Output Addendum" booklet supplied when this option is fitted.
CI L.L	Control integral limit low - seen only when the analog retransmission option is fitted and rEC ctrl is set to on. Refer to the separate "RM4 DIN Rail Meter Optional Output Addendum" booklet supplied when this option is fitted.
rEC SPAC	Control setpoint access on or off - seen only when the analog retransmission option is fitted and rEC ctrl is set to on. Refer to the separate "RM4 DIN Rail Meter Optional Output Addendum" booklet supplied when this option is fitted.
CAL 1 & CAL2	Calibration scaling points - see "Calibration" chapter. Displays and sets the independent calibration/scaling points of the input to the display. See "Calibration" chapter for full details of setting up.
USEr En4	This function is not used on RM4-AI instruments
USEr En20	This function is not used on RM4-AI instruments
UCAL	Uncalibration- see "Calibration" chapter. Used to set the instrument back to the factory calibration values.

P.but	P button function - the function of the P button is programmable in the same manner as the remote input (see r.i nP below). The P button selection will override the selection made under the r.i nP function if both have the same functions selected. Upon reaching the P.but function the choices shown below are available, see "Remote input functions" chapter for a full description of each choice. Note: To prevent accidental operation of the P button in the tArE or 2Er0 functions it is necessary to hold the button in for approx. 2 seconds to perform the selected operation. When in Lo .Hi or Hi Lo the high/low values held in memory can be reset (i.e. the memory is cleared) by holding the P button pressed for 2 seconds. Choices available for the P button function are: nonE No function, Hi Peak memory, Lo Valley memory, Hi Lo Toggles between peak and valley memory, tArE Push button tare or nett or gross display function (toggles), 2Er0 Push button zero.
r.i nP	Remote input - displays and sets the special function input selection, see “Remote input functions” chapter.
ACCS	Alarm relay access mode - see “Alarm relays” chapter.
SPAC	Setpoint access - sets the FUnC mode access to the alarm relays set points. The following choices are available; A 1 - Allows setpoint access to alarm 1 only. A 1-3 - Allows access to alarms 1 and 3 only etc. up to the maximum number of relays fitted. To allow this function to operate the remote input r.i nP function must be set to SPAC.
SAFt	Not used in RM4-AI instrument leave setting at OFF.
A1 to A4	Alarm mode - The alarms can be set to operate from the live input value (Li uE), the tare value (tArE), the batch value (btch), the peak hold value (P.HLd), the display hold (dHLd), the peak memory (Hi) or the valley memory (Lo). Ensure that the r.i nP or P.but function is also set to the desired operation. See “Alarm relays” chapter for further information.
rEC and SErL	Analog retransmission mode - The description below applies to both the analog retransmission mode (4-20mA or DC Volts) and the serial (RS232, RS485 or RS422) communications. Refer to the separate “RM4 DIN Rail Meter Optional Output Addendum” booklet supplied when this option is fitted. The serial communications mode is set via the SErL function. The following choices are available for analog or serial retransmission operation mode: Li uE - live input mode. The retransmission will follow the electrical input and will not necessarily follow the 7 segment display. For example if the remote input is set for peak hold operation then when the remote input is closed the 7 segment display will only show the peak value but the retransmission will be free to change to follow the electrical input. tArE - tare mode. The retransmission value will tare (fall to zero) along with 7 segment display when the remote input tare function is operated. If the remote input toggles the 7 segment display to show gross (grOS) then the 7 segment display will change to show the gross value but the retransmission will not respond (see Li uE for alternative operation). P.HLd - peak hold mode. The 7 segment display and retransmission value will indicate the peak value only whilst the peak value function is operated via a contact closure on the remote input i.e. the 7 segment display and retransmission can rise but not fall whilst the remote input switch is closed. When the remote input switch is opened the retransmission value will remain fixed i.e. it will not rise or fall, although the 7 segment display value will be free to alter. This peak retransmission output can be cleared by closing the remote input switch for another operation or by removing power from the instrument. Note: In this mode the retransmission will show a zero reading until the remote input is operated for the first time after switch on. d.HLd - display hold mode. The 7 segment display and retransmission value will be held whilst the remote input display hold switch is closed. When the switch is opened the retransmission value will remain fixed at the held value although the 7 segment display value will be free to alter. The held retransmission output can be cleared by closing the remote input switch for another operation or by removing power from the instrument. Hi - peak (max.) memory mode. With the peak remote input switch open the retransmission will indicate the peak value in memory i.e. the retransmission output can rise but not fall. The retransmission output can be reset by clearing the memory. The memory may be cleared either by closing the remote input switch for approximately 2 seconds or by removing power to the instrument.

rEC and SErL continued	Lo - valley (min.) memory mode. With the valley remote input switch open the retransmission will indicate the valley (min.) value in memory i.e. the retransmission output can fall but not rise. The retransmission output can be reset by clearing the memory. The memory may be cleared either by closing the remote input switch for approximately 2 seconds or by removing power to the instrument. di SP - display mode. The retransmission output will follow whatever value is on the 7 segment display. For example if the remote input is set to tArE then the 7 segment and retransmission output will indicate the tared value and both will also be changed if the remote input toggles the displays between nEtt and grOS. If the rEC function had been set to tArE rather than di SP then the retransmission output would not respond to the grOS toggle.
bAud	Set baud rate - seen only with serial output option -Refer to the separate “RM4 DIN Rail Meter Optional Output Addendum” booklet supplied when this option is fitted. Select from 300. 600. 1200. 2400. 4800. 9600. 19.2 or 38.4.
PrtY	Set parity - seen only with serial output option - Refer to the separate “RM4 DIN Rail Meter Optional Output Addendum” booklet supplied when this option is fitted. Select parity check to either nONE, EVEn or odd.
O.Put	Set RS232/485 interface mode - seen only with serial output option - Refer to the separate “RM4 DIN Rail Meter Optional Output Addendum” booklet supplied when this option is fitted. Select , Cont or POLL Allows user to select the RS232/485 interface operation as follows:- di SP Sends image data from the display without conversion to ASCII. Cont Sends ASCII form of display data every time display is updated. POLL Controlled by computer or PLC as host. Host sends command via RS232/485 and instrument responds as required.
Addr	Set unit address for polled (POLL) mode (0 to 31)) - seen only with serial output option - Refer to the separate “RM4 DIN Rail Meter Optional Output Addendum” booklet supplied when this option is fitted. Allows several units to operate on the same RS485 interface reporting on different areas etc. The host computer or PLC may poll each unit in turn supplying the appropriate address. The unit address ranges from 0 to 31 (DEC) but is offset by 32 (DEC) to avoid clashing with ASCII special function characters (such as <> and <CR>). Therefore 32 (DEC) or 20 (HEX) is address 0, 42 (DEC) or 2A (HEX) addresses unit 10.
SErL	Serial communications output mode - seen only with serial output option - see rEC function for description. Refer to the separate “RM4 DIN Rail Meter Optional Output Addendum” booklet supplied when this option is fitted.

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 .1 Error Messages

"----" - This display indicates that the actual input is higher than the selected input range e.g. 0 to 10V range selected but the input is more than 10V. Check the input range selected and if this is OK then measure the input.

"-or-" - This display indicates an overrange reading. This means that the instrument is not being able to display the number because it is too large e.g. above 99999 . Check that the calibration scaling figures are correct.

SPAnErr - this message indicated that the input was not changed by a sufficient percentage during calibration - see "Calibration" chapter.

5 Function table

Initial display	Meaning of display	Next display	Default Setting	Record Your Settings
C.SEt	Analog PI control setpoint	Value in memory	0	
AxLo	Alarm x low setpoint value	Setpoint value or OFF	OFF	See following table
AxHi	Alarm x high setpoint value	Setpoint value or OFF	1000	See following table
AxHY	Alarm x hysteresis	Hysteresis value in measured units	10	See following table
Axtt	Alarm x trip time	No of seconds before relay x trips	0	See following table
Axrt	Alarm x reset time	No of seconds before relay x resets	0	See following table
Axno or Axnc	Alarm x action N/O or N/C	Axno or Axnc	Axno	See following table
Ax.SP or Ax.t 1	Alarm x independent or trailing setpoint 1,2 etc.	Ax.SP or Ax.t 1 etc.	Ax.SP	See following table
brgt	Digital display brightness	1 to 15 (15 = highest brightness)	15	
dULL	Remote brightness control	0 to 15 (15 = highest brightness)	1	
d.oFF SECS	Display auto dimming timer (seconds)	0 to 9999	0	
rEC_	Recorder output low limit	Value in memory	0	
rEC^	Recorder output high limit	Value in memory	100	
Functions below are accessible via CAL mode only				
drnd	Display rounding selects resolution	Value in memory	1	
dCPt	Display decimal point	Decimal Pt position (e.g. 0. 1 or 0.02)	0	
FLtr	Digital filter range 0 to 8	0 to 8 (8 = most filtering)	2	
rEC ctrl	Analog PI control on or off	on or OFF	OFF	
C.SPn	Analog PI control span	Value in memory	0	
C.Pg	Analog PI control proportional gain	- 19.999 to 32.767	1.000	
C.P0	Analog PI control proportional offset	0 to 100	0	
C.I g	Analog PI control integral gain	- 19.999 to 32.767	0	
CI L.H	Analog PI control integral limit high	0 to 100	100	
CI L.L	Analog PI control integral limit low	0 to 100	100	
rEC SPAC	Analog PI control setpoint access on	on or OFF	on	
CAL 1	Calibration - first point	See calibration chapter	n/a	
CAL2	Calibration - second point	See calibration chapter	n/a	
USEr En4	Not used in RM4-AI	Value in memory	n/a	

USEr En20	Not used in RM4-AI	Value in memory	n/a	
UCAL	Uncalibrate	CAL CLr	n/a	
r.1 nP	Remote Input 1	nonE .P.HLd .d.HLd . Hi .Lo .Hi Lo .tArE . 2Er0 .SP.Ac .no.Ac . CAL.S .or dULL	nonE	
P.but	P Button function	nonE . Hi . Lo . Hi Lo . tArE . or 2Er0	nonE	
ACCS	Setpoint access mode	OFF, EASY or nonE	OFF	
SPAC	Setpoint access (only seen if 2 or more relays fitted)	A 1 .A 1-2 .A 1-3 etc.	A 1	
S9rt	Not used in RM4-AI	OFF or on	OFF	
A 1	Alarm mode for relay 1	Lo uE, tArE, P.HLd . d.HLd . Hi . Lo or di SP	Lo uE	
Ax	Alarm mode for subsequent relays	Lo uE, tArE, P.HLd . d.HLd . Hi . Lo or di SP	Lo uE	
rEC	Retransmission mode	Lo uE, tArE, P.HLd . d.HLd . Hi . Lo or di SP	Lo uE	
bAUd rAtE	Baud rate	300, 600, 1200, 2400, 4800, 9600 . 19.2 or 38.4	9600	
PrtY	Parity select	nonE .EUEn or Odd	nonE	
O.Put	Output continuous or controlled	POLL .Cont or di SP	Cont	
Addr	Set unit address for poll mode	0 to 3 1	0	
SErL	Serial communications mode	Lo uE, tArE, P.HLd . d.HLd . Hi . Lo or di SP	Lo uE	

Note: Functions in the shaded areas on this table will be displayed only when those particular options are fitted.

Settings for relays - record settings here				
	A1	**A2**	**A3**	**A4**
AxLo		n/a		
AxHi		n/a		
AxHY		n/a		
Axtt		n/a		
Axrt		n/a		
Axn.o or Axn.c		n/a		
Ax.SP or Ax.t 1	n/a	n/a		
Ax		n/a		

6 Alarm relays

The RM4 is provided with one alarm relays as standard. One or two extra optional independent alarm relays may also be provided, these relays are designated **A1** , **A3** etc. (note alarm 2 function e.g. **A2Lo** should be ignored in the RM4-AI since this relay is not fitted). Each alarm has the following parameters which may be set by the user:

1. Low trip point, adjustable in measurement units.
2. High trip point, adjustable in measurement units.
3. Alarm hysteresis, adjustable in measurement units.
4. Alarm trip time, adjustable in one second steps.
5. Alarm reset time, adjustable in one second steps.
6. N/O or N/C relay operation.
7. Independent or trailing alarms (available on relays 2 and upwards)
8. Alarm to follow the display value, the tare value or the batch value.

Note that the alarm settings are not changed when calibration scaling channels are changed. The alarms operate in the following way:

If the measured value is above the High Trip Point, or below the Low Trip Point, the alarm trip timer starts. This timer is reset if the measured value drops below the High Trip Point or above the Low Trip point. When the alarm trip timer's time exceeds the Trip delay time, the alarm is operated.

When the alarm has tripped, the measured value is compared to the High Set Point less the Hysteresis value and the Low Set Point plus the Hysteresis value. If it is less than the High Set Point less the Hysteresis value and greater than the Low Set Point plus the Hysteresis value, the alarm is reset.

Alarm low setpoint

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

Alarm high setpoint

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

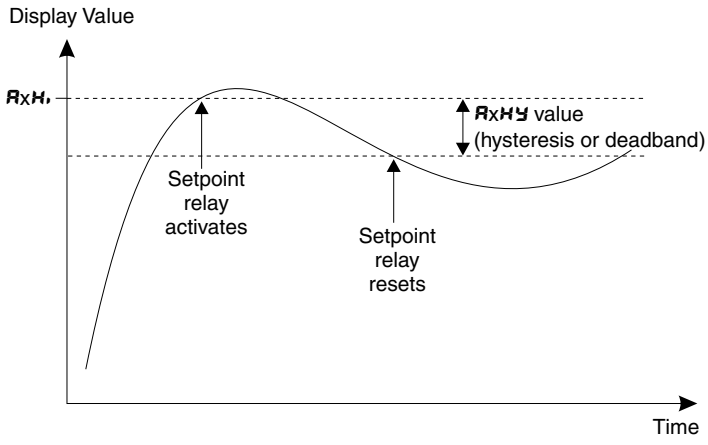
Alarm hysteresis

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

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

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

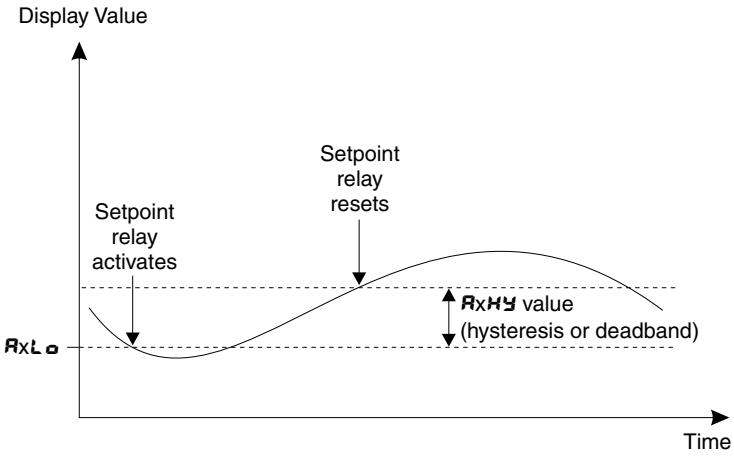
In the low alarm mode, once the alarm is activated the input must rise above the setpoint value plus the hysteresis value to reset the alarm.



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

The hysteresis units are expressed in displayed engineering units.

The alarm trip time determines how long the measured value has to be above the high trip point or below the low trip point before an alarm is given. This can be used to prevent false alarms on noisy inputs. The value is set in seconds, with a range of 0 to 60 seconds. For normal operation a delay of three to five seconds is suitable.



Alarm Reset Time

The alarm reset time determines how long the measured value has to be below the high trip point or above the low trip point before the alarm is reset. The value is set in seconds, with a range of 0 to 60 seconds. For normal operation a delay of zero seconds is suitable.

Alarm Relay N/O or N/C Operation

Each alarm may be programmed to operate as a normally open (N/O e.g. A1 no) or normally closed (N/C e.g. A2nc) device. A N/O relay is de-energised when no alarm condition is present and is energised when an alarm condition is present. A N/C relay is normally energised and is de-energised when an alarm condition is present. The N/C mode is useful for power failure detection.

Trailing or independent set points

A function exists to allow relays, other than relay 1, to be used as independent relays with their own set points or they may be made to "trail" another relays setpoint. For example if A3.SP is selected then alarm 3 will act as an independent relay. If A3.t 1 is selected then the alarm 3 relay will trail alarm 1 relay. With A3.t 1 selected if alarm 1 high setpoint is set to 50 and alarm 3 high set point set to 20 then alarm 3 relay will operate at a display of 70 (50 + 20). Alternatively alarm 3 could be set to operate at 30 (50 - 20) by setting alarm 3 high setpoint to -20. Note: any reference to A2 in this function should be ignored since alarm relay 2 is not fitted to the RM4-AI.

Trailing Alarm Table
Showing Possible Alarm Assignments

	A3	A4
A 1	A3.t 1	A4.t 1
A3		A4.t 3

Access mode

The access mode function ACCS has three possible settings namely OFF, EASY and NONE. If set to off the mode function has no effect on alarm relay operation. If set to EASY the easy alarm access mode will be activated, see details below. 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.

6.1 Easy Alarm Access

The RM4 has an easy alarm access facility which allows operator access to the selected alarm setpoints (only to the setpoints selected at the SPAC function) simply by pressing the F button. The first setpoint will then appear and changes to this setpoint may be made to this setpoint via the ▲ or ▼ buttons. Press the F button to accept any changes or to move on to the next setpoint.

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

1. Either the ACCS function must be set to EASY or the r.i nP function must be set to SP.AC. If the ACCS function is used the remote input function r.i nP can be assigned to a different use.

2. The selected relays must have a setpoint, nothing will happen if all the alarm relay 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 1-3 then the easy access will work only with alarm relays 1 and 3 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 no entry to FUNC mode unless the instrument is powered up in CAL mode.

6.2 Alarm mode

The alarm mode functions (A1 to A4) allow the alarm relays to follow either the live input value (L.uE), the tare function (tARE), the peak hold function (P.HLd), the display hold (d.HLd), the peak memory (H.), valley memory (Lo) or display value (d1 SP). Other than L.uE or d1 SP operation a remote input or P button must also be set to the function required.

Example 1- A1 is set to L.uE

The alarm relay will follow the electrical input and will not necessarily follow the 7 segment display. For example if the remote input is set for peak hold operation then when the remote input is closed the 7 segment display will only show the peak value but the relay will be free to follow the live electrical input. With the alarm function set to follow the live input value the alarm will activate at the alarm high/low settings. Thus if A1H. is set to 100 then alarm 1 will activate if the live electrical input goes above what would normally result in a display value of 100 or more.

Example 2 - A1 is set to tARE and F.1 nP (remote input special function) is set to tARE.

Assume that A1H. is set to 100 and that the instrument is given a remote tare when the display reads 40. Once the instrument is tared the display will read 0. Alarm 1 is set to follow the tare value and will therefore operate when the (nett) display becomes greater than 100.

Note: If the instrument had been tared when A1 was set to d1 SP then the alarm will follow the gross value not the tared value and will operate if the nett display is above 60 (i.e. the gross value is above 100). The low alarm setting operates in the same manner e.g. if A1Lo was set to 100 and the display was tared at a reading of 40 then the low alarm would operate when the display reads 60 or below.

Example 3 - A1 is set to P.HLd and F.1 nP is set to P.HLd

If A1H. is set to 100 then it will operate whenever the display shows a value over 100. If the peak value exceeds 100 when the remote input is closed then alarm 1 will activate and will not reset until the remote input opens and the display value falls below 100.

Example 4 - A1 is set to d.HLd and F.1 nP is set to d.HLd

If A1Lo is set to 5 then it will operate whenever the display shows a value below 5. If the display hold remote input is operated at a value above 5 then the alarm will not activate whilst the remote input remains closed, no matter what the electrical input. Likewise if the remote input is operated at a value below 5 then alarm will not de activate until the remote input is opened and the display value goes above 5.

Example 5 - A1 is set to H. and F.1 nP is set to H.

If A1H. is set to 50 and the peak memory value becomes greater than 50 then alarm 1 will be constantly activated at this point and will only become de activated when the memory is reset at a value below 50. The memory can be reset by holding the remote input closed for 2-3 seconds. Note that in this case the alarm can be activated even if the display value is less than the alarm setting, this is because the alarm is activated by the value in peak memory rather than the display value.

Example 6 - A1 is set to Lo and F.1 nP is set to Lo

If A1LO is set to 280 and the valley memory value becomes less than 280 then alarm 1 will be constantly activated at this point and will only become de activated when the memory is reset at a value above 280. The memory can be reset by holding the remote input closed for 2-3 seconds. Note that in this case the alarm can be activated even if the display value is greater than the alarm setting, this is because the alarm is activated by the value in valley memory rather than the display value.

Example 7 - A1 is set to d1 SP

With A1 set to d1 SP alarm relay 1 will activate whenever the value on the display at the time is above the A1H. setting or below the A1Lo setting.

Optional relays

Two alarm relays are fitted as standard. One or two extra relays are optionally available. Refer to the separate “RM4 DIN Rail Meter Optional Output Addendum” booklet supplied when this option is fitted.

Switching Inductive Loads

If the alarm relay is to be used to switch an inductive load, such as a solenoid, it is advisable to use a suppressor circuit either across the load or across the relay contacts. Switching inductive loads without a suppressor circuit can cause arcing at the relay contacts resulting in electrical interference and wear on the contacts. A typical suppressor circuit consists of a 100Ωresistor in series with a 0.1uF capacitor, this circuit is then placed across the load or relay contacts. Ensure that the resistor and capacitor are of sufficiently high rating to cope with the voltage and current encountered.

7 Remote input functions

Remote input operation is via voltage free contacts on the instrument terminal block (terminals 5 and 9) shorting together these terminals will cause the selected function to operate.

The remote input may be either a bi-state contact closure (toggle switch, PLC or other external switch) or a momentary or latching switch contact, depending on the function requirements. Each remote input may be configured to perform any **one** of the following functions:

Function	Description
nonE	None - this function is selected when none of the special functions are required.
PHLd	Peak hold - this function displays and holds the peak reading, when the contact input is closed i.e. the maximum value from the time of contact closure. When the contact is open the display indicates the live reading. A two position toggle switch or normally closed momentary action switch would be commonly used for peak hold.
dHLd	Display hold - the display hold function is similar to peak hold, except that the held reading is the value displayed at the time the switch contact is closed.
H,	Peak Memory - the peak memory (max) is displayed when the pushbutton contact is closed momentarily i.e. the maximum display value since the last reset. The display is returned to the normal display after 20 seconds. To reset the peak memory the button must be held closed for 1 to 2 seconds. Note: the H, function will be reset 5 seconds after instrument switch on i.e. the H, readings will only start to be stored once 5 seconds have elapsed.
Lo	Valley memory - the valley memory (min) operates in a similar way to the peak memory but shows the lowest display value since last reset. Note: the Lo function will be reset 5 seconds after instrument switch on i.e. the Lo readings will only start to be stored once 5 seconds have elapsed.
H, Lo	Peak memory/valley memory - The display may be toggled between peak and valley memory indications.
tArE	Pushbutton tare - when the remote pushbutton is closed for 2 to 3 seconds the current input value is tared off. The switch input for this function is usually a momentary action pushbutton switch. Once the display has been tared the “live” display will be interrupted every few seconds by the message nEtt to indicate that the reading has been tared and the nett reading is being displayed. Further operation of the pushbutton will cause the display to toggle between gross reading (the display will indicate this by flashing grOS periodically) and nett reading (indicated by nEtt). Removing power from the instrument will cause the value tared to be lost so another tare operation may be needed.
2Er0	Pushbutton zero - allows the display to be set to zero via momentary operation of the pushbutton. This zero value will be retained even if the power is removed.
SP.Ac	Setpoint access only - allows access to the selected (via the SPAC function) alarm set points only, no other functions, when key switch is open. Allows full access with the key switch/remote input closed. The switch input for this function is usually a key switch between terminals 5 and 9.
no.Ac	No program access - inhibits access to functions via keypads. The remote input requires a contact closure (short circuit) to allow access to functions. The switch input for this function is usually a key switch between terminals 5 and 9.
CAL.S	Select calibration - one set of calibrations can be performed with the switch open and a second set with the switch closed. The remote input can then be used to switch between these two separate calibration memories. When the external input is open one set will be displayed and when the switch is closed the next calibration set will be used. This function may be used to select different input devices, different scale values etc. This may also be used to change measuring units. e.g. the unit may be calibrated in metres on one set of calibrations and inches on the second set. The CAL.S function also allows different decimal point settings between the two calibrations.

dULL	Dull - 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 (display off) 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 and for reducing power consumption in battery powered applications.

Selecting the remote input function

To select the required function, enter CAL mode in the usual way (see “Explanation of functions” chapter) and step through the functions until you reach the remote input indicated by the display message r.1 nP followed by the selected function. Use the ▲ and ▼ buttons to select the required function.

With functions requiring a latching switch (peak hold and display hold) the r.1 nP value will be used when the switch is ON and the display value when the switch is OFF.

8 Calibration

The 2 point calibration method (CAL 1 & CAL2) may be used on any of the input ranges to scale the display.

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

CAL 1 and CAL2 are used together to scale the instruments display, values for both must be set when using this scaling method.

The CAL 1 function sets the first calibration point for live input calibration . When using this method a signal input must be present at the input terminals. Note: CAL 1 and CAL2 can be set independently.

The procedure for entering the first scaling point is:

a. Ensure that an input signal is present at the input terminals, this will usually be at the low end of the signal range e.g. 0 Amps.

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

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

d. Either press the F button to accept changes or the P button to abort the scaling.

CAL2 (second scaling point for 2 point scaling method)

The second point scaling is performed in exactly the same manner as CAL 1 except that SCL2 will be seen instead of SCL 1. It is essential that the live input is different in value to the CAL 1 input e.g. use 5A as the CAL2 live input. Note; it is not essential that 0 and 5A are used as the live inputs for a but there must be at least a 10% of full scale difference between the CAL 1 and CAL2 inputs, if this is not the case then a SPAN Err message will be seen and the calibration point will not be accepted.

The procedure for entering the second scaling point is:

a. Ensure that an input signal is present at the input terminals, this will usually be at the high end of the signal range e.g. 5 Amps.

b. At the CAL2 function press ▲ and ▼ simultaneously then release them. The display will indicate the live input value. Do not be concerned at this stage if the live input display value is not what is required. It is important that the live input value seen is a steady value, if not then the input needs to be investigated before proceeding with the scaling.

c. Press, then release the F button. The display will indicate SCL2 followed by a value. Use the ▲ or ▼ button to change this value to the required display value at this input. e.g. if 5A was input and the required display at 5A was 50 then ensure 50 is selected at SCL2.

d. Either press the F button to accept changes or the P button to abort the scaling.

UCAL (uncalibration)

Used to return the instrument back to the factory calibration values. This function should only be used when calibration problems exist, and it is necessary to clear the calibration memory. To clear the memory press the ▲ and ▼ buttons simultaneously at the UCAL functions. The message CAL CLr will be seen to indicate that the memory has cleared.

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.

9 Specifications

9 .1 Technical Specifications

Input Types:	0-5A AC
Impedance:	< 50mΩ
ADC Resolution:	1 in 20,000
Accuracy:	0.5% when calibrated
Sample Rate:	7.5 per sec
Isolation:	Between input and power supply or output 2kV for 30 seconds
Conversion Method:	Dual Slope ADC
Microprocessor:	MC68HC11
Ambient Temperature:	-10 to 60°C
Humidity:	5 to 95% non condensing
Display:	LED 5 digit 7.6mm + alarm annunciator LEDs
Power Supply:	AC 240V, 110V, 24V or 32V 50/60Hz. DC 12 to 48V wide range.
Power Consumption:	AC supply 6VA max, DC supply 6W max. (depends on options)
Output (standard):	1 x relays, form A rated 5A resistive 240VAC
Relay Action:	Programmable N.O. or N.C.

9 .2 Output Options

Second Relay:	Rated 0.5A resistive 30VAC or DC form C or configured as form A if any other options are fitted.
Third Relay:	Rated 0.5A resistive 30VAC or DC, form A.
Switched Voltage:	24VDC output (common to remote input ground but isolated from input and power supply) to be used for open collector or solid state relay driver output.
Analog Retransmission:	Isolated 4 to 20mA or 0 - 1V or 0 - 10V link selectable, 12 bit Configurable as retransmission or PI control.
Serial Communications:	RS232, RS485 or RS422 (factory configured).

9 .3 Physical Characteristics

Case Size:	44mm (w) x 91mm (h)x 141mm (d)
Connections:	Plug in screw terminals (max 1.5mm^2 wire for remote input and options 2.5mm^2 for input, power and relay 1)
Weight:	500 gms basic model, 550 gms with option card

10 Guarantee & 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.