Contents

Introduction

This Setup Guide describes how to install and configure your instrument.

This instrument is marked with the international hazard symbol. It is important to read this Setup Guide before installing or commissioning your panel meter as it contains important information relating to safety and Electromagnetic Compatibility EMC.

The instrument provides the following features as standard:

- 4 configurable alarms.
- Scaleable analogue retransmission output.
- Dual logic/status inputs.
- RS485 serial communications interface with 3 protocols including MODBUS™ RTU.
- 5 digit bright LED display.
- Programmable function keys
- Optional dual relay output or quad digital (TTL) outputs.
- 10V bridge/load cell supply.

Installation

To install your instrument, you will need to carry out the following steps:

- Apply the engineering units label to the right-hand side of the display panel. A sheet of labels covering the most commonly used engineering units is supplied with all units. If the unit you require is not on the sheet, a blank label is provided on which you can use LETRASET™.
- Install the instrument into a panel.
- Make connections to the instrument.

WARNING:

- Ensure that the power to the instrument is switched off before carrying out any installation or maintenance work.
- It is recommended that all connections to the terminals are made using ferrules to afford greater reliability and to prevent short circuits between adjacent terminals.
- Avoid installing the instrument close to switch gear, contactors or motor starters.
- Do not place signal and power supply wiring in the same loom.
- Use screened cables or wires for all signal/sensor leads with screen earthed at one point only.

If this instrument is not installed in accordance with the instructions in this manual, protection against electrical hazards may be impaired resulting in injury or loss of life. Installation Category II as defined by BSEN61010-1 and Pollution Degree 2 environments apply.

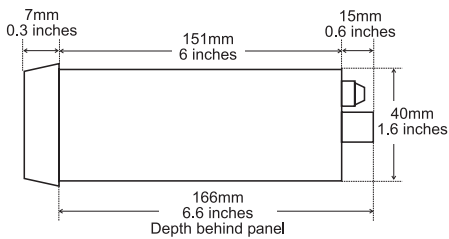
This instrument should be disposed of correctly. Do not burn or throw into any fire as there is a risk of explosion. Please contact your supplier or local council for advice.

For data retention purposes, this instrument may contain a lithium battery type CR2032. In normal circumstances, the battery will provide a service life in excess of 5 years.

The battery contained in this instrument should be disposed of correctly. Please contact your supplier or local council.

Panel Mounting

Ensure that there is sufficient space behind the instrument panel for the depth of the instrument to allow for safe routing of cables. The diagram below shows a side view of the instrument's dimensions.



The instrument is supplied with an installation kit consisting of 2 mounting clamps and a panel sealing gasket. To install the instrument:

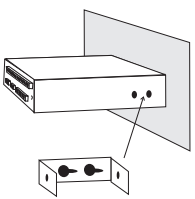
1 Make panel cut-out with the dimensions as shown below. Panel thickness from 1.5mm to 9.5mm can be accommodated.

2 Fit the rubber seal by slipping it over the unit from the rear of the box and pushing it forwards until it sits behind the front lip of the unit.

3 Insert the instrument into the panel from the front, pushing it through as far as the front lip to ensure correct seating of the rubber seal between the panel and the unit.

4 Working from behind the panel, take the 2 mounting brackets and locate onto the case as shown below (note orientation of keyhole slots relative to instrument case). With the brackets located, slide them backwards until they lock into place.

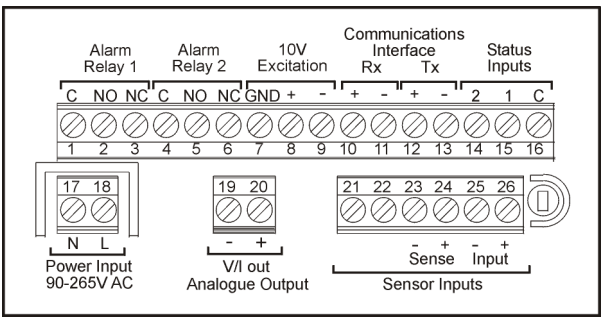
5 Tighten the screws until they bite into the panel, securing the instrument in place. Take care not to overtighten the screws as this may damage the case of the instrument.



Connections

The diagram below shows the rear panel terminal connection arrangement.

NOTE: Terminals 1 to 6 are not used on some models (see the table on page 9).



Rear Panel Terminal Connections

Terminal	No Outputs	Dual Relays	Quad TTL
1	None	Relay 1 - Common	Output GND
2	None	Relay 1 - Normally Open	Output 1
3	None	Relay 1 - Normally Closed	Output 2
4	None	Relay 2 - Common	Output 3
5	None	Relay 2 - Normally Open	Output 4
6	None	Relay 2 - Normally Closed	Output supply
7	Screen (GND)		
8	Transducer supply +ve		
9	10V Transducer supply -ve		
10	Receive B		
11	Receive A		
12	Transmit B		
13	Transmit A		
14	Status (Logic) Input 2		
15	Status (Logic) Input 1		
16	Status input common (GND)		
17	Power input neutral (-)		
18	Power input live (+)		
19	Analogue retransmission output -		
20	Analogue retransmission output +		
21	No connection		
22	No connection		
23	Sense -ve		
24	Sense +ve		
25	Input -ve		
26	Input +ve		

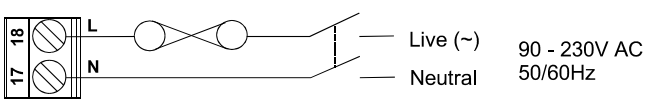
Powering the Instrument

THERE ARE 2 SUPPLY VARIANTS: a mains supply variant and a low voltage supply variant. The instrument is designed to operate from either an AC supply with voltages in the range 90 to 230V AC 50/60Hz mains supply or from a DC supply with voltages in the range 24 to 32V DC (20 to 30V AC) 50/60Hz low voltage supply with a maximum power consumption of 20VA when all outputs are fully loaded and the display has all segments illuminated.

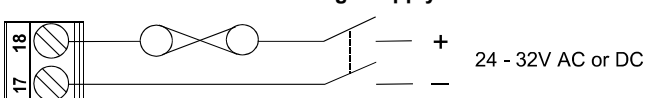
The diagrams below show how the instrument should be connected to the mains supply. Isolation should be provided by a double pole switch and a time delay 200mA fuse.

WARNING - The instrument is designed for installation in an enclosure which provides adequate protection against electric shock. Access to power terminals should be restricted to authorised skilled personnel only. Application of supply voltages higher than those for which the instrument is intended may compromise safety and cause permanent damage.

Recommended Mains Supply Connections



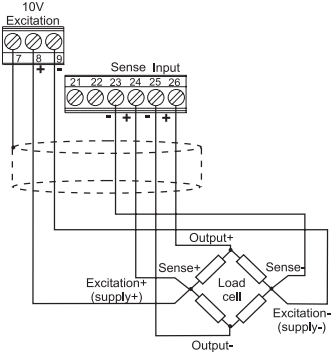
Recommended Low Voltage Supply Connections



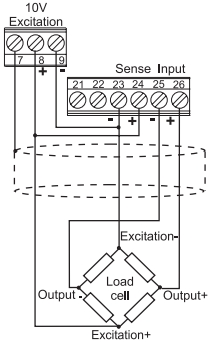
BEFORE POWERING UP THE INSTRUMENT, check the model label on the underside of the instrument for the supply variant, eg. MAINS OR LOW VOLTAGE.

Connecting the Load Cells

The load cells should be connected to the instrument as illustrated in the diagrams below. When making connections to the transducer, use a screened cable with the screen connected to ground at one point only. Avoid running signal cables close to cables carrying high current or voltages or those connected to motor drives or contactors.

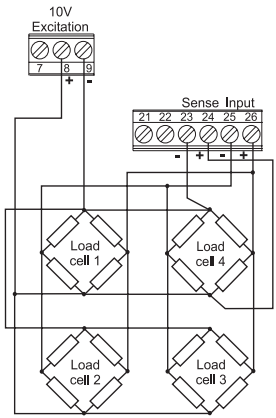


Single Load Cell Transducer Connections with Remote Sense



Single Load Cell Transducer Connections with Local Sense

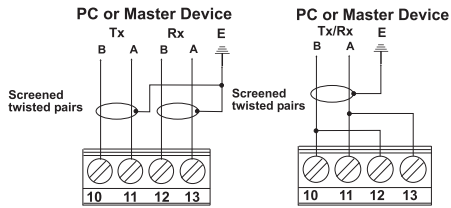
The instrument uses a ratiometric measurement technique to allow variations in the load cell power supply to be compensated for. For best measurement results, connect the instrument's sense input signals at the load cell, which will enable any errors due to wiring impedance to be minimised. Cable impedance may introduce a significant error, especially in multiple load cell applications with long cable runs. For correct operation of 4-wire load cell applications, it is necessary to connect the instrument's sense terminals to the transducer supply output terminals.



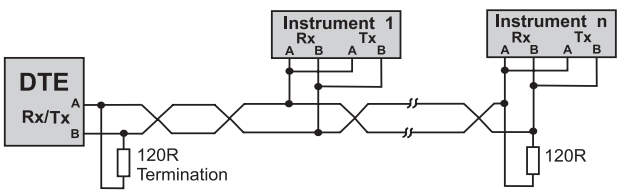
Multiple Load Cell Transducer Connections

Connecting the Communications Interface

The diagrams below show the connections necessary to interface your instrument to a PC RS485/422 port or to an RS485 to RS232 converter. It is recommended that a screened twisted pair cable be used for all applications requiring cable lengths greater than 3m. It is also recommended that a 120Ω termination resistor is added across each pair of wires at the furthest point from the master device. The screen of the cable should be connected to the frame ground or ground connection of the master device. The diagram below shows the wiring required for both 4-wire full duplex and 2-wire half duplex installations.



4-Wire & 2-Wire Communications Interface Connections

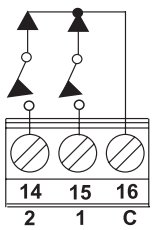


Typical RS485 Multidrop Half Duplex Application

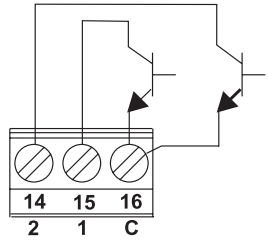
Connecting the Status Inputs

There are 2 status (logic) inputs provided by your instrument. The inputs can be used with either voltage free contacts such as relay contacts, switches, open collector transistor outputs or voltage driven. The inputs are active low, ie. apply a short circuit between the status input and status common. The diagrams below show some typical applications.

NOTE: These inputs are not isolated from the instrument's input circuit.

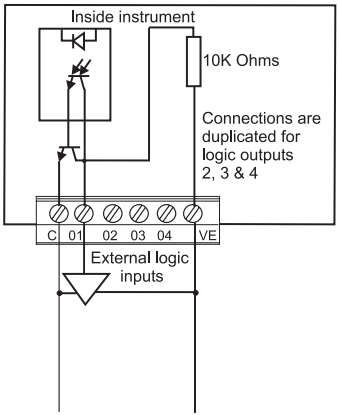


Volt Free Contacts

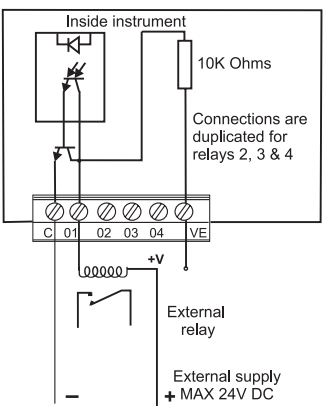


Open Collector TTL Outputs

Connecting the Logic Outputs



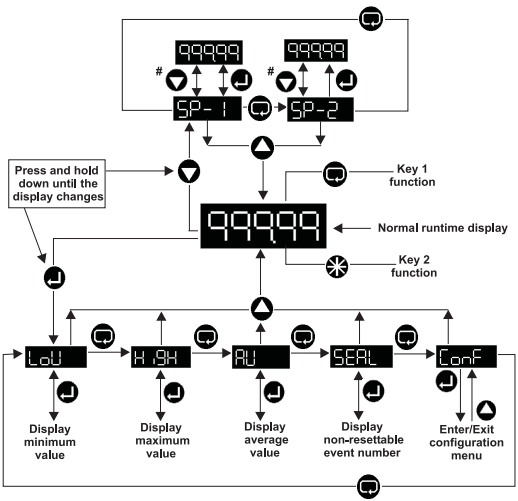
Connecting to External Logic Inputs



Connecting to External Relays

Operator Functions

All of the operator functions are described in the following section along with the key actions required. The diagram below shows the facilities available directly from the Operator (Normal) Mode.



Use Key to view or Key to edit (provided the alarm edit option is **on** - see **Front Panel Edit** page 77).

SP-1 SP-2 SP-3 SP-4 Represent Alarm Setpoints 1 - 4.

CSP1 CSP2 Also appear after the setpoints on instruments with logic outputs.

LoU Displays the lowest measured value since last reset (see **Reset** pages 94 and 98).

Displays the highest measured value since last reset (see **Reset** pages 94 and 98).

Displays the average measured value since last reset (see **Reset** pages 94 and 98).

Refers to "calibration seal" and displays a non-resettable value. Changes to any one of the setup items listed below, will cause the **SEAL** value to increment and thereby show that a calibration change has taken place.

diSP (display) menu	**dP** (decimal point position). **SorC** (display value source). **Filt** (display filtering).
inPt (input) menu	**SEn** (load cell sensitivity).
SCLE (scale) menu	**HdSP** (high display value). **LdSP** (low (zero) display value). **H-iP** (high input). **L-iP** (low input).
ULin (user linearisation) menu	**EnAb** (enable user linearisation). **PntS** (number of points). **di01 - di08** (display values). **iP01 - iP08** (input values).
Aout (analogue output) menu	**tyPE** (output type). **SorC** (source of output level). **LoW** (low scaling). **HigH** (high scaling). **dAMP** (damping filter).
CoMM (serial communications) menu	**SPAn** (scaling). **L-iP** (scaling). **H-iP** (scaling).

Enables Configuration//Setup Mode (see **How to Navigate the Configuration Menus** page 20).

Operator Mode - Key Functions

Caution: the keys have an "auto-repeat" facility whereby holding down a key for longer than necessary will have the same effect as multiple presses. From the normal runtime display:

 **Enter -** Allows access to the operator functions (**LoW**, **HigH** (peak) and **AV** (average) values) since last reset, **SEAL** and **ConF** (Configuration/Setup Mode). To access the operator functions, press and hold for approximately 3 seconds until **LoW** is displayed.

 **Next -** Function Key 1 can be configured to perform various functions such as fast calibration, zeroing and tare. Details of the facilities available and how to configure the key are described later in this Guide (see **Configuring Function Keys** page 97).

 **Down** - Accesses the 4 alarm and 2 control setpoints for viewing and editing if enabled (see **Front Panel Edit** page 77).

 **Up -** Exits from menus to normal running.

 **Star** - Function Key 2 can be configured to perform various functions. Details of the facilities available and how to configure the key are described later in this Guide (see **Configuring Function Keys** page 97).

 **Up** and  **Down** - Pressed together will perform an alarm acknowledge for latched alarms (see **Latching** page 74 and **Alarm Acknowledge** page 93) and **ACk** will be displayed.

Menu Mode - Key Functions

The instrument may be configured using the front panel keys to enter and navigate through the multi-level menu structure. Caution: the keys have an "auto-repeat" facility whereby holding down a key for longer than

necessary will have the same effect as multiple presses. When navigating through the menus, the keys perform the following functions:

 **Enter** - Selects or accesses a sub-menu.

 **Next** - Scrolls forward through the menus within a level.

 Up - Moves back up to the parent menu level. Multiple key presses will always return the instrument to the measured value (runtime) display.

The menu system lists *categories* (eg. **diSP**, **inPt**, **SCLE**, **Aout**). Selecting a category may lead to a sub-category, but eventually it leads to a list of configurable instrument *parameter*s (eg. category **Aout** leads to parameters **tYPE**, **SorC** etc.).

When the **Enter** Key is pressed to change a parameter, the existing *setting* is displayed. Notice that a letter or digit always flashes when a setting is on display.

Some settings are chosen from a list of settings (eg. parameter **tYPE** has 3 settings: **0 - 10**, **4 - 20**, **0 - 20**).

Other parameters are setup by editing a multi-digit value (eg. **LoW** has a default numeric setting of [**0000.0**]).

Selecting a Setting from a List

When the first letter of a menu option flashes, it represents the setting for a parameter.

 cycles round the list of possible settings for the parameter.

 Aborts the setting selection without changing the setting.

 Makes the currently displayed setting the new setting.

Editing a Value

When the last digit of a numeric value flashes, it represents the setting for a parameter.

Notice that the flashing digit is the one that is edited by the **Up** and **Down** arrow Keys.

The sign is changed by editing the most significant digit.

 Selects the next flashing digit to edit. The next digit left is selected.

When the leftmost digit is reached and if the decimal point position can be changed, the decimal point flashes next.

 Clears the whole value to zero if zero is a valid value.

 Increments the flashing digit. If the decimal point is flashing, the decimal point moves left.

If negative values are allowed and the most significant digit is flashing, the digit rotates round the sequence: 0 1 2 3 4 5 6 7 8 9 -1 -.

 Decrements the flashing digit. If the decimal point is flashing, the decimal point moves right.

If negative values are allowed and the most significant digit is flashing, the digit rotates round the sequence: 9 8 7 6 5 4 3 2 1 0 - -1.

 Exits, making the edited value displayed the new setting.

How to Navigate the Configuration Menus

This example will show you how to edit one of the unit's configuration options. We will turn down the brightness (labelled **briL**) of the display. Use this example in conjunction with the **Configuration Menu Map** on page 22 to navigate your own way to the options that you wish to change.

1. With the unit displaying the current measured value, press and hold  until the display changes to show  .

2. Press  until  is displayed.

3. Press  to enter the **ConF** (configuration) menu.

4. Press  until  is displayed.

5. Press  to enter the **diSP** (display) menu.

6. Press  to cycle through the sub-menus of the **diSP** menu until  is displayed.

7. Press  to enter the **briL** (brilliance***)*** menu. You will know that you have successfully entered the Edit Mode if a flashing figure is displayed. This will be the currently set value for this option.

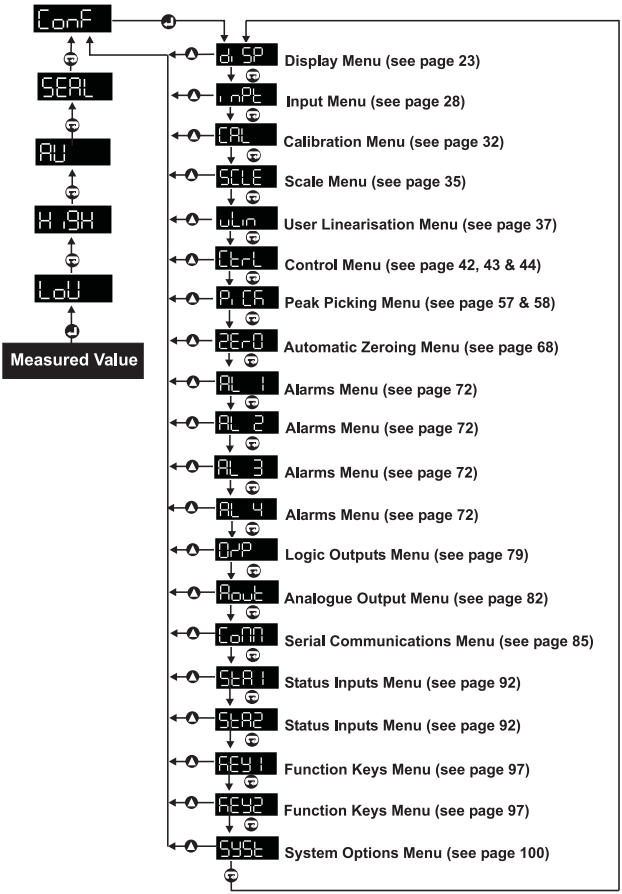
8. In the case of brilliance, there are 4 options, each numbered 1 to 4 (*the default is 4*). Press the  Key to cycle through the options available to you.

9. If the original setting was 4, cycle to 1 by pressing  until 1 is displayed.

10. Press  to select 1, save your change and finalise editing. The display brightness will change and become darker.

11. Pressing  will move you back up the menu-tree one level for each press of the key. Press this repeatedly until the measured value display appears again.

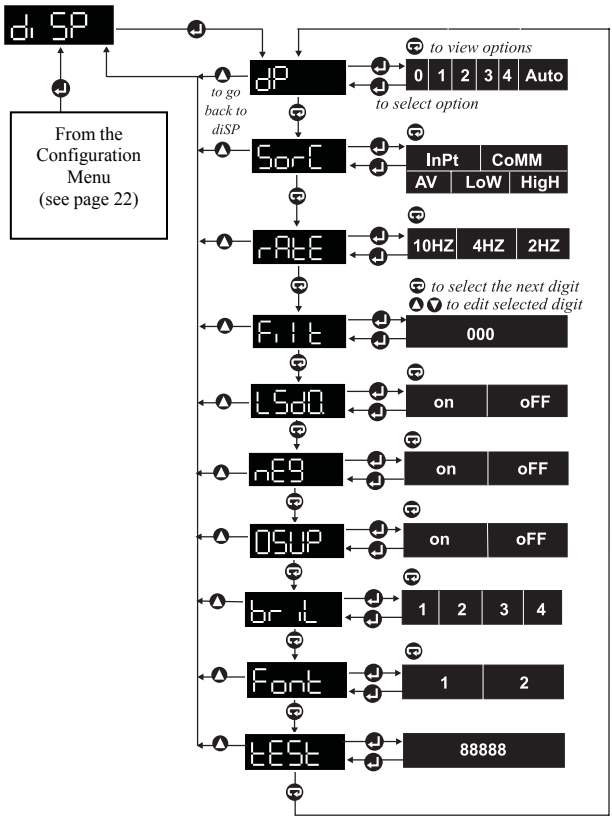
Configuration Menu Map



Configuring the Display

This menu sets up the instrument's display attributes.

Display Menu Map



Decimal Point Position

Default: 1 decimal place

Defines the position of the decimal point on the 5 digit display. The decimal point may be fixed to give 0 to 4 digits after the decimal point or it may be positioned automatically. Automatic positioning displays as many of the most significant digits as possible while allowing the decimal point and sign to remain visible. For example:

Value	Displayed as
12345.67	12346 (point not needed so not shown)
123.4567	123.46
0.1234567	0.1235
-0.1234567	-.1234

The dP setting limits the range of displayable values as follows:

Displayable range	Decimal point setting
Integers: -19999 through 0 to 99999	0
-1999.9 to 9999.9	1
-199.99 to 999.99	2
-19.999 to 99.999	3
-1.9999 to 9.9999	4
Any: -19999 through 0.0000 to 99999	Auto

The unit will display **oVEr** (over) or **undr** (under) when appropriate.

Analogue 54 Comms Location	Read/Write
Integer range	0 to 5 (5=Auto)

Editing Out of Range Values

Increasing the **dP** (decimal point) setting can make editable values go outside of the displayable range. For example:

dP	1
Maximum displayable range	9999.9
Alarm Setpoint 1	1234.5
When **dP** is changed to	2
Maximum displayable range	999.99
So Alarm Setpoint 1 of	1234.5 is now out of range

When this happens, it is the users' responsibility to edit such parameters so that they are within the displayable range.

Parameters effected by the displayable range are:

- Alarm setpoints (see page 73).
- Alarm on-hysteresis and off-hysteresis (see page 76).
- Analogue output low and high scale points (see page 84).
- Comms low and high scale points (MODBUS™ only) (see page 87).
- User linearisation display points **dP01** to **dP24** (see page 39).

Normally, when editing one of these values, the decimal point is fixed within these values to prevent them being edited to a value that is out of the displayable range. However, if the value becomes out of range due to increasing the **dP** setting, rather than by editing the value, the decimal point may be movable within such a value.

Display Value Source

Default: Input

Defines the source of the displayed value. The options are:

- **inPt** The measured input value.
- **HigH** The maximum measured input value.
- **LoW** The minimum measured input value.
- **AV** The average measured input value.
- **CoMM** The value received from the communications interface.

The time over which the average value is taken is specified in the **AVti** (average time) option in the **SYSt** (system) menu (see **Averaging Time** page 101).

When set to **CoMM**, the display value is taken from Analogue Location 3. For example, a SCADA system can read the weight from the instrument via Analogue Location 1, perform some operation on the value and send the processed value back to the instrument for display via Analogue Location 3.

Analogue 53 Comms Location					Read/Write
Analogue value	0	1	2	3	4
Display source	Input	High	Low	Average	Comm

Eg. Sending **;001SA53 0 <CR>** via comms, sets the display source to input.

Update Rate

Default: 2Hz

rAtE Allows the update rate of the display to be set from 10Hz to 2Hz. The 10Hz update rate may vary from 7Hz to 10Hz.

Analogue 55 Comms Location			Read/Write
Analogue value	0	1	2
Update rate	2Hz	4Hz	10Hz

Filtering

Default: 0 seconds

FiLt Applies a simulated rolling average filter to the displayed value. The time constant of the filter is entered in seconds from 0 to 999. 0 disables the filter (see also **Averaging Time** page 101).

Analogue 56 Comms Location	Read/Write
Integer range (seconds)	0 to 999

Least Significant Digit Zero

Default: Off

LSd0 **on** enables the right-hand digit to be displayed as 0. For example, 14.567 will be displayed as 14.570 when **LSd0** is **on**.

Logic 49 Comms Location	Read/Write
On	Least significant digit displayed as 0
Off	Normal display

Negative Numbers

Default: On

nEG **on** allows the display of negative numbers. When **oFF**, negative numbers are displayed as 0.

Logic 50 Comms Location	Read/Write
On	Negative values displayed
Off	Negative values displayed as 0

Leading Zero Suppression

Default: On

dSUP **oFF** allows leading zeros to be displayed.

Logic 48 Comms Location	Read/Write
On	Leading zeros not displayed
Off	Leading zeros displayed

Brilliance

Default: 4

brit Allows the brightness of the display to be adjusted to match other instruments or ambient lighting conditions. The brightness may range 1 (dimmest) to 4 (brightest).

Analogue 57 Comms Location				Read/Write
Analogue value	0	1	2	3
Brilliance setting	1	2	3	4

Font

Default: Off

Font Selects one of 2 fonts for the display of numerals.

Logic 47 Comms Location		Read/Write
Off	Font 1	976
On	Font 2	976

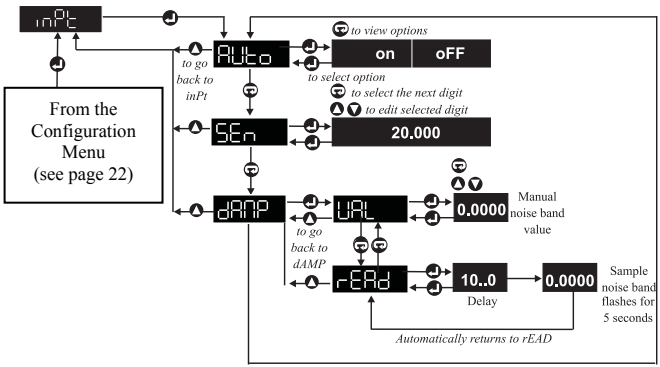
Test

tESt Performs a display test that illuminates all display digits and segments (**8.8.8.8.8.**) when the **Enter** button is pressed. Press **Enter** again to proceed.

Configuring the Input

The indicator has to be setup to match the output from the load cell. This information should be provided by the manufacturer.

Input Menu Map



Automatic Sensitivity Selection

Default: Off

AUto If the load cell full scale output (in mV/V) is not available, set **AUto** to **on**. The instrument must then be calibrated using known weights (see **Calibration Sequence** page 29).

Logic 57 Comms Location	Read/Write
On	Auto finds load cell sensitivity
Off	Load cell sensitivity is specified

Load Cell Sensitivity

Default: 20mV/V

SEn Determines the most appropriate internal measurement range used by the instrument. Enter the approximate full scale output of the load cell in mV/V. If a number of load cells are connected to the instrument in parallel, the sensitivity should be set to the average rated output of all the load cells, eg. if 3 x 10mV/V load cells are connected in parallel,

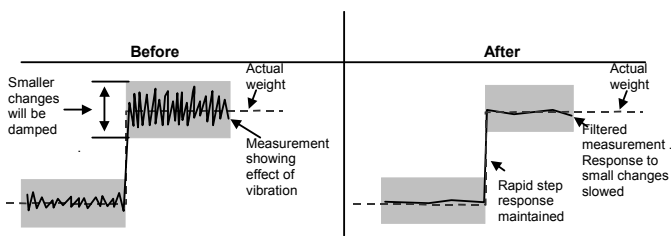
sensitivity is 10/3 = 3.33mV/V. If you have set **AUto** to **on**, this parameter is ignored.

Analogue 63 Comms Location	Read/Write
Sensitivity range (mV/V)	0.10 to 29.999

Damp

dAMP The filter is designed to damp the effect of vibration or noise on measurements. Without this anti-vibration filter, the last 2 or 3 digits of a weight measurement may continuously change due to the effect of vibration, especially for larger weights.

The filter works by damping only the small changes between successive measurements. In other words, consecutive changes below a set threshold are damped whilst large changes beyond the threshold are not. The filter is setup by defining this threshold. Consecutive measurements that change by less than this threshold are called "qualifying measurements" and it is these measurements that activate damping.



Effect of Vibration Damping Filter

Damping is achieved by taking a simulated rolling average of all qualifying measurements over the last 20 seconds. In this way, the most recent qualifying measurement has only a small damped effect on the filtered average.

NOTE: When the filter is first activated, 20 seconds worth of qualifying measurements will not have occurred, so the first qualifying measurement is assumed to apply over the time when non-qualifying measurements were taken. The important point, is that the effect of the most recent qualifying measurement is made smaller by averaging.

The **dAMP** menu allows the amount of noise on measurements due to vibration to be specified or sampled. During normal operation, the instrument responds slowly to small changes in measurements below this threshold, with a slow step response of 20 seconds. Large consecutive changes in weight measurements above the threshold continue to have a fast step response of 125mS+.

NOTE: As this input filter is applied at the earliest possible stage, all downstream processes that accept the measured input, such as the analogue output and alarm comparisons, should benefit from the effect of this filter.

Damping Values

Default : 0

Select **VAL** from the **dAMP** menu option to specify the noise level to be damped. The value entered is expressed in the same engineering units as the displayed value. Changes in consecutive measurements below this value, will be damped by averaging them over 20 seconds.

It is recommended that the **rEAd** option described below, is used in preference to **VAL**. **VAL** might be used to reduce the noise band so that real changes in weight close to the threshold do not take a long time to settle. However **VAL** might also be used to increase the noise band so that weights greater than that sampled, will be adequately damped. It is assumed that larger weights would need a greater value because they would vary more.

Any positive value in the displayable range may be entered. The position of the decimal point matches the displayed measurement and it may not be edited. A value of zero disables the noise band filter completely.

rEAd It is recommended that this function is used to sample the noise level to be damped. Before selecting **rEAd** from the **dAMP** menu, a large weight, similar to the largest expected steady measurement during normal use, should be placed on the load cell. Pressing the instrument's **Enter** key starts a 10 second countdown display during which, the instrument samples variations in the measurements. At the end of the sampling period, the maximum variation between measurements, plus 2%, is flashed on the display. This value is the new noise band setting. Changes in consecutive measurements below this value will be damped by averaging them over 20 seconds.

Example

Problem

An instrument measures weight from 0.0 to 6000.0g. When a small object is placed on the load cell, the instrument displays between 10.5 and 11.0g. However, when a larger weight is put on the load cell, the instrument displays between 587.7 and 592.0g. The weight measurement seems less stable for the larger weight.

Reason

When large weights seem to be less stable, it is quite likely that this is due to vibration. This is because a large mass with great inertia will move much less than a light weight when the load cell it rests on vibrates. As the load cell vibrates up and down, a large weight will tend to remain still, whilst a light weigh is more likely to move up and down with the load cell.

Solution:

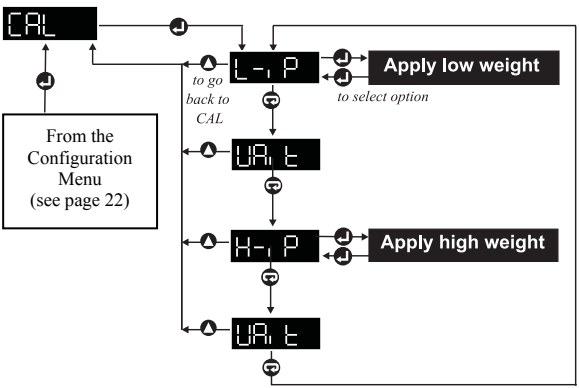
To make the weight measurement more stable, place a large weight on the load cell and select the **rEAd** option. The instrument will sample about 80 measurements over 10 seconds and will find the maximum and minimum measurements over that time. At the end of the sample period, the maximum amount of change in the measurement is flashed on the display. From this point onwards, the instrument damps all measurements that change by less than this amount, ie. the vibrations are damped.

Analogue 62 Comms Location	Read/Write
Sets the damping filter value in engineering units	

Calibration Sequence

Use this facility to calibrate the instrument to known weights. Before the instrument can measure weights accurately, it must know exactly what output (in mV/V) from the load cell corresponds to 2 known weights.

Calibration Menu Map



Load cell mV/V CAL (calibration) menu	Weight represented SCLE (scale) menu
L-iP low input	LdSP low display
H-iP high input	HdSP high display

The calibration procedure prompts for known weights to be placed on the load cell: firstly the low known weight (**L-ip**), and secondly, the high known weight (**H-ip**). Both of these values can also be entered manually (in mV/V) from the **SCLE** (scale) menu (see **Scaling** page 35). The instrument is recalibrated to the weights only if the weights are acceptable. If they are unacceptable (over range or equal), the calibration is unchanged. The weights should be as different as possible. The low

weight is normally zero.

NOTE: For best results, power the system for a minimum of 30 minutes before calibrating.

To access the **CAL** prompt from Normal Operating Mode:

1. Press the **Enter**  Key and hold down for approximately 3 seconds until **LoW** is displayed.

2. Press the **Next**  Key 3 times until the **ConF** (configuration) menu is displayed.

3. Press the **Enter** Key once to access the **ConF** menus.

4. Press the **Next** Key twice until **CAL** is displayed.

To calibrate the instrument:

1.  Press **Enter** to begin the **CAL** procedure.

2.  Apply low weight or load to transducer and allow the output to settle. Press the **Enter** Key.

3.  Wait while the load cell output is being measured.

4.  Apply high scale weight or load to transducer and allow the output to settle. Press the **Enter** Key.

5.  Wait while the load cell output is being measured. If the instrument has detected an error during calibration, 1 of the 3 error messages (6a to 6c below) will be displayed. The original calibration values will be retained.

6a.  The measured output from the load cells at the 2 calibration points were closer than 0.02mV/V. Press **Enter** to return to the menu.

6b. oUEr or HIGH The instrument input was too high during the calibration process. Press **Enter** to return to the menu.

6c. undr or LoU The instrument input was too low during the calibration process. Press **Enter** to return to the menu.

Should calibration fail (6a to 6c displayed), press the **Enter** Key to continue and the unit returns to **CAL**.

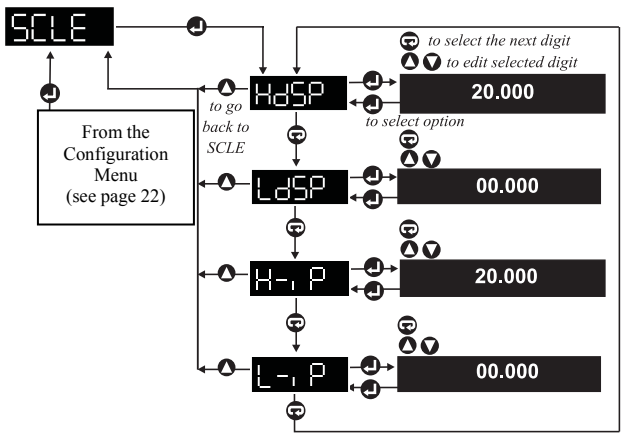
1. CAL The instrument has completed the calibration process with no errors detected and the new calibration data will be used for all subsequent measurements.

Logic Comms Locations for remote operations		
Logic 25 (Read/Write)	Write On	To trigger first and subsequent steps of calibration procedure.
	Test Off	To ensure previous calibration step finished (Off) before writing (On) again.
Logic 24 (Read-Only)	Test On	On indicates that more calibration steps need to be carried out before calibration is complete.

Scaling

If the system is being calibrated from the information on the load cells' calibration certificate, all the values in the **SCLE** (scale) menu must be entered.

Scale Menu Map



If the system is calibrated to known weights as described above, do not change **H-ip** and **L-ip**. Enter weights for **HdSP** and **LdSP** only.

If the scaling is changed via comms, the instrument must be told when to use the new setup by setting Logic Location 44 On.

Logic 44 Comms Location	Write-Only
On	Makes the instrument use scaling changes

High Display Value

Default: 20

HdSP Enter the value, in engineering units, of the high calibration point (eg. 50 Tonnes). If the system has not been calibrated to a known weight/load, enter the full rating of the load cell(s).

Analogue 75 Comms Location	Read/Write
Integer range	-19999 to 99999 to 5 decimal places

Low (Zero) Display Value

Default: 0

LdSP Enter the value, in engineering units, of the low calibration point (eg. 0 Tonnes). If the system has not been calibrated to a known weight, set this parameter to zero.

Analogue 73 Comms Location	Read/Write
Integer range	-19999 to 99999 to 5 decimal places

High Input

Default: 20mV/V

H-I P This is the signal output from the load cell that corresponds to the high display value. This value may be entered numerically, and is generally supplied as part of the documentation with the load cell. The required value is the rated output of the load cell in mV/V. Do not change if the load cell is calibrated using weights.

Analogue 76 Comms Location	Read/Write
Integer range (mV/V)	-19.999 to 29.999

Low Input

Default: 0mV/V

L-I P This is the signal output from the load cell in mV/V that corresponds to the low display value, usually 0mV/V. This value may be entered numerically, and is generally supplied as part of the documentation provided with the load cell. Do not change if the load cell is calibrated using weights.

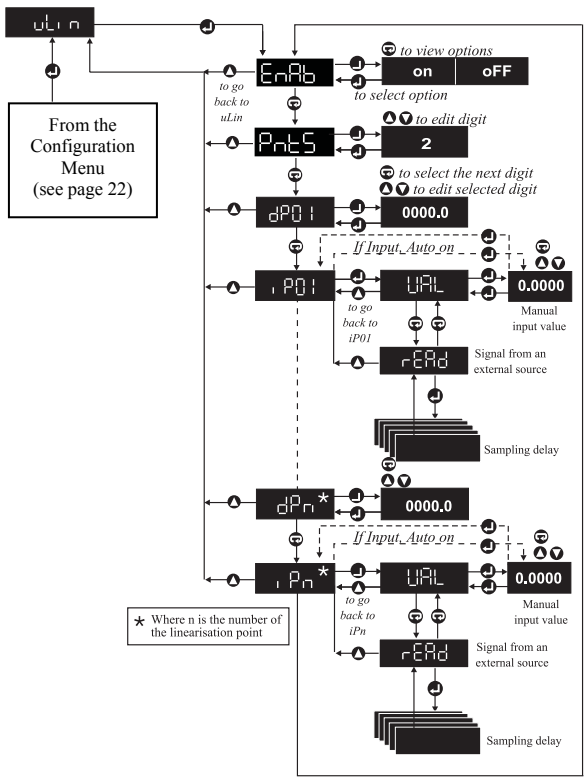
The load cell's offset error at zero is often expressed in µV (microvolts) at 10V excitation, eg. a load cell's offset when there is no load is 2.4µV at 10V excitation. To convert to mV/V, divide 2.4µV/10V giving 0.24µV/V and divide again by 1000 (µV per mV) giving 0.00024mV/V.

Analogue 74 Comms Location	Read/Write
Integer range (mV/V)	-19.999 to 29.999

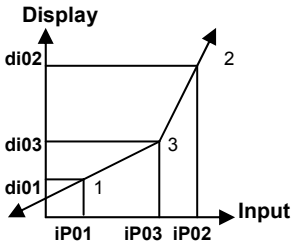
Configuring User Linearisation

This menu can setup the instrument with a non-linear relationship between the input from the load cell and the displayed value.

User Linearisation Menu Map



Between 2 to 8 calibration points may be defined in terms of load cell input (mV/V) and the corresponding displayed value. A 3-point relationship is illustrated below.



Notice that:

- The points do not need to be declared in any order, the last point declared may lie between 2 other points. The instrument joins the points in order of ascending input as illustrated.
- The input value may not be the same for 2 or more points.
- The display value may be the same for 2 or more points.

User linearisation can compensate for a non-linear relationship between the signal from the load cell and the weight it represents.

Enable

Default: Off

EnAb **on** enables user linearisation. When enabled, the user linearisation overrides scaling entered from the **CAL** (calibration) and **SCLE** (scale) menus.

Logic 46 Comms Location	Read/Write
On	Enables user linearisation
Off	Disables user linearisation

Number of Points

Default: 2

PnLS Defines the number of user linearisation points. This may range from 2 to 8. 2 points would define a linear scale.

Analogue 72 Comms Location	Read/Write
Integer range	2 to 8

Display Values

Default 0.0

 to  Define the displayed value corresponding to the input value for the point. Together **di01** and **iP01** define point 1. Similarly **di02** and **iP02** define point 2, etc.

Display values may be any value in the displayable range. This is dictated by the decimal places setup from the **diSP** (display) menu (see **Decimal Point Position** page 24).

Analogue Comms Locations								Read/Write
Analogue	77	79	81	83	85	87	89	91
Displayable range (see page 24)	di01	di02	di03	di04	di05	di06	di07	di08

Input Values

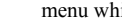
Default 0.0

 to  Define the input value corresponding to the displayed value for the point. Together **di01** and **iP01** define point 1. Similarly **di02** and **iP02** define point 2, etc.

Input values are expressed in mV/V. They represent the signal from the load cell. They should not fall outside the range -20 to +20mV/V.

When **AUto** sensitivity detection is **oFF** in the **inPt** (input) menu (see **Automatic Sensitivity Selection** page 28), pressing **Enter** in response to **iP01** to **iP08**, causes the existing input value for the point to be presented for editing. The value given, should be expressed to as many decimal places as possible.

When the **AUto** sensitivity detection is **on** in the **inPt** menu (**see Automatic Sensitivity Selection** page 28), **iP01** to **iP08** lead to a sub-menu which presents the following options:



To enter the input value manually via the front panel keys. To select **VAL**, press **Enter** when **VAL** is displayed. The

existing input value for the point is presented for editing. The value given should be expressed to as many decimal places as possible.

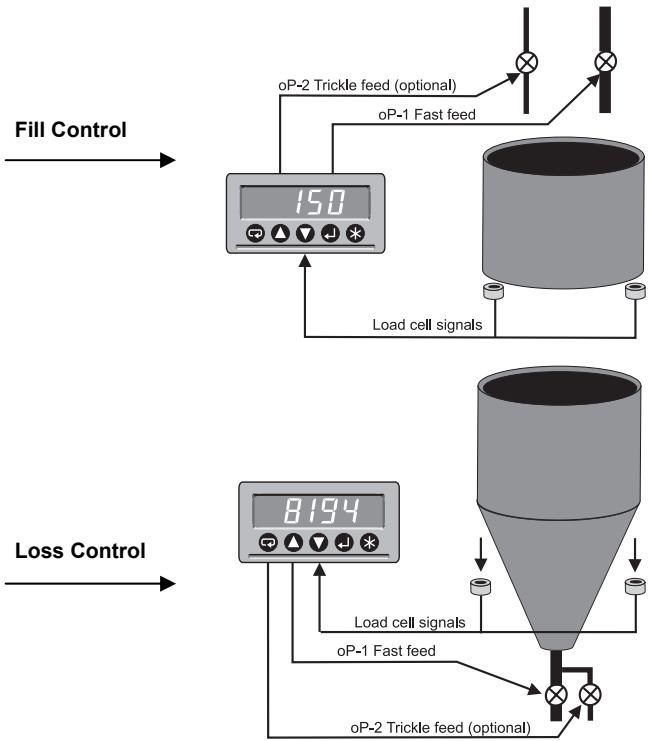
To sample the load cell output applied to the instrument input. To **rEAd**, the input from the load cell should be applied to the instrument's load cell input before pressing **Enter** to begin a read.

Analogue Comms Locations							Read/Write	
Analogue	78	80	82	84	86	88	90	92
Input value	iP01	iP02	iP03	iP04	iP05	iP06	iP07	iP08

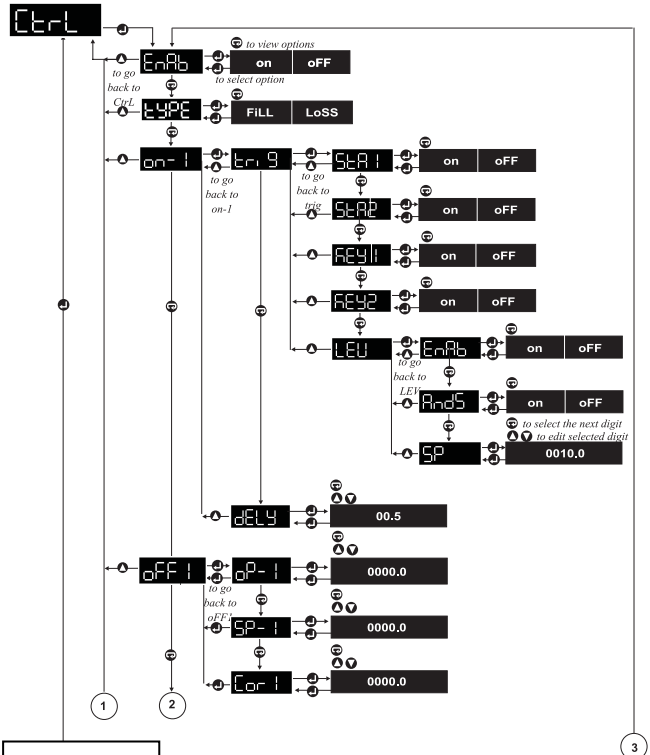
If the user linearisation is changed via comms, the instrument must be told when to use the new setup by setting Logic Location 45 On.

Configuring Control

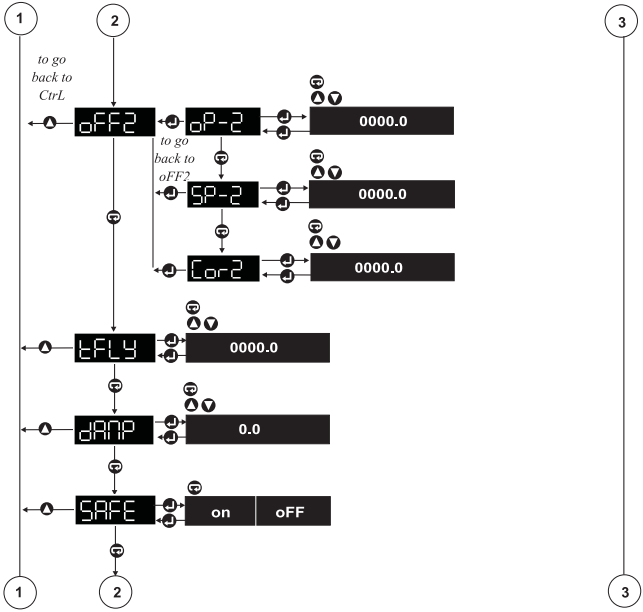
The control feature is used for repetitive filling applications either by weighing the target vessel (fill) or by measuring the loss of weight of the supply vessel (loss). The menus are visible only on instruments fitted with dual relays or quad TTL outputs.

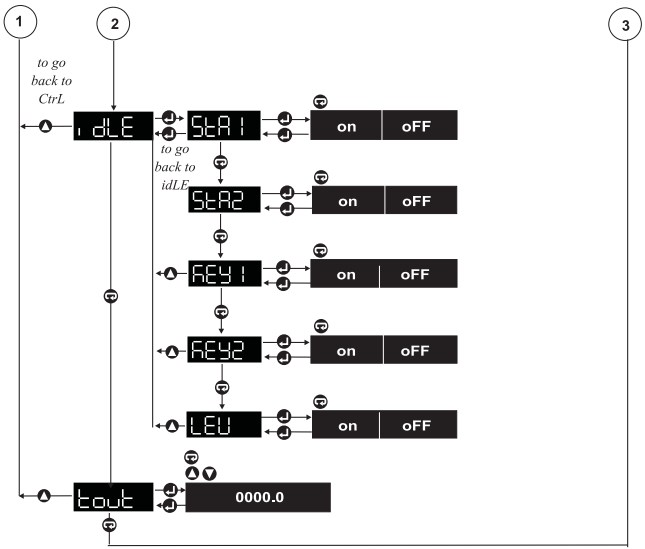


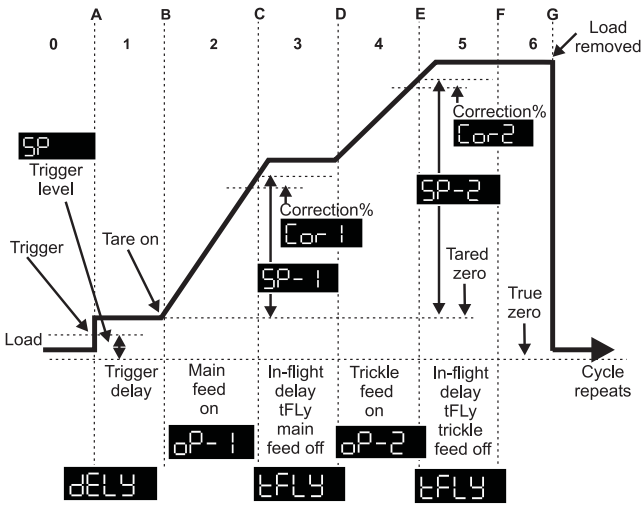
Control Menu Map



From the Configuration Menu (see page 22)


1
2
3
to go back to CtrL
oFF2
oP-2
0000.0
to go back to oFF2
SP-2
0000.0
Cor2
0000.0
tFLY
0000.0
dAMP
0.0
SAFE
on
oFF
1
2
3


1
2
3
to go back to CtrL
idLE
to go back to idLE
SLA1
SLA2
KEY1
KEY2
LEV
tout
on
oFF
0000.0



An Example of Fill Mode using Main and Trickle Feed

A The empty vessel arrives and is detected by one of the following: Status Inputs 1/2, Function Keys 1/2, weight of empty vessel (level).

B After trigger delay, weight of vessel is tared out and Control Output 1 is activated.

C When weight exceeds Control **SP-1**, Control Output 1 is de-activated.

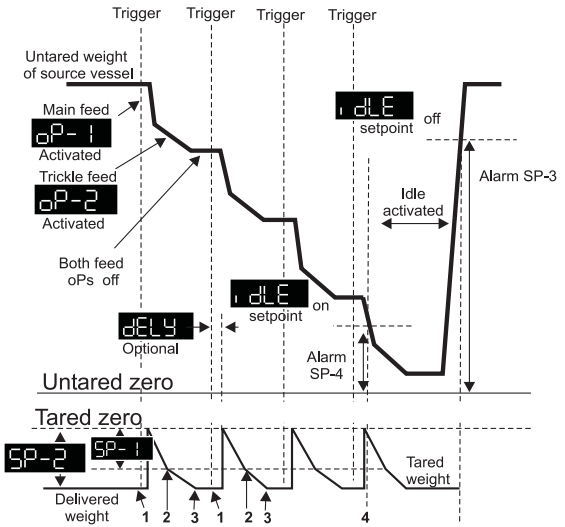
D After in-flight settling time: weight is measured, over-fill error is used to adjust Control **SP-1** and Control Output 2 is activated.

E When weight exceeds Control **SP-2**, Control Output 2 is de-activated.

F After delay: weight is measured and error is used to adjust Control **SP-2**.

G Vessel removed: wait for next trigger.

NOTE: Until the first trigger, the gross weight is displayed. Once the first trigger has occurred, the tared (delivered) weight is always displayed.



Typical Loss of Weight Application with Idle Function

1 Empty vessel arrives, triggers optional delay, then tares and activates Control Output 1.

2 When tared weight falls below **SP-1**, Control Output 1 is de-activated and Control Output 2 is activated.

3 When tared weight falls below **SP-2**, Control Output 2 is de-activated.

4 When untared weight falls below idle-on setpoint, fill finishes, but further triggers ignored until untared weight above idle-off setpoint (source vessel refilled).

NOTE: Until the first trigger, the gross weight is displayed. Once the first trigger has occurred, the tared (delivered) weight is always displayed.

NOTE: When a fill finishes, the instrument will enter the idle state earlier than expected if there is not enough weight to finish another fill.

Enable

Default: Off

EnAb To use the control facilities, turn this parameter **on**.

Logic 202 Comms Location	Read/Write
On	Enables control function
Off	Disables control function

NOTE: To reset the control operation in mid sequence, use the reset function (see pages **Reset** 94 & 98) or turn **EnAb oFF** and **on** again.

Type

Default: Fill

tYPE Select **FiLL** or **LoSS** of weight for the application as described above.

Logic 203 Comms Location	Read/Write
On	Selects loss control
Off	Selects fill control

Sequence Start

on-1 This menu defines what triggers Control **oP-1** and any delay between trigger and **oP-1** activation.

Trigger

Default: Off

tri 9 The trigger used to start filling can be selected from any combination of the following:

- **StA1** Status Input 1 (see page 13).
- **StA2** Status Input 2 (see page 13).
- **KEy1** Function Key 1.
- **KEy2** Function Key 2.
- **LEV** Weight of empty vessel (fill only).

Triggers may be selected by turning the parameter **on**. For example, either Status Input 1 or Function Key 2 can trigger the filling sequence if both parameters are **on**.

Logic Comms Locations		Read/Write
Logic	State	Triggered by
204	On	Status Input 1 closed contacts
205	On	Status Input 2 closed contacts
206	On	Function Key 1 pressed
207	On	Function Key 2 pressed
208	On	Weight > level (fill only)

Level Menu (Use for Fill Control Only)

Default: 10.00

LEU This menu configures filling to be triggered when an empty vessel is detected by its weight (load).

Trigger by level normally overrides triggering by status input or function key. This is because a trigger by status input or function key conflicts with the measured weight if it is below the trigger level. So, in this condition, the instrument ignores status input and function key triggers.

However, when **AndS** is **on**, trigger by level is ignored unless the configured status input(s) is (are) activated.

EnAb

Default: Off

on enables triggering by level.

Logic 208 Comms Location	Read/Write
On	Enables trigger by level
Off	Disables trigger by level

SP

Default: 10.0

Defines the weight that must be exceeded to trigger filling. For example, if empty vessels are 10Kg, specify a significantly lower weight like 6Kg.

Analogue 234 Comms Location	Read/Write
Trigger level setpoint value	Displayable range (see 24)

AndS

Default: Off

on prevents triggering by level unless triggering by Status 1 and/or 2 has also been setup **And** those **S**tatus inputs are activated.

Logic 209 Comms Location	Read/Write
On	Level and status input(s) required
Off	Level triggers independently

Trigger Delay

Default: 0.5 seconds

dELY Delays the actual filling after the initial trigger to allow the weighing system to stabilise after the placement of an empty container onto the load cell. The delay range is from 0 (no delay) to 59.9 seconds. A delay should always be used for fill control.

Analogue 235 Comms Location	Read/Write
Delay range (seconds)	0 to 2995 (20 mS ticks)

Feeder 1 Setpoint Parameters

oFF1 This menu sets up the main feed control (see diagrams pages 41, 45 & 46). The main feed normally performs the majority of the filling quickly, leaving the trickle feed to top up precisely. The main feed can be setup to perform the whole fill by disabling the trickle feed. The trickle feed is disabled by setting **SP-2** in the **oFF2** menu to a value smaller than **SP-1** and setting **oP-2** to activate no outputs.

Output (Main Feed)

Default: Output 1 (Relay 1)

oP-1 At least one output must be selected. The output used should not be activated by other facilities, eg. alarms. Once activated, the output remains **on** until the weight reaches **SP-1**.

Logic Comms Locations				Read/Write
Logic	216	217	218	219
On enables Off disables	Output 1	Output 2	Output 3	Output 4

Setpoint 1

Default: 30.0

SP-1 Defines the main feed cut-off weight. Typically, where 2 outputs (main and trickle feed) are used, this value should be about 3/4 of the required final fill weight. When only one control output is used, this value should be the exact required final fill weight. In either case, the weight

specified does not include the weight of the vessel/palette. The weight should be negative when control type is loss.

When **Cor1** is not 0, a working copy of **SP-1** is automatically corrected on each fill to achieve the specified ideal: **SP-1**. Therefore, despite corrections to the working copy, **SP-1** remains the ideal.

Changing **SP-1**, repowering the instrument, using the reset function (see **Reset** pages 94 & 98) or re-enabling control, all reset the working **SP-1** to the displayed ideal. The working setpoint is then "re-learned" after a few fill cycles.

Analogue 236 Comms Location	Read/Write
Setpoint 1 range	Displayable range (see page 24)

Setpoint 1 Correction (Fill Mode Only) *Default:0.00%*

Cor 1 Defines an optional correction made to **SP-1** as a percentage of the error between the target weight (**SP-1**) and the delivered weight. In other words, **SP-1** is adjusted to anticipate the error and partially correct for it in the next fill.

Eg:	**SP-1** (feed cut-off)	=	100Kg
	Delivered weight	=	105Kg
	Cor1 (required correction)	=	10%
	in Kg	=	(105-100) x 10/100
		=	5 x 0.1
		=	.5Kg
	New **SP-1** (feed cut-off)	=	100 - 0.5
		=	99.5Kg

To disable this feature, set to 0%. Values below 50% are recommended.

Changing **SP-1**, repowering the instrument, using the reset function (see **Reset** pages 94 & 98) or re-enabling control, all reset the working **SP-1** to the displayed ideal. The working setpoint is then "re-learned" after a few fill cycles.

Analogue 237 Comms Location	Read/Write
Correction 1 range (%)	0.00 to 100.00

Second (Trickle) Feeder Parameters

oFF2 This menu sets up the trickle feed control (see diagrams page 41, 45 & 46). The main feed normally performs the majority of the fill fast, leaving the trickle feed to top up precisely. However, if the main feed has been setup to do the whole fill, the trickle feed should be disabled by setting **SP-2** to 0 and **oP-2** to activate no outputs.

Output (Trickle Feed)

Default: Output 2 (relay 2)

oP-2 Defines the output(s) that control the trickle feeder. The output(s) is/are activated after the weight has reached **SP-1** and remains so until it reaches **SP-2** (see diagrams on pages 45 & 46). The output(s) chosen should not be used by other facilities such as alarms and peak picking.

Logic Comms Locations				Read/Write
Logic	220	221	222	223
On enables Off disables	Output 1	Output 2	Output 3	Output 4

Setpoint 2

Default: 60.0

SP-2 Defines the trickle feed cut-off weight. When the trickle feed is used, **SP-2** should be the final fill weight required. When only the main feed is used, **SP-2** should be 0. **SP-2** should not include the weight of the empty vessel/palette. **SP-2** should be negative when control type is loss.

When **Cor2** is not 0, a working copy of **SP-2** is automatically corrected on each fill to achieve the specified ideal: **SP-2**. Therefore, despite corrections to the working copy, **SP-2** remains the ideal.

Changing **SP-2**, repowering, using the reset function (see **Reset** pages 94 & 98) or re-enabling control, all reset the working **SP-2** to the displayed ideal. The working setpoint is then "re-learned" after a few fill cycles.

Analogue 238 Comms Location	Read/Write
Setpoint 2 range	Displayable range (see page 24)

Setpoint 2 Correction (Fill Mode Only) *Default:0.00%*

Cor2 Defines the optional correction made to **SP-2** as a percentage of the error between the target weight **SP-2** and the delivered weight, eg. **SP-2** is corrected downwards if the delivered weight is too much, so the overshoot is anticipated on the next fill. If **Cor2** is 50, the correction would be half the excess delivered (see also **Setpoint 1 Correction** page 50).

To disable this feature, set to 0%. Values below 50% are recommended.

Analogue 239 Comms Location	Read/Write
Correction 2 range (%)	0.00 to 100.00

Inflight Time (Fill Mode Only) *Default: 0.5 seconds*

tFLy Specifies the settling time between the weight crossing **SP-1** or **SP-2** and the delivered weight being measured in order to establish the overshoot and necessary correction. Neither control output is activated during this time.

A non-zero value must be entered when control type is fill. **tFLy** is ignored when control type is loss. The range is 0.1 to 99.9 seconds.

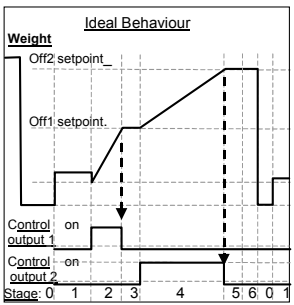
Analogue 240 Comms Location	Read/Write
Integer range (seconds)	5 to 495 (20mS ticks)

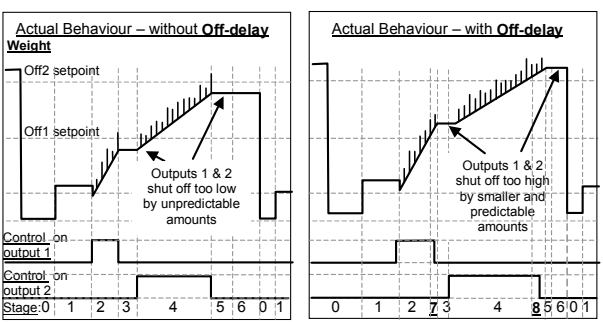
Damping (Fill Mode Only) *Default: 0.0*

dAMP Specifies the number of seconds for which the weight must be continuously above the setpoint before an output is turned off. The value may range from 00.0 to 05.1 seconds.

This option is designed to prevent momentarily high weights, referred to as 'spikes', from tripping off the feeders too early when they cross over high-acting off-setpoints. Spikes are most often caused by the deceleration of discrete objects landing on the load cell. Spikes may be less serious when controlling the delivery of fine particles and fluids as these might produce a more constant positive error in the measured weight as they land and decelerate on the load cell during delivery.

Spike rejection works by defining an off-delay for the feeder control outputs. With a suitable off-delay setup, the off-setpoint must now be crossed for the whole duration of the off-delay before the feeder is turned off.





Effect of Off-delay on Fill Control Process

Key to Stages

0 = waiting for empty vessel.
1 = pre-tare settling delay.
2 = fast filling.
3 = settling delay 1.
4 = trickle filling.
5 = settling delay 2.
6 = waiting for full vessel removal.
7 & 8 = waiting off-delay time to turn off relay.

The off-delay could cause a small overfill that can be anticipated either by reducing the off-setpoints slightly or by enabling the automatic setpoint correction facility. Reduce the setpoint slightly if the automatic correction facility is not used.

NOTE: When this setting is accessed via comms, it is always 50 times bigger than the true setting. For example, a comms value of 255 always represents a delay of 5.1 seconds.

Analogue 242 Comms Location	Read/Write
Integer range ($1/50^{th}$ second)	0 to 255

Safe

Default: Off

SAFE Normally, the control process displays the weight delivered to each target vessel as it is filled. So when the vessel is empty, the instrument displays **0**, and when it is full, the weight delivered. The display **rises** from **0** to the **delivered weight** during each filling. This is true in Fill and Loss Mode (although in Loss Mode, the delivered weight is displayed as a negative value).

Displaying the rising delivered weight seems ideal, but it is useful to display the target weight at the start of each fill when a target vessel is actually empty, and **0** when the target vessel is full. It can be useful if the display value **falls** from the target weight to **0** during each target vessel fill as the operator sees momentary acknowledgement of the target weight at the **start** of each fill. This may allow the operator enough time to prevent a spillage if the target weight has been entered as too large by accident. If however, the instrument simply displayed delivered weight, the operator would not notice the problem until the delivered weight was well past the capacity of the target vessel.

When **SAFE** is **oFF**, the display value rises from **0** to the target weight as described below during each fill.

Displayed value = delivered weight

By setting the **SAFE** option to **on** the display value falls from the target weight as described below, to **0** during each fill.

Displayed value = target weight minus delivered weight

By default this option is **oFF** which makes the display value behave as illustrated by the graphs on page 53.

Target weight means the weight that the user wants to deliver to each vessel. More specifically, the target weight is actually the largest of the 2 working control setpoints, ie. whichever setpoint is furthest from zero. This is because Control Setpoint-2 can be disabled by setting it to a smaller value (closer to zero) than Control Setpoint-1. For instance, if Control Setpoint-2 is set to zero, then Control Setpoint-1, assuming it is not also zero, represents the target weight.

The term 'working setpoints' means the ideal setpoints entered by the user plus or minus the automatic corrections learned by the instrument from errors in earlier delivered weights. Working setpoints are generally only slightly different from the ideal setpoints and will only be different if the correction % for each control setpoint is non zero, ie, if the user has indicated that automatic in-flight corrections are wanted.

Logic 224 Comms Location		Read/Write
On	Enables safe fill control	
Off	Disables safe fill control	

Idle (Loss of Weight)

Default: Disabled

The purpose of the idle facility is to suspend filling operations while the source vessel is not full enough or simply not ready.

While control is idle, both control outputs are turned **oFF**.
Idle can be triggered by:

Trigger	Idle starts	Idle ends
StA1	Closing Status Input 1 contacts	Opening Status Input 1 contacts
StA2	Closing Status Input 2 contacts	Opening Status Input 2 contacts
KEy1	Pressing Function Key 1	Pressing Function Key 1 again
KEy2	Pressing Function Key 2	Pressing Function Key 2 again
LEV	The weight of the source vessel falling below Alarm Setpoint 4	The weight of the source vessel rises above Alarm Setpoint 3

When idle is triggered by level, then Alarm Setpoints 4 and 3 determine the idle-on and idle-off setpoints respectively. When used in this way, Alarms 3 and 4 should be disabled or setup to activate NO outputs that may conflict with the control process.

Idle could be used in Fill Mode to de-activate control outputs.

Logic Comms Locations		Read/Write
Logic	State	Effect
210	On	Triggers by Status Input 1
211	On	Triggers by Status Input 2
212	On	Triggers by Function Key 1
213	On	Triggers by Function Key 2
214	On	Triggers by level (weight)
215	On	Enters idle directly
215	Off	Exits idle directly

Time-out

Default: 60 seconds

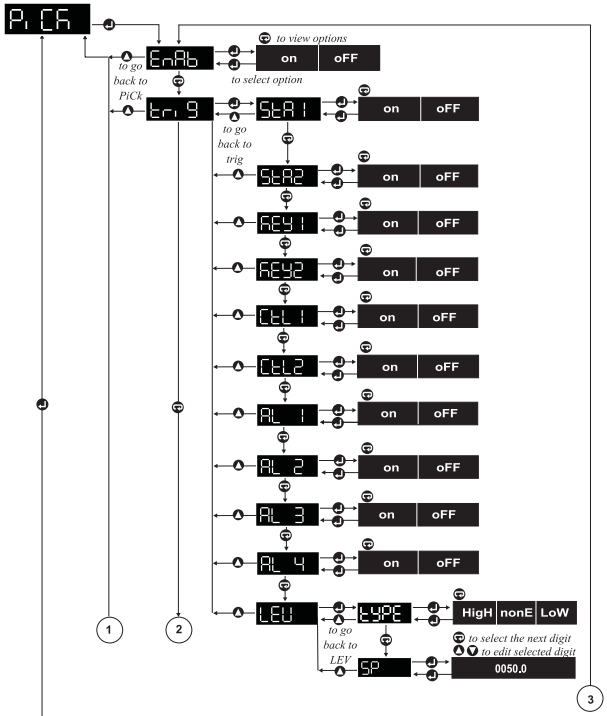
Limits the maximum time any control output can stay **on**. If a control output does stay **on** for more than the specified time, both control outputs are unconditionally turned **oFF** and the instrument waits for another trigger. When the value is 0, there is no limit to the time an output can stay **on**.

Analogue 241 Comms Location	Read/Write
Time-out integer range (seconds)	0 to 9999

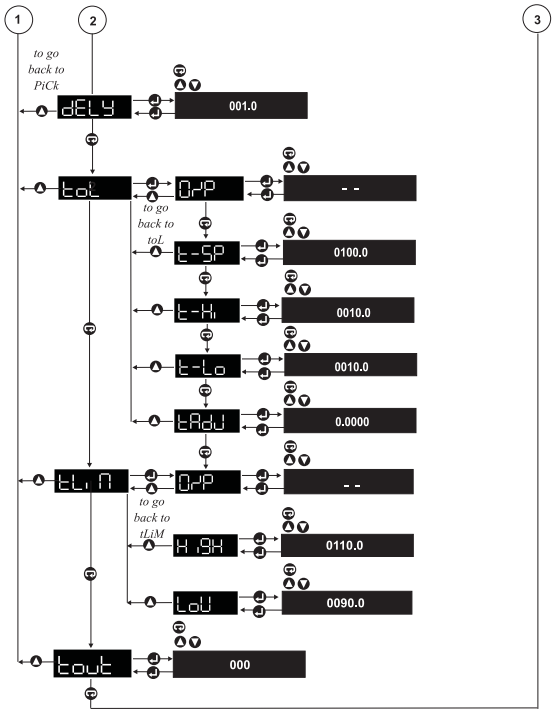
Configuring Peak Picking

This menu sets up peak picking.

Peak Picking Menu Map



From the Configuration (see page 22)


1
2
3
to go back to PiCk
dELY
001.0
toL
OrP
- -
to go back to toL
t-SP
0100.0
t-Hi
0010.0
t-Lo
0010.0
tAdJ
0.0000
tLiM
OrP
- -
to go back to tLiM
H.SH
0110.0
LoU
0090.0
tout
000

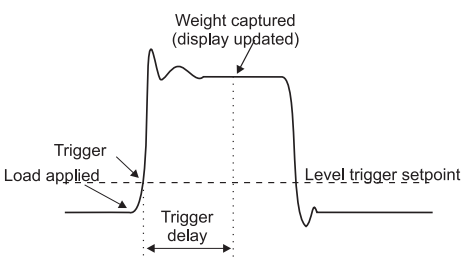
Peak picking is optional. In its simplest form, peak picking sets up the instrument so the displayed weight is updated only when triggered. A delay between the trigger and the display update can be setup.

The trigger may be a status input, a function key, an alarm or control output, or based on the measured weight.

Advanced peak picking functions include:

- A tolerance alarm output: triggered when a peak weight falls outside a user defined tolerance band. The alarm can also be setup to activate if no triggers occur within a set time.
- Automatic adjustment of the tolerance band's position in the same direction as the last peak's deviation from the band's setpoint.
- A limit alarm output, triggered when the tolerance band's adjustment limits are reached. Adjustment beyond the limits is prevented.

The tolerance alarm can indicate rejects and its automatic adjustment may allow for gradual changes in density.



An Example of the Peak Picking Trigger Process

Enable

Default: Off

EnAb **on** enables peak picking. Changing this parameter from **oFF** to **on**, clears any activated peak picking alarms and makes the process wait for a trigger.

The reset function can be used to reset the peak picking function at any point. This can be enabled from a function key or the **StA1**, **StA2** (status input) menus. Any outputs, status inputs or function keys to be used by peak picking should not be used for other facilities such as alarms.

Logic 229 Comms Location	Read/Write
On	Enables peak picking
Off	Disables peak picking

Trigger

Default: Off (with exception of LEV)

This menu sets up the display update trigger.

When peak picking is enabled, this trigger is the only normal cause of display updates. Therefore, at least one trigger source must be setup:

Trigger on	Method	
StA1	When Status Input 1 contacts closed	
StA2	When Status Input 2 contacts closed	
KEy1	When Function Key 1 momentarily pressed	
KEy2	When Function Key 2 momentarily pressed	
CtL1	When control turns off Control Output 1	
CtL2	When control turns off Control Output 2	
AL1	When Alarm 1 is activated	
AL2	When Alarm 2 is activated	
AL3	When Alarm 3 is activated	
AL4	When Alarm 4 is activated	
LEV: tYPE:	**HigH**	When weight > **LEV: SP**
(see **Type of Level Trigger** on the next page)	**LoW**	When weight < **LEV: SP**
	nonE	Weight has no effect

With the exception of trigger by **LEV** (see **Level Trigger** below), turning a trigger option **on**, enables triggering by that method.

During operation, instruments do not require status input trigger contacts to stay closed any longer than is necessary to detect the transition from open to closed, as this acts as the trigger. Closing the contacts for half a

second should be adequate, and they may stay closed longer provided that they open before the next trigger.

During operation, a function key, setup as a trigger, may need to be held down for a second or 2 to be successful.

Logic Comms Locations					Read/Write
Logic	230	231	232	233	234
On triggers by	**StA1**	**StA2**	**KEy1**	**KEy2**	**CtL1**
Logic	235	236	237	238	239
On triggers by	**CtL2**	**AL1**	**AL2**	**AL3**	**AL4**

Level Trigger

This menu sets up a level trigger for peak picking.

Type of Level Trigger

Default: High

Type options are:

- **HigH** Triggers when weight > setpoint.
- **LoW** Triggers when weight < setpoint.
- **NonE** Disables trigger by level.

(see **Level Trigger Setpoint** below for **HigH** and **LoW** options).

Analogue 245 Comms Location			Read/Write
Integer value	0	1	2
Effect	None	High	Low

Level Trigger Setpoint

Default: 50

Specifies the level that the weight must rise above or fall below, to trigger peak picking. Typically, **SP** would be less than half of the expected minimum valid peak weight.

SP is ignored if **tyPE** is set to **NonE**.

Analogue 246 Comms Location	Read/Write
Setpoint range	Displayable range (see page 24)

Delay after Trigger

Default: 1 second

dELY Specifies the delay between the peak picking trigger and displaying the peak value. The measured weight at the end of the delay is displayed. The delay should be long enough for the weight reading to reach a steady state after the trigger, but not so long that the peak to be measured is missed. The delay may range from 0.0 to 199.9 seconds (0.0 is not recommended).

Analogue 247 Comms Location	Read/Write
Integer delay range (seconds)	0 to 9995 (20mS ticks) (eg. 5=1 second)

Tolerance Alarm

tOL This menu sets up an optional tolerance alarm, triggered when a peak weight falls outside a tolerance band. It is not applicable on instruments without outputs.

Tolerance Alarm Output

Default: --3- (if fitted)

OUP Defines the output(s) activated when peaks fall outside of the tolerance band (see **Tolerance Band - High & Low Deviations** page 63), or a time-out occurs (see **Time-out** page 66).

Each illuminated digit position may be a digit or a hyphen. Digits indicate outputs that are enabled. For example **--3-** indicates Output 3 is activated. The flashing digit/hyphen can be edited with the **Up/Down** Keys. The **Next** Key is used to advance to the next output position.

Check used outputs are not unintentionally used by alarms or control.

Logic Comms Location				Read/Write
Logic	240	241	242	243
On enables Output	1	2	3	4
Off disables Output	1	2	3	4

Tolerance Alarm Setpoint

Default: 100.00

t-SP Specifies the ideal peak weight sought.

The top and bottom of the tolerance band are expressed as weight deviations relative to this setpoint. Therefore, when **t-SP** is adjusted, the whole tolerance band moves.

When a peak weight falls inside the tolerance band but does not equal the ideal weight, and if a tolerance adjustment has been setup, the **t-SP** is adjusted (see **Tolerance Adjustment** page 64).

When a peak weight falls outside the tolerance band, the tolerance alarm output is activated (see **Tolerance Alarm Output** page 62).

The instrument maintains and adjusts a working copy of **t-SP,** so **t-SP** remains the ideal peak weight.

Analogue 248 Comms Location	Read/Write
Tolerance setpoint range	Displayable range (see page 24)

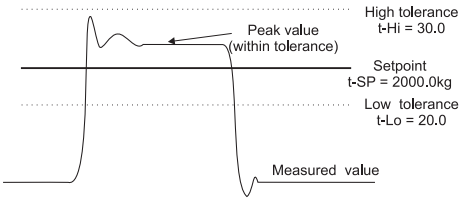
Tolerance Band - High & Low Deviations *Default: 10.000*

Define the highest and lowest acceptable deviations above and below the setpoint weight (**t-SP**). Both numbers should be positive.

Peak weights outside this band activate the configured tolerance alarm output(s).

When a peak weight falls inside the tolerance band but does not equal the ideal weight, and if a tolerance adjustment has been setup, the **t-SP** value is adjusted (see **Tolerance Adjustment** page 64).

Analogue Comms Locations	Read/Write
249 **t-Hi** 250 **t-Lo**	Displayable range (see page 24)



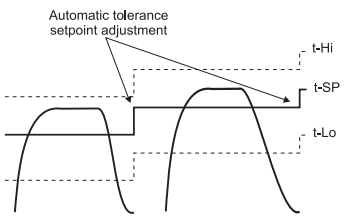
An Example of the Tolerance Band

Tolerance Adjustment

Default: 0.00%

tAdJ Defines the adjustment made to the tolerance band's position when a new peak weight is displayed.

The top and bottom of the tolerance band are expressed as weight deviations relative to the tolerance band setpoint (**t-SP**) so the adjustment is made to the **t-SP** in order to move the whole band. The adjusted **t-SP** is used after the next trigger.



An Example of Automatic Tolerance Setpoint Adjustment

The adjustment is expressed as a percentage of the difference between the ideal weight and the measured peak weight.

The direction of the adjustments is the same as the error. This lets the instrument accommodate gradual changes such as material density.

t-Adj may range from 0.00 to 100.00%. Values above 10% are not recommended.

Eg:

t-SP setpoint	= 100Kg
Peak weight	= 110Kg
t-Adj	= 1%
Error	= 10Kg
1% of error	= 0.1Kg
new **t-SP** setpoint	= 100 + 0.1Kg

In operation, the instrument works with a copy of **t-SP**, so **t-SP** remains the original ideal. Editing **t-SP** or resetting the instrument, resets the working copy to the ideal (see **Reset** page 67).

Analogue 251 Comms Location	Read/Write
Tolerance adjustment range (%)	0.00 to 100.00

Tolerance Band Setpoint Adjustment Limits

This menu defines limits to how far the **t-SP** (tolerance band setpoint) can be moved. It also defines which outputs are activated when any limit is reached. Without these limits, the setpoint could gradually be adjusted down to zero and without any alarm.

If a change to the **t-SP** (or a change to the limits) takes the **t-SP** outside the limits, the working copy of the **t-SP** is automatically changed to equal the limit that was violated, and the limit alarm output is activated.

Once a limit has been reached, further peak measurements can still move the **t-SP** back within limits and clear the limit alarm outputs.

This menu is not applicable on instruments with no outputs.

Tolerance Limit Outputs

Default: ---4 (if fitted)

Defines the output(s) activated when any **t-SP** (tolerance band setpoint) adjustment limit is reached.

Each illuminated digit position may be a digit or a hyphen. Digits indicate outputs that are enabled. For example **---4** indicates Output 4 is activated when a **t-SP** adjustment outside the limits is attempted. The flashing digit/hyphen can be edited with the **Up/Down** Keys. The **Next** Key is used to advance to the next output position.

Check used outputs are not unintentionally used by alarms or controls.

Logic Comms Locations				Read/Write
Logic	244	245	246	247
On enables Output	1	2	3	4
Off disables Output	1	2	3	4

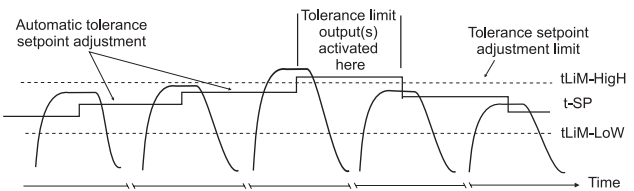
High/Low Tolerance Adjustment Limits

Defaults: High 110, low 90

H iGH LoU Define the maximum and minimum limits of adjustment to the **t-SP** (tolerance band setpoint). These limits are expressed as straightforward weights, not as deviations from a setpoint.

High should be greater than **t-SP** and low should be less than **t-SP**.

Analogue Comms Locations	Read/Write
252 **HighH** 253 **LoW**	Displayable range (see page 24)



An Example of the Tolerance Setpoint Limits

Time-out

Default: 0/disabled

tout Defines the maximum time the instrument will wait for a trigger (see **Trigger** page 60) before activating the tolerance alarm output(s) and returning the display to continuous weight monitoring.

Continuous weight monitoring stops again as soon as another trigger occurs. The tolerance alarm is cleared if the peak captured after the trigger is within tolerance.

Time-out may range from 0 to 255 seconds. 0 disables it so that when there is no trigger, the last peak remains displayed and the tolerance alarm

output remains unchanged.

Analogue 254 Comms Location	Read/Write
Time-out integer range (seconds)	0 to 255

Reset

rSEt Peak picking can be reset by activating a status input or function key that has been setup to perform the reset function (see **Reset** pages 94 & 98). Repowering the instrument also resets peak picking.

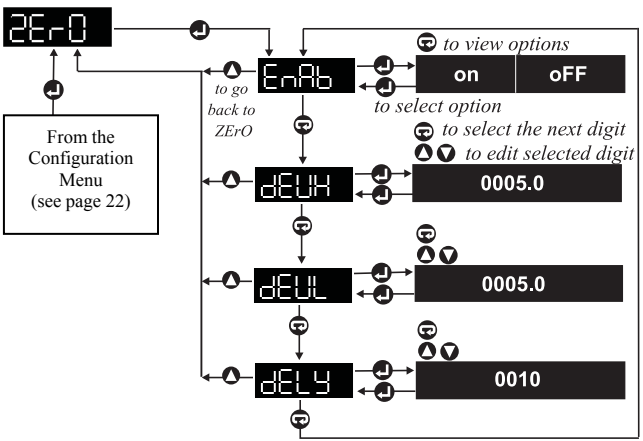
Reset turns **oFF** any peak picking alarms, clears any adjustments made to the **t-SP** (tolerance band setpoint), displays 0.0, and makes the instrument wait for another trigger.

Logic Comms Locations	
Logic	On
37	Resets only peak picking (Write-Only)
115	Enables closing Status Input 1 to reset (see page 94)
128	Enables closing Status Input 2 to reset (see page 94)
138	Enables pressing Function Key 1 to reset (see page 98)
146	Enables pressing Function Key 1 to reset (see page 98)

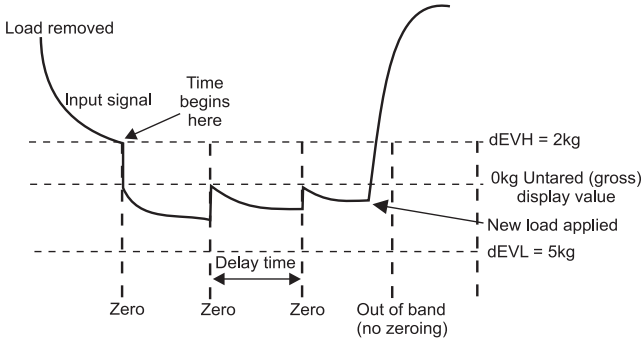
Configuring the Automatic Zeroing Function

This menu sets up automatic zeroing. It zeros the weight display at regular intervals so long as the measured weight is close to zero (see **Deviation High & Low** page 69).

Automatic Zero Menu Map



- Automatic zeroing is optional.
- When an automatic zero is performed, the display flashes **ZErO** 2 seconds after it has zeroed to confirm correct operation.
- When the instrument is repowered, the zero correction is lost, but automatic zeroing resumes with a new zero correction.
- Manual zeroing can also be performed at any time via a status input or function key (see **Zero** page 94).



An Example of Automatic Zeroing

Enable

Default: Off

EnAb **on** enables the automatic zeroing feature.

Logic 250 Comms Location		Read/Write
On	Enables automatic zeroing	
Off	Disables automatic zeroing	

Deviation High & Low

Default: 5

dEVH dEVL Specify how close to zero the displayed weight must be for the indicator to perform an automatic zero. They are the respective weight deviations above and below zero. Weights within this band will be zeroed.

Typical values for high and low deviation would be less than 5% of the full scale weight. Both values must be entered as positive numbers. Any weight in the displayable range can be entered.

Over time, the zero correction added or subtracted to the measured weight to achieve zero, can become larger than the high or low deviation because corrections are repeatedly applied to weights previously corrected. This may warrant larger deviations than originally estimated to ensure

automatic zeroing keeps working if the load cell has developed a large cumulative offset and the instrument is repowered.

Analogue Comms Locations	Read/Write
227 **dEVH**	Displayable range (see page 24)
228 **dEVL**	Displayable range (see page 24)

Delay Time Between Zeroing

Default: 10 seconds

dEL4 Defines how often an automatic zero is attempted. This may range from 0 to 9999 seconds. When 0, the interval will be less than one second. When 9999, the interval will be 2 hours 46 minutes and 39 seconds. The display will not flash **ZErO** more often than once every 2 seconds.

Analogue 229 Comms Location	Read/Write
Integer delay range (seconds)	0 to 9999

Configuring & Using Parts Count Mode

The **PArt** option in the **KEy1** (Function Key 1) or **KEy2** (Function Key 2) menus must be **on** to enable part counting (see **Part Count** page 99). This sets up one function key to prompt for a number of parts as described below. The other function key should be setup to zero the displayed weight (see **Configuring Function Keys** page 97).

The instrument normally displays weight. Pressing a part count function key allows the user to specify a number of parts corresponding to the weight, and from that point onwards, the instrument shows the number of parts corresponding to the weight.

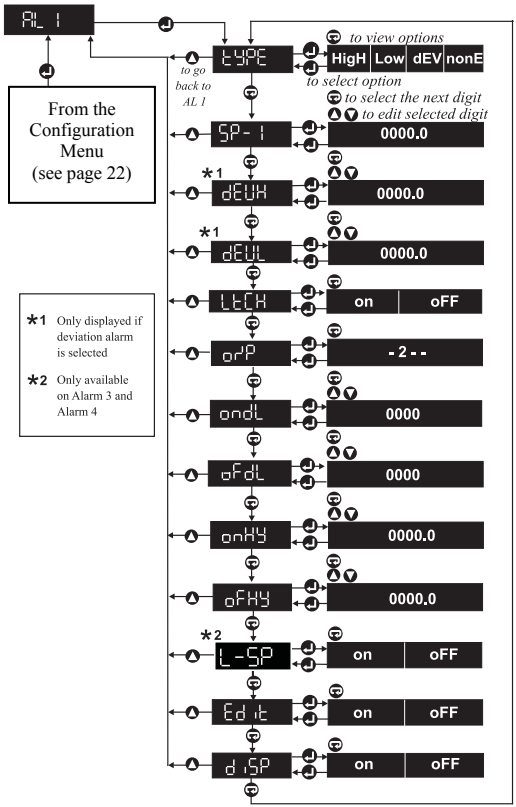
	Procedure	Display	Units
1	Ensure nothing is on the load cell and/or use the **ZErO** function key to zero the displayed weight.	[0.0]	Kg
2	Count a small number of equally heavy parts and place them on the load cell.	[0.2]	Kg
3	Press the **PArt** count function key. The display shows (flashes) a number of parts waiting to be edited and accepted. The integer range is 0 to 99999. The default setting is 10. (0 returns the display to weight. The **Star** Key clears the display to 0).	[00010] (flashes)	Parts
4	Edit the number of parts so it equals the number of parts on the load cell. Press the **Enter** Key to accept.	[00010]	Parts
5	The measurement display now shows the number of parts on the load cell. As more are added, the display shows the part count.	[10]	Parts

Logic Comms Locations		
141	On	Enables part count on Function Key 1
	Off	Disables part count on Function Key 1
149	On	Enables part count on Function Key 2
	Off	Disables part count on Function Key 2
120	On	Enables Status Input 1 to toggle parts/load display
	Off	Disables Status Input 1 parts/load display
133	On	Enables Status Input 2 to toggle parts/load display
	Off	Disables Status Input 2 parts/load display

Configuring Alarms

AL 1 AL 2 AL 3 AL 4 Instruments have 4 alarms.

Alarms Menu Map



Each alarm can be high or low acting or a deviation alarm. When an alarm occurs:

- An optional message can be displayed.
- Outputs may be optionally activated.

Care should be taken to ensure the same outputs are not unintentionally used by other facilities such as control, peak picking or another alarm.

Type

Default: None

tYPE Sets the alarm type:

- **nonE** Alarm disabled.
- **dEV** Deviation alarm.
- **LoW** Low acting alarm.
- **HigH** High acting alarm.

When a deviation alarm type is chosen, the options **dEVH** and **dEVL** (see **Deviation High & Low** page 69) appear after **SP** (see **Setpoint** below). A deviation alarm is activated when the measured weight falls outside a deviation band. The alarm setpoint plus the **dEVH** deviation weight represents the top of the deviation band and similarly, the alarm setpoint minus the **dEVL** weight deviation represents the bottom of the deviation band.

A low/high alarm is activated when the measured weight falls below/rises above the respective setpoints.

Analogue Comms Locations		Read/Write
Analogue	Alarm	Type
110	Alarm 1	0=High 1=Low 2=Deviation 3=None (disabled)
125	Alarm 2	0=High 1=Low 2=Deviation 3=None (disabled)
140	Alarm 3	0=High 1=Low 2=Deviation 3=None (disabled)
155	Alarm 4	0=High 1=Low 2=Deviation 3=None (disabled)

Setpoint

Default: 0.0

SP-1 SP-2 SP-3 SP-4 Specifies the alarm setpoint. The setpoint is ignored if the alarm type is **nonE**.

A **HigH** alarm is activated when the measured weight is higher than the setpoint.

A **LoW** alarm is activated when the measured weight is lower than the setpoint.

A **dEV** (deviation) alarm is activated when the measured weight falls outside the deviation band. The top of the deviation band is at weight: **SP** + **dEVH**. The bottom of the deviation band is at weight: **SP** - **dEVL**. Therefore, moving the setpoint, moves the whole deviation band.

SP can be any weight in the displayable range. Take care setting the display's decimal point position (see Displayable range page 24) as this can reduce the displayable range and leave the setpoint at an unreachable level.

It is possible to setup the instrument so that the setpoints can be edited quickly from the front panel during normal operation. To access the edit facility, set the **Edit** option in the **AL-** (alarm) menu to **on** (see **Front Panel Edit** page 77).

SP-3 (Setpoint 3) will always be the same as **SP-1** (Setpoint 1) if **L-SP** for Alarm 3 is **on**. **SP-4** (Setpoint 4) will always be the same as **SP-2** (Setpoint 2) if **L-SP** for Alarm 4 is **on** (see **Linked Setpoint** page 77).

SP-3 and **SP-4** are used by the control facility to determine the idle-on (**SP-4**) and idle-off (**SP-3**) weights (see **Idle** page 55). When used in this way, Alarms 3 and 4 may be enabled or disabled. It is recommended that they are disabled, or they should be setup to activate no outputs that may conflict with the control process.

Analogue Comms Locations				Read/Write
Analogue	111	126	141	156
Setpoint for Alarm	1	2	3	4
Integer range	Displayable range (see page 24)			

Latching

Default: Off

LECH **on** sets up the alarm to remain activated when the alarm condition has gone. Any output(s) and display message associated with the alarm stay latched too.

When the alarm condition has gone, latched alarms can be cleared via a status input or key function (see **Operator Mode - Key Functions** page 15) to perform the **ACk** (acknowledge function) (see **Alarm Acknowledge** page 93). Latched alarms can be acknowledged by pressing the **Up** and **Down** panel Keys together.

Logic Comms Locations				Read/Write
Logic	65	75	85	95
On enables latching for Alarm	1	2	3	4

Output

Default: "----" (no outputs activated for all alarms)

Defines optional output(s) activated when the alarm condition occurs. This option is only available on instruments with 2 relay outputs or 4 TTL (open collector) outputs.

When setting up, each illuminated digit position may be a digit or a hyphen. Digits indicate enabled outputs. For example **1-3-** enables Outputs 1 and 3 to be activated when the alarm occurs. The flashing digit/hyphen can be edited with the **Up**/**Down** Keys. Advance to the next output position with the **Next** Key.

Only 2 digit positions are illuminated for instruments with 2 relay outputs. 4 digit positions are illuminated for instruments with 4 open-collector outputs.

Check used outputs are not unintentionally used by other facilities including: control, peak picking or other alarms.

Logic Comms Locations				Read/Write
On activates	Alarm 1	Alarm 2	Alarm 3	Alarm 4
Output 1	61	71	81	91
Output 2	62	72	82	92
Output 3	63	73	83	93
Output 4	64	74	84	94

Delay

Default: 0 seconds

Define the time in seconds that an alarm condition must persist, ranging from 0 to 9999 seconds (see diagram page 77).

ondL (On-delay) defines the time an alarm condition must persist before the alarm is activated.

oFdL (Off-delay) defines the time an alarm condition must be clear before the alarm is de-activated.

Analogue Comms Locations					Read/Write
Alarm	1	2	3	4	Range (seconds)
On-delay	114	129	144	159	0 to 9999
Off-delay	115	130	145	160	0 to 9999

Hysteresis

Default: 0.0 (for On and Off and all alarms)

onHY oFHY (See diagram page 77).

onHY (On-hysteresis) defines how far a measurement must go beyond the activation level to activate the alarm.

oFHY (Off-hysteresis) defines how far a measurement must go beyond the deactivation level to de-activate the alarm.

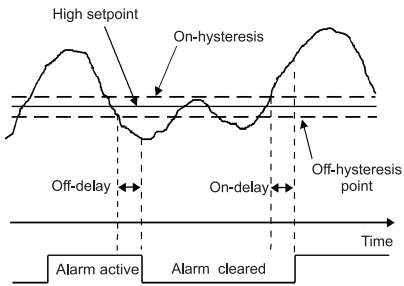
The effect of hysteresis on a high alarm, is to raise the activation level by the on-hysteresis value and lower the deactivation level by the off-hysteresis value.

The effect of hysteresis on a low alarm, is to lower the activation level by the on-hysteresis value and raise the de-activation level by the off-hysteresis value.

The effect of hysteresis on a deviation alarm is to broaden the activation band by the on-hysteresis value and narrow the de-activation band by the off-hysteresis value.

Hysteresis is normally used to prevent an alarm being activated and de-activated at high frequency when a noisy measurement dithers around a setpoint.

Analogue Comms Locations					Read/Write
Alarm	1	2	3	4	
On-hysteresis	116	131	146	161	Displayable range (see page 24)
Off-hysteresis	117	132	147	162	Displayable range (see page 24)



Effect of Hysteresis and Delay on a High Alarm

Linked Setpoint Alarms 3 & 4

Default: Off (both alarms)

L-SP This option is useful for associating 2 alarms with the same setpoint. When invoked from the **AL-3** (Alarm 3) menu, turning this option **on**, will make the Alarm 3 setpoint the same as the Alarm 1 setpoint. When invoked from the **AL-4** (Alarm 4) menu, turning this option **on**, will make the Alarm 4 setpoint the same as the Alarm 2 setpoint.

This option is useful for associating 2 alarms with the same setpoint.

Logic Comms Locations		Read/Write
Logic	88	98
On enables setpoint linking for Alarm	3 (to 1)	4 (to 2)

Front Panel Edit

Default: On for Alarms 1 & 2, off for Alarms 3 & 4

Edit **on** allows setpoint editing from the front panel during normal operation. Press the **Down** Key to access the setpoint editor. A password

is never needed to access the setpoint editor.

Logic Comms Locations				Read/Write
Logic	66	76	86	96
On enables the setpoint editor for Alarm	1	2	3	4

Message Display

Default: On (for all alarms)

di SP **on** programs the instrument to determine and display a message when the alarm occurs during normal operation. Messages are 3 letters followed by the alarm number. The 3 letter codes are:

- **HiA-** High alarm.
- **LOA-** Low alarm.
- **Hid-** High deviation alarm.
- **Lod-** Low deviation alarm.

Eg. **HiA4** indicates high Alarm 4 has been activated.

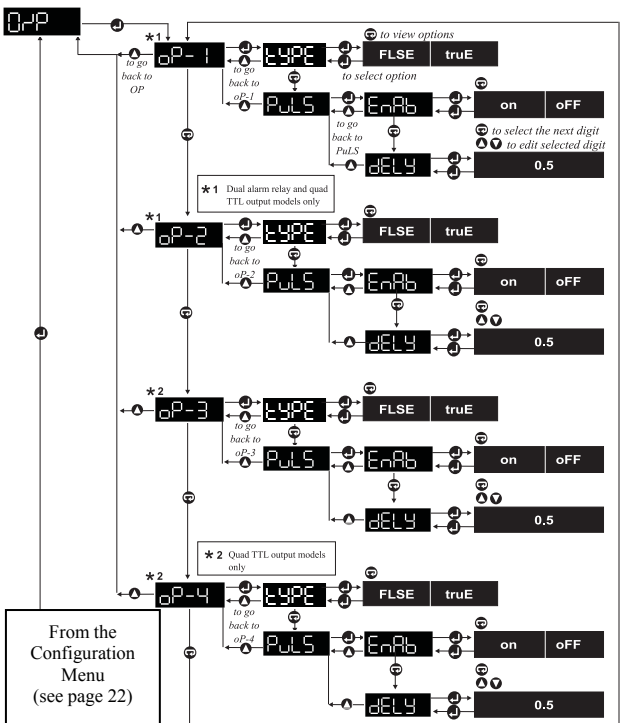
When more than one alarm is activated, messages are prioritised so the highest high alarm or the lowest low alarm is reported.

Logic Comms Locations				Read/Write
Logic	67	77	87	97
On enables message display for Alarm	1	2	3	4

Configuring Logic Outputs

The options in this menu effect the way outputs work when activated by alarms, control and peak picking. For example, the pulsed option is useful for peak picking if its alarm outputs are connected to audible alarms.

Logic Outputs Menu Map



The outputs available depend on the instrument type:

T243 - Has no outputs. (The **O/P** (output) menu is not displayed after **AL-4**).
T244 - Has 2 single pole double throw relays (see **Connections** page 7 and **Connecting the Logic Outputs** page 14).
T245 - Has 4 open collector outputs (see pages 7 & 14).

The instrument type is displayed on power up, after the test display and software version.

From the **O/P** menu, it is possible to reverse the sense of the relays or make them change state for a set time rather than for as long as the activation condition exists.

Output Selection Menu

oP-1 oP-2 oP-3 oP-4 Select the output to be setup. **oP-3** and **oP-4** are not available for instruments with 2 relay outputs.

Sense

Default: True (for all outputs)

tyPE **trUE** programs the instrument so that the output is energised in the alarm state. **FLSE** ensures the output is de-energised in the alarm state.

FLSE Might be used in a failsafe application so that power failure to the instrument or output results in the abnormal output state.

Logic Comms Locations				Read/Write
Logic	160	165	170	175
On sets type to true for Output	1	2	3	4

Pulsed Operation Menu

PuLS A pulsed output can be enabled and setup from this menu. Pulsed outputs should never be used with the control facility (see diagram page 41).

It should be noted that during operation:

- Once a pulse starts, it continues even if the original cause disappears.
- Maintaining the original cause of the pulse does not extend it.
- A second pulse occurs only if the original cause disappears and another one occurs after the end of the first pulse.

Pulse Enable

Default: Off (for all outputs)

EnAb **on** enables pulsed output. **oFF** disables pulsed output. Pulsed outputs should never be used with the control facility (see diagram page 41).

Logic Comms Locations				Read/Write
Logic	161	166	171	176
On enables pulsed output for Output	1	2	3	4

Pulse Duration

Default: 0.5 seconds

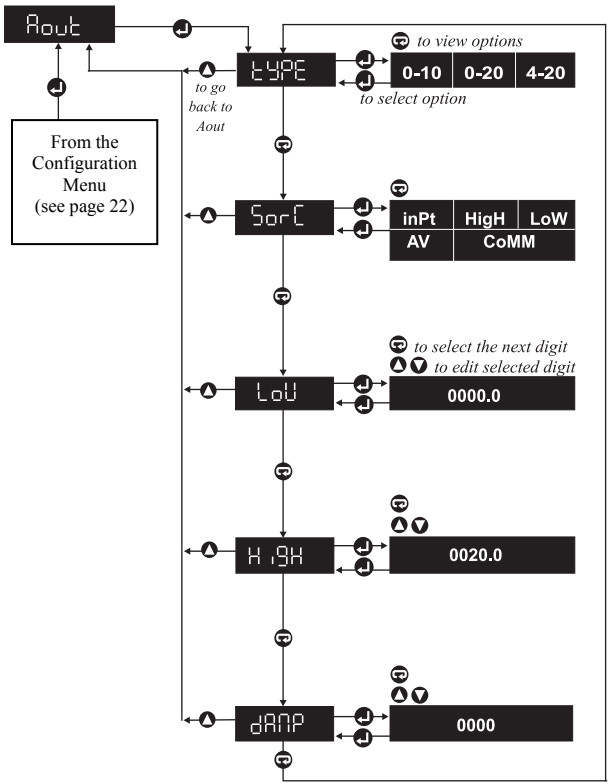
dELY Defines the output pulse duration. It may range from 0.1 to 5.0 seconds.

Analogue Comms Locations				Read/Write
Analogue	219	221	223	225
For Output	1	2	3	4
Integer range (seconds)	5 to 250 (20mS ticks) (eg. 50 = 1 second)			

Configuring the Analogue Output

This menu sets up the scaleable analogue retransmission.

Analogue Output Menu Map



Type

Default: 4 - 20mA

tyPE Selects the output range from:

- **0 - 10** 0 to 10V (volts).
- **0 - 20** 0 to 20mA.
- **4 - 20** 4 to 20mA (milliamperes).

Analogue 170 Comms Location			Read/Write
Integer value	0	1	2
Sets output type	0 to 10V	0 to 20mA	4 to 20mA

Source of Output Level

Default: Input

SorC Defines the source of the retransmission level from:

- **inPt** Measured weight.
- **CoMM** Serial comms interface.
- ***AV*** Average measured weight.
- **LoW** Lowest measured weight.
- **HigH** Highest measured weight.

Whatever the source, the value controlling the retransmission level should lie between the **LoW** and **HigH** settings declared next in the **Aout** (analogue output) menu (see **Low & High Scaling** page 84). For example, if **LoW** is 0 and **HigH** is 20, a source value of 10 will set the analogue output level to halfway up the output range. This would be 12mA when the **Aout tyPE** is 4 - 20mA.

InPt is the displayed weight, but before the display filters (**Filt, LSd0** or **nEg**) are applied (see **Filtering, Least Significant Digit Zero** and **Negative Numbers** page 26).

CoMM requires values to be sent to the instrument via the serial interface. They should be stored in Analogue Location 175. They control the output level during normal operation. For example, sending **;001SA175 10.000<CR><LF>** sends 10 to Analogue Location 175.

NOTE: When values have been sent via comms, the output will be

dependent on the values which have been sent for low and high scaling.

The **AV** (average) measured weight is a simulated rolling average taken over the period specified by the **AVti** option in the **SySt** (system) menu (see **Averaging Time** page 101).

The **AV**, **HigH** and **LoW** values are all reset to the current measured value on activating a status input or function key that has been setup to perform the reset function (see **Reset** pages 94 & 98).

Analogue 171 Comms Location					Read/Write
Integer value	0	1	2	3	4
Sets source to	Input	High	Low	Average	Comm

Low & High Scaling

Default: Low 0, high 20

Define the analogue output source values which correspond to the maximum and minimum of the range for the analogue output type:

Source: **LoW** to **HigH** Kg
Outputs: 4mA to 20mA when type is: **4 - 20**.
0mA to 20mA when type is: **0 - 20**.
0V to 10V when type is: **0 - 10**.

Analogue Comms Locations		Read/Write
Low	High	Range
172	173	Both may be any value in the displayable range (see page 24)

Damping Filter

Default: 0 seconds

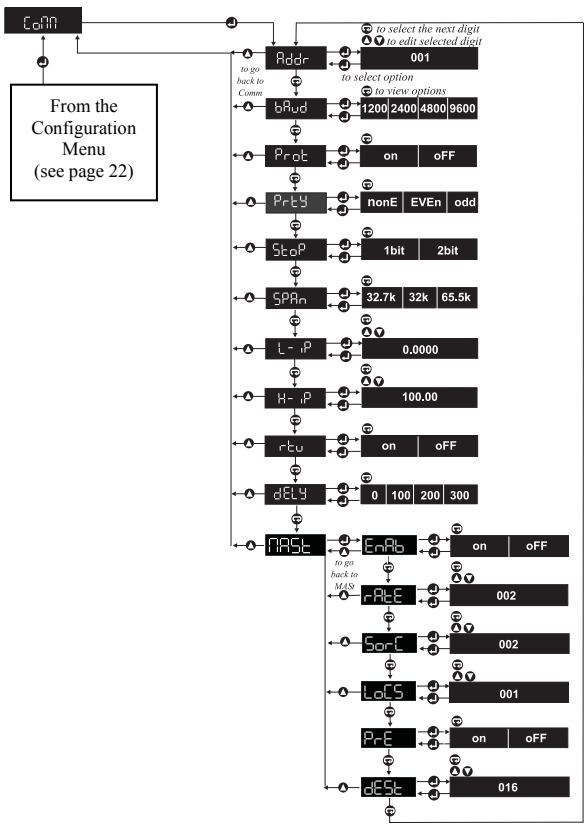
Defines a time constant in seconds over which a simulated rolling average is applied to the analogue output. Longer times make the analogue output more stable but give the analogue output a slower step response. The time may range from 0 to 9999 seconds. 0 = **oFF**.

Analogue 174 Comms Location	Read/Write
Integer damping time (seconds)	0 to 9999 0=no damping

Configuring Serial Communications

This menu sets up the instrument's RS485/422 communications interface.

Serial Communications Menu Map



The instrument can use 3 prototcols:

- ASCII Native .. .. (easy to use - no checksums).
- ASCII MODBUS™
- Binary MODBUS™ RTU (JBUS).

By default, instruments handle commands in either ASCII protocol.

Instrument Address

Default: 001

Addr Defines a unique communications address for the instrument. It may range from 001 to 247.

When more than one instrument is connected to a master via a multidrop bus, each instrument must have a different address.

Unique addresses mean commands can be directed to one instrument. They also stop all instruments replying at the same time. A command is sent to a particular address by ensuring the address field in the command equals the address of the instrument the command is intended for:

Eg. The command: ;**001 SA 175 10<CR><LF>**

Addresses instrument **001** because the address field is **001**.

This command **S**tores to **A**nalogue Location 175 the value **10**.

The instrument responds with **OK<CR><LF>**

During normal operation, a master may send commands to address 000. This is a broadcast address used only for store commands (see page 115) such as the example above. Instruments obey but never reply to broadcasts.

Analogue 182 Comms Location	Read/Write
Instruments communications address range	1 to 247

Baud Rate

Default: 9600bps

bAud Sets the communications speed.

Analogue 183 Comms Location				Read/Write
Integer value	0	1	2	3
Communications baud rate	1200	2400	4800	9600

Protection

Default: Off

Prot **on** protects the instrument's setup from any changes via the communications interface. **oFF** allows any analogue or logic location to be changed unless it is a read-only location.

Logic 102 Comms Location	Read/Write
On enables protection	Off disables protection

Attempts to write to a protected or read-only location using the native protocol causes the instrument to reply with **#2** (see **Errors** page 117).

Parity

Default: Even

PrtY Defines the parity setting for all communications.

Always set parity to **nonE** when **rtu** is **on** (see **Remote Terminal Unit** page 88).

Analogue 184 Comms Location			Read/Write
Integer value	0	1	2
Parity	Odd	Even	None

Stop Bits

Default: 1bit

StoP Defines the number of stop bits for all communications.

Always set stop bits to **1bit** when **rtu** is **on** (see **Remote Terminal Unit** page 88).

Logic 103 Comms Location	Read/Write
On=2bits	Off=1bit

Scaling (MODBUS™ only)

Default: span 32k, L-ip 0, H-ip 100

SPAn L-iP H-iP Allow transmission of values normally outside

the range of MODBUS™ integers.

SPAn defines the integer range used to transmit values ranging from **L-ip** to **H-ip** as follows:

L-ip to **H-ip** Kg is transmitted

as: 0 .. to..32000 when **SPAn** is **32k**.
or: 0 .. to..65536 when **SPAn** is **65.5k**.
or: 0 .. to..32767 when **SPAn** is **32.7k**.

Analogue Comms Locations		Read/Write
185	Span	0=32k 1=32.7k 2=65.6k
186	Low	Any value in displayable range (see page 24)
187	High	Any value in displayable range (see page 24)

Remote Terminal Unit

Default: Off

rtu **on** makes the instrument use only MODBUS™ **rtu** protocol. When the **rtu** is **on**:

- Parity must be set to **nonE**.
- Stop bits should be **1bit**.
- Delay before transmission is ignored (see **Transmit Delay** below).

MODBUS™ **rtu** is a binary protocol requiring 8 data bits per byte.

Logic 104 Comms Location	Read/Write
On enables rtu	Off disables rtu

Transmit Delay

Default: 0mS

dELY Defines a delay in milliseconds before the instrument replies to commands received over the communications interface. It is ignored if **rtu** is **on**.

The delay is useful if there is difficulty handling the instrument's fast response to commands using a 2-wire (half duplex) connection. For example, this is likely if a simple program is being written in Visual Basic

under Windows to talk to the instrument via a 2-wire (half duplex) connection.

Analogue 188 Comms Location				Read/Write
Integer value	0	1	2	3
Delay before transmit (mS)	0	100	200	300

Master Mode

MASt This menu sets up the instrument as a master. Masters transmit without being asked for data.

Master Mode does not work when **rtu** (binary MODBUS™) is enabled. Instruments do not always respond to commands when Master Mode is **on**.

A message is composed of:

- An optional prefix ("**;000SA016<space>**" by default).
- A programmable number of values (1 by default), starting from a specified analogue location (2 by default), separated by commas.
- An end of line sequence **<CR><LF>**.

Eg. **;000SA016 +0.0000<CR><LF>**

Enabling the default Master Mode setup allows another instrument connected via comms to act as a remote display unit. The other instrument must be setup so the displayed value is sourced from comms (see **Display Value Source** page 25).

Master Mode Enable

Default: Off

EnAb **on** enables Master Mode. Notice that Master Mode transmissions will not take place when enabled if the **MASt** option in a **StA1/2** (status input) menu is **on**, and the status input(s) concerned are not activated (see **Master Trigger/Enable via Status Input** page 95).

Logic 105 Comms Location	Read/Write
On enables Master Mode	Off disables Master Mode

Interval Between Transmissions

Default: 2 seconds

rAtE Defines the number of seconds between each transmission from the instrument. 0 to 999 may be entered. 0 causes transmissions at the display update rate (2, 4 and 10Hz) (see **Update Rate** page 26).

Analogue 192 Comms Location	Read/Write
Integer range (seconds)	0 to 999 (0=display update rate - see page 26)

Source Analogue Location

Default: 002 (displayed value)

SorC Defines the (first) analogue location transmitted.

Analogue 189 Comms Location	Read/Write
Source Analogue Location (integer)	0 to 255

Locations to Transmit

Default: 1 location

LoCS Specifies the number of consecutive analogue locations to transmit, starting from the source analogue location defined above. 1 to 19 can be entered.

Long messages at low baud rates can not be sent as fast as the display is updated. In these circumstances the messages are sent as fast as possible and they are never truncated.

NOTE: A T220 instrument can only receive one location per message and this location must not be read-only.

Analogue 190 Comms Location	Read/Write
Analogue Locations to transmit (integer)	1 to 19

Prefix Enable

Default: On

PrE **on** enables the message prefix discussed above.

Eg. Whole default message with prefix:
;000SA016 +0.1000 <CR><LF>

Whole default message with no prefix:
+0.1000<CR><LF>

(see also **Destination Location** page 91).

Logic 106 Comms Location	Read/Write
On enables prefix	Off disables prefix

Destination Location

Default: 016 (display source)

dESt Defines the analogue location that the first value sent should be stored in by the receiving instrument. This analogue location number makes up the last 3 digits of the optional message prefix as underlined below:

;000SA016<space>

0 to 255 can be entered, but the valid range depends on the instrument receiving the message. The destination location can only receive one location per message and this location must not be read-only.

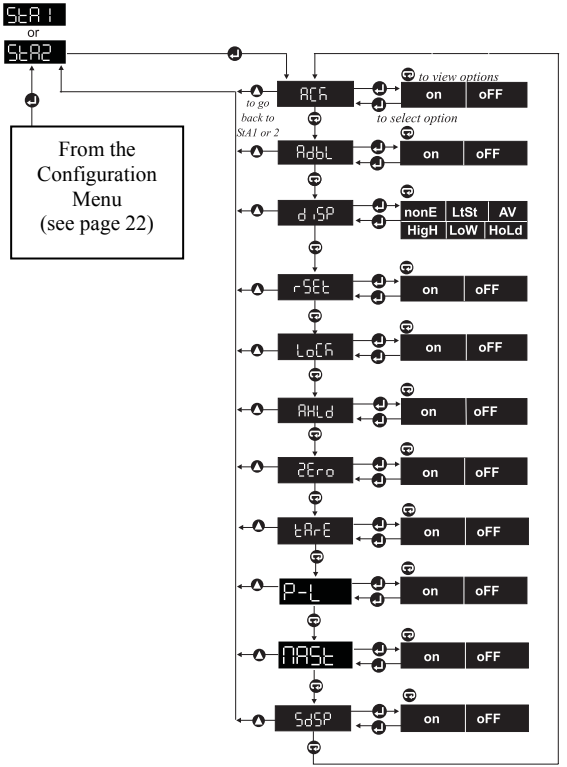
Only 0 may be written to an unused location.

Analogue 191 Comms Location	Read/Write
Destination Analogue Location in target (integer)	0 to 255

Configuring Status Inputs

These menus allow the user to program the optional effects of activating Status Inputs 1 and/or 2 respectively.

Status Inputs Menu Map



Many function key and status input effects are the same.

Status Input 1 is activated by connecting Terminal 15 (Status 1) to Terminal 16 (common). Similarly, Status Input 2 is activated by connecting Terminal 14 (Status 2) to Terminal 16 (common). (See **Connections** page 7 and **Connecting the Status Inputs** page 13).

Alarm Acknowledge

Default: Off

ACk **on** programs the status input so that a momentary activation de-activates active latched alarms. Alarms only clear if the cause of the alarm no longer exists (see **Latching** page 74).

Logic Comms Locations			Read/Write
Logic	113	126	On enables alarm acknowledge
Status Input	1	2	Off disables alarm acknowledge

Alarm Disable

Default: Off

AdbL **on** programs the status input to disable Alarms 1 to 4 while the status input remains activated.

Logic Comms Locations			Read/Write
Logic	114	127	On enables alarm disable
Status Input	1	2	Off disables alarm disable

Display

Default: None

di SP Selects one of several displays to be shown while the status input is activated. The choices are:

- **nonE** Display unchanged. No display function selected.
- **LtSt** Lamptest; all display segments light-up showing [**8.8.8.8.8.**].
- **AV** Display the average weight over **AVti** (see page 101) and since last **rSE**t (see page 94).
- **HigH** Display the highest weight since last **rSEt** (see page 94).
- **LoW** Display the lowest weight since last **rSEt** (see page 94).
- **HoLd** Hold the displayed weight.

Analogue Comms Locations		Read/Write
Analogue	Status Input	Range
197	1	0=None 1=Hold 2=Low 3=High 4=Average 5=Lamptest
201	2	0=None 1=Hold 2=Low 3=High 4=Average 5=Lamptest

Reset

Default: Off

rSEt **on** programs the status input so that a momentary activation:

- Resets the **HigH**, **LoW** and **AV** values to the current display value.
- Resets the control and peak picking operations.

Logic Comms Locations			Read/Write
Logic	115	128	On enables reset function
Status Input	1	2	Off disables reset function

Disable Panel Keys

Default: Off

LoCA **on** programs the status input to disable the keys on the instrument panel while the status input remains activated.

Logic Comms Locations			Read/Write
Logic	116	129	On enables key lock function
Status Input	1	2	Off disables key lock function

Analogue Output Hold

Default: Off

AHLd **on** programs the status input to hold the analogue output level while the status input remains activated.

Logic Comms Locations			Read/Write
Logic	117	130	On enables analogue output hold
Status Input	1	2	Off disables analogue output hold

Zero

Default: Off

2Er0 **on** programs the status input to zero the display when the status input is momentarily activated.

When the display is zeroed, the value displayed becomes zero and the instrument displays weight changes since zeroing.

Logic Comms Locations			Read/Write
Logic	118	131	On enables zeroing function
Status Input	1	2	Off disables zeroing function

Tare

Default: Off

tArE **on** programs the status input to tare the display. When the status input is first activated, the display is zeroed, normally to ignore the weight of a container. While the status input remains activated, the display shows only weight changes since it was zeroed. The display also flashes **tArE** every 2.5 seconds. When the status input is de-activated, the display is restored to show total weight again.

This tare is independent of the tare action used in control (see diagram page 45).

Logic Comms Locations			Read/Write
Logic	112	125	On enables tare function
Status Input	1	2	Off disables tare function

Part/Load Display Toggle

Default: Off

P-L **on** programs the status input to make the display show parts when activated and weight (load) when de-activated.

(See also **Configuring & Using Parts Count** page 71).

Logic Comms Locations			Read/Write
Logic	120	133	On enables parts/load toggle
Status Input	1	2	Off disables parts/load toggle

Master Trigger/Enable via Status Input

Default: Off

MASt **on** causes activation of the status input to enable Master Mode transmissions, but only if Master Mode is also enabled via the **CoMM**, **MASt**, **EnAb**, **on** option (see **Master Mode Enable** page 89).

Notice that as soon as the status input is activated, a transmission occurs, and transmission timing is resynchronised to the event. So if the transmission rate is slow, a momentary closure of the status input contacts can be used as a single transmission trigger. Further transmissions occur only if the status input remains activated. If both status inputs are setup to activate Master Mode transmissions, only one need be activated to enable transmissions.

Logic Comms Locations		Read/Write
121	Status Input 1	On activation enables/triggers Master Mode
134	Status Input 2	Off activation enables/triggers Master Mode

Status Message Display

Default: On

on causes the instrument to display the status messages listed below, every 2 seconds, while the status input stays active and it is setup to:

- **ACk** Acknowledge alarms.
- **AdbL** Disable alarms.
- **AHLd** Hold the analogue output.
- **LoCk** Lock the front panel keys.
- **tArE** Tare the display.
- **AV** Display the average weight over **AVti** (see page 101) and since last **rSEt** (see page 94).
- **HigH** Display the highest weight since last **rSEt** (see page 94).
- **LoW** Display the lowest weight since last **rSEt** (see page 94).
- **HoLd** Hold the displayed weight.

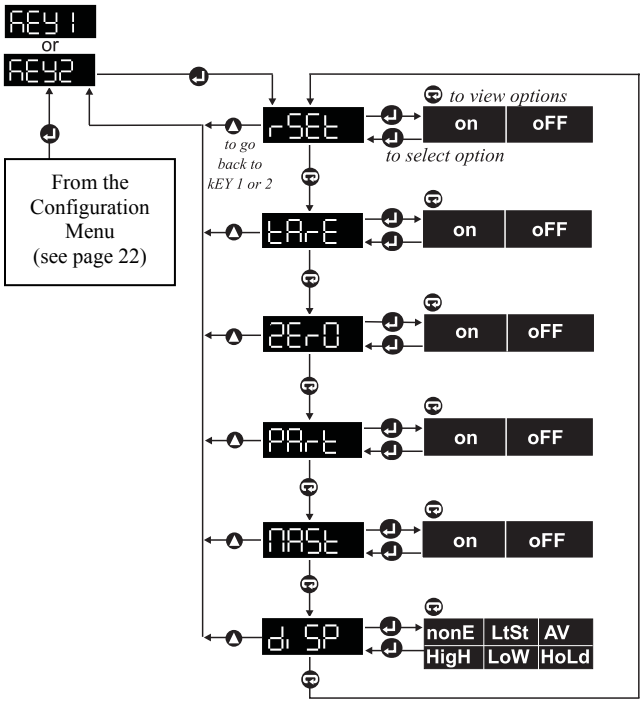
If an alarm is also active, and alarm messages are enabled, both alarm and status messages are displayed in sequence with the displayed value.

Logic Comms Locations			Read/Write
Logic	119	132	On enables status message display
Status Input	1	2	Off disables status message display

Configuring Function Keys

These menus allow users to program the optional effects of pressing Function Key 1 and Function Key 2 .

Function Keys Menu Map



Many function key and status input effects are the same.

The following functions may be assigned to either or both keys unless stated:

Reset

Default: Off

rSEt **on** programs the function key to:

- Reset the **HigH**, **LoW** and **AV** values to the current display value.
- Reset the control and peak picking operations.

Logic Comms Locations			Read/Write
Logic	138	146	On enables reset function
Function Key	1	2	Off disables reset function

Tare

Default: Off

tArE **on** programs the function key to tare the display as follows:

When this function key is first pressed, the display is zeroed, normally to ignore the weight of a container. The display continues to show only weight changes since zeroing, and flashes **tArE** every 2.5 seconds.

When the key is pressed again, the total unzeroed display is restored.

This tare is independent of the tare used in control (see diagram page 45).

Logic Comms Locations			Read/Write
Logic	139	147	On enables tare function
Function Key	1	2	Off disables tare function

Zero

Default: Off

ZEr0 **on** programs the function key to zero the display.

When the display is zeroed, the value displayed becomes zero and the instrument displays weight changes since zeroing.

Logic Comms Locations			Read/Write
Logic	140	148	On enables zero function
Function Key	1	2	Off disables zero function

Part Count

Default: Off

PArt **on** programs the function key to activate the part count function (see **Configuring & Using Parts Count Mode** page 71).

Logic Comms Locations			Read/Write
Logic	141	149	On enables part count function
Function Key	1	2	Off disables part count function

Master Trigger/Enable via Function Key

Default: Off

MASt **on** causes the function key to trigger just one Master Mode transmission, but only if Master Mode is also enabled via the **CoMM**, **MASt**, **EnAb**, **on** option. (see **Master Mode Enable** page 89).

Notice that as soon as the function key is pressed, a transmission occurs and transmission timing is resynchronised to the event.

Logic Comms Locations		Read/Write
142	Function Key 1	On key triggers Master Mode transmission
150	Function Key 2	Off key has no effect on Master Mode

Display

Default: None

d. SP Selects one of various displays to be shown while the function key remains pressed. The choices are:

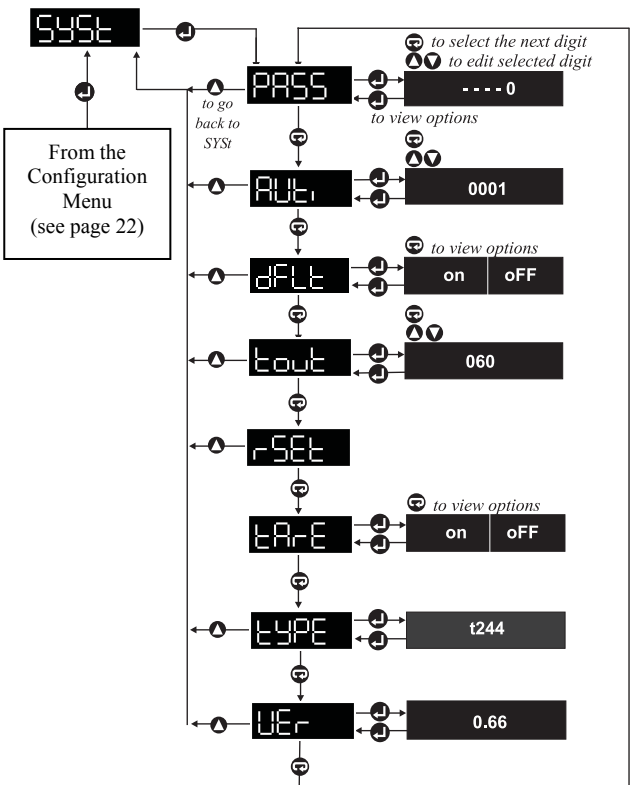
- **nonE** Display unchanged. No display function selected.
- **LtSt** Lamptest; all display segments light-up showing [**8.8.8.8.8.**].
- **AV** Display the average weight over **AVti** (see page 101) and since last **rSEt** (see page 98).
- **HigH** Display the highest weight since last **rSEt** (see page 98).
- **LoW** Display the lowest weight since last **rSEt** (see page 98).
- **HoLd** Hold the displayed weight.

Analogue Comms Locations		Read/Write
Analogue	Function Key	Range
206	1	0=None 1=Hold 2=Low 3=High 4=Average 5=Lamptest
210	2	0=None 1=Hold 2=Low 3=High 4=Average 5=Lamptest

Configuring System Options

This menu configures system wide parameters and performs other miscellaneous actions.

System Options Menu Map



Password

Default: ----0 (disabled)

PASS Defines an optional password. Its value may range from 00000 to 99999. If the password is not 00000, it is requested whenever the instrument enters the **ConF** (configuration) menu.

Password prompts show only the value of one highlighted digit at a time. Other digits, represented by hyphens, can only be viewed and edited by moving the highlight to the digit concerned. This stops anyone seeing the whole password.

DO NOT FORGET THE PASSWORD, OR THE INSTRUMENT SETUP CANNOT BE ACCESSED FROM THE PANEL.

Averaging Time

Default: 1 second

AVE. Defines the time in seconds over which a simulated rolling average is taken. During normal operation, this average can be viewed by:

a) Activating a status input or function key assigned the **diSP**, **AV** function.
b) Holding the **Enter** Key down when the **AV** option is reached in the **LoW** - **HigH** - **AV** - **ConF** menu (this menu is reached by holding the **Enter** Key down).

(See also **Filtering** on page 26 and **Reset** on pages 94 & 98).

Analogue 214 Comms Location		Read/Write
Averaging time range (seconds)	0 to 9999 0 performs no averaging at all	

Default

Default is an action, not a setup item

dFLt **on** defaults the instruments whole setup to the factory defaults shown in this manual in italics to the right of each setup item title. **oFF** leaves the instrument's setup unchanged.

Logic 154 Comms Location		Write-Only
On	Defaults the instrument's setup	

Time-out

Default: 60 seconds

tout Specifies the maximum number of seconds the instrument will wait for a key press before it returns to normal operation from a **ConF** (configuration) sub-menu.

Analogue 215 Comms Location	Read/Write
Time-out range (seconds)	15 to 255

The **CAL** (calibration) and **SCLE** (scale) sub-menus do not time-out.

Reset

Reset is an action, not a setup item

rSEt **on** makes the instrument perform a power up reset.

The instrument displays **WAit** for a moment while the hardware is reset, followed by the power on display sequence:

- Test display **8.8.8.8.8.**
- Version (eg.) **9.99**.
- Instrument type (eg.) **t244**.

Logic 155 Comms Location	Write-Only
On	Resets the instrument

Tare

Default: Off

tArE **on** allows the user to manually enter a tare value, in engineering units, from the front panel during normal operation. The manually entered tare value is subtracted from the realtime (gross) weight.

From the normal runtime display, press the **Down** Key and the display will show **tArE**. Press the **Enter** Key and the current tare value will be displayed in Edit Mode (editable digit will flash). Enter the required tare value (the container weight), press the **Enter** Key and the display will show **tArE** again. Press the **Up** Key (or wait for the time out) and the display will show the tared value (the contents weight)

NOTE: If the manual tare function is used, the tare parameter is displayed first when the **Down** Key is pressed. Repeated pressing of the **Next** Key

will also allow access to the 4 alarm setpoints and the 2 fill/loss of weight control function setpoints.

NOTE:

1 Alarms and analogue transmission are linked to the display (tared) value, unless configured otherwise.

2 If the Tracker's zero function is used, the manual tare value will automatically be reset to zero.

3 If the Tracker's input is recalibrated or the scaling changed, the tare value is automatically set to zero.

4 The last tare value is retained after a power supply interruption.

5 The tare numeric range is -19999 to 99999 (decimal point position is set in the **dP** parameter of the **diSP** (display) menu.

6 Modification of the tare value does not increment the seal security value.

7 Negative tare values which are entered will add to the displayed value (see also Note 8).

8 Negative sign is only selectable in the left, most significant digit (not normally used in this type of application).

Analogue Comms Locations		Read/Write
48	Manual tare value	

Logic 156 Comms Locations		Read/Write
On	Enables the manual tare function and in realtime lists the tare option at the top of the setpoint edit menu (see **NOTE** on page 102).	
Off	Disables the manual tare function and in realtime hides the tare option in the setpoint edit menu (see **NOTE** on page 102). Any tare offset is no longer subtracted from the realtime weight.	

Instrument Type

Type is an action, not a setup item

tYPE Displays the instrument type:

- **t243** Weighing instrument with no logic outputs.
- **t244** Weighing instrument with 2 relay outputs.

- **t245** Weighing instrument with 4 open collector outputs (TTL).

Analogue 0 Comms Location	Read-Only
Value may be 243, 244 or 245	

Software Version

Version is an action, not a setup item

Displays the instrument's software version, eg. **9.99**. PLEASE QUOTE THE SOFTWARE VERSION AND INSTRUMENT TYPE WHEN CONTACTING YOUR SUPPLIER WITH A QUERY. The instrument's serial number is useful too. The serial number may be seen to the right of the rightmost display digit through the tinted display filter.

Analogue 9 Comms Location	Read-Only
Version eg. +0.5900	

Product Specification

Power Requirements

90V AC to 265V AC 50/60Hz,
20VA maximum.

Operating Conditions

Ambient temperature	Storage -10°C to 70°C. Operating 10°C to 50°C.
Humidity	10% to 95% RH non-condensing.

Display

Type	14.7mm high brightness 7 segment LED red (optionally green).
Range	-19999 to +99999.

Input

ADC	Sigma Delta.
Input ranges	20mV/V, 10mV/V, 4mV/V, 2mV/V.
Resolution	18bit, 1μV per display digit.
Accuracy	0.02%.
Update rate	20 Hz.
Input impedance	>100MΩ.
Common mode rejection	>150dB.
Series mode rejection	>70dB @ 50/60Hz.

Transducer Supply

Range	10V DC.
Output current	135mA maximum (limited).
Accuracy	typically ± 200mV.
Output noise	<10mV @ 30 Hz.

Analogue Output

Ranges	0 to 10V, 0 to 20mA or 4 to 20mA selectable.
Accuracy	0.2% of span.
Temperature drift	<100ppm/°C.
Output ripple	<10mV or 50µA @ 30Hz.
Response	63% within 32mS. 99% within 100mS.
Resolution	0.05% of span, 5mV or 0.01mA.
Maximum output	18V @ 22mA.
Isolation	500V.

Alarm Relays (when fitted)

Type	2 off changeover.
Rating	1A @ 250V.

Logic Outputs (when fitted)

Type	4 off optically isolated (common ground) open collector transistor outputs.
Rating	20mA, 24V.

Communications Interface

Type	EIA RS485 (RS422 compatible).
Isolation	500V DC / Peak AC.

Appendix A - Display Messages

Power Up Messages

AdEr6 Is displayed on power up when no load cell at all is connected to the instrument. It can also be displayed when the load cell(s) is/are wrongly connected (see **Connecting the Load Cells** page 10). Press a key to acknowledge before the instrument automatically resets again. The instrument displays **undr** or **oVEr**. If the load cell wiring is subsequently corrected, reset the instrument.

AdEr6 is also displayed if the instrument detects an internal hardware problem (internal zero reference appears too low).

AdEr1 Indicates a load cell measurement hardware error on power up (internal zero reference appears too high). Press a key to acknowledge before the instrument automatically resets again. The instrument normally displays **undr** or **oVEr**.

AdEr2 Indicates a load cell measurement hardware error on power up (unable to take readings from ADC chip). The instrument automatically resets.

AdEr1 Indicates a load cell measurement hardware error on power up (ADC chip reset unsuccessful). The instrument automatically resets.

Err1 Err2 Err3 Err4 Indicate an error occurred accessing the instrument's memory. The unit should be returned to your supplier.

Err1 Will not program eeprom.

uCAL The instrument has lost its factory calibration constants in non-volatile memory. Could be non-volatile memory failure. Return unit to factory.

Out of Range Messages

Indicates either:

- Displayed value is below displayable range (see **Decimal Point Position** page 24).
- The measured value is below the measurable range for the sensitivity of the input (see below).

Indicates either:

- Displayed value is above displayable range (see **Decimal Point Position** page 24).
- The measured value is above the measurable range for the sensitivity of the setting (see below).

Measurement range limits for different sensitivities are;-

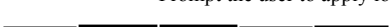
Sensitivity	Measurement Range
Up to 2mV/V	-2 to +2mV/V
>2 to 4mV/V	-4 to +4mV/V
>4 to 10mV/V	-10 to +10mV/V
>10 to 20mV/V	-20 to +20mV/V

If **AUto** Sensitivity is **on** (see **Automatic Sensitivity Selection** page 28), the sensitivity can be established by inspecting **H-ip** and **L-ip** in the **SCLE** (scale) menu after calibration and using whichever value is furthest from zero, ignoring the sign.

Calibration Messages

Calibration is discussed on page 29, but since it can be controlled without front panel intervention via comms, the messages are listed here:

Prompt the user to apply low and high weights.



Are possible calibration errors.

The action that started the calibration process should be repeated until none of these messages are displayed. This action might be pressing the **Enter** Key or setting Logic Location 25 to On via comms again.

A power up reset aborts calibration.

Alarm Messages

Alarm messages are 3 letters followed by the alarm number. The codes are:

 High alarm.

Eg. **HiA4** indicates high Alarm 4 has been activated.

 Low alarm.

 High deviation alarm.

 Low deviation alarm.

When more than one alarm is activated, messages are prioritised so the highest high alarm or the lowest low alarm is reported.

(See also **Message Display** page 78).

Appendix B - Connecting the Serial Interface

Four instrument Terminals: 10, 11, 12 and 13 are used for serial communications. These can be used to establish a 2-wire or 4-wire RS485 connection with a master device (usually a PC). The interconnecting wires are collectively known as a "BUS".

A strict rule governs how the bus is routed. Obviously it must be connected from the master to one instrument, but if there is a second instrument, the bus should continue only from the terminals of the first instrument to the second. Similarly, if there is a third instrument, the bus should continue only from the terminals of the second instrument to the third, and so on. This is called a "multidrop bus". There should be no T-junctions in the bus.

A 120Ω resistor should be connected between Terminals 10 and 11 on the last instrument furthest from the master.

Half Duplex - 2-Wire Communications

One of the bus wires must be connected to Terminals 10 and 12 of each instrument, and the other wire must be connected to Terminals 11 and 13 of each instrument as described above.

A 2-wire bus can communicate in only one direction at a time. So the direction of communication is controlled by the master. Masters must:

a) Know how to switch from transmit to receive (RTS goes low).
b) Avoid switching to receive before transmit is finished.
c) Avoid switching to receive after some/all of the reply is missed.

For example, Windows Terminal transmits via a 2-wire bus okay, but the instruments' replies are not received because the Terminal does not know it should switch from transmit to receive, or how, or when.

Full Duplex - 4-Wire Communications

One bus wire must be connected to Terminal 10 of each instrument, the second wire to Terminal 11, the third wire to Terminal 12, and the fourth

wire to Terminal 13 of each instrument, as described above.

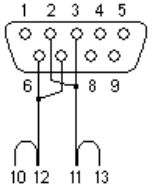
One pair of wires is used for transmitting and the other pair listens. This avoids the problems of how and when to switch from transmit to receive as described above.

4-wire links are useful for experimenting with the Windows Terminal.

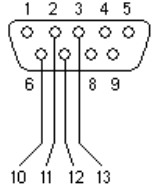
The instruments have an RS485/RS422 compatible interface with the additional ability to release the instrument-to-master communication channel when not transmitting. This allows other instruments wanting to transmit to do so.

PC Setup Program

The program runs on a PC running Windows 3.1, 95 or NT4.0 or later. It transmits and receives whole setups between the PC and an instrument. The setups can also be saved and retrieved from disk. The program automatically adapts to a 2 or 4-wire bus. In order for the program to work, a converter enables communications between the Tracker and any PC or terminal with an RS232 serial port. Only a KK Systems K485-FD, wired as shown below or a KK Systems K2-ADE converter as shown on page 113, is recommended with the program.



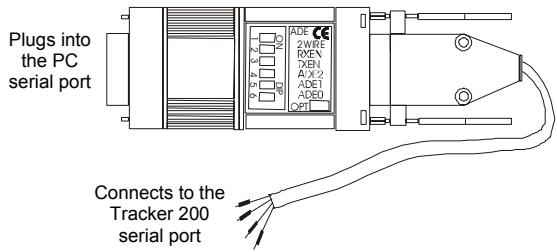
KK Systems K485-FD or any other K485 converter wired for 2-wire comms



KK Systems K485-FD-4w K422 or K485-4w converter wired for 4-wire comms

K485-FD Instrument Terminals

Connections are made via a 9-way 'D'-type male connector and a 4-wire configuration cable. The 'D'-type male connector marked RS232 plugs into the PC or terminal serial port and the 4 wires on the free end of the supplied cable connect to the Tracker's serial port.



K2-ADE Instrument

The table below shows the connections necessary to interface your instrument to an RS232 port via the K2 RS485 to RS232 converter.

Wire Colour	Tracker 200 Terminal	K2 9-way Pin
Yellow	10	3
Green	11	8
Blue	12	7
Red	13	2
Note: For 2-wire operation, link Terminals 11 to 13 and 10 to 12.		

K2 Converter Switch Settings - 9600 bps					
SW1	SW2	SW3	SW4	SW5	SW6
OFF	OFF	OFF	ON	OFF	OFF

Note: For 2-wire operation (Tracker 221/222 or when using windows configuration software), set SW1 to ON.

Note: Refer to the K2 Converter Setup Guide for communication speeds other than the Tracker's default of 9600 bps as SW4 to SW6 settings will change.

KK Systems can be contacted by telephone on +44 (0) 1273 857 185.

Appendix C - Using the Native Communications Protocol

Throughout this Guide, analogue and logic locations corresponding to setup parameters have been documented. These locations can be read and written to via the serial interface. All locations can be write-protected by setting **Prot** to **on** in the **CoMM** (communications) menu (see page 87). Some read-only locations, eg. the displayed value, can never be written to via comms.

Listings in location order are given in the index.

Command Structure

Here is an example of a command sent to an instrument:

;001 SA 54 2<CR><LF>

and here is the normal reply:

OK<CR><LF>

This is what each piece of the command does (and each piece must be present):

; Start of the command.

01 Instrument Address
May range from 000 to 247. There must always be 3 digits. These 3 digits must match the instrument's address as setup in the **CoMM**, **Addr** (communications, address) menu. 000 can only be used in write commands to broadcast to all instruments simultaneously.

<space> This space character after the address is optional.

SA Action

SA = Store Analogue	RA = Read Analogue
SL = Store Logic	RL = Read Logic

54 Data Location
May range 0 to 255. Some locations are not used. Unused analogue locations only read/write as 0.0000. Unused logic locations only read/write as off.

<space>

2 Data
For read commands RA and RL, this is the number of consecutive parameters to read from the instrument.
For write commands, it is the data to be written. If more values follow, separated by spaces, these are written to consecutive data locations following the Data Location. If an error occurs during a multiwrite, only writes up to the error are completed.
For logic writes only, the data may only be On or Off.

Eg. **;001 SL 154 ON<CR><LF>**

<CR> End-of-line carriage return
(ASCII 13 decimal).

<LF> Linefeed
(ASCII 10 decimal).

Here is an example of a read command which reads **4** analogues from Location **0**:

;001RA0 4<CR><LF>

and here is the reply:

+244.00 -3723.5 -03723 ?99999<CR><LF>

The ?99999 indicates the value was over range. ?19999 indicates a value is under range (see **Troubleshooting Comms** page 122) .

Errors

#1 Invalid command action, only SA, SL, RA, RL allowed. Check address field is 3 digits. Also check you have not used On or Off as data for a Store Analogue command. Ensure numeric data, eg. 0, or 1 has not been used in a Set Logic SL command.

#2 Attempted a write to a read-only or protected location. Some locations are permanently read-only. However, this message also occurs for any location if the **Prot** option in the **Comm** menu has been turned **on** (see page 87).

#3 Data location specified does not exist. Start location or number of locations could be invalid.

#4 Invalid data value, or no space before the data value, or syntax error.

#5 Attempt to change a location while instrument is in the **ConF** (configuration) menu. Instrument will normally exit from menu after one minute (default).

#7 Attempted to write to a non-zero value to an unused location.

Appendix D - Realtime Comms Locations

Analogue Locations

(RO indicates location can be Read-Only, RW indicates Read/Write)

0	RO	Instrument type ie: +243.00 or +244.00 or +245.00.
1 & 38	RO	Measured value (unfiltered, no **LSd0**, no **nEg**).
2 & 39	RO	Displayed value.
3 & 16	RO	Source of displayed value when display sourced from comms (ie when Analogue Location 53 is 4 - see **Display Value Source** page 25).
5	RO	Number of logic outputs fitted: 0, 2 (relays) or 4 (TTL's).
7	RO	First 4 digits of serial number (eg. +9908.0 indicates 9908).
8	RO	Last 4 digits of serial number (eg. +7.0000 indicates 0007).
9	RO	Instrument software version (eg. +0.5800 indicates version 0.58).
29	RO	Zero offset in display units (+0.0000 if display is not zeroed).
30	RO	Tare offset in display units (+0.0000 if display is not tared).
32	RO	Test value incremented every 20mS by instrument. Resets at 32767.
33	RO	millivolts applied to Status 1 Input (0 to 5000mV 1% resolution).
34	RO	millivolts applied to Status 2 Input (0 to 5000mV 1% resolution).
35	RO	Low display value (minimum peak since reset - see **Reset** page 94).
36	RO	High display value (maximum peak since reset - see **Reset** page 94).
37	RO	Average display value (over **AVti** - see **Averaging time** page 101).

Peak Picking Facility

40	RO	Most recent peak picked weight.
41	RO	Adjusted peak picking (working) setpoint.
42	RO	Peak picking stage: 0 = waiting for trigger. 1 = waiting for delay after trigger to end. 2 = waiting for trigger to clear.

Control Facility

43	RO	ONGOING tared fill level as a weight.	
44	RO	Most recent final achieved tared weight.	
45	RO	Latest working corrected Setpoint-1.	
46	RO	Latest working corrected Setpoint-2.	
47	RO	Control stage:	Control outputs
		0 = waiting for empty vessel trigger	both Off.
		1 = waiting for end of delay after trigger	both Off.
		2 = waiting for level to pass Control Setpoint-1	1 On.
		3 = waiting inflight material to land	both Off.
		4 = waiting for level to pass Control Setpoint-2	2 On.
		5 = waiting for inflight material to land	both Off.
		6 = waiting for full vessel removal (load<trig.sp)	both Off.

Part Counting Facility

49	RW	Parts factor: amount weight is multiplied by to give part count.
50	RW	Number of parts entered at the **PArt** prompt (see **Configuring & Using Parts Count Mode** page 71).

Logic Locations

Status

6	RO	State of Function Key 1	On = pressed (leftmost key).
7	RO	State of Function Key 2	On = pressed (rightmost key).
8	RO	State of Status Input 1	On = contacts closed.
9	RO	State of Status Input 2	On = contacts closed.
10	RO	State of Alarm 1	On = activated.
11	RO	State of Alarm 2	On = activated.
12	RO	State of Alarm 3	On = activated.
13	RO	State of Alarm 4	On = activated.

14	RO	On = abnormal state of Output 1 (T244 or T245 only).
15	RO	On = abnormal state of Output 2 (T244 or T245 only).
16	RO	On = abnormal state of Output 3 (T245 only).
17	RO	On = abnormal state of Output 4 (T245 only).
23	RO	On if control facility is idle (see **Idle** 55).
24	RO	Off indicates whole calibration process complete (see Logic Location 25 below).

Commands

25	RW	On Performs a calibration step. After turning On, read location repeatedly until Off (step done), then turn On again (next step) if Logic Location 24 is On too (more steps to perform). Low & high calibration weights should be applied to the load cell for the same steps that they are when **CAL** is performed from the panel (see **Calibration Sequence** page 29).
26	RW	On acknowledges any/all active latched alarms.
27	RW	On performs the reset function (see **Reset** pages 94 & 98).
28	RW	On resets the high value (maximum peak) to the current display value.
29	RW	On resets the low value (minimum peak) to the current display value.
30	RW	On resets the average value to the current display value.
31	RW	On Zeros display.
32	RW	On Unzeros display (not recommended: use Tare/Untare instead).
33	RW	On Tares display.
34	RW	On Untares display.
35	RW	On Recalculates parts factor (Analogue Location 49). Correct load must be on load cell and Analogue Location 50 must represent the number of parts on the load cell.
36	RW	On Displays part count, Off displays weight.
37	RW	On Clears adjustments made to peak picking tolerance band position. Clears any active peak picking alarms.

200	RW	On Triggers control process delay. Tare & fill occur next.
201	RW	On Clears corrections made to control process Setpoints 1 & 2. Turns Off both feeder outputs.

Appendix E - Troubleshooting Comms

1. When using 2-wire comms with a KK Systems' converter on a PC serial port, it is necessary to:

   a) Assert the RS232 RTS output in order to TRANSMIT.
   b) Send the command and monitor its progress in order to:

      i) Clear the RTS immediately after the **<LF**> has been sent, and
      ii) Only then, read the reply from the instrument.

2. When checking for an **OK** response, look for **K** anywhere in the response and not just in a set position. Garbage can precede it.

3. When a reply is out of range, the first character is a question mark.

4. Early evaluation instruments have comms Terminals 10 and 11 and Terminals 12 and 13 the wrong way round. These are "Issue B" instruments. The revision letter can be seen by removing the circuit from its case and looking along the back edge of the circuit board.

5. If you are having difficulty with comms, try sending a command which resets the instrument, such as:

   ;001 SL 155 ON<CR><LF>

   This way, it is possible to tell if the instrument is receiving okay even if it cannot transmit. This may narrow down the possible reasons for the problem. This test can be performed using Windows Terminal (not Hyperterminal). Terminal will never be able to show responses from the instrument if connected in 2-wire mode. In this case, if the above test passes, it is likely comms between instrument and PC are okay. Terminal must be setup to match the instrument comms setting which defaults to:

Communications:

- Baud: 9600.
- Parity: Even.
- Stop bits: 1.
- Parity check: [Yes].
- Comm port: (As applicable).
- Flow control: None.

Terminal Preferences:

- **CR →CR/LF outbound, enabled**

6. The most common comms problems are:

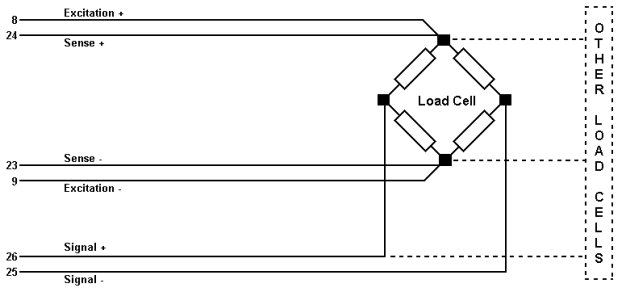
a) Connected to the wrong comm port or not connected at all!
b) Setup mismatch. Baud, parity, stop bits different. Make sure the address in the command match the **COMM**, **Addr** of the instrument. If using MODBUS™ RTU, ensure Parity = none, Stop bits = 1.
c) Incorrect wiring. Wires of a pair the wrong way round; whole set of 4 wires shifted along one terminal position; terminals not screwed up tightly, wire dropped off fragile home-made cable.
d) RTS (at master RS232 end) not asserted when master transmits, or cleared when master is to receive (2-wire comms).
e) Comms converter has inadequate supply. Self powered converters require DTR to be high. If laptop used, ensure POWER.EXE is DISABLED.
f) 120Ω resistor not fitted across Terminals 10 and 11 of last instrument in daisy chain.

NOTE: The instruments' use of the MODBUS™ protocol differs from the norm in that there is no requirement to subtract one from a data location accessed.

Eg. If x is the data location to access, specify location x and not x-1.

Appendix F - Tracker Fast Start

Wire the load cell as shown below.



The load cell wiring above shows a 6-wire connection.. If sense wires are not available from the load cell (4-wire system), link Terminals 9 to 23 and Terminals 8 to 24.

NOTE: On early models, Terminals 23 to 26 were marked incorrectly on the top label (polarity reversed).

There are 2 methods of scaling configuration:

Method A: Scaling the Tracker to calibration values supplied with the load cell.

Method B: Scaling and calibrating the Tracker using known loads or weights.

All configuration is by use of the front panel buttons. There are no internal potentiometers, jumpers or links. To enter the **ConF** (configuration) menu, press and hold the **Enter** button (second from right) until **LoW** is displayed. Use the scroll key (far left) until **ConF** is displayed. Press the **Enter** Key and **diSP**, the first configuration sub-menu, is displayed.

Method A

1. In the **inPt** (input) menu set the **SEn** (sensitivity) parameter to the mV/V value shown on the calibration certificate supplied with the load cell. (Leave the **AUto** parameter set to **oFF**).

The following parameters are set in the **SCLE** (scale) menu:

2. Set **HdSP** (high display) value to the full range of the load cell in the engineering units required.

3. Set **LdSP** (low display) value to the lowest measured value (which is normally Zero).

4. Set **H-iP** (high input) value to the mV/V value shown on the calibration certificate supplied with the load cell (which should be the same value entered in 1. above).

5. Set **L-iP** (low input) value to the mV/V value for the lowest measured value (normally zero).

Exit the configuration menus and the Tracker should be displaying the correct value to one decimal place. If the resolution needs to be increased or decreased, enter the configuration menus and enter the **diSP** (display) menu. Alter the **dP** (decimal point) parameter value to select required resolution.

Example A1

Calibrating a 0 - 6Kg load cell with a 1.9693mV/V sensitivity. The customer requires the display to show grams to a resolution of 1 gram (eg. 0 - 6000g).

DISPLAY MENU
dP = 0 (no decimal places).

INPUT MENU
AUto = Off
SEn = 1.9693 (allows the Tracker to select the optimum input gain).

SCALE MENU
HdSP= 6000
LdSP= 0
H-iP = 1.9693
L-iP = 0

Example A2

Calibrating a 0 - 6Kg Load cell with a 1.9693mV/V sensitivity. The customer requires the display to show Kg to a resolution of 1gram (eg. 0.000 - 6.000Kg).

DISPLAY MENU
dP = 3 (three decimal places).

INPUT MENU
AUto = Off
SEn = 1.9693

SCALE MENU
HdSP= 6 (can also be entered as 6.0, 6.00, 6.000 or 6.0000).
LdSP= 0
H-iP = 1.9693
L-iP = 0

Method B

1. In the **inPt** (input) menu set the **SEn** (sensitivity) parameter to the mV/V value shown on the calibration certificate supplied with the load cell. (Leave the **AUto** parameter **oFF**).

2. Enter the **CAL** (calibration) menu and the display will show **L-iP**. Set the load cell to the minimum calibration weight (normally zero - no weight or load) and press **Enter**. The display will show **WAit** (wait) while the Tracker measures the output from the load cell. The measured value is stored and the display shows **H-iP**.

3. Place a known calibration weight or load on the load cell and press enter. Again the display will show **WAit** and store the measured

signal value. The display will return to **CAL** when the calibration is complete.

The following parameters are set in the **SCLE** (scale) menu.

4. Set **HdSP** (high display) value of the load cell calibration (high point) in the engineering units required.

5. Set **LdSP** (low display) value to the lowest calibration value (which is normally zero).

Exit the configuration menus and the Tracker should be displaying the correct value to one decimal place. If the resolution needs to be increased or decreased, enter the configuration menus and enter the **diSP** (display) menu. Alter the **dP** (decimal point) parameter value to select required display resolution.

Example B1

Calibrating a 0 - 6Kg load cell with a 1.9693mV/V sensitivity. The customer requires the display to show grams to a resolution of 1 gram (eg 0-6000g). The two calibration points will be at 0 and 5Kg.

DISPLAY MENU
dP = 0 (no decimal places).

INPUT MENU
AUto = Off
SEn = 1.9693 (allows the Tracker to select the optimum input gain).

SCALE MENU
HdSP = 5000 (the chosen high calibration weight).
LdSP = 0 (the chosen low calibration weight).
H-iP = 1.6043 (this mV/V value "read" by the Tracker during the **H-iP CAL** sequence) .
L-IP = 0.0453 (this mV/V value "read" by the Tracker during the **L-iP CAL** sequence).

Questions

What if the sensitivity (mV/V) value of the load cell(s) is not known?
Method B calibration must be used. In the **inPt** (input) menu turn the **AUto** parameter **on**. During the **CAL** sequence the Tracker will automatically select the optimum gain for the two calibration points selected. The high calibration value should equal to or higher than the actual measurement range required in service.

Do I need to enter the configuration menus to re-calibrate the system?
If **Method B** calibration is used and the same two calibration points are used then a front panel function button or a status (logic) input can be configured to trigger the calibration sequence.

Can I use an external power supply for the load cell excitation?
An external 10V DC power supply can be used as long as the sense wires are connected. The sense wires will compensate for any variation in the power supply voltage output and for best results they should be wired as close to the load cells as possible.

Index

A

C

D

M

N

O

P

Q

R

S

T

U