

# **TP4-WT**

Intelligent Load Cell Monitor  
Operation and Instruction Manual



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# 1 Introduction

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This manual contains information for the installation and operation of the TP4-WT Load Cell Monitor. The TP4-WT is a high speed/precision load cell/ strain gauge monitor which may be configured to accept an input from any conventional 4 or 6 wire strain gauge bridge of 80Ω or higher. The instrument has a full scale range of 0.5mV/V to 100mV/V. Excitation voltages of 5 Volt or 10 Volt are selectable by PCB links. The TP4 is suitable for measuring weight, pressure, force, torque and similar variables. Calibration, setpoint and other set up functions are easily achieved by push buttons (located on the front panel). A choice of four separate calibration scaling methods is given to suit different calibration requirements, these four are:

2 Point Calibration - see page 16

ECAL Calibration - see page 17

Offset Calibration - see page 17

Remote Input Calibration - see page 14

Isolated analog retransmission (4-20mA) and serial communications (non isolated RS232) is provided as standard. Isolated RS485 is optionally available as an alternative to RS232. Four standard inbuilt relays provide alarm on/off control functions. Auto zero and batch functions are included and may be set as required. The TP4 has a 6 digit, 20mm LED display which is readable to a distance of 10 metres.

Unless otherwise specified at the time of order, your TP4 has been factory set to a standard configuration. 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.

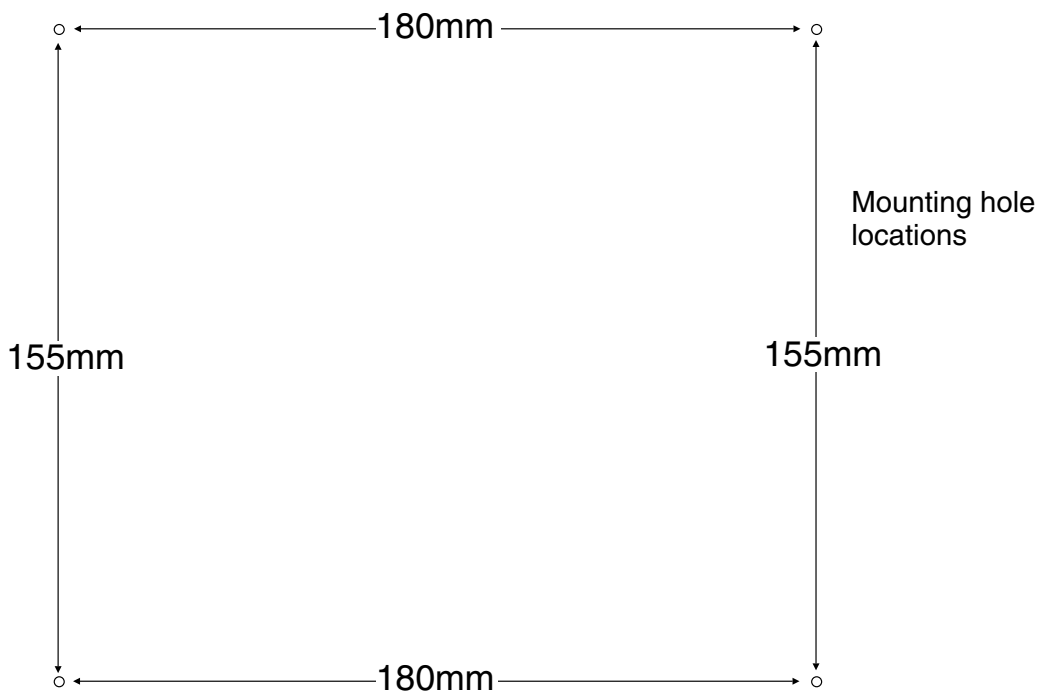
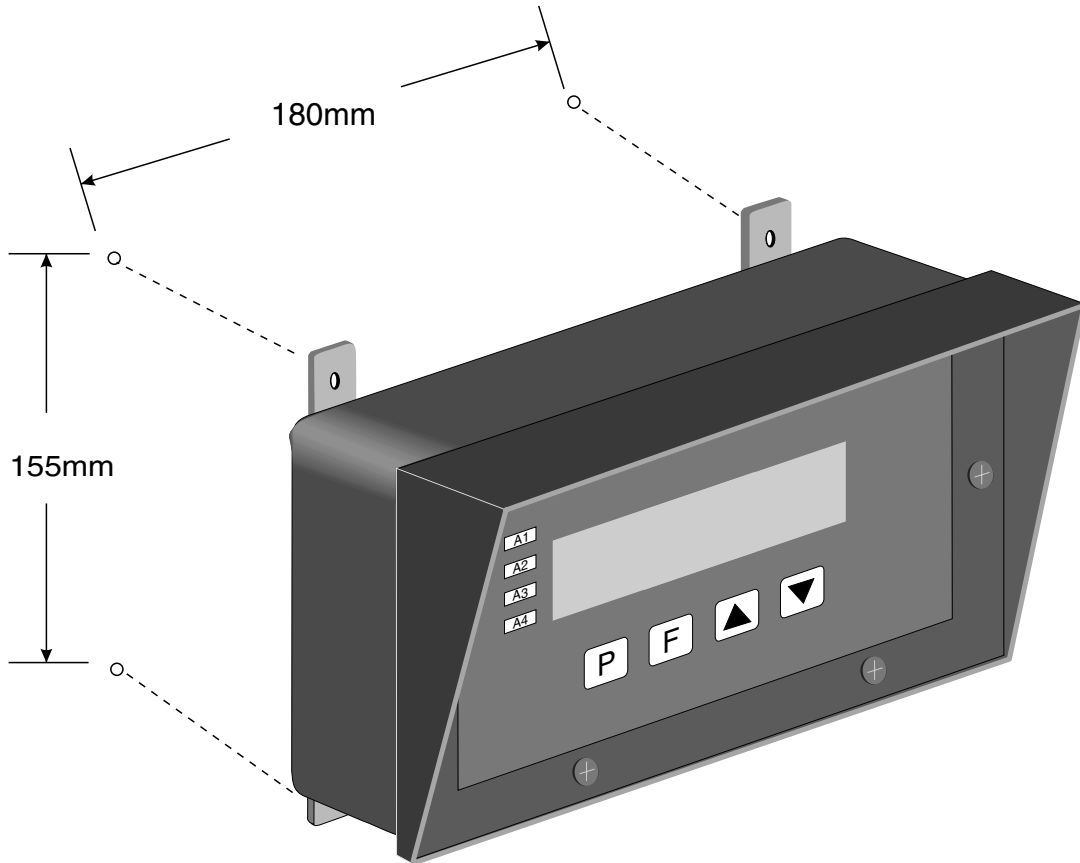
Full electrical isolation between power supply, input and analog retransmission output (RS232 is not isolated) is provided by the TP4, thereby eliminating grounding and common voltage problems. This isolation feature makes the TP4 ideal for interfacing to computers, PLC's and other data acquisition devices

TP4 Monitors are designed for high reliability in industrial applications. The high brightness LED display provides good visibility, even in areas with high ambient light levels. A feature of the TP4-WT is the programmable display brightness function, this allows the unit to be operated with low display brightness to improve readability in darker areas. The TP4 is housed in an IP65 rated enclosure.

## 2 Mechanical Installation

The instrument is designed to be wall mounted using the four mounting brackets provided. Carefully measure and drill four holes as shown below.

An optional panel mount kit is available for use with the TP4. The panel cut out size when this option is chosen is 240 x 130mm -0.0mm/+0.5mm.

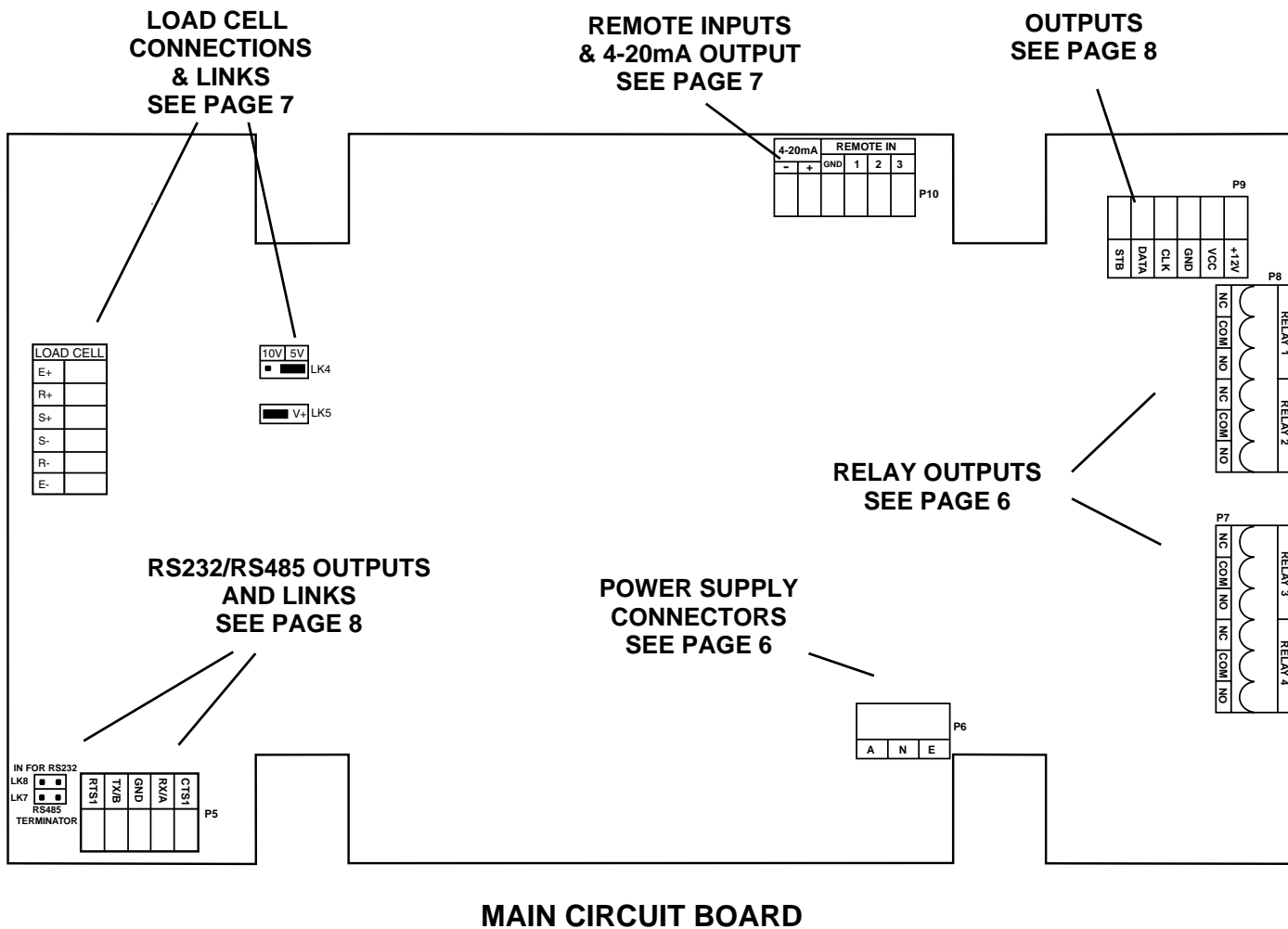


### 3 Electrical Installation

The TP4 Panel 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.

Plug in terminal blocks are provided to make installation easier. The terminal blocks allow for wires of up to 1.5mm<sup>2</sup> (2.5mm<sup>2</sup> for power supply and relay terminal blocks) to be fitted. Connect the wires to the appropriate terminals as indicated in the appropriate diagrams in this chapter. 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.

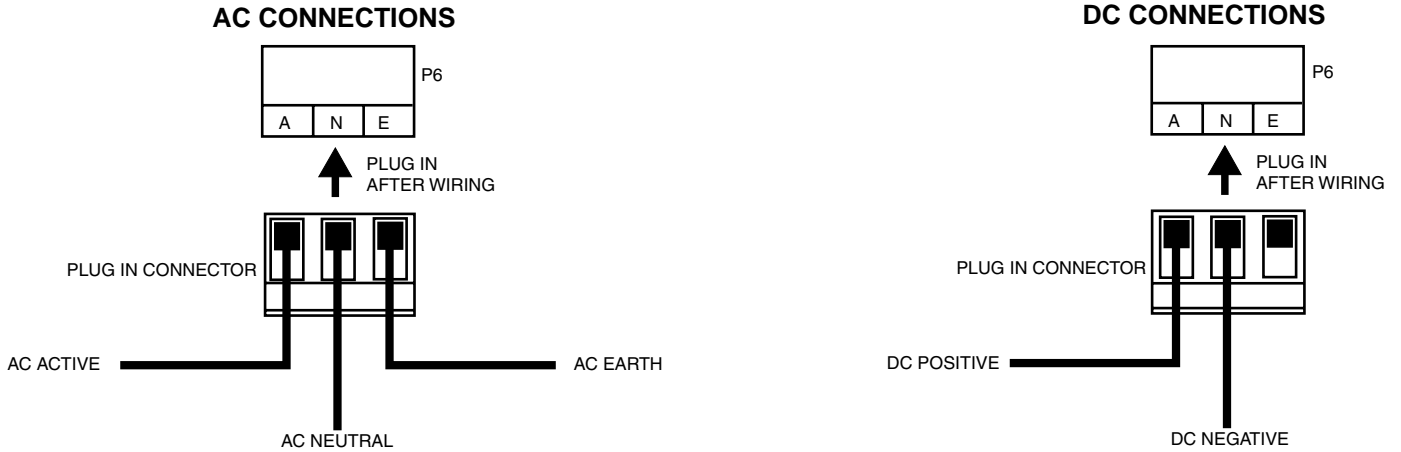
When an input is applied a display indication should be seen. The instrument will be set to a factory default scaling (unless otherwise arranged) and so it may be necessary to scale the instrument to the required engineering units for your application. See Chapter 4 "Explanation of Functions" for a description of the calibration/scaling functions and Chapter 5 "Examples and Trouble shooting" for examples.



### 3.1 Power supply connections

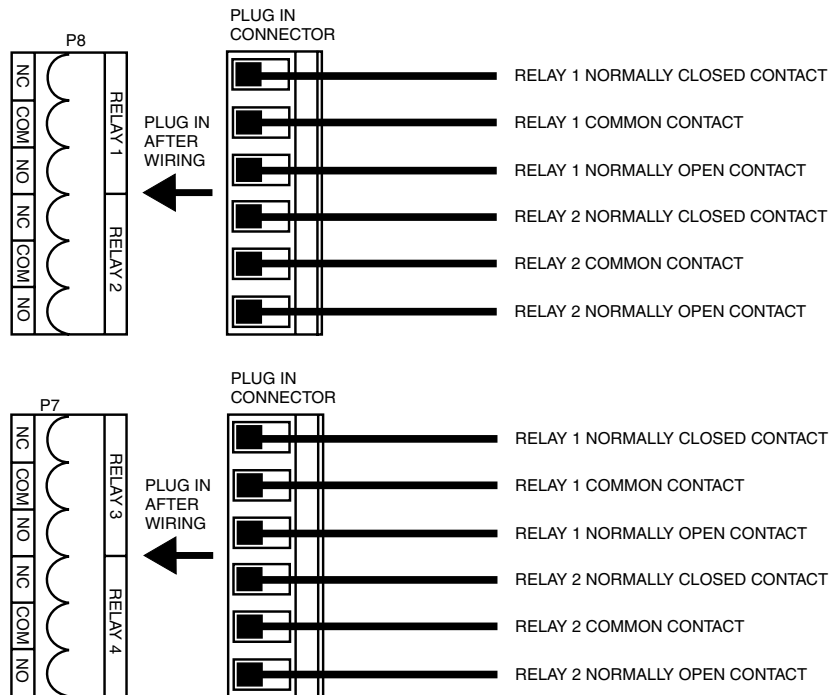
The power supply for the instrument is factory fitted and is of a fixed type. If you are unsure of the supply requirement for your instrument it can be determined by the model number on the instrument label:-

- TP4-WT-240-..... Requires 240VAC
- TP4-WT-110-..... Requires 110VAC
- TP4-WT-12D-..... Requires 12VDC
- TP4-WT-24D-..... Requires 24VDC
- TP4-WT-48D-..... Requires 48VDC



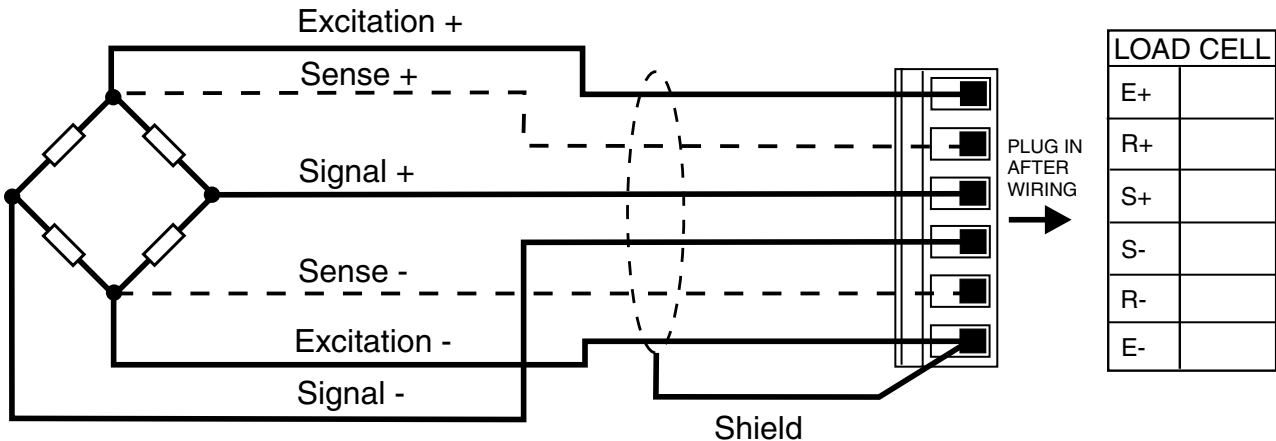
### 3.2 Relay connections

The TP4-WT is supplied with 4 alarm relays as standard, an extra 8 alarm external relay pack is available, as an option. The relays are all single pole, double throw types and are rated at 5A, 240VAC into a resistive load. The relay contacts are voltage free. When switching inductive loads (e.g. a solenoid) a suppressor circuit should be used across the load or across the relay contacts. A simple suppressor circuit consists of a 100Ω resistor in series with a 0.1uF capacitor (ensure that the ratings for the resistor and capacitor are sufficient for the voltages and currents being switched).



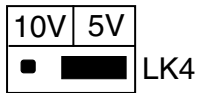
### 3.3 Load cell connections

The TP4-WT will accept either a 4 wire load cell, or a 6 wire load cell. Excitation voltages of 5V or 10V are provided and are link selectable (LK4 & LK5). The sense wires which connect to terminals R+ and R- are used only in 6 wire load cells. The use of shielded cable is recommended to help control electrical noise pickup.

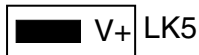


Note: Sense - and Sense + are 6 wire load cell connections only

#### Excitation Links



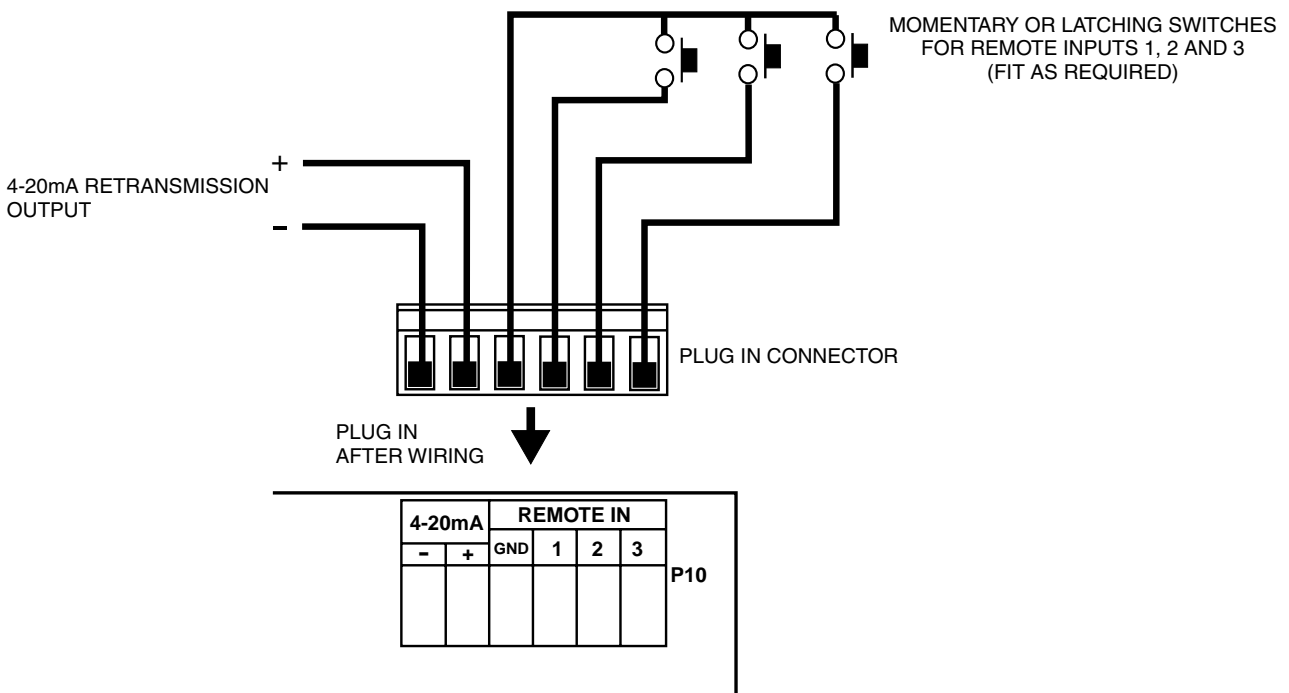
Select either 5V or 10V excitation. The V+ link LK5 should also be in if excitation is to be obtained via the TP4.



If the load cell is to obtain excitation (10V max) externally then remove both LK5 and LK4.

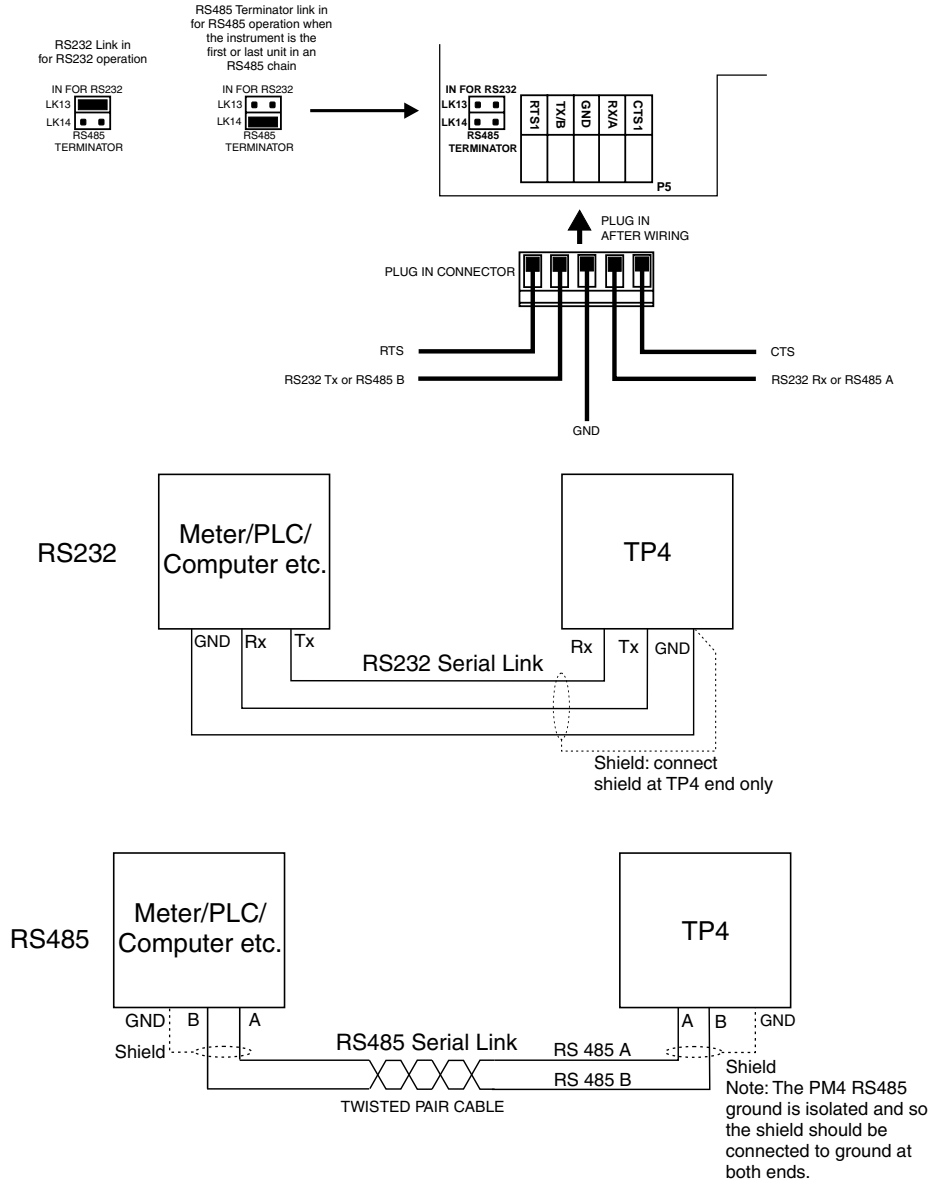
### 3.4 Remote inputs and analog retransmission

Each of the three remote input functions (see “Explanation of Functions” Chapter 4) requires a separate remote input switch connection for operation. Choose a momentary switch for those functions requiring a brief closure (e.g. tare and zero) or latching switch for functions which require a longer closure (e.g. peak hold and display hold). Connect the 4-20mA retransmission outputs as shown.



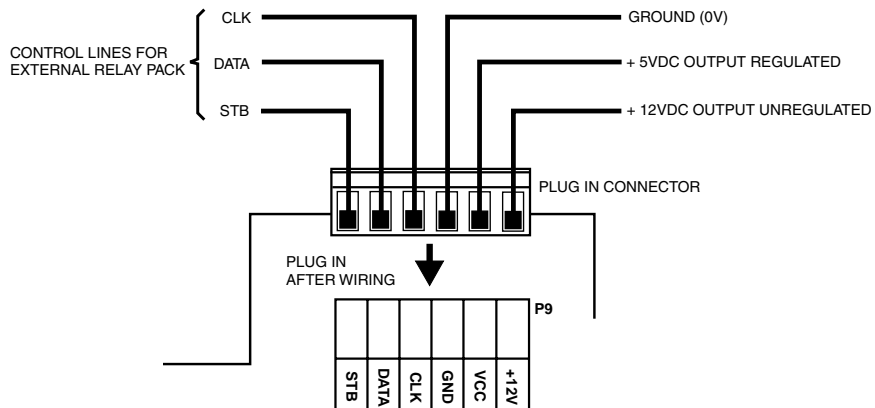
### 3.5 Serial output

RS232 communications is provided as standard, alternatively RS485 is available as an option. When using RS232 output link LK13 must be in, Tx at the TP4 end connects to Rx at the other end of the serial link, likewise Rx at the TP4 end connects to Tx at the other end of the link. When using RS485 connections are A at the TP4 end to A at the other end of the link and B at the TP4 end to B at the other end. The ground line should be connected in each case. For long cable runs where the TP4 is the first or last unit in an RS485 chain then the link LK14 should be in, this places a terminating resistor across the input to help prevent signal reflections.



### 3.6 Voltage and external relay pack outputs

This connector is provided for future development and is not normally fitted.



## 4 Explanation of Functions

The TP4 setup and calibration functions are configured through a push button sequence. Two levels of access are provided for setting up and calibrating:-

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

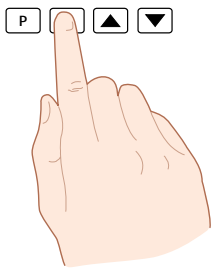
**CAL** mode (power up sequence plus push button sequence) allows access to all functions including calibration parameters.

The push buttons located at the top edge of the circuit board are used to alter settings. Once you have entered either **CAL** or **FUNC** mode you 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 when the required function is reached.

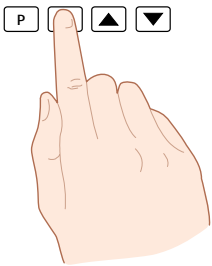


↑  
Front Panel  
Setup Push Buttons

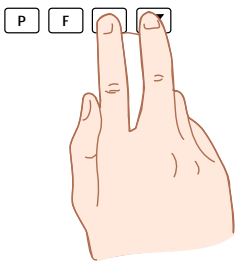
### Entering **CAL** Mode



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.



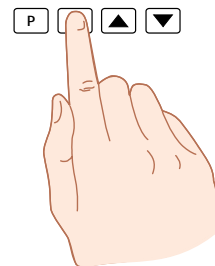
2. When the "wake up" messages have finished and the display has settled down to its normal reading press, then release the **F** button.



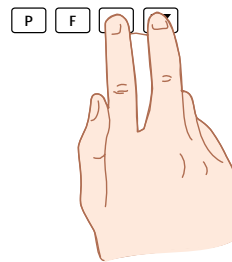
3. Within 2 seconds of releasing the **F** button press, then release the **▲** and **▼** buttons together. The display will now indicate **FUNC** followed by the first function.

### Entering **FUNC** Mode

No special power up procedure is needed 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.

Below is a description of each function. Remember that you will need to enter via **CAL** or **FUNC** mode to gain access to functions, the function table shows which functions require entry via **CAL** mode.

Note: Four alarm relays are fitted as standard on the TP4-WT. The “x” shown in the following display messages represents the alarm number i.e. **RxLo** as shown in the text will appear as **R1Lo**, **R2Lo** etc. on the instrument display.

**RxLo (alarm low setpoint)**

Displays and sets the alarm low setpoint value for the designated alarm relay. The low alarm setpoint may be disabled by pressing the **▲** and **▼** pushbuttons simultaneously. When the alarm is disabled the display will indicate **OFF**. The alarm relay will trip when the displayed value is less than the **RxLo** setpoint value. Each relay may be configured with both a low and high setpoint, so the relay may be tripped when the reading moves outside the band set between low and high.

**RxHi (alarm high setpoint)**

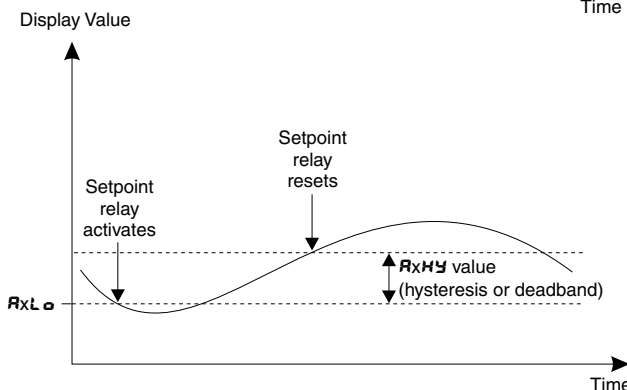
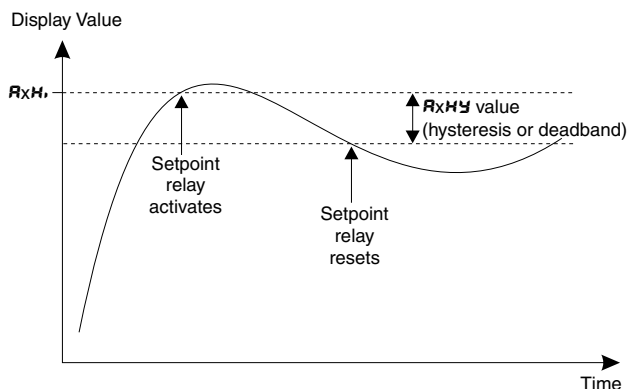
Displays and sets the alarm high setpoint value for the designated alarm relay. The high alarm setpoint may be disabled by pressing the **▲** and **▼** pushbuttons simultaneously. When the alarm is disabled the display will indicate **OFF**. The alarm relay will trip when the displayed value is greater than the **RxHi** setpoint value. Each relay may be configured with both a low and high setpoint, so the relay may be tripped when the reading moves outside the band set between low and high.

**RxHy (alarm hysteresis [deadband])**

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

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

In the low alarm mode once the alarm is tripped the input must rise above the setpoint value plus the hysteresis value to reset the alarm. The hysteresis units are expressed in displayed engineering units.



**RxLt (alarm trip time)**

Displays and sets the alarm trip time and is common for both alarm high and low setpoint values. The trip time is the delay time before the alarm relay will trip when an alarm condition is present. The alarm condition must be present continuously for the trip time period before the alarm will trip. This function is useful for preventing an alarm trip due to short non critical deviations from setpoint. The trip time is selectable over **0.0** to **999.9** seconds.

**RxRt (alarm reset time)**

Displays and sets the alarm relay reset time. When the alarm condition is removed the alarm relay will stay in its alarm condition for the time selected as the reset time. The reset time is selectable over **0.0** to **999.9** seconds.

**RxNo or RxNc (alarm x normally open or normally closed)**

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

**Rx.SP, Rx.L 1, Rx.L 2 etc. (relay operation independent setpoint or trailing)**

Each alarm may be programmed to operate with an independent setpoint setting or may be linked (or trailing) to operate at a fixed difference to another relay setpoint. The operation is as follows: Alarm 1 (**R1**) is always independent. Alarm 2 (**R2**) may be independent or may be linked to Alarm 1. Alarm 3 (**R3**) may be independent or may be linked to Alarm 1 or Alarm 2. Alarm 4 (**R4**) may be independent or may be linked to Alarm 1, Alarm 2 or Alarm 3. The operation of each alarm is selectable within the Function Setup Mode by selecting, for example, (Alarm 4) **R4.SP** = Alarm 4 normal setpoint or **R4.L 1** = Alarm 4 trailing Alarm 1 or **R4.L 2** = Alarm 4 trailing Alarm 2 or **R4.L 3** = Alarm 4 trailing Alarm 3. For trailing set points the setpoint value is entered as the difference from the setpoint being trailed. If the trailing setpoint is to operate ahead of the prime setpoint then the value is entered as a positive number and if operating behind the prime setpoint then the value is entered as a negative number. For example, with Alarm 2 set to trail alarm 1, if **R1H** is set to 1000 and **R2H** is set to 50 then Alarm 1 will trip at 1000 and alarm 2 will trip at 1050 (i.e. 1000 + 50). If Alarm 2 had been set at -50 then alarm 2 would trip at 950 (i.e. 1000 - 50). See the trailing alarm table which follows.

Trailing Alarm Table Showing Possible Alarm Assignments			
	<b>R2</b>	<b>R3</b>	<b>R4</b>
<b>R1</b>	<b>R2.L 1</b>	<b>R3.L 1</b>	<b>R4.L 1</b>
<b>R2</b>		<b>R3.L 2</b>	<b>R4.L 2</b>
<b>R3</b>			<b>R4.L 3</b>

It is possible to set one alarm to trail an alarm which itself is a trailing alarm e.g. you can have **R2.L 1** and **R4.L 2**.

**RxFFEE (free fall alarm)**

In most applications the **RxFFEE** function will be used in conjunction with a “high” alarm setting such as **R1H** to force the alarm relay to operate at a given measured quantity prior to the actual alarm setting. This function can be used to prevent any overfilling due to product which was in “free fall” when the alarm relay operated.

Applications include filling containers via a chute, auger or conveyor belt in which shutting off the filling process once the desired weight is reached will result in some overfilling due to the free fall product. The free fall value can be found by comparing the required product weight to the final weight.

For example a series of containers is to be filled with 40.0kg of product, **R1H** is set to **40.0** and this relay activation is used to stop the filling process. It is found that due to free fall product the average weight of the filled containers is actually 41.7kg. i.e. 1.7kg of product continues to fill the container after the alarm relay used to stop the filling process is activated. As an alternative to subtracting 1.7kg from the **R1H** setting we can use the free fall setting **R1FF** of 1.7 to ensure that alarm 1 relay operates 1.7kg prior to the desired weight.

The table below illustrates the action of the free fall alarm with both high and low alarm relay settings.

		Alarm relay activates display reading of:	With a hysteresis of 5 ( <b>RxHY</b> ) alarm resets at:
<b>RxFF = 10</b>	<b>RxH = 100</b>	90 or above	85 or below
<b>RxFF = 10</b>	<b>RxLo = 50</b>	40 or below	45 or above
<b>RxFF = -10</b>	<b>RxH = 100</b>	110 or above	105 or below
<b>RxFF = -10</b>	<b>RxLo = 50</b>	60 or below	65 or above

**P.5Et (preset value)**

Displays and sets the preset value to be used with the remote inputs or **P** button. When **P.5Et** is used as a remote input or **P** button special function the preset value will be set on the display when the appropriate remote or **P** button input is activated. The live mV input present at the time of the preset operation will now be assigned to the preset value.

**b.r.9t (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, see also the **dULL** function below.

### **dULL (remote display brightness)**

Displays and sets the level for remote input brightness switching, see **r.I NP** function. When the remote input is set to **dULL** the remote input can be used to switch between the display brightness level set by the **br 9t** function and the display brightness set by the **dULL** function. The display brightness is selectable from **0** to **15**, where **0** = lowest intensity and **15** = highest intensity. This function is useful in reducing glare when the display needs to be viewed in both light and dark ambient light levels and also in reducing power consumption in battery powered applications.

### **rEE - (analog recorder/retransmission output low value)**

Displays and sets the analog retransmission (4 to 20mA) output low value (4mA) in displayed engineering units. For example if a 4mA output is required at a display value of **0** the **rEE -** function should be set to **0**.



### **rEE ~ (analog recorder/retransmission output high value)**

Displays and sets the analog retransmission output high value (20mA) in displayed engineering units. For example if a 20mA output is required at a display value of **500** the **rEE ~** function should be set to **500**.

### **drnd (display rounding)**

Displays and sets the display rounding value. This value may be set from **1 - 5000** displayed units (e.g. **0.00 1** to **5.000** if decimal point set to 3 places). Display rounding is useful for reducing the instrument resolution without loss of accuracy in applications where it is undesirable to display to a fine tolerance. (example: if set to **10** the instrument display will increment in multiples of 10). The display rounding will also affect the alarm setpoint settings in that the alarms will also operate on multiples of the display rounding figure.



### **dCPt (period decimal point selection)**

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

### **FLt (digital filter)**

Displays and sets the digital filter value. Digital filtering is used for reducing susceptibility to short term interference such as electrical noise, interference is normally seen as unwanted display variations from the expected value. The digital filter range is selectable from **0** to **8**, where **0** = none and **8** = most filtering. The higher the filter setting the slower the display update. A typical value for the digital filter would be **3**.

### **CLno (cell number selection)**

Selects one of the two possible calibration settings (**CAL. 1** or **CAL.2**). This function allows the instrument to be calibrated to 3 different load cells and hold the calibration values in memory. Alternatively 3 different calibration values may be entered for a single cell, allowing the same cell to display in different units e.g. pounds, kilograms and tonnes. The user may select the load cell to be used via this function, via the  button or via a remote input. Whenever a the cell selection is changed it is necessary to zero the instrument using either the **SEt ZErO** function, a remote input zero or a  button zero.

### **rRE (sample rate for ADC)**

Displays and sets the ADC sample rate from 5 to 100 samples per second and is selected in steps as follows: **5, 10, 15, 20, 30, 40, 50, 60, 80** and **100**

### **r9E (full scale mV per V output of transducer)**

Displays and sets the full scale mV/V range to suit the load cell transducer usable range and is selected in steps as follows: **0.5, 1.0, 2.5, 5.0, 10, 25, 50** and **100**

### **r.I NP (remote input 1)**

Displays and sets the special function input selection for remote input 1. May be set to any one of the following shown in the table below:

Function	Description
<b><i>NONE</i></b>	No function
<b><i>P.HLd</i></b>	Peak hold
<b><i>d.HLd</i></b>	Display hold
<b><i>H<sub>i</sub></i></b>	Peak memory
<b><i>L<sub>o</sub></i></b>	Valley memory
<b><i>H<sub>i</sub> L<sub>o</sub></i></b>	Toggles between peak and valley memory
<b><i>tARE</i></b>	Push button tare
<b><i>ZERO</i></b>	Push button zero
<b><i>SP.Ac</i></b>	Alarm setpoint only access to functions
<b><i>No.Ac</i></b>	No access to functions
<b><i>CAL.S</i></b>	Select calibration to be used
<b><i>P.SET</i></b>	Preset value
<b><i>i.CAL</i></b>	Initiate auto calibration
<b><i>batch</i></b>	Batch
<b><i>CAL</i></b>	Calibration via remote input
<b><i>t.Add</i></b>	Add to total
<b><i>t.CLR</i></b>	Clear total
<b><i>t.dSP</i></b>	Display total
<b><i>D.Pwt</i></b>	Send display value out as serial ASCII string
<b><i>d.Lo9</i></b>	Data log enable input
<b><i>S.Lo9</i></b>	Single data log input

There are up to 3 remote inputs available on the TP4-WT. Operation is via voltage free contacts on connector P9 on the main circuit board. Shorting these contacts to the GND terminal will cause the function to operate, see Chapter 3 “Electrical Installation” for wiring details.

If 2 or more remote inputs are operated at once then input 1 has the highest priority followed by input 2. 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:

***NONE*** (None) - This function is selected when none of the special functions are required.

***P.HLd*** (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 reverts back to the live reading.

***d.HLd*** (Display hold) - The display hold function is similar to peak hold, except that the held reading is the value displayed when the switch contact is closed.

***H<sub>i</sub>*** (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 pushbutton must be held closed for 1 to 2 seconds or power removed.

***L<sub>o</sub>*** (Valley memory) - The valley memory (min) operates in a similar way to the peak memory but shows the lowest display value since last reset.

***H<sub>i</sub> L<sub>o</sub>*** (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.

***SP.Ac*** (Setpoint access only) - Allows access to 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 7 and 8. Note: If more than one remote input is set to **SP.Ac** then all of those inputs must be closed to allow full access.

**No.Ac** (No program access) - Inhibits access to functions via pushbuttons and front panel 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 7 and 8. If more than one remote input is set to **No.Ac** then all of those inputs must be closed to allow access.

**CAL.S** (Select calibration scaling) - When the external input is open the calibration selected in function mode will be used. When the external input is closed the next calibration set will be used. e.g. if **CAL.1** is selected under the **CL.no** function then closing the switch will cause the next calibration (**CAL.2**) to be used. This function may be used to select different load cells, different rigging arrangements etc. This may also be used to change measuring units. e.g. the unit may be calibrated in kg on **CAL.1** and pounds on **CAL.2**

**P.SET** (Preset value) - The display value will start at the value selected in the preset value function **P.SET** (this function appears after the alarm functions, see "Function Table"). This works in a similar manner to the **ZERO** function except that a preset weight/pressure value can be input. See also the separate **P.SET** function.

**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.

**batch** (Batch) - The batch function does not affect the display value when operated. It does, however, affect the retransmission and alarm functions, see the **FEE** and alarm mode (**A1** to **A7**) functions for a full description.

**CAL** (Calibration via remote input) - When set to **CAL** the remote input can be used to perform a simple, live input calibration for situations requiring frequent calibration and item counting by weight applications. In this method of calibration a remote input (**F1.NP**, **F1.N2** or **F1.N3**) is assigned to **CAL**, closure of this remote input then initiates the calibration process. The procedure is as follows:

- \* Assign a remote input to **CAL**.
- \* Assign a different remote input or **P** button function to **ZERO**, then zero the system via the remote input or **P** button when the system is in a no load condition.
- \* Place a known weight (or known number if items) on the weighing platform then close the **CAL** remote input.
- \* The message **SCALE** will appear on the display followed by the previous scale value in memory, use the **▲** or **▼** push button to alter this reading to the value required for this load.
- \* Press, then release, the **▢** push button, the message **CAL End** will be seen and the instrument will return to normal measurement display mode.

Note that the **P** button may be used to abort the calibration.

The following three modes of remote input operation are used to set up and operate the TP-WT weight capability. These modes allow weights displayed to be added to the total in memory, displayed and also allow the memory total to be cleared.

**t.Add** - (Add to total) - When this mode is selected for a given remote input the weight displayed at the time of remote input operation will be added to the total memory when the input is operated.

**t.CLR** - (Clear the total) - When this mode is selected operation of the chosen remote input will cause the total memory to be cleared.

**t.dSP** - (Display total) - When this mode is selected operation of the chosen remote input will cause the total memory value to be displayed.

The following function can be used to cause the display value to be send as an ASCII string out of the serial port.

**O.Put** - (Output as a serial string) - When this mode is selected a contact closure on the remote input selected will cause the display value to be sent via the serial port as an ASCII string. This can be sent to a computer, suitable serial printer, PLC etc. The format of data sent is: <STX> XXXXXXX<CR>. Where <STX> is the start of text character, X is a space for a positive number or a "-" for a negative number, XXXXXX is the display value and <CR> is a carriage return character. Refer to the "RS232/RS485 commands" chapter for further information on serial communications.

The following two functions can be used with the optional internal data logger memory to allow manual logging to the memory. Note: when either one of these two options is selected the data logger will cease permanent logging operation and will wait for a manual input. If the **d.Lo9** function is selected at more than one remote input then all of these remote inputs must be activated to allow data logging. If **S.Lo9** is selected at more than one remote input of at the **P** button then any of these inputs can be used to allow data logging. If a mixture of **d.Lo9** and **S.Lo9** options are selected then the **d.Lo9** inputs must be activated to allow the **S.Lo9** input to function. The **d.Lo9** option will not operate whilst **S.Lo9** is selected at another input.

**d.Lo9** - (Data log input)- applicable only to instruments with the internal data logger option fitted. The display value will be logged continuously into data logger memory whilst the remote input is held closed. The time period for the logging is set by the **Lo9UPdt** function e.g. if **Lo9UPdt** is set to **1.00** minute then whilst the remote input is closed the display value will be logged into the data logger memory once per minute. Note: when the **d.Lo9** option is selected the data logger will cease permanent logging operation and will wait for a manual input.

**S.Lo9** - (Single log input) - applicable only to instruments with data logger option. The display value will be logged into memory once when the remote input is activated. The message **d.Lo9** will be seen when data is accepted. There is a delay time during which new inputs cannot be accepted, this delay time is set by the **Lo9UPdt** function e.g. if **Lo9UPdt** is set to **1.00** minute then once a log input has been accepted no new inputs can be accepted for 1 minute. Note: when the **S.Lo9** option is selected the data logger will cease permanent logging operation and will wait for a manual input.

### Selecting the remote input function

To select the required function, enter the **CR.L** mode in the usual way and step through the functions until you reach the required remote input indicated by the display message **F.: RP**, **F.: R2** or **F.: R3** 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 **F.: RP** value will be used when the switch is ON and the display value when the switch is OFF.

#### F.: R2 (remote input 2)

Displays and sets the special function input selection for remote input 2. May be set to any one of the functions shown in the **F.: RP** table above.

#### F.: R3 (remote input 3)

Displays and sets the special function input selection for remote input 3. May be set to any one of the functions shown in the **F.: RP** table above.

#### P.but (P button function)

The front panel **P** push button has a selection of special functions which may be assigned to it. This button is programmable in the same manner as a remote input. The **P** button selection will override the selection made under the **F.: RP** function if both have the same functions selected. Upon reaching the **P.but** function the choices in the table below are available. Note: To prevent accidental operation of the **P** button in the **tARE**, **ZEFO** or **P.SET** functions it is necessary to hold the button in for 2 seconds to perform the selected operation.

<b>P</b> Function	Description
<b>NONE</b>	No function
<b>H.</b>	Peak memory. To clear the memory hold the <b>P</b> button pressed for 2 seconds
<b>Lo</b>	Valley memory. To clear the memory hold the <b>P</b> button pressed for 2 seconds
<b>H, Lo</b>	Toggles between peak and valley memory. To clear the memory hold the <b>P</b> button pressed for 2 seconds
<b>tARE</b>	Push button tare or nett or gross display function (toggles)
<b>ZEFO</b>	Push button zero
<b>CR.L.S</b>	Select calibration to be used
<b>P.SET</b>	Preset value
<b>btch</b>	Batch
<b>t.Add</b>	Add the current displayed value to memory total. Pressing the <b>P</b> button will cause the total memory value to appear on the display preceded by the message <b>tot!</b> , if the <b>P</b> button is held pressed for 2 seconds the current weight will be added to the total memory, the message <b>Add</b> will appear followed by the new total

<b>t.dSP</b>	Display the total memory. Pressing the <b>P</b> button will cause the total memory value to appear on the display preceded by the message <b>tOtI</b> , if the <b>P</b> button is held pressed for 2 seconds the total will be reset the message <b>CLr</b> will be seen just prior to the memory clearing
<b>O.PUt</b>	Output to the serial port the display value as an ASCII serial string
<b>S.LoG</b>	Single log input - applicable only to instruments with the internal data logger option fitted. The display value will be logged into memory once when the <b>P</b> button is pressed. The message <b>d.LoG</b> will be seen when data is accepted. There is a delay time during which new inputs cannot be accepted, this delay time is set by the <b>LoG UPdt</b> function e.g. if <b>LoG UPdt</b> is set to <b>1.00</b> minute then once a log input has been accepted no new inputs can be accepted for 1 minute. Note: when the <b>S.LoG</b> option is selected the data logger will cease permanent logging operation and will wait for a manual input.

### **ACCESS (access mode)**

The access mode function **ACCESS** has one of four possible settings namely **OFF**, **EASY**, **NONE** and **ALL**. If set to **OFF** the mode function has no effect or alarm relay operation. If set to **EASY** the “easy alarm access” mode will be activated, see below 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. If set to **ALL** then access to all functions can be made via **FUNC** mode i.e. there is no need for the **CAL** mode power up sequence. This function provides an alternative to using the **F:NP**, **F:N2** & **F:N3** functions for easy access or no access mode thereby allowing the remote input to be programmed for an alternative use.

**Easy Alarm Access** - The TP4-WT has an easy alarm access facility which allows access to the alarm setpoints simply by pressing the **F** button at the front of the instrument. The first setpoint will then appear and changes to this setpoint may be made to this setpoint via the **▲** or **▼** buttons. Press the **F** button to accept any changes or to move on to the next setpoint.

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

1. Either the **F:NP** function must be set to **SP.AC** or the **ACCESS** function must be set to **EASY**.
2. At least one alarm must have a setpoint, nothing will happen if all the alarm setpoints are set to **OFF**.
3. The **SP.AC** function must be set to allow access to the relays required e.g. if set to **A 1-2** then the easy access will work only with alarm relays 1 and 2 even if more relays are fitted.
4. The instrument must be in normal measure mode i.e. if the instrument is powered up so that it is in **CAL** mode then the easy access will not function. If in doubt then remove power from the instrument, wait for a few seconds then apply power again.
5. If the easy access facility is used then the only way to view or alter any other function settings is to power up via **CAL** mode i.e. there is no entry to **FUNC** mode unless the instrument is powered up in **CAL** mode.

### **SPAC (setpoint access)**

Sets the 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. For this function to operate one of the remote input functions must be set to **SPAC**.

### **Li n Pts (lineariser points)**

Displays and sets the number of calibration scaling points to be used. Choices are 2, 3, 4 or 5 points. For most applications two points will be used. If more than 2 points are selected the **ECAL/ESCL** and remote input calibration methods cannot be used. Selecting 3 or more points allows for compensation for non linear inputs from load cells and pressure sensors.

### **CAL 1 & CAL 2 . CAL 3 . CAL 4 & CAL 5 (live input calibration points)**

Displays and sets the independent calibration/scaling points of the input to the display. The **Li n Pts** function sets the number of live input samples required for calibration. For example with 2 points selected two different live inputs are applied and the instrument is scaled to each these inputs in turn. Alternative methods of calibration are via the **ECAL** function, the **CAL OFSt** function or the remote input calibration function.

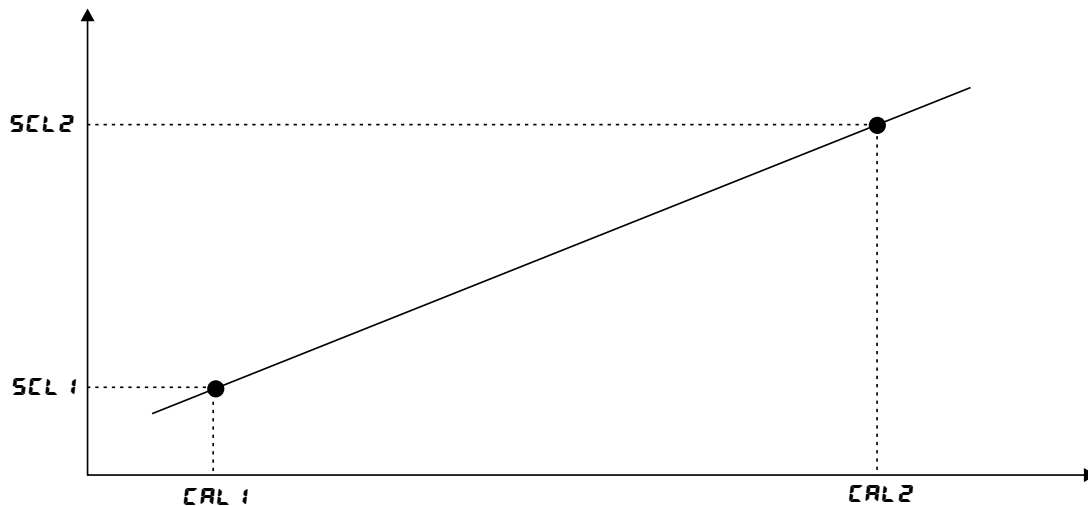
The procedure for a 2 point calibration (**Li n Pts** set to **2**) is as follows:

- \* When the **CAL 1** function is reached press the **▲** and **▼** push buttons simultaneously, then

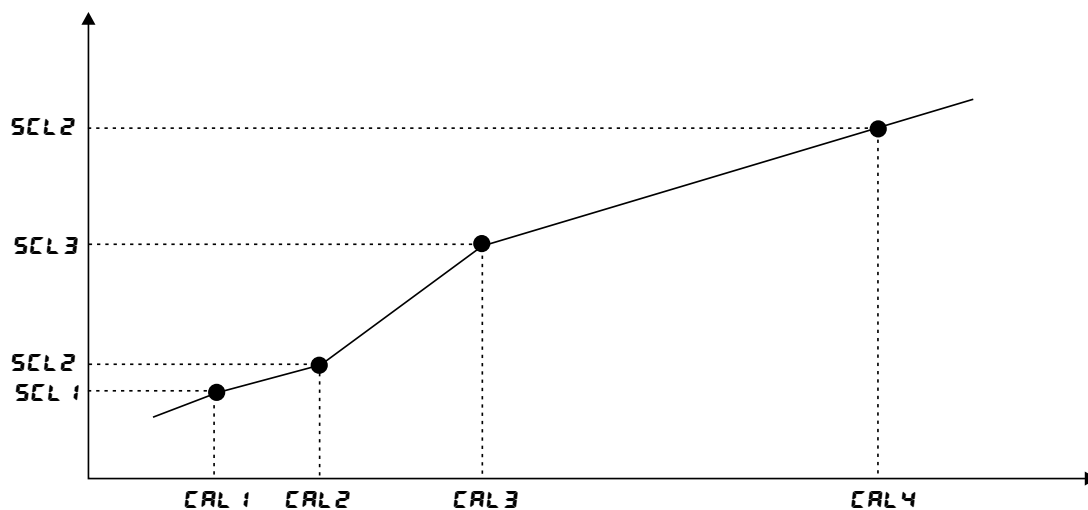
release them.

- \* The display will flash **CAL 1** followed by a “live” reading from the input. Apply a known weight to the load cell e.g. zero load.
- \* When the “live” reading is steady (do not worry if this is not the reading required) press, then release the **F** push button.
- \* The display will flash **SCL 1** followed by the last scale value in memory. Use the **▲** or **▼** push button to alter this value to the required reading i.e. the display value required for the load now on the load cell.
- \* Press, then release, the **F** push button. The display will now indicate **CAL End** followed by **CAL 2**.
- \* Press both the **▲** and **▼** push buttons simultaneously, then release them. The display will flash **CAL 2** followed by a “live” reading from the input. Apply a different known weight to the load cell. For best accuracy this second weight should be as close as possible to the normal full load weight for the system.
- \* When the “live” reading is steady (do not worry if this is not the reading required) press, then release the **F** push button.
- \* The display will flash **SCL 2** followed by the last scale value in memory. Use the **▲** or **▼** push button to alter this value to the required reading i.e. the display value required for the load now on the load cell.
- \* Press, then release, the **F** push button. The display will now indicate **CAL End** and the instrument will now move on to the next function.
- \* Step through to the **SET ZERO** function, remove the load and operate the set zero.

The calibration of these points may also be carried out as independent operations i.e. **CAL 1** and **CAL 2** points may be changed independently. If more than two calibration points have been selected at the **LOADS** function the appropriate extra functions will be seen e.g. **CAL 3** and **SCL 3** for the third point.



Two scaling points - display is linear



More than two scaling points - linearised display

## **ECAL (mV/V calibration)**

This alternative calibration method allows the known mV/V and full scale value of the load cell to be entered as the calibration value i.e. no live inputs are required. The **LOAD PLS** function must be set to **2** for this method. The mV/V value is entered to 3 decimal places. Press, then release **▲** and **▼** simultaneously to enter the **ECAL** function, the display will indicate the last stored mV/V value, use the **▲** or **▼** push button to change this display to the mV/V output for your cell. Press and release the **F** push button, the display will now indicate **ESCL** followed by the previous full scale value in memory, use the **▲** or **▼** push button to change this to the required full scale reading. For example a 10 kilogram, 2.000mV/V load cell is used, it is known that at the maximum rated load (10kg) the display is to be scaled to read **500.0**, once the **ECAL** function has been entered change the mV/V value **2.000** and the **ESCL** setting to **500.0**.

Once the **ESCL** value has been entered use the **SET ZERO** function with zero weight on the load cell to give the instrument a zero reference. Alternatively a zero from the **P** button or a remote input can be used (see **P.but** & **FNIP** functions).

When using the two point calibration method (**CAL 1** and **CAL 2**), described previously, the mV/V value is automatically calculated and may be viewed in this function. The **ECAL** and **ESCL** values may be recorded and re-entered to re-scale the instrument to the same load cell at a later date.

## **CAL OFFS (offset calibration)**

Allows the instrument calibration to be offset by a single point value. This value is added or subtracted equally across the range of the instrument and so it is suitable for use only when the entire range of display values is to be adjusted. With a known load on the cell press then release **▲** and **▼** simultaneously to enter the **CAL OFFS** function, the current reading will be displayed. Press, then release, the **F** push button, **SCALE** will then be briefly displayed followed by a reading, alter the reading on the display (via the **▲** or **▼** pushbutton) to give the required reading for the load. Press, then release the **F** push button, the message **OFFS End** will be displayed and the display will move on to the next function.

## **SET ZERO (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 display will show a live reading from the cell, press the **F** push button to accept this or the **P** push button to abort the function. The display will indicate **ZERO End** then move on to the normal measure mode once the set zero has been accepted. The zero point will be retained even if power is removed. The set zero function should be operated whenever the load cell calibration number (see **CLNO** function) is changed. Alternatively a zero from the **P** button or a remote input can be used (see **P.but** & **FNIP** functions).

## **ZERO RANGE (zero range)**

The zero range function allows a limit value to be set above which the display will not zero i.e. if a zero operation is attempted via the **P** button, remote input or **SET ZERO** function when the display value is greater than the zero range setting the display will refuse to zero and give a **ZERO RANGE Err** message. For example if the zero range setting is 10 the instrument will only respond to a zero operation if the display reading at the time is between -10 and 10. If the zero range function is not required it can be set to **OFF** by pressing the **▲** and **▼** buttons simultaneously at this function. When switched off the instrument can be zeroed no matter what the display value.

Note that the instrument keeps track of the value being zeroed at each operation, when the total amount zeroed from repeated operations becomes greater than the zero range value the instrument will reject the zero operation and a **ZERO RANGE Err** message will be seen. If repeated zero operations are required the **ZERO RANGE** function should be set to **OFF** or alternatively the **LARGE** operation could be considered.

## **CAL ZERO (calibration zero)**

The calibration zero can be used to select a zero point other than the display zero as the reference for the **ZERO RANGE** function. The calibration zero function is used only with the **ZERO RANGE** function. For example if the **CAL ZERO** operation is carried out with a display reading of 500 and a **ZERO RANGE** reading of 10 the zero range function will allow the display to zero only if the current display reading is between 490 and 510. To enter an input level as the new cal zero point press the **▲** and **▼** buttons simultaneously at the **CAL ZERO** function, the display will show a live reading from the cell, press the **F** push button to accept this or the **P** push button to abort the function. The display will indicate **CAL ZERO End** then move on to the normal measure mode once the set zero has been accepted.

## **AUTO ZERO (auto zero)**

The TP4-WT can be set to automatically re-zero its reading if the display is within the range set by the **AUTO ZERO** function (for the set number of samples, see **A.2. Count**). For example if the auto zero is set to 10 then the instrument will re-zero itself whenever the display is within 10 units of zero (for the set number of samples). The auto zero can be set within the range 0 to 100 display units. Setting auto zero to 0 will disable the function and the instrument will not re-zero automatically.

The time taken to auto zero depends upon the sample rate and the sample count (**A.2. Count**) setting.

### **A.2. Count (auto zero sample count)**

Displays and sets the number of samples to be taken for the auto function. For example if set to 50 then if the display is within the auto zero setting (e.g. 10) for 50 samples then the instrument will re-zero. The sample count may be set within the range of 10 to 1000.

### **A1 to A4 (alarm mode)**

The alarm mode function (**A1** to **A4**) allows the alarm relays to follow either the valley memory (**Lo**) the peak memory (**H**), display hold (**d.HLD**), peak hold (**P.HLD**), batch (**batch**), the tare value (**TARE**) or the live display value (**LIVE**). The tare, peak hold, display hold and batch operations are via a remote input, see the **F.1 NP** function.

**Example 1- A1** is set to **d: SP**.

If the live display mode is used then the alarms will operate purely on the display value at the time i.e. if the display is showing above high setpoint or below the low setpoint value then the alarm relay will activate. For example if the remote input were set to peak memory and **A1** were set to display mode then, unless the display is actually showing the peak memory value (i.e. the remote input has just been activated), the alarm relay is free to operate from the changing display value i.e. the memory does not have to be reset to clear an alarm condition.

**Example 2- A1** is set to **LIVE**.

With the alarm function set to follow the display 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 3 - 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 **d: SP** then the alarm will follow the gross value not the tared value and will operate if the nett display is above **50** (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 **50** or below.

**Example 4 - A1** is set to **H**.

Assume that **A1H** is set to **500**. If the peak memory value reaches **500** the relay will activate. The relay can now only be de-activated by resetting the peak memory. The peak memory can be reset by holding the remote input or **P** button (depending on which is of these inputs is set to the **H** function) closed for approximately 3 seconds. Alternatively the peak and valley memory will be reset if power is removed from the instrument.

**Example 5 - A1** is set to **batch** and **F.1 NP** is set to **batch**.

Assume that **A1H** is set to **250** and that the instrument is given a remote batch input when the display reads **70**. The display does not alter when a batch input is applied but alarm 1 will not trip until the display goes above **320** (**250** plus **70**). i.e. once the batch input is applied the display value must **increase** by the alarm value before the alarm will trip. The low alarm setting operates in the same manner e.g. if **A1Lo** was set to **250** and a remote batch input was applied at a reading of **70** then the low alarm would operate when the display reads **320** or below.

Note: If the instrument had a remote batch input when **A1** was set to **d: SP** then the alarm would still operate above a display value of **250** i.e. it would operate when the displayed value becomes greater than the **A1H** setting.

## FEC (retransmission mode)

The retransmission of 4-20mA can be set to follow the display value (**d: SP**), valley memory (**Lo**) the peak memory (**H**), display hold (**d.HLD**), peak hold (**P.HLD**), batch (btch), the tare value (**tARE**) or the live display value (**L: UE**). The tare, peak hold, display hold and batch operations are via a remote input, see the **F: NP**, **F: N2** or **F: N3** function is set to tare or batch as required.

Operation is as follows:-

**d: SP** - the **d: SP** option allows the retransmission to follow the display value rather than the live input value. This is particularly useful when using **tARE** or **ZEFO** to zero the display since the display will show zero rather than the live input value.

**Lo** - with the **FEC** function set to **Lo** the retransmission will follow the valley memory value. This means that the analog output can fall if the display reading and hence the valley memory value falls but it cannot rise unless the memory is reset.

**H** - with the **FEC** function set to **H**, the retransmission will follow the peak memory value. This means that the analog can rise if the display reading and hence the valley memory value rises but it cannot fall unless the memory is reset.

**P.HLD** - with the **FEC** function set to **P.HLD** the retransmission will follow the peak value whilst the peak hold remote input is activated.

**d.HLD** - with the **FEC** function set to **d.HLD** the retransmission will be held whilst the display hold remote input is activated.

**btch** - with the **FEC** function set to **btch** the retransmission will follow the remote input batch function. e.g. if **FEC<sub>-</sub>** is set to **0** and **FEC<sub>+</sub>** is set to **100** and the instrument is given a remote batch (via the external input) when the display shows **30** then after the batch input the display is unaltered but for a 4-20mA retransmission, 4mA will be transmitted at the batched display value of **30** and 20mA will be transmitted for a display value of **130**.

**tARE** - with the **FEC** function set to **tARE** the retransmission will follow the remote input tare function. e.g. if **FEC<sub>-</sub>** is set to **0** and **FEC<sub>+</sub>** is set to **100** and the instrument is given a remote tare (via the external input) 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 nett value of **100**.

**L: UE** - with the **FEC** function set to **d: SP** 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.

## tot: (total mode)

Allows selection of display (**d: SP**), tare (**tARE**) or batch (**btch**) for total display, this will operate in the same manner as the **R1-R7** functions except that the total display will be affected rather than the alarms. See the **R1** to **R7** functions for further explanation & examples.

## Lo d: SP (low overrange limit value)

The display can be set to show an overrange message if the display value falls below the **Lo d: SP** setting. For example if **Lo d: SP** is set to **50** then once the display reading falls below **50** the message **-or-** will flash or the value will flash (see **d: SP** function which follows) 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.

## H: GH d: SP (high overrange limit value)

The display can be set to show an overrange message if the display value rises above the **H: GH d: SP** setting. For example if **H: GH d: SP** is set to **1000** then once the display reading rises above **1000** the message **-or-** will flash or the value will flash (see **d: SP** function which follows) instead of the normal display units. This message can be used to alert operators to the presence of an input which is above the high limit. If this function is not required it should be set to **OFF** by pressing the **▲** and **▼** buttons simultaneously at this function.

## d: SP (overrange display warning message)

The **d: SP** function can be set to **FLASH** or **-or-**. If the **Lo d: SP** or **H: GH d: SP** functions are used then the **d: SP** function determines the nature of the overrange warning display. If set to **FLASH** the display value will flash on and off approximately once per second. If the **d: SP** function is set to **-or-** then the **-or-** message will flash on and off approximately once per second whenever an overrange condition exists. In each case the display will return to normal if the input returns to a non overrange value.

**LOG UPdt (select log update time)** - seen only with data logger option.

Displays and sets the time period between each log sample. Available selections are:

**0.10** (10 seconds), **0.20** (20 seconds), **0.30** (30 seconds), **1.00** (1 minute), **2.00** (2 minutes), **3.00** (3 minutes), **4.00** (4 minutes), **5.00** (5 minutes), **6.00** (6 minutes), **10.00** (10 minutes), **15.00** (15 minutes), **20.00** (20 minutes), **30.00** (30 minutes) and **60.00** (60 minutes).

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

**CLr LOG (clear data log memory)** - seen only with data logger option.

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

**SEt rTc (set time)** - seen only with data logger option.

Displays and sets the current time in hours and minutes (24 hour format HH.MM) e.g. set as **1720** for 5:20 pm.

**SEt dRtE (set date)** - seen only with data logger option.

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

**SEt YERr (set year)** - seen only with data logger option.

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

**BRud (set baud rate)** - seen only with serial output option.

Select from 9600, 4800, 2400, 1200, 600, 300, 19.2 or 38.4.

**PrEtY (set parity)** - seen only with serial output option.

Select parity check to either **none**, **EVEN** or **odd**.

**Q.PUt (set RS232/485 interface mode)** - seen only with serial output option.

Select **d**, **SP**, **Cont** or **POLL**

Allows user to select the RS232/485 interface operation as follows:-

**d**, **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.

**R.buS** Special binary output for communications with optional download and data logger Windows software for use with a PC. Whilst the data logger download software can operate with ASCII input the binary communications is recommended for higher speed and reliability of communications.

**Addr (set unit address for polled (POLL) mode (0 to 31))** - seen only with serial output option.


Allows several units to operate on the same RS485 interface reporting on different areas etc. The host computer or PLC may poll each unit in turn supplying the appropriate address.

The unit address ranges from 0 to 31 (DEC) but is offset by 32 (DEC) to avoid clashing with ASCII special function characters (such as <STX> and <CR>). Therefore 32 (DEC) or 20 (HEX) is address 0, 42 (DEC) or 2A (HEX) addresses unit 10.

### Returning to the normal measure mode

If entry via **CLrL** mode has been made it is advisable to return the instrument to the normal mode (where calibration functions cannot be tampered with). To return to the normal display mode, turn off power to the instrument, wait a few seconds and then restore power.

#### 4.1 Function table

Initial display	Meaning of display	Next display	Default Setting	Record Your Settings
<b>RxLo</b>	Alarm x low setpoint value	Setpoint value or <b>OFF</b>	<b>OFF</b>	See following table
<b>RxHi</b>	Alarm x high setpoint value	Setpoint value or <b>OFF</b>	<b>1000</b>	See following table
<b>RxHY</b>	Alarm x hysteresis	Hysteresis value in measured units	<b>10</b>	See following table
<b>RxTt</b>	Alarm x trip time	No of seconds before relay trips (0.0 to 999.9)	<b>0.0</b>	See following table
<b>Rxrt</b>	Alarm x reset time	No of seconds before relay resets (0.0 to 999.9)	<b>0.0</b>	See following table
<b>Rxn.o</b> or <b>Rxn.c</b>	Alarm x action N/O or N/C	<b>Rxn.o</b> or <b>Rxn.c</b>	<b>Rxn.o</b>	See following table
<b>Rx.SP</b> or <b>Rx.t 1</b>	Alarm x independent or trailing setpoint 1,2 etc.	<b>Rx.SP</b> or <b>Rx.t 1</b> etc.	<b>Rx.SP</b>	See following table
<b>RxFFEE</b>	Alarm free fall value	Value in memory	<b>0</b>	See following table
<b>P.SET</b>	Preset value	Value in memory	<b>0</b>	
<b>brgt</b>	Digital display brightness	<b>0</b> to <b>15</b> ( <b>15</b> = highest brightness)	<b>15</b>	
<b>dULL</b>	Remote input display brightness switching	<b>0</b> to <b>15</b> ( <b>15</b> = highest brightness)	<b>1</b>	
<b>*rEE-</b>	Recorder output low limit	Value in memory	<b>0</b>	
<b>*rEE+</b>	Recorder output high limit	Value in memory	<b>100</b>	
<b>*drnd</b>	Display rounding selects resolution	Value in memory	<b>1</b>	
<b>*dCPE</b>	Display decimal point	Decimal Pt position (e.g. <b>0.1</b> or <b>0.02</b> )	<b>0</b>	
<b>*FLtr</b>	Digital filter range 0 to 8	<b>0</b> to <b>8</b> ( <b>8</b> = most filtering)	<b>2</b>	
<b>*CL.no</b>	Cell number selection	<b>CAL. 1</b> , <b>CAL.2</b> or <b>CAL.3</b>	<b>CAL. 1</b>	
<b>*RATE</b>	Sample rate (samples per second)	<b>5. 10. 15. 20. 30. 40. 50. 60. 80</b> or <b>100</b>	<b>10</b>	
<b>*RNGE</b>	Full scale mV/V range	<b>0.5. 1.0. 2.5. 5.0. 10. 25. 50.</b> or <b>100</b>	<b>5.0</b>	
<b>*r.1 NP</b>	Remote input 1 operation	<b>NONE. P.HLd. d.HLd. Hi. Lo. Hi. Lo. tArE. 2EFO. SP.Ac. No.Ac. CAL.5. P.SET. 1. CAL. btch. CAL. t.Add. t.Clr. t.dSP. dULL. d.Lo9. S.Lo9</b> or <b>0.Put</b>	<b>NONE</b>	
<b>*r.1 N2</b>	Remote input 2 operation	As per <b>r.1 NP</b>	<b>NONE</b>	
<b>*r.1 N3</b>	Remote input 3 operation	As per <b>r.1 NP</b>	<b>NONE</b>	
<b>*P.but</b>	 Button function	<b>NONE. Hi. Lo. Hi. Lo. tArE. 2EFO. CAL.5. P.SET. btch. t.Add. t.dSP. S.Lo9</b> or <b>0.Put</b>	<b>NONE</b>	
<b>*RCCS</b>	Alarm relay access mode	<b>OFF, EASY, NONE</b> or <b>ALL</b>	<b>OFF</b>	
<b>*SPAC</b>	Setpoint access (only seen if 2 or more relays fitted)	<b>A 1, A 1-2, A 1-3</b> etc.	<b>A 1</b>	
<b>*L.n Pts</b>	Lineariser points	<b>2, 3, 4</b> or <b>5</b>	<b>2</b>	

Initial display	Meaning of display	Next display	Default Setting	Record Your Settings
* <i>CAL 1</i>	Calibration standard two point	See section on calibration	n/a	
* <i>CAL 2</i> , <i>CAL 3</i> , <i>CAL 4</i> & <i>CAL 5</i>	Calibration - second, third, fourth & fifth points	See calibration chapter	n/a	
* <i>ECAL</i>	Calibration by entering mV/V value	See section on calibration	n/a	
* <i>CAL OFFSt</i>	Offset calibration	See section on calibration	n/a	
* <i>SEt ZER0</i>	Set zero	See section on calibration	n/a	
* <i>ZER0 RNgE</i>	Zero range	Value in memory or <i>OFF</i>	<b>1000</b>	
* <i>CAL ZER0</i>	Calibration zero	<i>CAL ZER0 End</i> , after <i>CAL ZER0</i> operation	n/a	
* <i>Auto ZER0</i>	Auto zero range	<b>0</b> to <b>100</b>	<b>0</b>	
* <i>A.Z.Cnt</i>	Auto zero samples	<b>10</b> to <b>1000</b>	<b>10</b>	
* <i>A 1</i>	Alarm mode, alarm 1	<i>Lo.Hi .d.HLd.P.HLd.bctch . tARFE</i> or <i>LI UE</i>	<i>LI UE</i>	
* <i>A 2</i>	Alarm mode, alarm 2	<i>Lo.Hi .d.HLd.P.HLd.bctch . tARFE</i> or <i>LI UE</i>	<i>LI UE</i>	
* <i>A 3</i>	Alarm mode, alarm 3	<i>Lo.Hi .d.HLd.P.HLd.bctch . tARFE</i> or <i>LI UE</i>	<i>LI UE</i>	
* <i>A 4</i>	Alarm mode, alarm 4	<i>Lo.Hi .d.HLd.P.HLd.bctch . tARFE</i> or <i>LI UE</i>	<i>LI UE</i>	
* <i>REC</i>	Retransmission mode	<i>Lo.Hi .d.HLd.P.HLd.bctch . tARFE</i> or <i>LI UE</i>	<i>LI UE</i>	
* <i>totl</i>	Total mode	<i>di SP .tARFE</i> or <i>bctch</i>	<i>di SP</i>	
* <i>Lo di SP</i>	Low overrange	Value in memory or <i>OFF</i>	<i>OFF</i>	
* <i>HI SH di SP</i>	High overrange	Value in memory or <i>OFF</i>	<i>OFF</i>	
* <i>di SP</i>	Overrange warning display	<i>FLSH</i> or <i>-or-</i>	<i>FLSH</i>	
* <i>Lo9 UPdt</i>	Select data logger update time	<b>0. 10. 0.20. 0.30. 1.00. 2.00. 3.00. 4.00. 5.00. 6.00. 10.00. 15.00. 20.00. 30.00</b> or <b>60.00</b>	<b>10.00</b>	
* <i>CLr Lo9</i>	Clear data logger memory	<i>Pro9 Lo9</i> (seen after memory cleared)	n/a	
* <i>SEt rtc</i>	Set clock time	Hours:min:sec e.g. <b>12:23:55</b>	n/a	
* <i>SEt dAtE</i>	Set date	Day:Month e.g. <b>14: 10</b>	n/a	
* <i>SEt YEAr</i>	Set year	Year e.g. <b>1999</b>	n/a	
* <i>bAUd RAtE</i>	Baud rate	<b>300, 600, 1200, 2400, 4800, 9600, 38.4</b> or <b>19.2</b>	<b>9600</b>	
* <i>Prty</i>	Parity select	<b>NONE, EVEN</b> or <b>Odd</b>	<b>NONE</b>	
* <i>O.PUt</i>	Serial output mode	<b>di SP, Cont .POLL</b> or <b>A.bUS</b>	<b>Cont</b>	
* <i>Addr</i>	Set unit address	Value in memory	<b>0</b>	

Note: Functions in the shaded areas on this table will be displayed only when those particular options are fitted. Functions marked \* are available only through entering *CAL* (calibration) mode or by setting the *ACC5* function to *ALL*.

<b>Settings for relays - record settings here</b>				
	<b>A1</b>	<b>A2</b>	<b>A3</b>	<b>A4</b>
<b>RxLo</b>				
<b>RxH.</b>				
<b>RxHY</b>				
<b>Rx.t.t</b>				
<b>Rx.r.t</b>				
<b>Rxn.o</b> or <b>Rxn.c</b>				
<b>Rx.SP</b> or <b>Rx.t 1</b>	n/a			
<b>Rx FTEE</b>				
<b>Rx</b>				

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## 5 Examples and Trouble Shooting

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### 5.1 Alteration of function settings

Most of the TP4 functions are altered simply by entering either **FUNC** or **CAL** modes, stepping through the functions until the required function is reached, making the alteration required via the **▲** or **▼** push button, accepting the change by pressing the **F** push button then returning to the normal measurement display.

The example below gives the steps required to alter the alarm relay 1 trip time from 2 seconds to 10 seconds.

- \* The alarm trip time is accessible via **FUNC** mode so enter this mode using the method shown at the beginning of "Explanation of Functions" Chapter 4.
- \* Step through the functions, by pressing, then releasing, the **F** push button, until **AL1T** is reached.
- \* The value for **AL1T** will show as **2** seconds, use the **▲** push button to change this value to **10**.
- \* Press, then release the **F** push button to accept the change.
- \* Press, then release the **P** push button to return to a normal measurement display.

### 5.2 Setting the auto zero facility

The example below gives the steps required to set the auto zero so that the instrument will zero the display whenever the display is within 5 display units of zero for 20 sample counts (the sample count refers to the instruments internal sampling rate, not the number of samples placed on the load cell).

- \* The auto zero functions are accessible via **CAL** mode so enter this mode using the method shown at the beginning of "Explanation of Functions" Chapter 4.
- \* Step through the functions, by pressing, then releasing, the **F** push button, until **AUTOZERO** is reached.
- \* Use the **▲** or **▼** push button to alter the auto zero display number to **5**.
- \* Press, then release the **F** push button to accept the change and to move onto the next function **A.Z.CNT** (auto zero sample count).
- \* Use the **▲** or **▼** push button to alter the **A.Z.CNT** sample number to **20**.
- \* Press, then release the **F** push button to accept the change.
- \* Press, then release the **P** push button to return to a normal measurement display.
- \* Check that the instrument is functioning as required then exit **CAL** mode by removing power from the instrument, waiting for a few seconds, then re applying power.

### 5.3 2 point calibration

The example below gives the steps required to perform a 2 point calibration. The 2 point calibration method requires that the load cell is connected and that 2 known weights or pressures are placed, in turn, on the load cell, the display value required (scale value) for each load is entered. Ideally the known weights should be 0% and 100% of the maximum load, this is not essential but they should be as far apart as possible. In the example below the known weights are 0kg (no load) and 50kg and this is to be stored as the third cell calibration (**CL.no** function). The instrument is to be scaled so that when there is no load the display will indicate **0.0** and when there is a 50kg load the display will indicate **200.0**. Remember that the decimal point function setting must be on **0.1** to give one decimal point place on the display.

- \* The calibration functions are accessible via **CAL** mode so enter this mode using the method shown at the beginning of "Explanation of Functions" Chapter 4.
- \* Step through the functions, by pressing, then releasing, the **F** push button, until **CL.no** is reached. Use the **▲** or **▼** push button to select the third cell calibration (**CAL.3**). Remember that the **CL.no** function allows up to three sets (**CAL.1**, **CAL.2** and **CAL.3**) of cell calibration values to be stored, do not confuse these with the **CAL.1** and **CAL.2** functions which follow.
- \* Step through the functions, by pressing, then releasing, the **F** push button, until **CAL.1** (first calibration point) is reached.
- \* Ensure that there is no load on the load cell/pressure transducer sensor being used.

- \* Press the **▲** and **▼** buttons simultaneously, then release them. The display will now show a “live input” value from the load.
- \* Wait until the “live input” value is steady (the actual value displayed is not important at this stage) then press and release the **F** push button.
- \* The display will now indicate **SCAL 1** (scale 1) briefly followed by the last scale value in memory. The **SCAL 1** value is the display value required when the instrument sees the present load (zero load in this example). Use the **▲** or **▼** push button to change this value to **0.0**.
- \* Press, then release the **F** push button to accept the change. The display will show **CAL End** followed by **CAL 2** (second calibration point).
- \* Change the load on the cell to 50kg.
- \* Press the **▲** and **▼** buttons simultaneously, then release them. The display will now show a “live input” value from the load.
- \* Wait until the “live input” value is steady (the actual value displayed is not important at this stage) then press and release the **F** push button.
- \* The display will now indicate **SCAL 2** (scale 2) briefly followed by the last scale value in memory. The **SCAL 2** value is the display value required when the instrument sees the present load (50kg load = a scaled display value of 200.0 in this example). Use the **▲** or **▼** push button to change this value to **200.0**.
- \* Press, then release the **F** push button to accept the change. The display will indicate **CAL End** then move onto the next function.
- \* Remove the load from the load cell.
- \* Step through the functions, by pressing, then releasing, the **F** push button, until **SET ZERO** is reached.
- \* Press the **▲** and **▼** buttons simultaneously, then release them.
- \* Press, then release the **F** push button to perform the set zero function for this cell. The display will indicate **ZERO End** and will then automatically return to normal measure mode.
- \* Check that the instrument is functioning as required then exit **CAL** mode by removing power from the instrument, waiting for a few seconds, then re applying power.

## 5.4 Weight totalisation

The TP4 has the capability, via the remote inputs or the front panel **P** button, to add a number of displayed weights to a total memory, display the total and clear the total. The example below uses three remote inputs to perform the totalisation.

- \* Enter via **CAL** mode using the method shown at the beginning of “Explanation of Functions” Chapter 4.
- \* Step through the functions by pressing, then releasing the **F** button until the **F: NP** function is reached, select **t.dSP** for **F: NP**. Press and release the **F** button, **F: N2** will appear, select **t.Add**. Press and release the **F** button, **F: N3** will appear, select **t.CLR**. Press and release the **F** button until the **FUNC End** message is seen and the display returns to normal measurement mode.
- \* A contact closure on remote input 1 will now cause the total memory to be displayed. A contact closure on remote input 2 will now cause the weight displayed to be added to the total memory. A contact closure on remote input 3 will now cause the total memory to be cleared.
- \* Check that the instrument is functioning as required then exit **CAL** mode by removing power from the instrument, waiting for a few seconds, then re applying power.

## 5.5 Trouble shooting

The examples given below illustrate typical problems which may occur when setting up an instrument of this type.

1. Display shows **----**, **-or-**, **CAL ERR**, **SPAN ERR**, **Adc 9A1 0 Err**, **ZERO RANGE Err**, **No ACCS** or **No SP.AC** message

- \* The **----** error message indicates that the mV/V input is higher than the instrument is expects. Check that the **RANGE** function is set to the mV/V input which corresponds to the cell being used. If the **RANGE** setting is correct then check the load cell wiring and the load cell itself.

- \* The **-or-** error message indicates that the display value is too high to display e.g. the TP4 display can display values up to **999999**, if the input is telling the display to indicate a number higher than this then the **-or-** error message will be displayed. Check the calibration values for this cell and ensure that the display is scaled within the range of the number of display digits. Alternatively the **-or-** message will be displayed if the **Lo** or **Hi 9H d: 5P** limit value has been exceeded and the instrument is showing a warning message.
  - \* The **CAL EFF** error message indicates that one of the calibration points mV/V inputs was too high, again check the **RANGE** function.
  - \* The **SPAN EFF** message indicates that the calibration points are too close together, re calibrate and ensure that the calibration points are at least 2% of full scale apart.
  - \* **ADC 9A: n 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 **RANGE** function. The **RANGE** function should be set to be equal the **ECAL** value or to the next available value higher than the **ECAL** value.
  - \* **ZERO RANGE Err** - This indicates that an attempt to zero or preset a value on the display has failed due to the **ZERO RANGE** function value being exceeded. Check the **ZERO RANGE** function setting, if this is set at the required figure and the display value seems to be within the zero range limits then it could be that previous preset or zero operations has caused the limit to be exceeded.
  - \* **NO ACCESS** - This display means that function access has been denied. This will be due to either one of the remote input functions (**F: 1P**, **F: 2** or **F: 3**) being set to **No.Ac** or that the **ACCESS** function being set to **NONE**. To override the remote input functions and gain access you can either place a short circuit between the appropriate remote input and ground or power up the instrument in **CAL** mode (see “Explanation of functions” chapter). To override the **ACCESS** function you must power up in **CAL** mode.
  - \* **NO SPAC** - This display mean that function access has been denied. This will be due to either one of the remote input functions (**F: 1P**, **F: 2** or **F: 3**) being set to **SP.Ac** or the **ACCESS** function has being set to **EASY** and all alarm setpoints have been set to **OFF**. To override the remote input functions and gain access you can either place a short circuit between the appropriate remote input and ground or power up the instrument in **CAL** mode. To override the **ACCESS** function you must power up in **CAL** mode.
2. A new set of calibration values have been entered but the display is not indicating correctly.
- \* Check that the **SET ZERO** function was operated after the calibration, if necessary re calibrate and operate the **SET ZERO** following the calibration.
  - \* Ensure when calibrating that the “live input” values shown at **CAL 1** and were steady before being accepted. If they are not steady then the signals from the load cell need to be investigated for electrical noise.
3. Display value is fluctuating wildly.
- \* Check load cell connections
  - \* If a recent calibration change has been made check that the live inputs of at least 2% of full scale load difference were used.
4. Display resets itself during normal operation i.e. the “wake up” display messages seen when power is applied to the instrument appear on the display without power being removed.
- \* Check for voltage surges or drop outs on the power supply line, also check for gross electrical noise pickup (typical electrical noise sources are motors, generators, fluorescent lights, high voltage cables etc.) on the load cell wiring. The use of shielded cable is recommended for load cells used in situations where electrical noise is likely to be encountered. If power surges or dropouts are experienced then investigate the cause and rectify or place the instrument on another power circuit.
5. Display value flashes on and off.
- \* This means that the **Lo** or **Hi 9H d: 5P** limit value has been exceeded and the instrument is showing a warning message.

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## 6 RS232/RS485 Commands

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### RS232/485 Operation and Commands

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

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#### **d. SP** - Image Display Mode:

In image display mode the display value is sent via RS232/RS485 as raw data in the following format:

<ESC> IXYYYY

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

This information is output every display update (approx. 4 times per second - depending upon baud rate). The number of image bytes sent depends on the number of display digits present. This mode is suitable only when the receiving unit is produced by the same manufacturer as the PM4.

The most common usage would be to provide a large digit display for wide area viewing which just mimics the smaller display on the measuring instrument. The large digit displays automatically detect the image mode data and display the correct value accordingly. The data is in seven segment display image i.e. Bit 0 is segment A, Bit 1 is segment B etc.

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#### **Cont** - Continuous Transmit Mode:

In this mode the display value is continually sent via the RS232/485 interface in ASCII format with 8 data bits + 1 stop bit. Data will be updated at approximately the same rate as the sample rate selected (**FRE** function). The format for this is as follows:-

<STX> XYYYY<CR>

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

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

---

#### **POLL** - Host Controlled Transmit Mode:

This mode requires a host computer or PLC to poll the instrument to obtain display or other information or reset various setpoint parameters. Special communications software such as "Telix" or "Hyperterminal" is required when using POLL mode. Data is in ASCII format with 8 data bits + 1 stop bit. When polling the PM4 it is essential that the command characters are sent with less than a 10mS delay between them. This normally means that each command line must be sent as a whole string e.g. <STX>PA<CR> is sent as one string rather than <STX> on one line followed by P etc. If testing using "Telix" or other software this is normally achieved by allocating a command string to a function key. Whenever the function key is operated the whole string is sent. The format used is ASCII (8 data bits + 1 stop bit) so, for instance, if address 1 is used then the string <STX>PA<CR> must be put into "Telix", or similar program as:

^BP!^M

where: ^B is the ASCII character for STX

P is the command line to transmit the primary display value

! is the ASCII character for address 1 (33 Dec of 21 Hex)

^M is the ASCII character for CR

A typical format for the host command is as follows:-

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

<STX>CA<CR>N<CR>YYYYY (Set Value Command)

Where: <STX> is Start of Text Character (2 Dec, 02 Hex, ^B ASCII)  
C is the command character (see following commands)  
A is the unit address (Range: 32 to 63 Dec, 20 to 3F Hex, "SPACE" to ? ASCII  
the address is offset by 32 Dec, 20 Hex)  
<CR> is Carriage Return (13 Dec, 0D Hex, ^M ASCII)  
N is the setpoint number in ASCII e.g.: 1 for alarm 1 etc.  
X SPACE for positive and '-' for negative  
YYYY is the setpoint value in ASCII

---

**The POLL commands available and instrument responses are as follows:**

### 1. Transmit Primary Display Value: <STX>PA<CR>

e.g. ^BP!^M using Telix or similar (address 1).

Instructs unit to return the primary display value. The primary value is the main reading e.g. load or pressure on a PM4-WT meter. Format of returned data is:-

<ACK>PAXYYYYY<CR>

Where: <ACK> is Acknowledge (6 Dec, 06 Hex)  
P echo command received 'P' (80 Dec, 50 Hex)  
A is the responding unit's address  
X SPACE for positive and '-' for negative  
YYYY is the display value in ASCII  
<CR> is a Carriage Return (13 Dec, 0D Hex)

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

### 2. Transmit Secondary Display Value: <STX>SA<CR>

e.g. ^BS!^M using Telix or similar (address 1).

Instructs the unit to send the secondary display value. The value will equal the primary display value if the **F.I NP** function is set to **NONE**. If the **F.I NP** function is set to **H, Lo, H, Lo, P.HLd** or **d.HLd** the value for the selected operation will be returned (note: For **H, Lo** the Hi value followed by the Lo value will be sent separated by a comma). Format of returned data is:

<ACK>SAYYYYY<CR> or  
<ACK>SAYYYYY,YYYY<CR> in the case of **H, Lo**

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

### 3. Reset Special Function Value: <STX>RA<CR>

e.g. ^BR#^M using Telix or similar (address 3).

Instructs the unit to reset the special function value (if applicable). Will reset the stored value for Peak Hold, Valley High and Valley Low or will operate the selected special function (tare, zero, batch or preset functions only). Format of returned data is:-

<ACK>RA<CR>

Where: <ACK> is Acknowledge (6 Dec, 06 Hex)  
R echo command received 'R' (82 Dec, 52 Hex)  
A is the responding unit's address  
<CR> is a Carriage Return (13 Dec, 0D Hex)

If special functions are not active then the invalid command message will be returned (refer "Invalid

Command" later).

**4. Read Low Alarm Setpoint: <STX>LA<CR>N<CR>**

e.g. ^BL%^M2^M to read alarm 2 low setpoint value using Telix or similar (address 5).

Instructs unit to return value of low alarm setpoint.

Format of returned data is:

<ACK>LANXXXXX<CR>

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

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

**5. Read High Alarm Setpoint: <STX>HA<CR>N<CR>**

e.g. ^BH%^M1^M to read alarm 1 high setpoint value using Telix or similar (address 10).

Instructs unit to return value of high alarm setpoint.

Format of returned data is:

<ACK>HANXXXXX<CR>

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

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

**6. Set Low Alarm Setpoint: <STX>IA<CR>N<CR>XXXXX<CR>**

e.g. ^BI!^M1^M500^M to set alarm 1 low setpoint to 500 using Telix or similar (address 1)

Instructs unit to change value of low alarm setpoint.

Format of returned data is:-

<ACK>IANXXXXX<CR>

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

If setpoint number specified is not present the return string will have the setpoint number set to zero (i.e.: <ACK>IA0XXXXX).

### 7. Set High Alarm Setpoint: <STX>hA<CR>N<CR>YYYYY<CR>

e.g. ^Bh!^M1^M1000^M to set alarm 1 high setpoint to 1000 using Telix or similar (address 1)

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

<ACK>hANYYYYY<CR>

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

If setpoint number specified is not present the return string will have the setpoint number set to zero (i.e.: <ACK>hA0YYYYY).

### 8. Tare Using Current Display Value: <STX>TA<CR>

e.g. ^BT\$^M using Telix or similar (address 4).

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

<ACK>TA<CR>

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

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

### 9. Transmit Instrument Model and Version: <STX>IA<CR>

e.g. ^BI!^M using Telix or similar (address 1)

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

<ACK>IACCX.X<CR>

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

### 10. Read Default Calibration Channel: <STX>CA<CR>

e.g. ^BC!^M using Telix or similar (address 1)

This command reads the default calibration channel. If the external inputs or the **P** button are configured to change the calibration channel selection then the channel used for the actual gain may not be the default calibration channel. If using the serial interface to change the default calibration channels then the **P** button or external input settings should not be set to **SEL**. Format of returned data is:-

<ACK> CA <channel\_number> <CR>

Where: <ACK> is Acknowledge (6 Dec, 06 Hex)  
C is echo command received 'C' (67 Dec, 43 Hex)  
A is the responding unit's address  
channel\_number is the channel number 1, 2 or 3  
<CR> is a Carriage Return (13 Dec, 0D Hex)

### 11. Set Default Calibration Channel:

<STX> cA <channel\_number> <CR>

e.g. ^Bc#^M2^M to set default channel to 2 using Telix or similar (address 3).

This command sets the default calibration channel. If the external inputs or the **P** button are configured to change the calibration channel selection then the channel used for the actual gain may not be the default calibration channel. If using the serial interface to change the default calibration channels then the **P** button or external input settings should not be set to **CTRL.S**. Format of returned data is:-

<ACK> cA <channel\_number> <CR>

Where: <ACK> is Acknowledge (6 Dec, 06 Hex)  
c is echo command received 'c' (99 Dec, 63 Hex)  
A is the responding unit's address  
channel\_number is the channel number 1, 2 or 3  
<CR> is a Carriage Return (13 Dec, 0D Hex)

### 12. Read ADC Calibration Gain: <STX> GA <CR>

e.g. ^Bc&^M using Telix or similar (address 6).

This is set for the default calibration channel. If the external inputs or the **P** button are configured to change the calibration channel selection then the channel used for the actual gain may not be the default calibration channel. If using the serial interface to change the default calibration channels then the **P** button or external input settings should not be set to **CTRL.S**. Note: The gain reading is only valid on the actual instrument it is read from and may give errors if used with other instrument. Format of returned data is:-

<ACK> GA <adc\_gain> <CR>

Where: <ACK> is Acknowledge (6 Dec, 06 Hex)  
G is echo command received 'G' (71 Dec, 47 Hex)  
A is the responding unit's address  
adc\_gain is the adc gain as a floating point number  
<CR> is a Carriage Return (13 Dec, 0D Hex)

### 13. Set ADC Calibration Gain: <STX> gA <CR> <adc\_gain> <CR>

e.g. ^Bg"^M0.0002134^M using Telix or similar (address 2).

This is set for the default calibration channel. If the external inputs or the **P** button are configured to change the calibration channel selection then the channel used for the actual gain may not be the default calibration channel. If using the serial interface to change the default calibration channels then the **P** button or external input settings should not be set to **CTRL.S**. Note: The value returned may not be exactly the same as the number sent. The internal floating point accuracy is only to around 24 bits and some rounding in the last digits may occur. Format of returned data is:-

<ACK> gA <adc\_gain> <CR>

Where: <ACK> is Acknowledge (6 Dec, 06 Hex)  
g is echo command received 'g' (103 Dec, 67 Hex)  
A is the responding unit's address  
adc\_gain is the adc gain as a floating point number  
<CR> is a Carriage Return (13 Dec, 0D Hex)

#### 14. Read ADC Zero Offset: <STX> ZA <CR>

e.g. ^BZ!^M using Telix or similar (address 1).

This is set for the default calibration channel. If the external inputs or the **P** button are configured to change the calibration channel selection then the channel used for the actual gain may not be the default calibration channel. If using the serial interface to change the default calibration channels then the **P** button or external input settings should not be set to **CR.L.S**. Format of returned data is:-

<ACK> ZA <adc\_zero> <CR>

Where: <ACK> is Acknowledge (6 Dec, 06 Hex)  
Z is echo command received 'Z' (90 Dec, 5A Hex)  
A is the responding unit's address  
adc\_zero is the adc gain as a floating point number  
<CR> is a Carriage Return (13 Dec, 0D Hex)

#### 15. Set ADC Calibration Zero: <STX> zA <CR> <adc\_zero> <CR>

e.g. ^Bz%^M-00120.321^M using Telix or similar (address 5).

This is set for the default calibration channel. If the external inputs or the **P** button are configured to change the calibration channel selection then the channel used for the actual gain may not be the default calibration channel. If using the serial interface to change the default calibration channels then the **P** button or external input settings should not be set to **CR.L.S**. Note: The value returned may not be exactly the same as the number sent. The internal floating point accuracy is only to around 24 bits and some rounding in the last digits may occur. Format of returned data is:-

<ACK> zA <adc\_zero> <CR>

Where: <ACK> is Acknowledge (6 Dec, 06 Hex)  
z is echo command received 'z' (122 Dec, 7A Hex)  
A is the responding unit's address  
adc\_zero is the adc gain as a floating point number  
<CR> is a Carriage Return (13 Dec, 0D Hex)

#### 16. Invalid Command

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

<ACK>?A<CR>

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

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

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

## Host Timing Requirements for RS485 Operation:

RS485 operation requires the host to switch the RS485 transceiver to transmit before a command is sent. The instrument is capable of replying after 1 to 2 milliseconds. Therefore the host should switch the RS485 transceiver back to receive mode within 0.5 milliseconds after the last character of the command has been sent to ensure correct operation.

## ASCII Code Conversion Listing

ASCII for control characters is shown in brackets. e.g. STX is entered as ^B if typing into a communications package for computer communication .

ASCII Char.	Dec	Hex	ASCII Char.	Dec	Hex
NUL (^@)	000	00	SP ( )	032	20
SOH (^A)	001	01	!	033	21
STX (^B)	002	02	“	034	22
ETX (^C)	003	03	#	035	23
EOT (^D)	004	04	\$	036	24
ENQ (^E)	005	05	%	037	25
ACK (^F)	006	06	&	038	26
BEL (^G)	007	07	‘	039	27
BS (^H)	008	08	(	040	28
HT (^I)	009	09	)	041	29
LF (^J)	010	0A	*	042	2A
VT (^K)	011	0B	+	043	2B
FF (^L)	012	0C	,	044	2C
CR (^M)	013	0D	-	045	2D
SO (^N)	014	0E	.	046	2E
SI (^O)	015	0F	/	047	2F
DLE (^P)	016	10	0	048	30
DC1 (^Q)	017	11	1	049	31
DC2 (^R)	018	12	2	050	32
DC3 (^S)	019	13	3	051	33
DC4 (^T)	020	14	4	052	34
NAK (^U)	021	15	5	053	35
SYN (^V)	022	16	6	054	36
ETB (^W)	023	17	7	055	37
CAN (^X)	024	18	8	056	38
EM (^Y)	025	19	9	057	39
SUB (^Z)	026	1A	:	058	3A
ESC (^[)	027	1B	;	059	3B
FS (^\\)	028	1C	<	060	3C
GS (^^)	029	1D	=	061	3D
RS (^_)	030	1E	>	062	3E
US (^_)	031	1F	?	063	3F
@	064	40	‘	096	60

A	065	41	a	097	61
B	066	42	b	098	62
C	067	43	c	099	63
D	068	44	d	100	64
E	069	45	e	101	65
F	070	46	f	102	66
G	071	47	g	103	67
H	072	48	h	104	68
I	073	49	i	105	69
J	074	4A	j	106	6A
K	075	4B	k	107	6B
L	076	4C	l	108	6C
M	077	4D	m	109	6D
N	078	4E	n	110	6E
O	079	4F	o	111	6F
P	080	50	p	112	70
Q	081	51	q	113	71
R	082	52	r	114	72
S	083	53	s	115	73
T	084	54	t	116	74
U	085	55	u	117	75
V	086	56	v	118	76
W	087	57	w	119	77
X	088	58	x	120	78
Y	089	59	y	121	79
Z	090	5A	z	122	7A
[	091	5B	{	123	7B
\	092	5C		124	7C
]	093	5D	}	125	7D
^	094	5E	~	126	7E
_	095	5F	DEL	127	7F

## 7 Data Logger

The internal data logger memory is an optional addition to the TP4. This chapter applies only to instruments fitted with the data logger option. If the data logger is being used with the Windows compatible software provided then refer to the separate "Download Software User Guide" booklet.

### Operation of the Data Logger

The data logger memory will store the hours:mins:secs, day:month and year together with the TP4 display reading at the time of log update. The log update time may be set at the **LOG UPdt** function.

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

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

Manual logging of data via remote input contact closure or the front **P** button can be selected instead of permanent data logging, see **F.I NP** and **P.but** function for details. Note: permanent data logging is not possible when one of the manual logging options is selected.

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

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

### Data Logger Software

Data logger software compatible with Windows 95, 98, 2000 & NT is provided for use with the data logger. A separate user manual for the software is also provided. Consult this user manual for details of software setup. The data logger can also communicate using standard serial polling commands, these are listed under the heading "Serial Command Format" in this chapter.

### Data Logger Table - Maximum Logging Times

Times are approximate.

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

## Explanation of Functions

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

### **LOG UPdt** (select log update time)

Displays and sets the time period between each log sample. Available selections are:

**0.10** (10 seconds), **0.20** (20 seconds), **0.30** (30 seconds), **1.00** (1 minute), **2.00** (2 minutes), **3.00** (3 minutes), **4.00** (4 minutes), **5.00** (5 minutes), **6.00** (6 minutes), **10.00** (10 minutes), **15.00** (15 minutes), **20.00** (20 minutes), **30.00** (30 minutes) or **60.00** (60 minutes).

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

### **CLR LOG** (clear data log memory)

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

### **SEt rTc** (set time)

Displays and sets the current time in hours and minutes (24 hour format HH.MM) e.g. set as **1720** for 5:20 pm.

### **SEt dAtE** (set date)

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

### **SEt YEAr** (set year)

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

## Serial Command Format

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

## Initial Setup

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

## Extra Functions

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

### Transmit Record Block:

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

Where: TTTTTTTTTT is the start time of the block (in Julian time format).

NNNN is the number of records to be sent.

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

The returned data format is:-

<ACK>DAD<CR>

Followed by NNNN records in the format:-

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

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

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

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

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

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

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

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

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

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

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

<ACK>DAT TTTTTTTTTT<CR>

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

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

The returned data format is:-

<ACK>DAS TTTTTTTTTT<CR>

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

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

The returned data format is:-

<ACK>DAU NNNN<CR>

Where: NNNN is the update time in seconds.

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

Returns the size of the log memory in records.

The returned data format is:-

<ACK>DAM NNNN<CR>

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

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

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

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

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

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

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

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

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## 8 Specifications

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### 8.1 Technical Specifications

Input:	Ratiometric 4 arm strain gauge (4 or 6 wire type)
Input Sensitivity:	0.5mV/V to 100mV/V selectable
Bridge Compatibility:	80Ω to > 2000Ω
Excitation:	5V, 10V or 15V link selectable
Accuracy:	Up to 0.005% of full scale (alarms and display) dependant upon sample rate selection. Including analog retransmission better than 0.05% system accuracy
Sample Rate:	5 to 100 per sec selectable
ADC Resolution:	Up to 22 bits depending on sample rate
ADC Conversion:	Sigma Delta
Microprocessor:	MC68HC11FI CMOS
Ambient Temperature:	-10 to 60°C,
Humidity:	5 to 95% non condensing
Display:	6 digit 20mm + 4 way keypad and annunciator LED's
Power Supply:	AC 240V or 110V 50/60Hz. DC 12V, 24V or 48V
Power Consumption:	AC supply 15 VA max, DC supply 500mA typical, 2A peak
Output (standard):	4 x relay, Form C rated 5A resistive 240VAC Analog retransmission 4-20mA RS232 (non isolated) serial communications +5VDC regulated and +12VDC unregulated
Relay Action:	Programmable N.O. or N.C.

### 8.2 Output Options

Serial Communications:	RS485 (isolated) in place of the RS232 supplied as standard
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### 8.3 Physical Characteristics

Case Size:	255mm x 145mm x 125mm
Panel Cut Out:	If using this method of mounting the panel cut out size is 240 x 130mm -0.0mm/+0.5mm
Connections:	Plug in screw terminals (max 1.5mm wire)
Weight:	1.3kgs

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## 9 Guarantee & Service

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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.

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the instrument manufacturer  
and may not be reproduced in whole or part without the  
written consent of the manufacturer.

This product is designed and manufactured in Australia.

