RM4-SG

Strain Gauge/Load Cell Monitor

Process Monitor/Controller

Operation & Instruction Manual

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1 Introduction

This manual contains information for the installation and operation of the RM4-SG Load Cell Monitor. Model RM4-SG is a general purpose load cell/strain gauge monitor which may be configured to accept an input from any conventional 4 wire strain gauge bridge of 85Ω or higher. The instrument has a selectable full scale range settings from 0.5mV/V to 100mV/V.

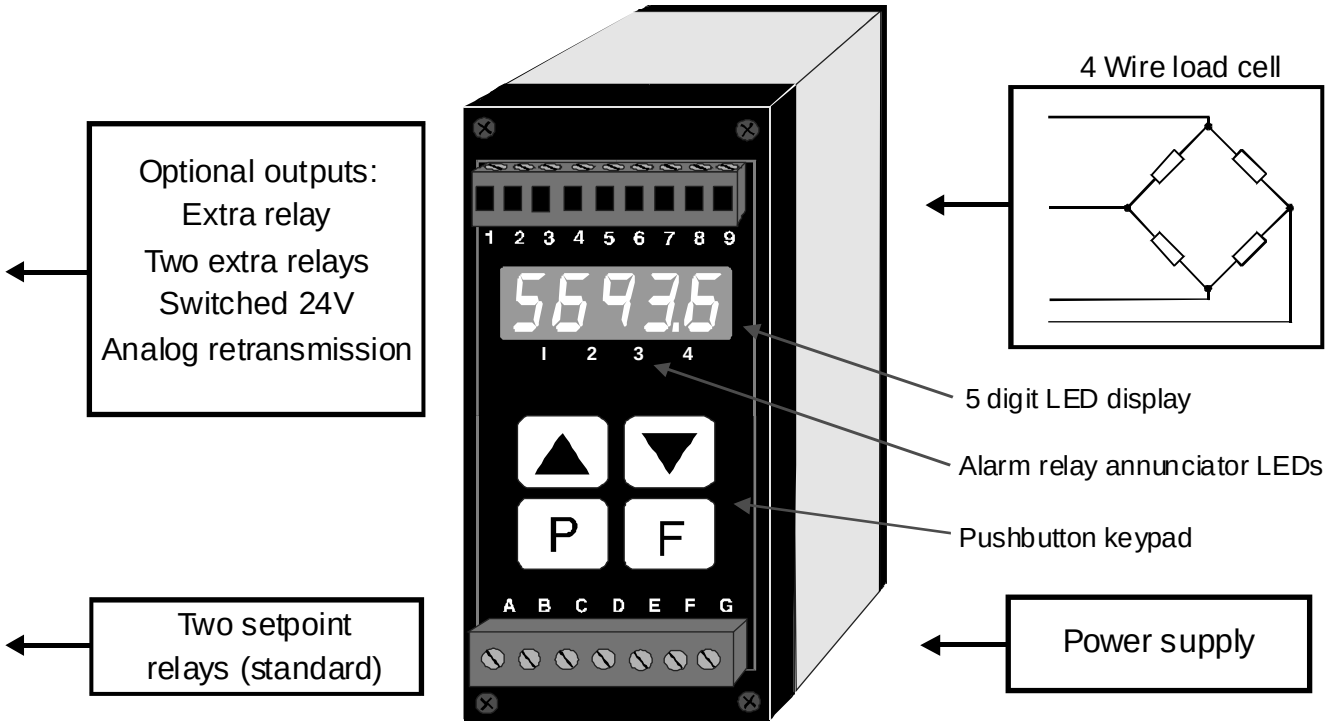
The RM4-SG has various calibration method options. It may be calibrated by applying know weights to the load cell or by entering the mV/V value for the load cell or via a single offset value. Excitation voltages of 5 volt and 10 volt are selectable by PCB links. 10V excitation is standard and would normally be used.

The RM4 is suitable for measuring weight, pressure, force, torque and similar variables. Calibration, setpoint and other set up functions are easily achieved via the keypad. Two standard inbuilt relays provide alarm/control functions. Various combinations of one or two optional extra relays or analog (4-20mA, 0-1V or 0-10V) may also be provided as an option. Alarms and retransmission may be set to operate from the live input 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.

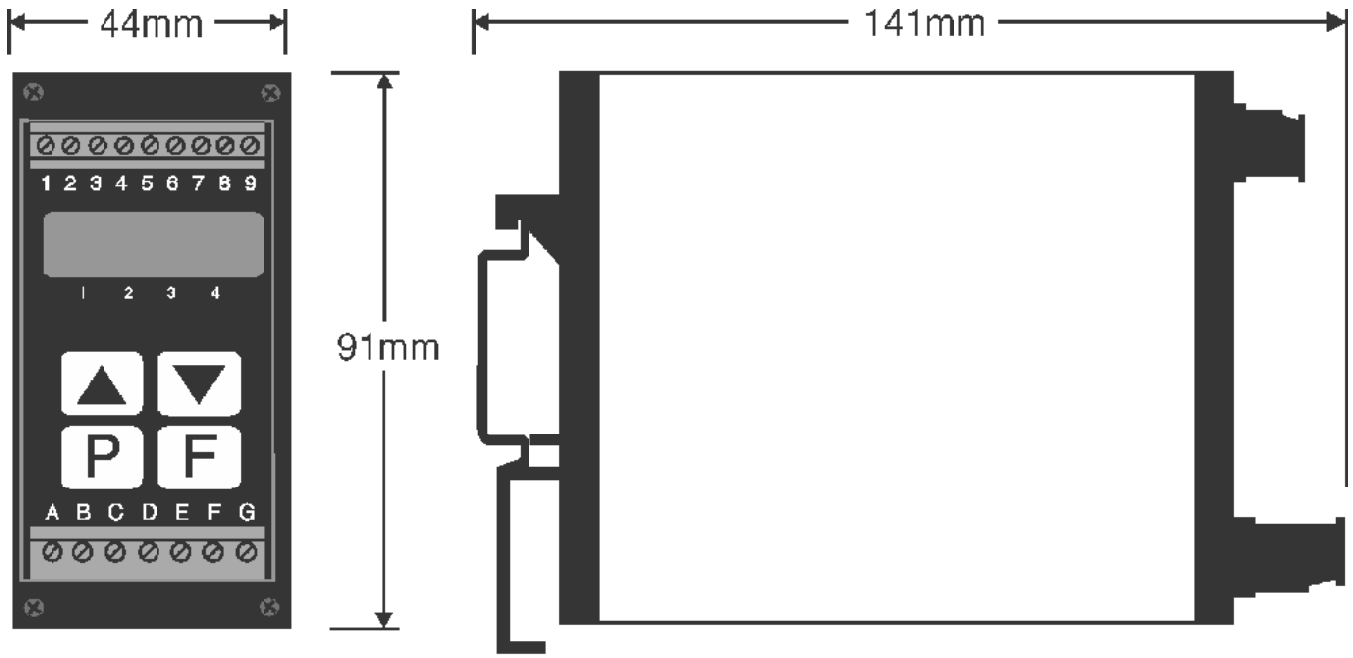
Full electrical isolation between power supply, input voltage or current and retransmission output is provided by the RM4, thereby eliminating grounding and common voltage problems. This isolation feature makes the RM4 ideal for interfacing to computers, PLCs and other data acquisition devices. The RM4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

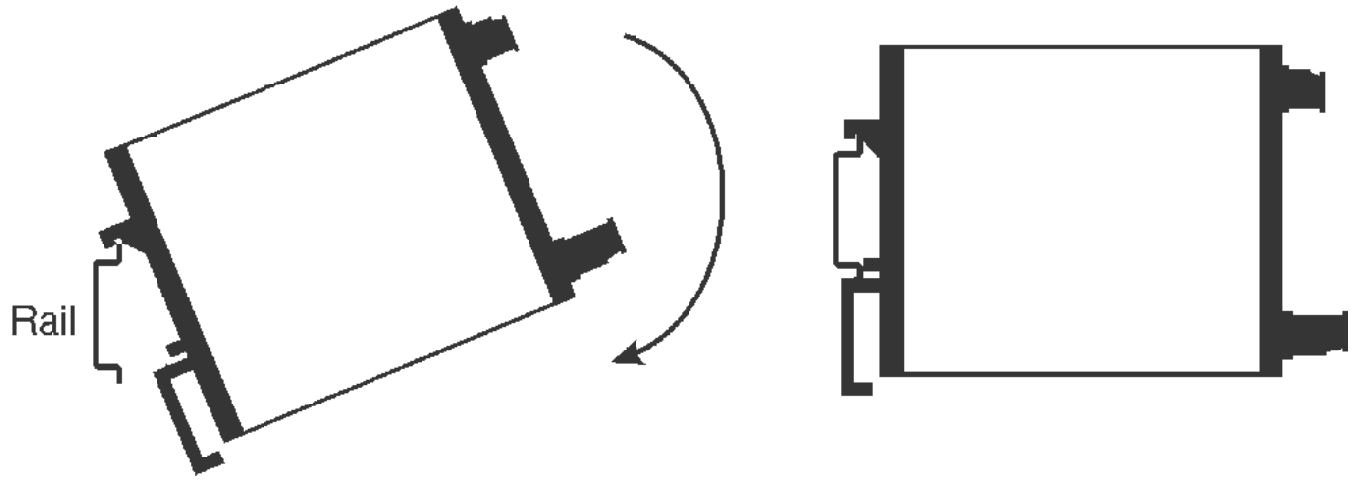
1 .1 Inputs & outputs



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.

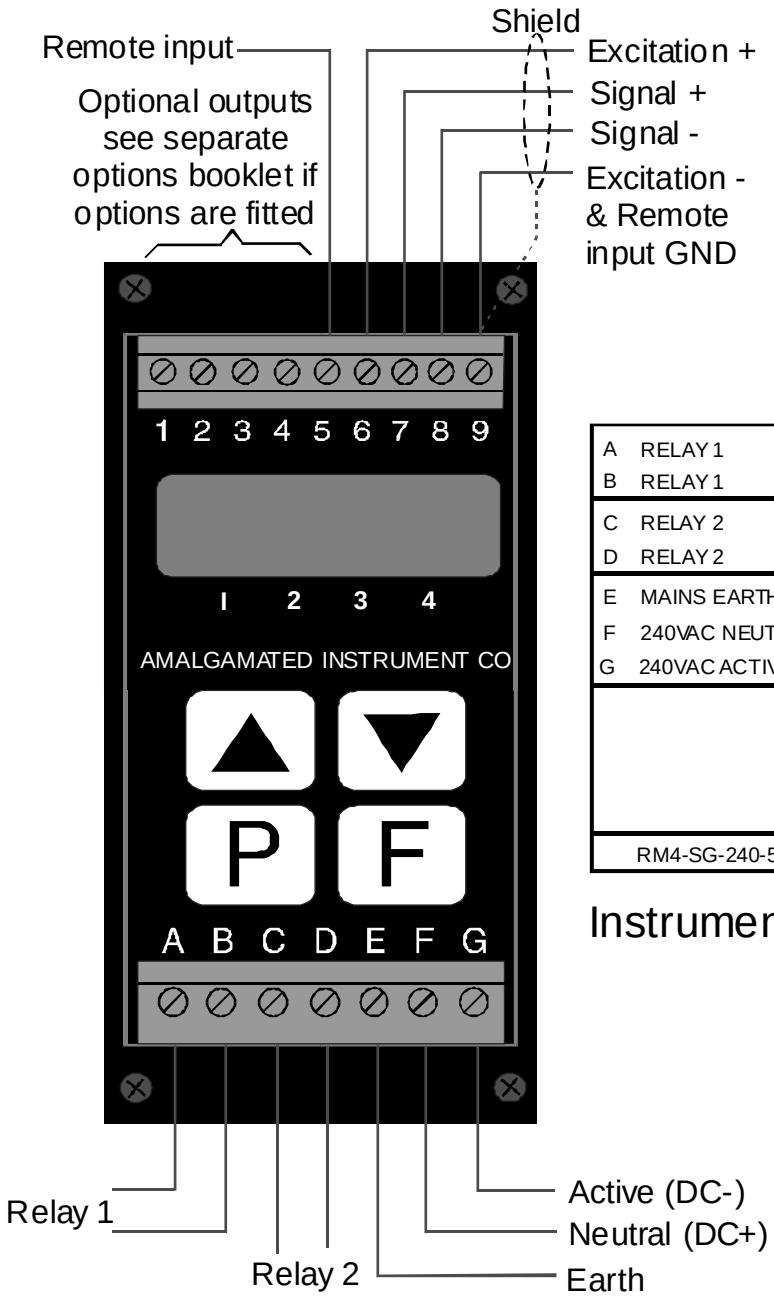




3 Electrical installation

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 and relays 1 and 2 or 1.5mm^2 for load cell connections 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.



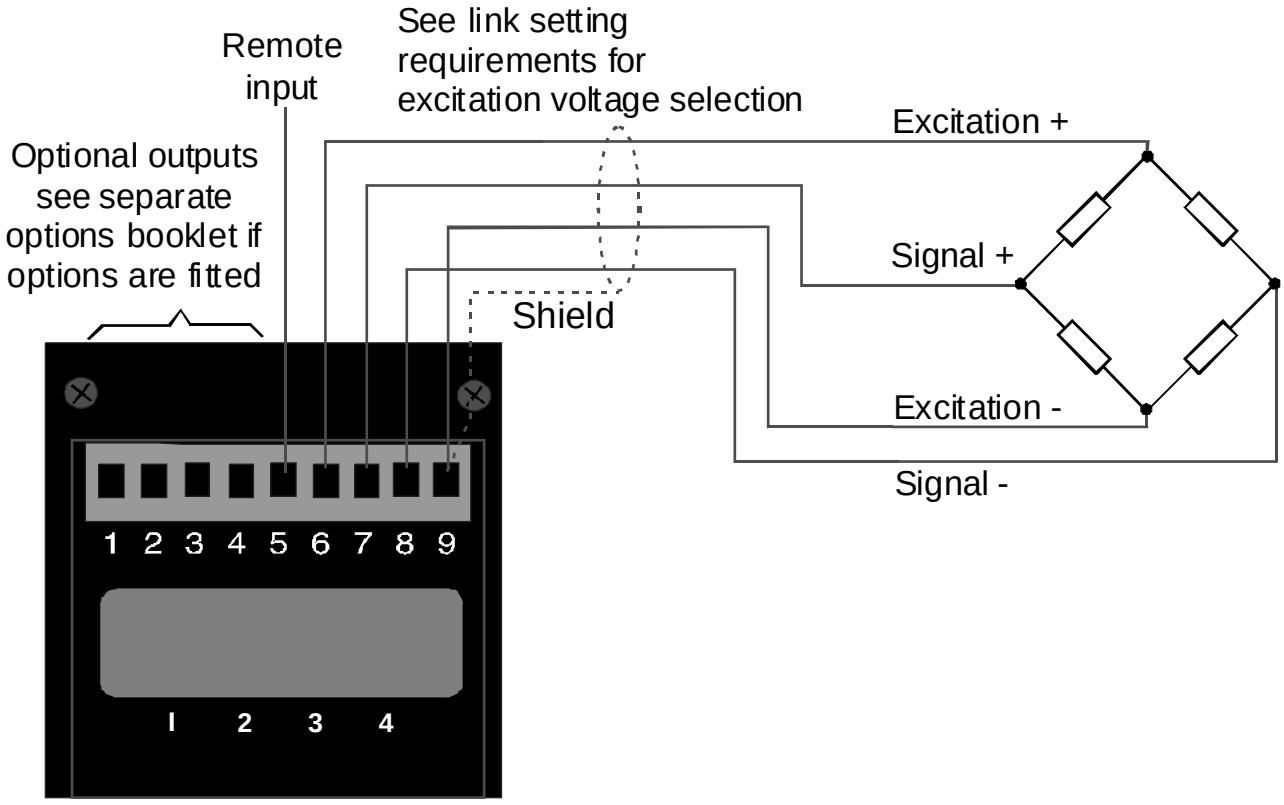
A	RELAY 1	COM	1
B	RELAY 1	N/O	2
C	RELAY 2	COM	3
D	RELAY 2	N/O	4
E	MAINS EARTH		5 REMOTE INPUT
F	240VAC NEUTRAL		6 EXCITATION +VE
G	240VAC ACTIVE		7 SIGNAL +VE
			8 SIGNAL -VE
			9 EXCITATION -VE
RM4-SG-240-5E			SERIAL No.

Instrument data label (example)

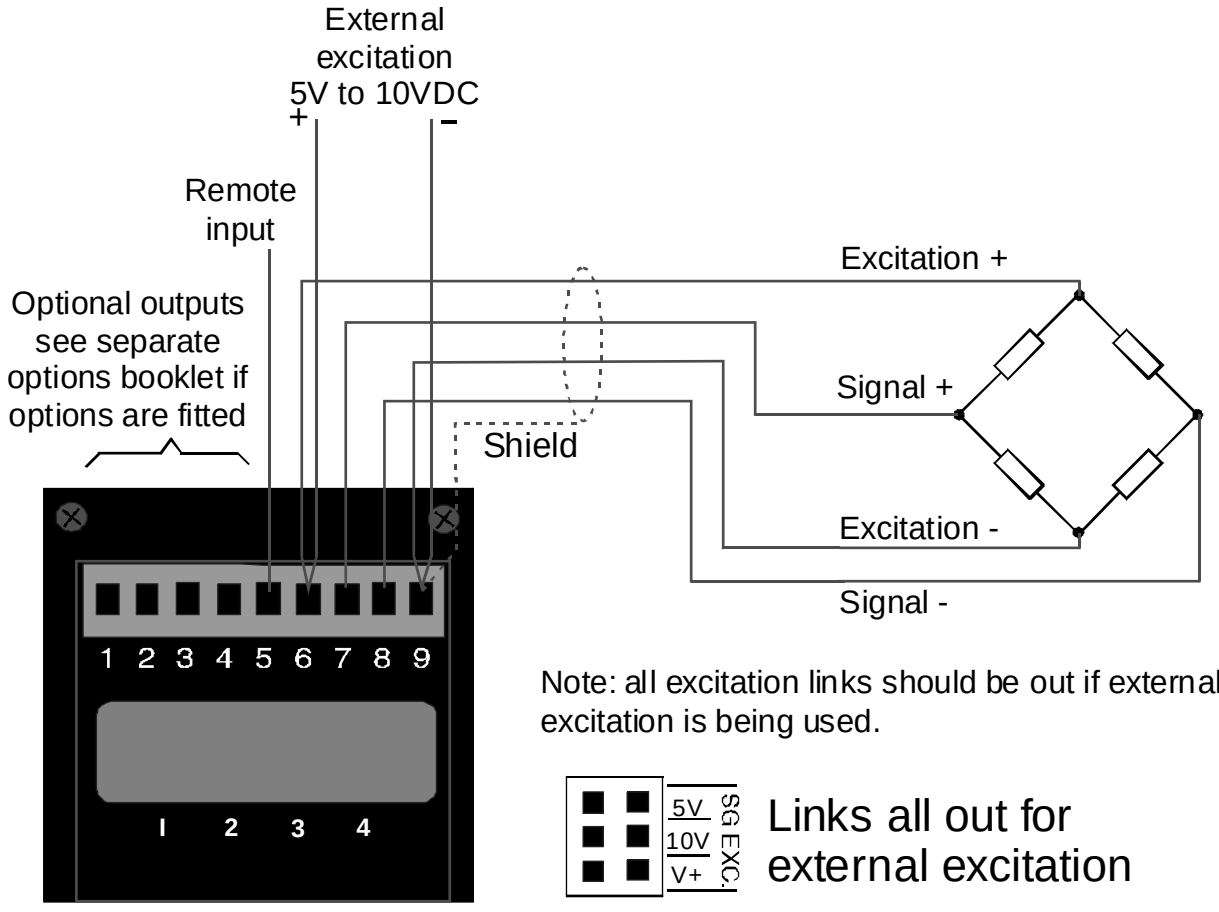
3 .1 Load cell connection using internal excitation.

When connecting load cells in parallel (or using a low resistance bridge) the input resistance of the load cell combination must not be lower than 85Ω irrespective unless external excitation is used.

See “Configuring the input board” section in this chapter for details of link settings for excitation voltage and external excitation.



3 .2 Load cell connection using external excitation



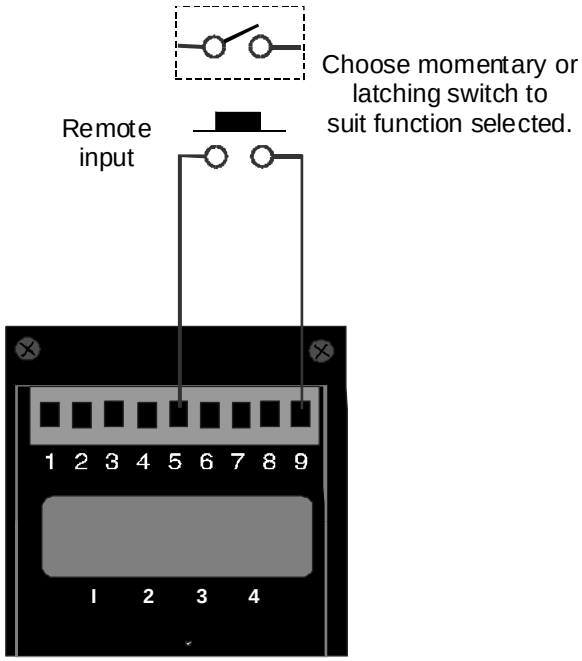
Note: all excitation links should be out if external excitation is being used.

Links all out for external excitation

3 .3 Remote input connections

The selected remote input function can be operated via an external contact closure via a switch, relay or open collector transistor switch.

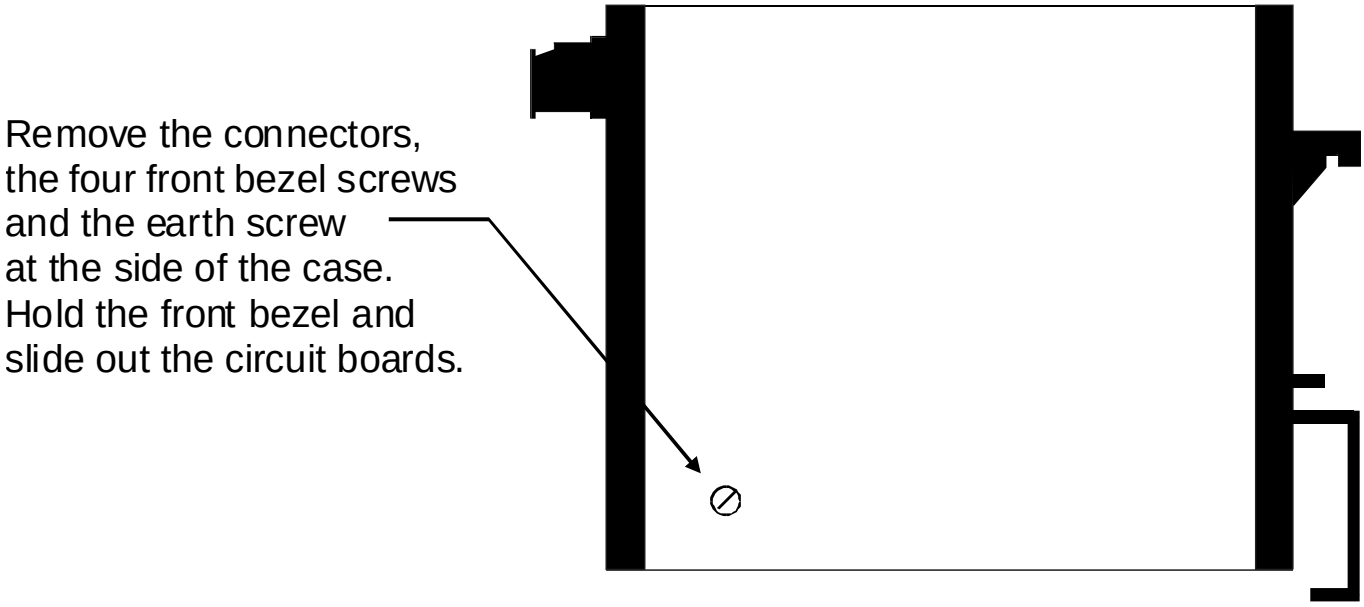
A momentary action is required for functions such as **TARE** and **ZERO**, a latching switch or normally closed momentary switch may be required for functions such as peak hold.

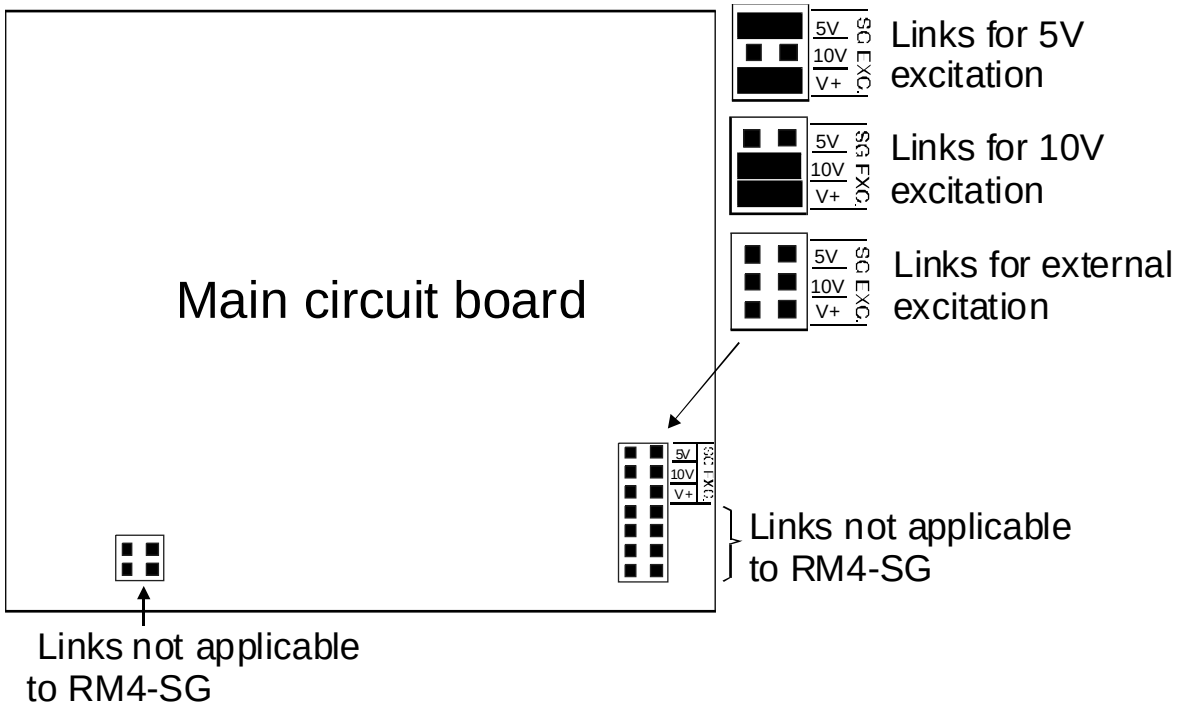


3 .4 Configuring the input board

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

Link settings for the main input board are as shown below. For optional output link settings consult the appropriate appendix in this manual. The minimum resistance of any load cell or combination of load cells connected to the input is 85Ω unless external excitation is used. This applies to both 5V and 10V excitation.





4 Explanation of functions

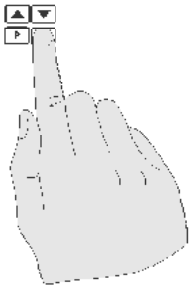
The RM4 setup and calibration functions are configured through a push button sequence. Two levels of access are provided for setting up and calibrating:-

FUNC mode (simple push button sequence) allows access to alarm relay, preset value, display brightness & cell mV/V selection 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	Range	Description
AxLo	Display value or OFF	Alarm relay low setpoint - see “Alarm relays” chapter. Displays and sets each alarm low setpoint value.
AxHi	Display value or OFF	Alarm relay high setpoint - see “Alarm relays” chapter. Displays and sets each alarm high setpoint value.
AxHY	0 to 5000 display units	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	0 to 60 seconds	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	0 to 60 seconds	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	n/a	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.
brgt	1 to 15	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	1 to 15	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	0 to 15	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.		
drnd	0 to 5000	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	0 to 0.0004	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	0 to 8	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-	Display value	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^	Display value	Analog recorder/retransmission output high value - seen only with analog output option. 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.
rnGE	0.5 to 100 in steps	mV per Volt output of transducer - displays and sets the mV/V range to suit the load cell transducer useable range and is selected in steps as follows: 0.5, 1.0, 2.5, 5.0, 10, 25, 50 and 100 If a value equal to the quoted loadcell output is not available then choose the next highest value e.g. for a 2.0mV/V output load cell choose a rnGE setting of 2.5.
r.i nP	n/a	Remote input - displays and sets the special function input selection, see "Remote input functions" chapter.
P.but	n/a	P button function - the function of the P button is programmable in the same manner as the remote input. 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 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.
ACCS	OFF, EASY, nonE or ALL	Alarm relay access mode - The access mode function ACCS has one of three possible settings namely OFF, EASY or nonE. If set to OFF the mode function has no effect or alarm relay operation. If set to EASY the "easy alarm access" mode will be activated, see "Alarm relays" chapter for a description. 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 functions. This function provides an alternative to using the r.i nP function for easy access or no access mode thereby allowing the remote input to be programmed for an alternative use.
SPAC	A 1, A 1-2 etc.	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 1-2 - Allows access to alarms 1 and 2 only. A 1-3 - Allows access to alarms 1, 2 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.
CAL 1 & CAL2	n/a	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.
ECAL	-19.999 to 32.000	mV/V calibration - see also "Calibration" chapter. This alternative calibration method allows the known mV/V value of the load cell to be entered as the calibration value.

CAL OFSt	Display value	Offset calibration - see also “Calibration” chapter. Allows the instrument calibration to be offset by a single point value. This value is added or subtracted across equally the range of the instrument. Press, then release ▲ and ▼ simultaneously to enter the CAL OFSt function.
SEt ZERO	n/a	Set zero - Used to set the load cell system to display reading of zero. The set zero point is entered when the load cell is installed and in a no weight condition. To operate the set zero function press, then release, ▲ and ▼ simultaneously. The zero point will be retained even if power is removed.
A1 to A4	Li nE, tARE, btch, P.HLd, d.HLd, Hi or Lo	Alarm mode - The alarms can be set to operate from the live input value (Li nE), the tare value (tARE), the peak hold value (P.HLd), the display hold (dHLd), the peak memory (Hi) or the valley memory (Lo). Ensure that the r.1 nP, r.1 n2 or r.1 n3 or P.but function is also set to the desired operation. See “Alarm relays” chapter for further information.
rEC	Li nE, tARE, P.HLd, d.HLd, Hi or Lo	Retransmission mode - seen only with analog retransmission option. See also “Remote Input Functions” chapter. Refer to the separate “RM4 DIN Rail Meter Optional Output Addendum” booklet supplied when this option is fitted. The retransmission of 4-20mA, 0-1V or 0-10V can be set to follow the live input value (Li nE), 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.1 nP or P.but function is also set to the desired operation. Operation is as follows:- Li nE - with the rEC function set to Li nE the retransmission will follow the “live” input signal present i.e. any tare, zero, batch or other operation will have no effect on the retransmission. tARE - with the rEC function set to tARE the retransmission will follow the remote input or P button tare function. e.g. if rEC_ is set to 0 and rEC¯ is set to 100 and the instrument is given a remote tare (via an external input or P button) when the display shows 40 then after the tare the display will change to 0. For a 4-20mA retransmission, 4mA will be transmitted at the new (tared) display value of 0 and 20mA will be transmitted for a gross value of 100. d.HLd - with the rEC function set to d.HLd the retransmission will follow the remote input or P button display hold function. i.e. whilst the remote input is closed or the P button held in the retransmission will represent the held value only. Hi - with the rEC function set to Hi the retransmission will follow the remote input or P button peak memory function. i.e. the retransmission value will always be the peak memory value. A remote input closure or P button operation can be used to reset the memory. Lo - with the rEC function set to Lo the retransmission will follow the remote input or P button valley memory function. i.e. the retransmission value will always be the lowest memory value. A remote input closure or P button operation can be used to reset the memory.
Lo di SP	Display value or OFF	Low overrange limit value - The display can be set to show an overrange message if the display value falls below the Lo di SP setting. For example if Lo di SP is set to 50 then once the display reading falls below 50 the message -or- will flash instead of the normal display units. This message can be used to alert operators to the presence of an input which is below the low limit. If this function is not required it should be set to OFF by pressing the ▲and ▼ buttons simultaneously at this function.
Hi 9H di SP	Display value or OFF	High overrange limit value - The display can be set to show an overrange message if the display value rises above the Hi 9H di SP setting. For example if Hi 9H di SP is set to 1000 then once the display reading rises above 1000 the message -or- will flash instead of the normal display units. This message can be used to alert operators to the presence of an input which is above the high limit. If this function is not required it should be set to OFF

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

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

CAL ERR - This indicates that one of the calibration points has caused an overrange error in the analog to digital converter. Change the mV/V (**RNGE** function) setting to a higher value and try calibration again.

SPAN ERR - This indicates that the calibration points entered were too close together. Either calibrate again with the points further apart or change the mV/V setting to make the instrument more sensitive. The calibration points need to be at least 2% of full scale apart.

AdC GAIN Err - This indicates that when an **ECAL**/**ESCL** method of calibration has been used the mV/V figure entered at the **ECAL** function is greater than the mV/V range entered at the **RNGE** function. The **RNGE** function should be set to be equal the **ECAL** value or to the next available value higher than the **ECAL** value.

"----" - This display indicates that the actual mV input is higher than the value set at the **RNGE** function. Check the function setting and if this is OK then check the actual mV input from the cell.

"-or-" - This display indicates an overrange reading. This could be due to the instrument not being able to display the number because it is too large to display. Alternatively it could mean that the **Lo dISP** or **HI GH dISP** limit value has been exceeded and the instrument is showing a warning message.

5 Function table

Initial display	Meaning of display	Next display	Default Setting	Record Your Settings
AxLo	Alarm x Low Set point Value	Set point value or OFF	OFF	See following table
AxHi	Alarm x High Set point Value	Set point 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 (seconds)	0 to 60	0	See following table
Axrt	Alarm x Reset Time (seconds)	0 to 60	0	See following table
Axn.o or Axn.c	Alarm x Action N/O or N/C	Axn.o or Axn.c	Axn.o	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 or if the ACCS function is set to ALL 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	
rnGE	Full Scale mV/V Range	0.5, 1.0, 2.5, 5.0, 10, 25, 50, or 100	5.0	
r.i nP	Remote Input 1	nonE.P.HLd.d.HLd.Hi .Lo. Hi Lo.tArE.2Er0.SP.Ac. no.Ac.i .CAL or dULL	nonE	
P.but	P Button function	nonE. Hi .Lo. Hi Lo.tArE or 2Er0	nonE	
ACCS	Set point access mode	OFF, EASY.EASY or ALL	OFF	
SPAC	Set point access (only seen if 2 or more relays fitted)	A1.A1-2.A1-3 etc.	A1	
CAL 1	Calibration - first point	See calibration chapter	n/a	
CAL2	Calibration - second point	See calibration chapter	n/a	
ECAL	Calibration By Entering mV/V Value	See calibration chapter	n/a	
CAL OFSt	Offset calibration	See calibration chapter	n/a	
SEt 2Er0	Set zero	See calibration chapter	n/a	
A1	Alarm mode for relay 1	Lo uE,tArE.P.HLd.d.HLd. Hi or Lo	Lo uE	
Ax	Alarm mode for subsequent relays	Lo uE,tArE, P.HLd.d.HLd. Hi or Lo	Lo uE	
rEC	Retransmission mode	Lo uE,tArE, P.HLd.d.HLd. Hi or Lo	Lo uE	
Lo di SP	Low overrange	Value in memory or OFF	OFF	
Hi gH di SP	High overrange	Value in memory or OFF	OFF	
di SP	Overrange display warning flashing mode	FLSH or -or-	FLSH	

Note: Functions in the shaded areas on this table will be displayed only when those particular options are fitted. Refer to the separate "RM4 DIN Rail Meter Optional Output Addendum" booklet supplied if options are fitted.

Settings for relays - record settings here				
	A1	**A2**	**A3**	**A4**
AxLo				
AxHi				
AxHY				
AxtE				
Axrt				
Axn.o or Axn.c				
Ax				

6 Alarm relays

The RM4 is provided with 2 alarm relays as standard. One or two extra optional independent alarm relays may also be provided, these relays are designated A1 , A2 etc. 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.

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 set point (AxLo)

Displays and sets the low set point value for the designated alarm relay. The low alarm set point may be disabled by pressing the ▲ and ▼ keypads simultaneously. When the alarm is disabled the display will indicate OFF . Use ▲ or ▼ to adjust the set point value if required. The alarm will activate when the displayed value is lower than the AxLo set point value. Each relay may be configured with both a low and high set point 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 set point (AxHi)

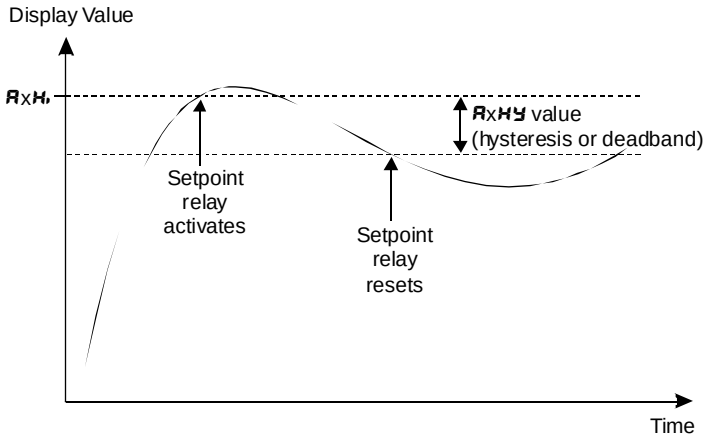
Displays and sets the high set point value for the designated alarm relay. The high alarm set point may be disabled by pressing the ▲ and ▼ keypads simultaneously. When the alarm is disabled the display will indicate OFF. Use ▲ or ▼ to adjust the set point value if required. The alarm will activate when the displayed value is higher than the AxHi set point value. Each relay may be configured with both a low and high set point 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 (AxHY)

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

In the high alarm mode, once the alarm is activated the input must fall below the set point 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 set point 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).

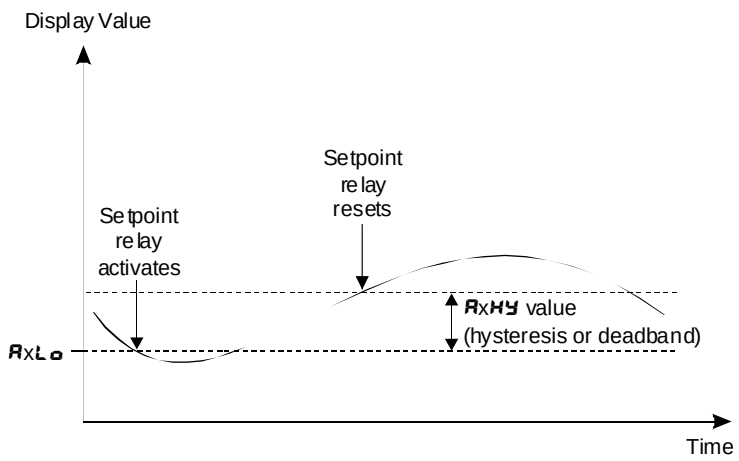


In the low alarm mode, once the alarm is activated the input must rise above the set point value plus the hysteresis value to reset the alarm.

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.



Alarm Reset Time (**AxrE**)

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 Trip Time (**AxtE**)

The alarm trip time determines the length of time the display must be continuously in alarm condition before the relay will trip. 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 (**Axn.o** or **Axn.c**)

Each alarm may be programmed to operate as a normally open (N/O e.g. **A1n.o**) or normally closed (N/C e.g. **A1n.c**) 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.

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 set point will then appear and changes to this set point may be made to this set point via the ▲ or ▼ buttons. Press the **F** button to accept any changes or to move on to the next set point.

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 **F.1 nP** function must be set to **SP.AC**. If the **ACCS** function is used the remote input function **F.1 nP** can be assigned to a different use.
2. The selected relays must have a set point, 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 **A1-2** then the easy access will work only with alarm relays 1 and 2 even if more relays are fitted.
4. The instrument must be in normal measure mode i.e. if the instrument is powered up so that it is in **CAL** mode then the easy access will not function. If in doubt then remove power from the instrument, wait for a few seconds then apply power again.
5. If the easy access facility is used then the only way to view or alter any other function settings is to power up via **CAL** mode i.e. there is 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,**) or valley memory (**Lo**). Other than **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**

With the alarm function set to follow the live input value the alarm will activate at the alarm high/low settings. Thus if **A1Lo** is set to **50** and **A1H,** is set to **100** then alarm 1 will activate if the display reading falls below **50** or goes above **100**.

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

Assume that A 1H, is set to 100 and that the instrument is given a remote tare when the display reads 40. Once the instrument is tared the display will read 0. Alarm 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 Ai was set to dI 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 A 1Lo 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 - A 1 is set to P.HLd and r.I nP is set to P.HLd

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

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

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

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

If A 1H, 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 - A 1 is set to Lo and r.I nP is set to Lo

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

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 100Ω resistor 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.
Hi	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 Hi function will be reset 5 seconds after instrument switch on i.e. the Hi 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.
Hi 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.
ZERO	Pushbutton zero - allows the load cell system display to be set to zero via momentary operation of the pushbutton. This zero value will be retained even if the power is removed. If the zero operation were to cause the zero to shift beyond the ZEROrnGE function limits the preset will be aborted and a ZEROrnGE Err message will be seen.
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 the keypads. The remote input requires a contact closure to allow access to functions. The switch input for this function is usually a key switch between terminals 5 and 9.
I.CAL	Initiate auto calibration - this function allows the user to select when an auto calibration takes place rather than relying on the instruments normal internal calibration which may cause the output to pause. Closing the external input will cause an internal calibration to take place. If the input is held closed then an internal calibration will take place periodically.
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.i 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.i nP value will be used when the switch is ON and the display value when the switch is OFF.

8 Calibration

To enter the CAL (calibration) mode a follow the method described on the first page of the "Explanation of Functions" chapter.

Unique calibration procedures allow two different methods of calibration to suit various applications plus a calibration offset adjustment. Use **either** method 1 or method 2.

Method 1- two calibration points are independently set from "live" inputs. The ability to set each point individually is useful where the calibration is being carried out on site and delays are experienced during the calibration procedure (e.g. filling tanks etc.).

Method 2 - allows entry of the mV/V figure of the load cell being used together with a scaling value i.e. no live input is required to obtain the scaling points.

Calibration offset - allows a single point offset to be introduced to the calibration slope obtained from method 1 or 2 calibrations.

Calibration - method 1, calibration by entering in known values

Method 1 uses two different live input values for calibration.

1. Enter CAL mode and step through the functions until the display indicates CAL 1. Now press then release the ▲ and ▼ buttons simultaneously to enter the calibration functions. The display will now indicate CAL 1 (1st calibration point) followed by a "live" reading. Apply a known input to the instrument of nominally 0% (this value is not critical and may be anywhere within the measuring range of the instrument). For example you could arrange that the load or pressure is zero at this time. When the live reading has stabilised press the F button.

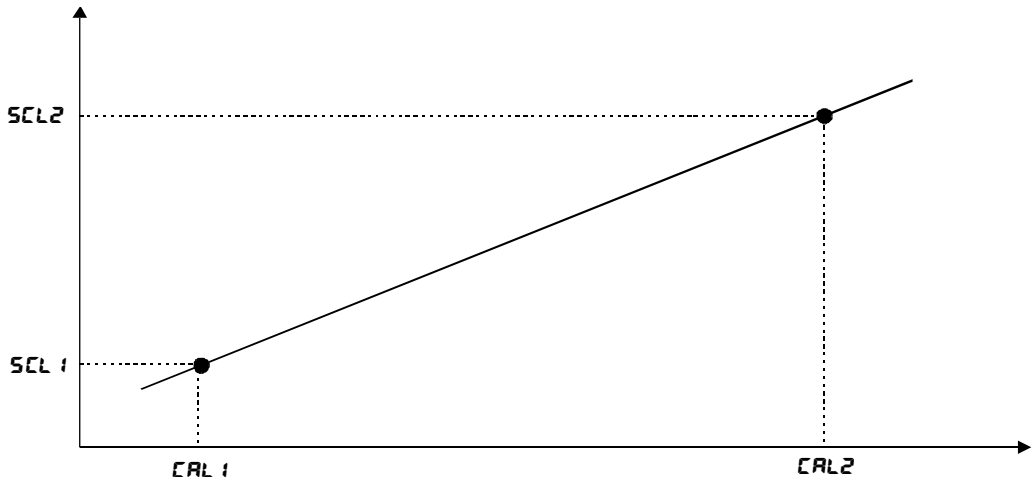
2. The display will indicate SCL 1 (scale 1) followed by the scale value in memory. Now use the ▲ or ▼ button to obtain the required scale value. For example if it is required to read zero for the load applied adjust the SCL 1 setting to 0 or 0.0 etc.

3. Press the F button, the display will now indicate CAL End (indicating that calibration of the first point is complete).

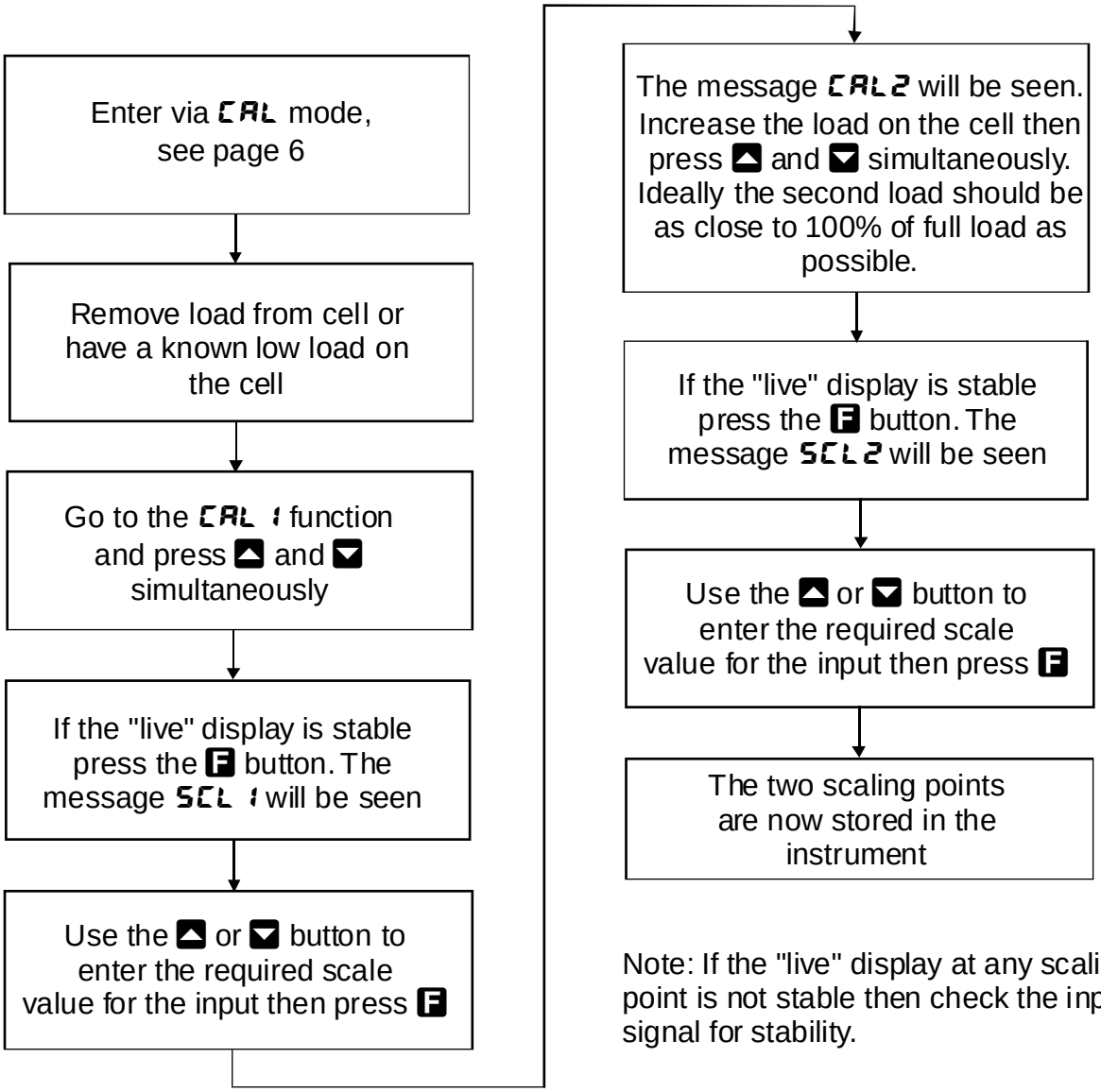
4. The display will now indicate CAL2 (2nd calibration point). If you do not wish to enter the second point at this stage then press and release the F button until the FUNC End message is seen. If you wish to enter the second point at this stage press the ▲ and ▼ buttons simultaneously.

5. The display will now indicate CAL2 (2nd calibration point) followed by a "live" reading. Apply an input greater than that used for CAL 1 (again this value is not critical but it should be at least 10% of full load cell capacity different to the CAL 1 input. For best accuracy the input should be as close to full capacity as possible).

6. When the reading has stabilised, press the F button, the display will now read SCL2 (scale 2) followed by the second scale value in memory. Use the ▲ or ▼ button to obtain the required scale value. Press the F button, the display will now read CAL End (indicating that calibration of the second point is complete).



Example - Scaling using two live inputs



Calibration - method 2, calibration by entering the mV/V value

This alternative calibration method allows the known mV/V value of the load cell to be entered as the calibration value. The value is entered to 3 decimal places, any number from 32.000 to -19.999 mV/V can be input. If the required value is outside this range then use a convenient available value and alter the **ESCL** value to compensate.

1. In calibration mode step through the functions until the **ECAL** display is seen.

2. Press the ▲ and ▼ buttons simultaneously to get a display of the current mV/V setting. Use ▲ or ▼ to alter this value to the mV/V output of the cell being used.

3. Press and release the F button, the display will now show **ESCL** followed by the current scale value.

4. Use ▲ or ▼ to alter this value if required (this value is the reading required at the maximum rated load for the cell e.g. for a 100kg load cell required to display directly in kg set the **ESCL** value to **100** (or **100.0** etc.) depending on the decimal point setting).

5. Press then release the F button the display will show **ECAL End** and the instrument moves on to the next function (**CAL OFSt**).

6. Once the **ECAL** value has been entered you must operate the **SEt ZERO** function described below or use the P button or remote input **ZERO** function to zero the display at no load/pressure. This zeroing process will remove the effects of any no load offset outputs present at the sensor.

Use of ECAL & ESCL as reference values.

When using the two point calibration method (method 1), as previously described, the mV/V value is automatically calculated and may be viewed at the ECAL function. The ECAL and ESCL values may be recorded and used to re calibrate the instrument to the same load cell at a later date. This is particularly useful when the calibration has been accidentally altered and repeating the "live input" calibration is not practical. Note that the ECAL value calculated by this method will match the known mV/V value only if CAL2 was carried out at exactly the full rated load of the load cell. For example if a 2mV/V 10kg load cell is calibrated using method 1 with zero load used as the CAL 1 input and a 5kg load is used as the CAL2 input then when the ECAL value is viewed the value seen should be approximately 1.000mV/V. The ESCL value will match the SCL2 value.

SEt ZERO (set zero)

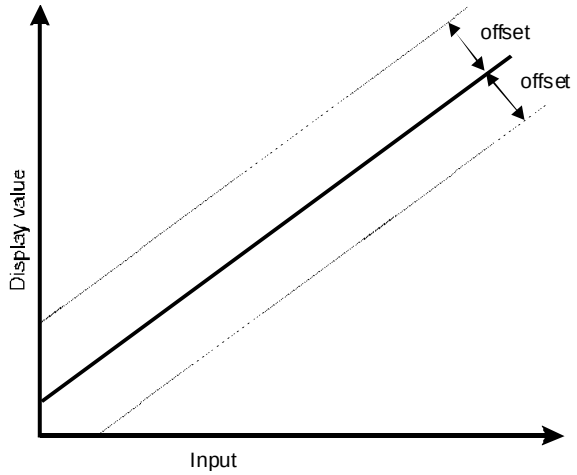
Used to set the load cell system to display reading zero. The set zero point is entered when the load cell is installed and in a no weight condition.

In calibration mode step through the functions until the SEt ZERO display is seen. Press the ▲ and ▼ buttons simultaneously to get a “live” display. Pressing and releasing the F button gives a ZERO End display.

Calibration offset

The calibration offset allows a single point adjustment to be made to the calibration. Note the value set in this function will add or subtract the value equally across the measurement range of the instrument.

Enter the calibration mode as described above, but do not enter CAL 1 or CAL2 etc. functions. Step through the functions until the display indicates CAL OFSt, Now press the ▲ and ▼ buttons simultaneously to enter the offset mode. The display will now indicate CAL OFSt (offset) followed by the “live” reading. *Apply a known input to the instrument. When the reading has stabilised press the F button. The display will indicate SCLE (scale) followed by the previous scale value set in memory. Now press the ▲ or ▼ button to obtain the required display value for this input. Press the F button the display will now indicate OFSt End (indicating that the offset calibration is complete).



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.

Note: * “Apply a known input” refers to either a simulated or real input. Since the RM4-SG is intended for use with various 4 arm strain gauge transducers, this input may take the form of a weight (load cell applications), applied force (torque transducers), an air or hydraulic pressure input (pressure transducers), or a suitable electronic simulator etc.

9 Specifications

9 .1 Technical Specifications

Input:	Ratiometric 4 arm strain gauge
Input Sensitivity:	0.5mV/V to 100mV/V selectable
Bridge Compatibility:	85Ω to > 2000Ω
Excitation:	5V or 10V link selectable
Accuracy:	Better than 0.01% of full scale (alarms and display) Including analog retransmission better than 0.1% system accuracy (12 bit)
Sample Rate:	10 per second
ADC Conversion:	20 bit Sigma Delta
Microprocessor:	MC68HC11FI CMOS
Ambient Temperature:	-40 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 4 VA max, DC supply, (depends on display type & options)
Output (standard):	2 x relays, form A rated 5A resistive 240VAC
Relay Action:	Programmable N.O. or N.C.

9 .2 Output Options

Third Relay:	Rated 0.5A resistive 30VAC or DC. May be configured for either form A or form C if the third relay is the only option fitted.
Fourth Relay:	Rated 0.5A resistive 30VAC or DC, form A.
Switched Voltage:	Non isolated 24VDC output to be used for open collector or solid state relay driver output.
Analog Retransmission:	Isolated 12 bit 4 to 20mA or 0 - 1V or 0 - 10V link selectable.
Transmitter supply:	Isolated & regulated. Link selectable12VDC (50mA max) or 24VDC (25mA max)

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 load cell and options 2.5mm^2 for power and relays 1 & 2)
Weight:	470 gms Basic model, 500 gms with option card

10 Guarantee and Service

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

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