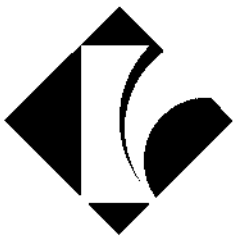
SMART WEIGHING SOLUTIONS



rinstrum

5000
Digital Indicator Reference Manual

For use with Software Versions 4.6 and above

5000-600-462

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Disclaimer

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SPECIAL NOTE
Trade Use of the Rinstrum 5000

This manual may occasionally make reference to Trade Use settings of the **5000**. Only properly marked Trade Certified versions of the **5000** can be used in **Legal for Trade** applications.

Some individual settings may not be legal for trade use.
Please check regulations with the appropriate Weights and Measures Authority.

"Everything should be made as simple as possible, but not simpler."

- Albert Einstein -

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1. Introduction

The **5000** is a precision digital indicator using the latest Sigma-Delta A/D converter to ensure extremely fast and accurate weight readings.

The setup and calibration are digital, with a non-volatile security store for all setup parameters. There is an NVRAM store to ensure day-to-day operating settings (zero, tare, clock, etc.), are retained when power is removed. There is a built-in clock for date-stamping printed outputs.

The instrument has four trip points with status display on the front panel. Output drive of these setpoints is provided by the optional setpoint card or combo card.

Three optional expansion cards are available for the **5000**.

- The first is an Analog Output card giving isolated 0-10V and 4-20mA precision outputs.
- The second is the Setpoint Card that provides four opto-isolated open-collector output drive transistors (one for each setpoint), and four opto-isolated inputs (one for each front key).
- The third is the Combo Card that combines the analog and setpoint functions to provide one opto-isolated input and two opto-isolated open-collector outputs, along with a -10 to 10V or 4 to 20mA analog output.

The **5000** provides a number of license options that extend the functionality of the instrument.

- The Communications License option provides two serial outputs**.** These allow communication with external computers, printers and remote displays. Serial 1 provides both RS-232 and full duplex RS-485 drivers. Serial 2 provides RS-232 transmission only. An optional RS-232 to Current Loop converter is also available which converts the RS-232 output to a passive 20mA current loop transmitter. An additional license option extends the network capability to include the MODBUS ASCII protocol.
- The Setpoint License extends the basic setpointing capabilities to allow complete multiple-product, multiple-feeder batching.

Figure 1: 5000 Weight Indicator

1.1. The Manuals Set

This manual is part of a set of manuals covering the setup and operation of the instrument. The set includes the following:

- **Reference Manual** - Contains detailed information on the **5000**, and includes data on the extended modes of operation.
- **Quick Start Manual** - Contains all the information needed to set up and calibrate the **5000**. It is very compact as it makes use of simple graphics and flow charts wherever possible. It is an ideal installation guide for those installers with experience in digitally programmed indicators, or anyone who has used the **5000** before.
- **Communications Manual** - Contains details on the extended networking capabilities of the **5000**.

1.2. Document Conventions

The following document conventions (typographical) are used throughout this Manual.

Bold Text	Bold text denotes words and phrases to note.
<Key>	**<Key>** denotes a Keypad key. **Note:** In the Specifications section the **<** symbol means **less than** and the **>** symbol means **greater than**.
…	Ellipses indicate an incomplete listing. For space considerations in this Reference Manual complete listings may not be shown.
⊗	Items marked with ⊗ indicate that the setting is available only in Full Setup and is trade critical. When trade critical settings are changed the calibration counter will be incremented.

2. Specifications

Performance		
Display		6 digit green LEDs, 14.5mm high
Display Resolution		Up to 100,000 divisions, minimum of 0.15 μV/division
Count-By		1, 2, 5, 10, 20, 50, 100 (Entered in Displayed Weight)
Operating Modes		Single Range, Dual Interval and Dual Range
Zero Cancellation		+ / - 2.0mV/V
Span Adjustment		0.1mV/V to 3.0mV/V full scale
Stability/Drift		Zero: < 0.1uV/°C, Span < 10ppm/°C, Linearity < 20ppm, Noise < 0.05μV p-p
Operating Environment		Temperature -10 to +50°C, Humidity < 90% non condensing
Digital		
Setup And Calibration		Full digital with visual prompting in plain messages
Memory Retention		Full non-volatile operation
Digital Filter		Averaging from 1 to 200 consecutive readings
Zero Range		Adjustable from 4% to 100% of full capacity
A/D Converter		
Type		24 bit Sigma Delta
Resolution		8,388,608 internal counts.
A/D Sync Filter		Adjustable, 15 to 60 cycles /second, FIR filter > 80dB
Load Cells		
Excitation		8 volts for up to 8 x 350 ohm load cells
Load Cell Connection		6-wire + shield
Serial Comms		**(Factory License option)**
Serial Outputs		Dual RS-232, plus RS-485
Capabilities		Automatic transmit, network, or printer drive
Clock		Battery backed clock and calendar fitted
Dimensions		
Case Size		150mm wide x 72mm high x 100mm deep
Panel Cutout		DIN 43 700 - 137(+1)mm wide x 68(+1)mm high
Power Supply Options	DC DC AC	12-15 volts DC 0.7A (Not for Trade Use) 12/24VDC 10VA 86 - 260VAC 48 - 62 Hz 8VA
Options		
Analog Option Card		0-10 volts and 4-20mA opto isolated (10,000 count)
Setpoint Option Card		4 x isolated 50volt, 500mA open collector transistor drives and 4 x isolated digital inputs (5V to 28V).
Combo Option Card		-10 to10 V or 4-20mA opto isolated analogue output, two outputs and one input as per the Setpoint option card.
No. of Option Slots		One
Features		
		Approved to OIML 6000 divisions, CE and C-Tick approved.
		Five point linearity correction
		Adjustable anti-vibration filter
		Extended setpoint batching operation (requires setpoint accessory card or combo card, and License)
		Modbus protocol support (license option)

3. Installation

3.1. Introduction

The **5000** can be used as either a desktop or panel-mount instrument. It contains precision electronics and must not be subject to shock, excessive vibration, or extremes of temperature, either before or after installation.

The inputs of the **5000** are protected against electrical interference, but excessive levels of electro-magnetic radiation and RFI may affect the accuracy and stability of the instrument. The **5000** should be installed away from any sources of electrical noise. The load cell cable is particularly sensitive to electrical noise, and should be located well away from any power or switching circuits. Termination of the load cell shield at the **5000** end (with a sound connection to the **5000** case via the DB9 backshell) is very important for EMC immunity.

3.2. Panel Mounting

Panel mounting requires the optional mounting kit, consisting of a pair of clamp slides.

Remove the two 5mm screws attaching the side clamp slides to the rear of the case. Remove the slides to the rear. Fit the case into the panel from the front. Replace the slides into the slots. Replace the two 5mm clamp screws. Do not over-tighten the screws as this could damage the case.

An optional swivel mounting kit required for desk and wall mounting is also available.

3.3. 5000 Rear Plate Connections

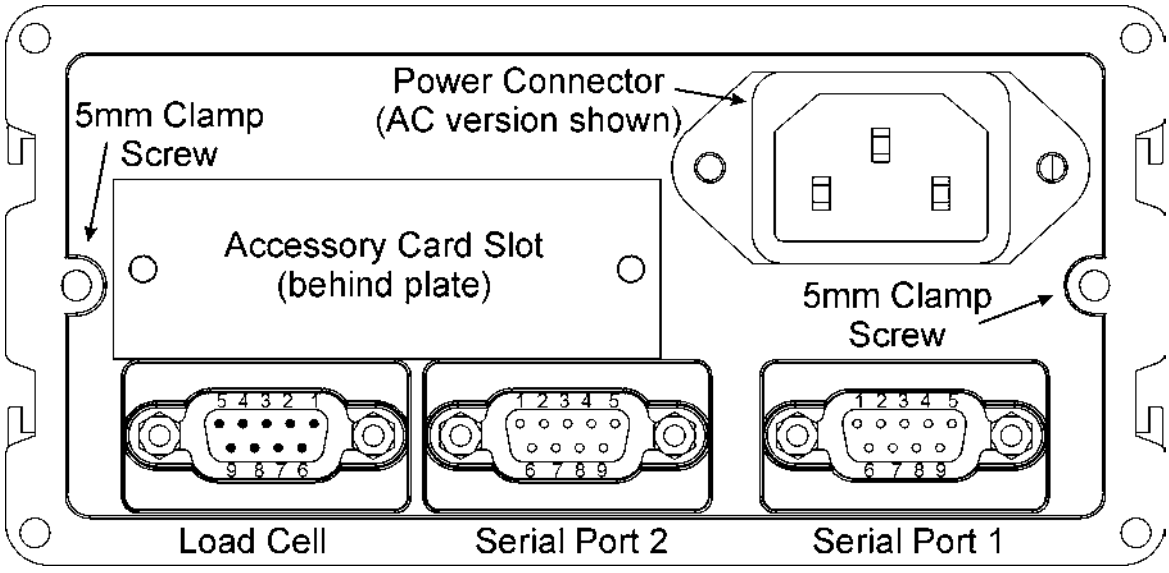
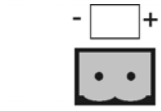


Figure 2: 5000 Rear Plate Connections

3.4. DC Power Supply

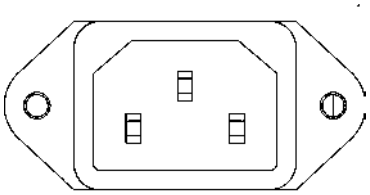


DC Power Supply:
12/24VDC 10VA

The DC supply need not be regulated, provided that it is free of excessive electrical noise and sudden transients. The **5000** can be operated from a high quality plug-pack as long as there is sufficient capacity to drive both it and the load cells.

The **5000** complies with all the relevant EMC standards, and carries full CE approval provided that the case ground connection is correctly made. The case ground connection is available either on the power connection socket or a termination bolt nearby. The resistance measured between the case of the **5000** and the nearest earth point should be less than 2 ohms.

3.5. AC Power Supply



AC Power Supply:
110/240VAC 50-60Hz 10VA
IEC cable supplied

The AC power supply for the **5000** can operate over a wide range of AC voltages. This power supply automatically adjusts to the incoming voltage that means that the **5000** is extremely tolerant of voltage dips and brown out conditions especially when running off 220 or 240 VAC mains.

The **5000** uses a standard IEC power inlet.

3.6. Load Cell Signals and Scale Build

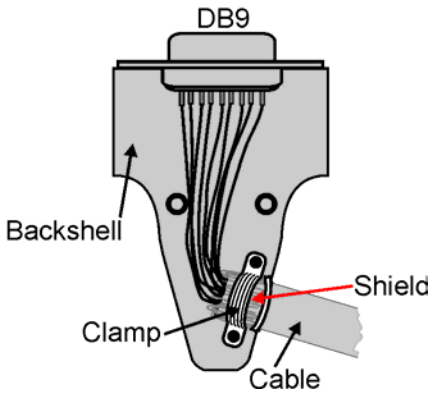
Very low output scale bases can be used with the **5000**, but may induce some instability in the weight readings when used with higher resolutions. Generally speaking, the higher the output, or the lower the number of divisions, the greater the display stability and accuracy.

The **5000** has a millivolt-per-volt meter test mode that can be used to check scale base signal output levels. Refer to Section 7.9, page 32.

3.7. Connecting Shields

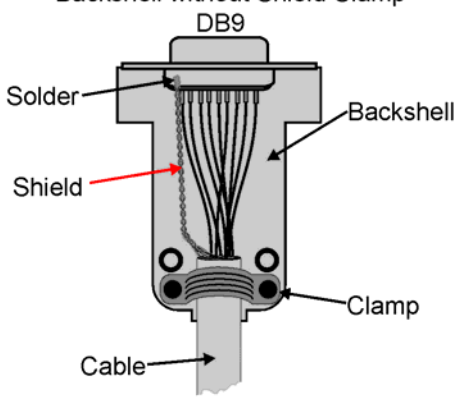
To obtain full EMC or for RFI immunity with the **5000**, the load cell shield MUST be connected electrically to the metal shell of the DB9 connector. Refer to diagrams below or to instructions supplied with the connector.

Backshell with Shield Clamp
(Preferred for Load Cells)



The easiest way to connect the cable shield to the DB9 backshell is to fold the shield wires back over the outside of the cable insulation so the cable clamp of the backshell makes good electrical contact with the shield when installed.

Backshell without Shield Clamp



A method for connecting the cable shield to the DB9 is to twist the shield wires together and solder the ends to the DB9 casing.

Figure 3: Cable Shield Connection

3.7.1. Cable Shield Connection and Earthing

- Care should be taken when connecting shields to maximise RFI immunity and minimise earth loops and cross-talk (interference) between instruments.
- For RFI immunity, termination of the load cell shield at the **5000** end is important (ie. with connection to the **5000** case via the shield connection).
- The **5000** enclosure is directly connected to the shield connections on the cables.
- The **5000** should be connected to earth via a single reliable link to avoid earth loops.
- Where each instrument is separately earthed, interconnecting cable shields should be connected at one end only.
- **Caution:** Some load cells connect the cable shield directly to the load cell (and therefore the scale base). Connection of the shield in this situation may be site specific.
- The instrument complies with relevant EMC standards provided case ground connection is correctly made. Resistance measured between **5000** case and nearest earth point should be less than 2 ohms.

3.8. Unused Pins

It is important to note that unused pins are not to be connected. The reason being that the functions of the pins may not be compatible with equipment at the other end (eg. connecting output pins to a PC communications port may affect the operation of the PC). Consequently many commercial communications cables are not suitable for use.

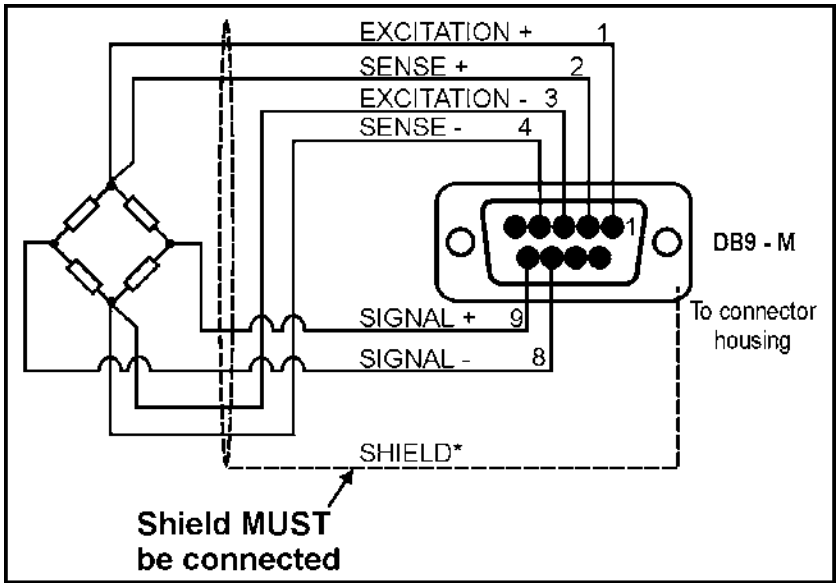
3.9. Load Cell Connection

3.9.1. 6-Wire Connection

The connection is made using a standard DB9 male plug. The load cell socket is wired for 6-wire systems as follows:

Pin	Function
1	Positive Excitation
2	Positive Excitation Sense
3	Negative Excitation
4	Negative Excitation Sense
9	Positive Signal
8	Negative Signal
Sense Lines MUST be connected	

Table 1: 6-Wire Connections



* For more information on Connecting Shields refer to page 10.

Figure 4: 6-Wire Connection

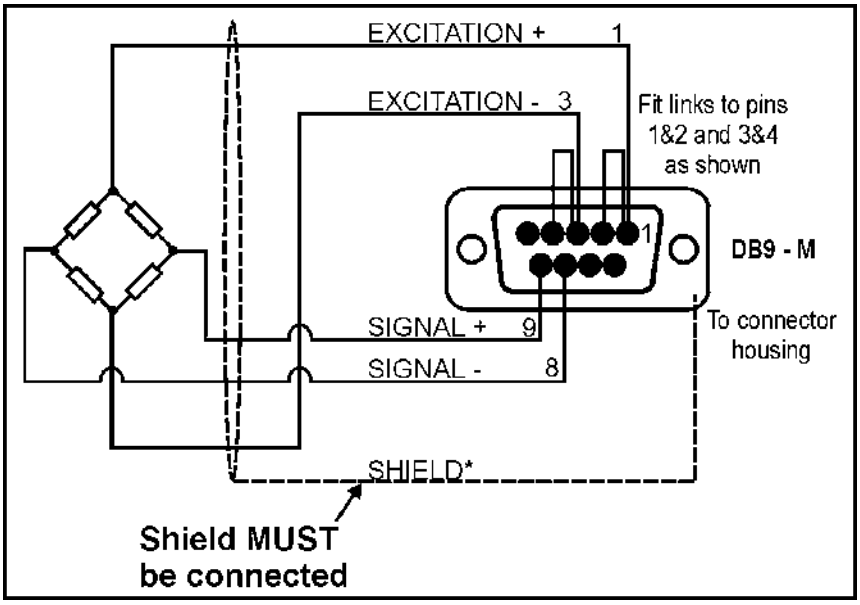
When wiring load cells use only high quality shielded multi-core cable. The cable should be run as far away from any other cabling as possible (minimum separation distance 150mm). Do not bundle load cell cables with power or control switching cables as interference can trigger display instability, and cause unreliable operation.

The load cell shield MUST be installed so as to connect electrically with the metal shell of the DB9 plug in order for the **5000** to provide its full EMC resistance. Any noise absorbed by the cable shield is then conducted directly to the **5000** case via the DB9 plug shell, and on to a solid earth point via the earth terminal in the power input socket. The easiest way to connect the cable shield to the DB9 backshell is to fold the shield wire back over the outside of the cable insulation so the cable clamp of the backshell makes good electrical contact with the shield when installed.

3.9.2. 4-Wire Connection

The **5000** is not fitted with auto-sensing of the loadcell excitation. This is intentional on this instrument to optimize the performance across all applications, including those involving intrinsic safety barriers.

When a 4-wire load cell system is connected, pins 1 and 2, and pins 3 and 4 must be joined by solder bridge or wire bridge to ensure that the excitation voltages are fed into the sense inputs (pins 2 and 4). Failure to do this will result in the **5000** displaying an error message (E0040, E0080 or E00C0). The instrument will not operate if the sense pins are not connected correctly.

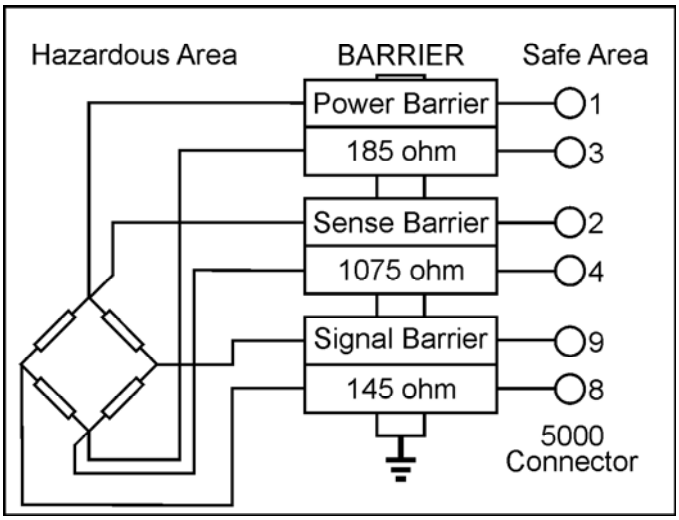


* For more information on Connecting Shields refer to page 10.

Figure 5: 4-Wire Connection

3.10. Intrinsic Safety

The **5000** has been designed to operate in installations with intrinsic safety barriers down to Class 1, Zone 1. The following diagram shows one suggested method of installing the **5000** with safety barriers for up to four load cells.



As the regulations concerning intrinsic safety can vary from country to country, consult local regulations before attempting such an installation. Pay special attention to the grounding of the **5000** and the barrier system.

3.11. Serial Ports

The Serial Ports are a factory fit optional extra. The DB9 connectors are fitted on all instruments. If the serial option is not fitted on your instrument all menus dealing with serial setup are blocked with the 'Access Denied' message.

Printer

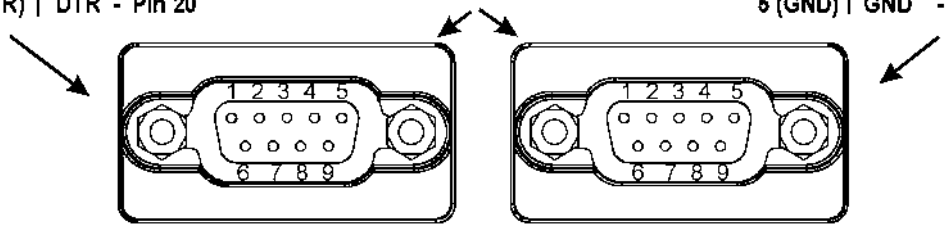
Pin	Printer Plug - DB25F
3 (TXD)	RXD - Pin 3
5 (GND)	GND - Pin 7
4 (DTR)	DTR - Pin 20

Remote Display

Pin	Remote Display Plug
3 (TXD)	RXD / Receive
5 (GND)	GND / Ground

Direct Computer Link : RS-232

Pin	Computer DB-9F (DB-25F)
2 (RXD)	TXD - Pin 3 (Pin 2)
3 (TXD)	RXD - Pin 2 (Pin 3)
5 (GND)	GND - Pin 5 (Pin 7)



Direct Computer Link : RS-485

Pin	Network Master
6 (RA (-))	8 (TA (-))
7 (RB(+))	9 (TB (+))
8 (TA (-))	6 (RA (-))
9 (TB (+))	7 (RB (+))

(NB: Pins 6..9 On Serial Port 1 are duplicated on Serial Port 2 for convenient cable termination)

3.11.1. Serial 1 - Networking Port

All connections for this port are on the Serial 1 connector. This is a standard DB9 socket requiring a female DB9 plug. Since both the RS-232 and RS-485 are connected in parallel within the **5000**, they will both output exactly the same message. The connections for the outputs are shown below. Note that the **5000** supports 4-wire full duplex RS-485 only, 2-wire half duplex communications are not supported.

Pin No.	Function	Description	Connect To
2	RX1	RS-232 Receive Line	External Device Transmitter (Usually pin 3)
3	TX1	RS-232 Transmit Line	External Device Receiver (Usually Pin 2)
5	GND1	RS-232 Digital Ground	External Device Digital Ground (Usually Pin 5)
6	RA	RS-485 Receive A (-)	External Network
7	RB	RS-485 Receive B (+)	External Network
8	TA	RS-485 Transmit A (-)	External Network
9	TB	RS-485 Transmit B (+)	External Network

Connect shield as directly as possible to the metal DB9 shell.

Multi-Drop Networking

The following table shows how to connect a number of instruments in an RS-485 4-wire multi-drop network:

Cable 1				Cable 2			
6700 or Network Master		5000 Unit 1 - Serial 1		5000 Unit 1 - Serial 2		5000 Unit 2 - Serial 1	
Function	Pin	Function	Pin	Function	Pin	Function	Pin
RA(-)	6	TA(-)	8	RA(-)	6	RA(-)	6
RB(+)	7	TB(+)	9	RB(+)	7	RB(+)	7
TA(-)	8	RA(-)	6	TA(-)	8	TA(-)	8
TB(+)	9	RB(+)	7	TB(+)	9	TB(+)	9

For more than 2 instruments duplicate Cable 2 between each new instrument and the network.

The end devices in a multi-drop RS-485 network may need to be provided with termination resistors to balance the network loadings. These resistors are built into the **5000** and they can be enabled or disabled using the digital setup, refer to Section 9.3.2, page 43.

3.11.2. Serial 2 - Printer Port

All connections for this port are on the Serial 2 connector. This is a standard DB9 socket requiring a female DB9 plug. The only output available from Serial 2 is RS-232. The connections for this are shown below.

Note that pins 6 to 9 of the Serial 2 connector are connected directly to pins 6 to 9 of the Serial 1 connector. This provides for convenient implementation of multi-drop RS-485 communications.

Pin No.	Function	Description	Connect To
3	TX2	Output Transmit Line	External Device Receiver (Usually Pin 3 on printer)
5	GND2	Digital Ground	External Device Digital Ground (Usually Pin 7 on printer)
4	DTR	DTR Handshake Line	External Device Busy Line (Usually Pin 20 on printer)
6	RA	RS-485 Receive A (-)	External Network
7	RB	RS-485 Receive B (+)	External Network
8	TA	RS-485 Transmit A (-)	External Network
9	TB	RS-485 Transmit B (+)	External Network

Connect shield directly to the metal DB9 back shell.

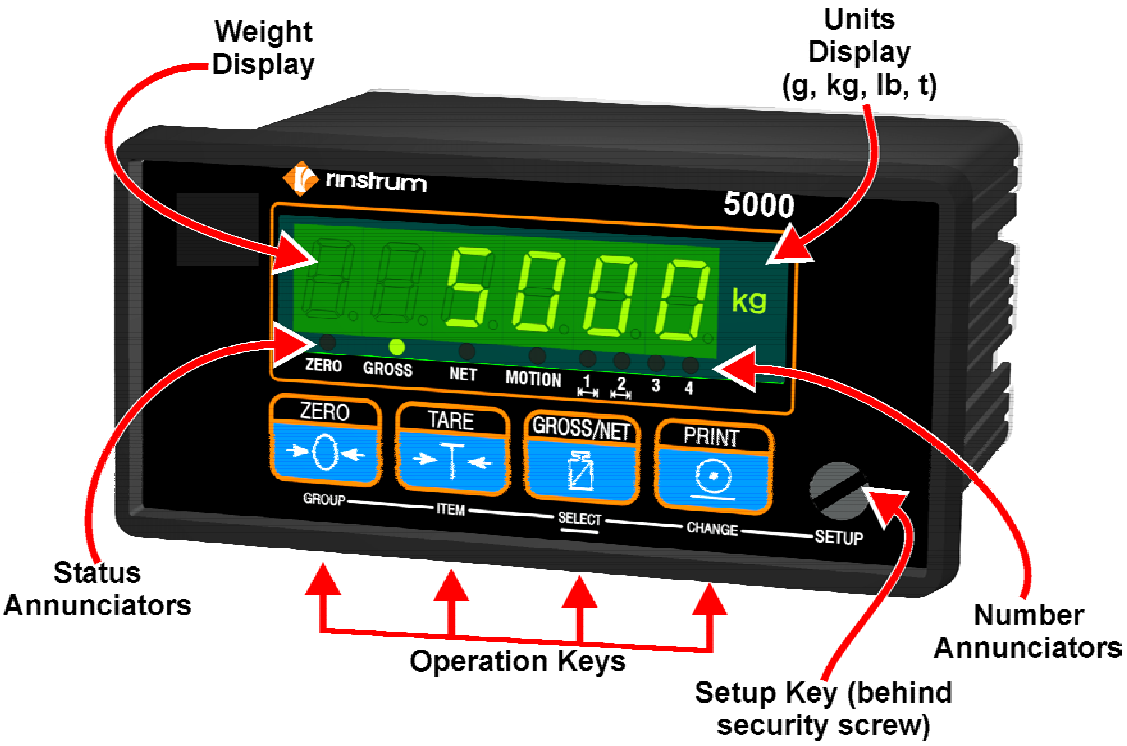
3.12. The Option Cards

Connection details for the optional output cards are provided in Section 12, page 61.

4. Display and Controls

4.1. Front Panel

The front panel of the **5000** has a six digit LED display, and a four key keypad. A sealing screw (setup) at the right of the panel allows access to a hidden key, which is used to trigger full digital setup and calibration. The figure below shows the main elements of the front panel.



4.2. Visual Display

The **5000** has three main display sections for the visual output of weight information. Each section is described below:

4.2.1. Weight Display

Displays the weight readings, setup information, errors and warnings.

4.2.2. Units Display

Shows the units for the weight reading as either grams (g), kilograms (kg), pounds (lb) or tonnes (t). Units flash to indicate that the weight reading is a 'peak hold' or 'manual hold' reading. See Section 11.1.7 page 60 for more information on these options.

4.2.3. Annunciators

The annunciator bank made up of two groups of four LEDs.

Status Annunciators: The status set show the status of the displayed reading.

Number Annunciators: The function of the number set depends on the mode of the scale selected on the setup. In single range mode they display setpoint status. In dual interval or dual range modes they show which range the display is using.

Annunciator	Description
ZERO	Lit when the displayed reading is within ± ¼ of a division of true zero.
GROSS	Lit when the display reading represents GROSS weight.
NET	Lit when the display reading represents NET weight.
MOTION	Lit when the displayed reading is not stable.
1,2,3,4	Lit to indicate when a set point output is active. In multi-range mode these show which range is active.

4.2.4. Operation Keys

The **5000** has four front panel keys that control the operation of the instrument.

Each of these four keys has two separate functions:

- **Primary Function** that is available during normal weighing - this function is printed in white at the top of the key.
- **Secondary Function** which is available during digital setting and calibration - this function is printed beneath the key.

4.2.5. Setup Key

The setup key is hidden behind a security screw at the right. The security screw can be sealed to prevent unauthorised tampering with the calibration of the **5000**.

5. Basic Operation

5.1. Introduction

In basic weighing mode, the **5000** acts as a simple weight readout with optional printing and serial output capability. Each key triggers the weighing operation printed on it.

The **5000** allows individual keys to be disabled in the setup. All keys are enabled at the factory, but some keys may have been intentionally disabled during installation. If a key has been locked a long beep sounds when it is pressed. If however the key beeps normally, but does not appear to trigger the desired action it is probably waiting for the weight reading to settle before the action can proceed. If the action is blocked for more than 10 seconds due to motion, the action is cancelled and a warning message is displayed.

5.2. ZERO Key

This key is used to perform a zero adjustment on the scale display if the empty scale has drifted away from a true zero reading. The zero adjustment is stored by the **5000** when power is removed, and is re-used when next powered up.

The amount of weight that may be cancelled by the **<ZERO>** key is limited according to the digital setup of the instrument.

5.3. TARE Key

This key is used to temporarily set the scale to zero (such as in the case of cancelling the weight of a carton before performing a filling operation). The display will show NET weight and the NET annunciator will be lit.

The **<TARE>** key can operate over the entire valid range of the display. In Trade Mode the **<TARE>** Key will not operate if the displayed gross weight is less than or equal to zero. Negative tare is permitted in Industrial Mode.

The weight tared is deducted from the allowable range of the scale, reducing the maximum weight that can be displayed.

Numeric TARE Entry

A two second press of the **<TARE>** key allows entry of a numeric Tare value. Along with the numeric Tare are a number of other operator input parameters. See Section 5.7 on page 19 for details of these other parameters.

Use the following procedure to enter a numeric TARE value:

• Press **[ITEM]** **<TARE>** key for two seconds to enter the Operator Setup.
• The menu item **Pre.Tar** is displayed.
• Press **[SELECT]** to set the TARE value.
• Use the **[SELECT]** and **[CHANGE]** keys to edit the value shown.
• Press **[ITEM]** to save changes and return to weight display.

5.4. GROSS/NET Key

This key toggles the weight display between the Gross weight and the Net weight (provided that a Tare has previously been acquired using the **<TARE>** key).

A two second press of the **<GROSS/NET>** key accesses the safe setup menus. This allows operator access to all settings that do not alter instrument calibration. A password may be entered to restrict access to this feature, see Section 6.8 page 23.

5.5. PRINT Key

If a printer or computer has been attached to the **5000** and the manual print function selected, the **<PRINT>** key will trigger an output of the current weight reading.

5.6. Stability Considerations

Once a **<ZERO>**, **<TARE>** or **<PRINT>** key is pressed the instrument waits for a stable valid reading before performing the associated operation. If the weight readings remain unstable or invalid due to some Diagnostic Error for longer than 15 seconds the operation is cancelled and an error message is displayed.

To improve the stability of the weight reading, increase the filtering or relax the motion detection criteria (see Section 7.5 page 27).

It is also possible in non-trade applications to set the keys to act immediately regardless of the stability of the weight reading. (See Section 7.8, page 31).

5.7. Setpoints - Direct Operator Access

The **5000** can drive up to four set points. The status of the outputs is displayed on the "1, 2, 3 and 4" lamps in the display. If a lamp is ON, the corresponding output is energized. Note that in multi-range applications that these lamps are used to indicate the current range, and do not show the setpoint status.

The trip values (Target and Flight) of these setpoints can be accessed directly by pressing the **<TARE>** (**[ITEM])** key for two seconds. Full access to all setpoint options is only possible through the normal digital setup menus. See Section 7.10, page 32 for details.

Use the following procedure for direct operator changes to setpoint trip values:

• Press **[ITEM]** for two seconds to enter the Operator Setup.
• Press **[ITEM]** to select a setpoint parameter.
• Press **[SELECT]** to check or change the parameter.
• Use the **[SELECT]** and **[CHANGE]** keys to edit the value shown.
• Press **[ITEM]** to save changes.
• Press **[GROUP]** to return the **5000** to weighing mode. Any new values entered will be used immediately.

If a parameter is locked or not available "No Entry" is displayed if changes are attempted.

6. Configuration Issues

6.1. Introduction

Digital setup and calibration is carried out entirely from the front panel using the secondary functions on the Operation keys. There are two methods of entering the digital setup programme.

The FULL SETUP is accessed by removing the security screw at the right of the keypad, and pressing the concealed key behind the screw. This setup program allows all steps to be accessed, including calibration.

The SAFE SETUP is accessed by pressing the **<GROSS/NET>** key for at least two seconds. Safe Setup is similar to the Full Setup, except all critical steps controlling the calibration and trade operation of the **5000** cannot be accessed. Safe setup only permits those digital functions to be accessed that will not effect a trade scale's certification.

The **5000** can be passcode protected (see Section 6.8 on page 23) to prevent unauthorized tampering. If the scale has been previously passcode protected, the setup menus cannot be accessed until the correct code has been entered.

6.2. Terminology

A knowledge of the basic weighing terms is useful in setting up and calibrating the **5000**. The terms used include "Units", "Range", "Count-by" and "Graduations". These terms are used throughout the setting procedure and are defined as follows:

- **Units** describes the actual units of displayed measurement (kilograms, tonnes, pounds etc)
- **Full Scale** describes the total change in weight between zero gross load and full capacity gross load. It is always given in displayed weight units. This is the nominated total capacity of the scale.
- **Count-by (E1 or E2)** describes the smallest change in weight units that the display can show.
- **Graduations** describe the maximum number of display steps between zero gross load and full capacity gross load. It is equal to the Full scale divided by the count-by.

Example: A 10,000kg 2.0mV/V load cell is used in an application with a 5000kg full scale, displaying in 5kg steps.

The values of each of the above terms is:

Units = kg Full scale = 5000 Count-by = 5 Graduations = 1000

Signal Voltages are as follows:

The fullscale load cell signal is
(5,000 / 10,000) * 2.0 mV/V = 1.0 mV/V

Since the **5000** uses 8V excitation, the absolute signal voltage is
8 * 1.0 = 8.0 mV

The signal resolution is therefore
8.0 / 1000 = 0.008 mV / division or 8 μV / division.

6.3. Dual Interval and Dual Range Operation

The **5000** provides both Dual Interval and Dual Range modes of operation as well as the traditional single range setting. In non-trade operation, up to 100,000 divisions are available so it is rare for the precision of the displayed reading to be a problem. However in Trade applications where the number of divisions that can be legally displayed is limited, the use of Dual Interval or Dual Range operation allows greater precision in the displayed readings without exceeding the maximum number of graduations available in the certification of the load cell.

Both of these modes of operation allow for the **5000** to operate with two count-by settings so that it is possible to weigh for example up to 2kg in 1g increments and then up to 5kg in 2g increments.

Dual Interval and Dual Range are identical in many respects and can be treated the same for the purposes of setup and calibration. The difference in the two comes about in the operation of the scale. With Dual Range operation the range is determined based on the gross weight. Once the scale changes from low range to high range it may not change back to low range again until the scale is returned to a stable zero reading. Dual Interval operation however is based on the net weight and no restrictions are placed on the change from the high interval to the low interval. With Dual Interval operation it is therefore possible to weigh in the low interval with high tare weights.

The **5000** is equally accurate in either mode but due to hysteresis effects in many load cells it may not be possible for them to operate accurately in Dual Interval mode. In these cases Dual Range mode ensures that the weight readings taken from the load cell are accurately displayed during loading and unloading operations.

6.4. Direct mV/V Operation

It is possible to calibrate the **5000** without test weights if the output capacity of the load cell is known. For applications like silo weighing etc where it is impractical to use test weights this mode of operation allows the mV/V signal strength at no load, as well as the mV/V signal strength of the span to be entered directly. This type of calibration is only as accurate as the load cell output figures but for many applications this is more than adequate. Extended features like multi-range and linearisation are not compatible with this form of calibration.

6.5. Filtering Techniques

The **5000** has a number of advanced filtering options available which allow it to be optimized to produce the most accurate readings possible in the shortest time. There is a trade off between noise filtering and the step response time of the system. The step response being the time between placing a weight on the scale and the correct weight reading being displayed. This does not affect the number of readings per second that are produced, it simply defines the amount of time that is required to determine a final weight reading.

6.5.1. FIR Filter

The first level of filtering provided is a FIR filter that is linked to the measurement rate. The measurement rate is set in the SYNC option of the SPEC menu. This filter is a very high performance 'tuned' filter that provides up to 180 dB of attenuation at multiples of the SYNC frequency and broadband filtering of between 40 and 80 dB generally. For example setting the SYNC frequency at 25Hz would provide 180 dB of noise rejection at 25, 50, 75 … Hz .

Changes to the SYNC setting effect the calibration of the system, so it is wise to determine the primary noise frequency of the system prior to calibration. Often the primary noise source is the mains power so the SYNC is usually set to 50 or 60Hz depending on mains frequency. However for applications with high levels of mechanical noise it is better to tune this filter to the natural frequency of the scale. (eg. a mixing paddle in a hopper scale may induce a vibration of 40 Hz)

The FIR filter introduces a delay of 3 samples to the step response. So for a SYNC frequency of 50Hz (ie. readings every 20 milliseconds) there is a delay of 60 milliseconds between a weight change and the final weight reading.

6.5.2. Digital Averaging

In addition to the FIR filter the **5000** has two levels of digital averaging. The first is a fixed length sliding window average where the average of the last 'n' readings is calculated. As each new reading is taken the oldest reading is discarded and a new average calculated. The length of the window is set using the FILTR option from 1 reading to 200 readings. Each reading in the average adds a delay to the step response equal to the measurement period. For example an average of 10 readings with a SYNC frequency of 50Hz results in a total step response of (10 + 3) * 20 = 260 milliseconds.

The second average is similar to the first but has a variable length that grows from 1 reading up to a maximum of 10 readings. If a disturbance on the scale is detected the old readings are discarded and a new average starts all over again. Each of the 10 readings is calculated over the window length of the fixed average. In this way very long-term averages are calculated without causing any delays. The amount of fluctuation that causes the average to be restarted can be selected as FINE or COARSE in the JITTER option. The COARSE setting is more tolerant of weight change than the FINE.

6.6. Trade vs Industrial Mode

The **5000** may be operated in Trade or Industrial mode. Following is a list of the differences in operation for each of the two modes:

Item	Trade	Industrial
Underload	-1% or -2% of fullscale depending on zero range setting	-105% of fullscale
Overload	fullscale +9 divisions	105% of fullscale
TARE	TARE values must be > 0	No restrictions on TARE.
Pre-set TARE	Not available	Pre-set TARE available via two second press of **<TARE>** key.
De-Zero	Not available	Two second press of the **<ZERO>** key will clear the zero setting
Test Modes	Limited to five seconds	Unlimited time allowed

6.7. Calibration Counter

Within the Setup Programme there are a number of critical steps that can effect the calibration or trade performance of the **5000**. If any of these steps are altered, the trade certification of the scale could be voided. These steps are automatically blocked in the Safe Setup.

The **5000** provides a built in Calibration Counter to monitor the number of times the critical steps are altered. The value of this counter is stored within the instrument, and can only be reset at the factory. Each time a critical step is altered, the counter will increase by one. Whenever the **5000** is powered up, or Safe Setup is accessed, the current value in the counter is displayed briefly.

6.8. Passcodes

The **5000** has two passcodes that provide a security lock on the setup programme. One passcode is used to secure the Safe Setup and the other one is used for Full Setup.

These Passcodes are set in the “SAFE.PC” and “FULL.PC“ ITEMS in the “Special” GROUP. **A setting of “000000” clears the Passcode and allows free access to the SAFE setup. This is the default setting and must be changed by the installer to restrict operator access .** Any other number will enable the passcode function and restrict access to the setup routines.

When a passcode is enabled, the **5000** will stop for passcode confirmation before entering Setup. A default passcode will be displayed. This number must be changed using the **[SELECT]** and **[CHANGE]** keys, and the new number entered using the **[ITEM]** key. Correct code entry will allow access to the Setup. An incorrect passcode will trigger an error message and the display will return to normal weighing.

The Safe Setup passcode may be cleared or changed at any time by using the Full Setup. This will require the Seal Screw to be removed and the entry of a Full Setup Passcode if enabled.

The passcode for the FULL Setup must not be forgotten as it is only possible to circumvent it at the factory. Clearly care must be taken with the use of the FULL Setup Passcode to ensure that the instrument is not permanently locked.

7. Setup

7.1. Accessing Setup

There are two methods of entering setup mode. One accesses the complete Full Setup. The other only allows access to the more restricted Safe Setup.

Full Setup	Safe Setup
(behind screw)	
To enter and exit **Full Setup** mode press the setup key (behind the setup screw).	To access **Safe Setup** press and hold the **<GROSS/NET>** key for two seconds

If a Passcode has been set it is necessary to enter the appropriate passcode to gain access to the Setup.

Once access to the Setup has been achieved the display will show (SEtUP) for two seconds before displaying the first group title.

7.2. Exiting Full or Safe Setup

The following identifies the methods used to save settings, exit setup and return to the normal weighing mode.

7.2.1. Exiting Safe Setup

- Press the **[GROUP]** key until the **-END-** group appears in the display.
- Press the **[ITEM]** key to exit the setup.

7.2.2. Exiting Full Setup

This method may be used where the **<SETUP>** key is not sealed and can be freely accessed.

- Press the **<SETUP>** key once.
- Reseal the key with the seal screw. In trade applications, the screw head can be sealed with a destructible verification sticker.

7.3. Groups, Items, and the Setting Keys

All setup options in the **5000** are organised into **Groups** and **Items**.

Groups	The digital settings are divided into a series of “Groups”. Each Group has a distinctive Group Title. All items in any one Group have related functions.
Items	Each Group is divided into numbers of individual setting “Items”. Each item represents a parameter that can be changed.

In the entire setting process, only four main operations are required. Each operation is assigned one key. The four basic operations are as follows:

	Steps through the list of available **Groups** . Returns the display to Group Headings List from anywhere
	Steps through the list of Items within a given Group. Returns the display to Item Headings List from anywhere
	Selects the displayed Item or digit to be examined or changed.
	Changes the flashing digit or steps through available settings or list items. After an entry has just been changed using the **[CHANGE]** key, the **5000** will automatically save the new value when returning to the **Items** list.

7.3.1. Groups Headings

Groups	Display	Use
Build	(buiLd)	Configures the scale build.
Options	(OPtiON)	Sets display dynamics
Calibration	(CAL)	Calibrates the scale zero and span
Communications	(SEriAL)	Sets the serial outputs and printing options
Special Modes	(SPEC)	Sets passcode, key locking and special modes
Test	(tESt)	Test routines for the scale and indicator.
Setpoints	(Set.PtS)	Setup the basic setpoint operation
Analog Output	(AnALoG)	Setup of the Analog output option card.
Clock	(CLOC)	Sets the time and date
Factory	(FACtry)	Setting menu for factory use (Passcode locked)
END	(-End-)	Exit point from Setup

7.4. Scale Build - (buiLd)

Items within this **Group** are used to configure the indicator to suit the current application. It is important to fully set the options within this Group before calibration is attempted, as later changes to Items within this Group may invalidate the current calibration data.

Items		Display	Use
Display Type	⊗	**(tyPE)**	Selects the type of display to suit the application. This can be set for Single Range, Dual Interval or Dual Range, or Direct mV/V operation.
Decimal Point Position	⊗	**(dP)**	Sets the location of the decimal point on the display. To avoid confusion, set this parameter first so that all other weight related values are displayed with the decimal point in the correct position. *Can be set from 000000 (none) to 0.00000*
Max1 Capacity (lower range)	⊗	**(CAP 1)**	Sets the nominal maximum capacity (or Full scale) of the scale in single range mode, or sets the maximum value of the lower range in dual mode. This is set in weighing units (eg. kg, t etc) with the decimal point in place. (For example, if a scale is to weigh 500.0 kg in 0.5 kg increments, then set CAP1 to 500.0, and set E1 to 0.5).
Count by 1 (lower range)	⊗	**(E1)**	Sets the resolution (or Count-by) of the display for single range, or sets the resolution of the lower range in dual mode. The resolution is the number by which the indicator will count by. This is set in weighing units with the decimal point in place. *Values of 1, 2, 5, 10, 20, 50 or 100 can be set*.
Max2 Capacity (upper range)	⊗	**(CAP 2)**	Sets the maximum capacity of the upper range in Dual Range and Dual Interval modes. This defines the maximum capacity of the scale in Dual Range or Dual Interval modes. This setting is ignored in single range mode. (For example, if a scale is to weigh in 0.05 kg to 100.00 kg and then in 0.10 kg to 300.00 kg then set CAP2 to 300.00, E2 to 0.10, CAP1 to 100.00 and E1 to 0.05).
Count by 2 (upper range)	⊗	**(E2)**	Sets the resolution (or Count-by) of the upper range in dual mode. This is set in weighing units with the decimal point in place. *Values of 2, 5, 10, 20, 50, or 100 can be set*.
Weighed units	⊗	**(UNitS)**	Sets the units for display and printing. *Settings are listed below* Default : kg (NONE) other units than those below (g) - grams (kg) - kilograms (lb) - pounds (t) - tonnes

7.5. Scale Options - (OPtiON)

Items within this **Group** are used to configure the operating parameters of the scale.

Only some of these items may be changed after calibration without effecting the calibration accuracy.

Items		Display	Use
Scale Use	⊗	**(USE)**	The basic scale use must be set here. Configures the **5000** for either Industrial or Trade operation. Trade configuration will limit the operation of the instrument to comply with OIML provisions. Industrial configuration removes all restrictions on operation.
Reading Average		**(FiLtER)**	The **5000** can average a number of sequential readings when calculating the displayed weight. This is used to dampen unwanted weight fluctuations caused by vibrations or dynamic forces. High settings will stabilise the display at the expense of rapid response to sudden weight changes. Set in steps from 1 to 200. Default 10
Anti-jitter Weight Stabilisation		**(JittEr)**	This feature can automatically damp out small weight fluctuations without effecting the speed of response to rapid weight changes (separate to averaging). Useful for stabilizing minor changes in weight readings. Set to either OFF , FinE, or CoArSE. Default : OFF
Motion Detection	⊗	**(MOtiON)**	Sets how much weight variation over a defined time period is allowed before the displayed weight is deemed to be unstable. This value is displayed in weight change (0.5, 1.0, 2.0 or 5.0 graduations) per time period (1.0, 0.5 or 0.2 seconds). When set to “none”, the Motion Detection is ignored and ZERO, TARE and PRINT actions are instantaneous. Motion can be set from 0.5 count-bys per 1.0 seconds (fine) to 5.0 count-bys per 0.2 seconds (coarse). Default : 0.5 -1.0 t
Auto-Zero on Startup		**(Auto.Z)**	This function can be used to automatically ZERO the indicator during power-up. The amount of weight that can be zeroed is limited to +/- 10% of Range. Set to ON or OFF Default : OFF

Items		Display	Use
Zero Tracking Sensitivity	⊗	**(Z.trAC)**	Zero tracking allows the display to adjust for minor changes in the zero balance of the scale. The zero track limit sets the fastest rate of change that is allowed to be compensated automatically. This value is displayed in the number of graduations (0.5, 1.0, 2.0 or 5.0) per time period (1.0, 0.5 or 0.2 seconds). When set to "none", the Zero Tracking is disabled. *Rate of weight change can be set from 0.5 graduations per 1.0s (fine) to 5.0 graduations per 0.2 s (coarse).* Default : none
Allowable Zero Operating Range	⊗	**(Z.rANGE)**	This setting restricts the range over which the Zero functions can operate. *Set in steps from -1% - 3% to ±100%.* Default : 02 - 02 (ie. -2% to +2%)
Zero 'Dead' Band	⊗	**(Z.bANd)**	This is an adjustable margin either side of true zero that defines the Zero 'Dead' Band. The Zero 'Dead' Band is used by the automated functions of the **5000** to determine 'Zero Load'. Eg. a setting of 4 specifies that readings between -4.5 and 4.5 are considered to be zero. *Settable over the full weight range.* *Always enter a number in multiples of display units (see E1 in BUILD)* Default : 0 (ie. -0.5 to 0.5)

7.6. Scale Calibration - (CAL)

For scale calibration procedures refer to Section 8 Calibration, page 36.

Certain items in the Scale Build, Special and Options sections can effect the calibration of the scale. Always check that these sections are correctly configured to suit the current application before attempting to calibrate the scale.

Items within this **Group** perform various calibration routines.

Items		Display	Use
Zero Calibration	⊗	**ZerO**	Select to start a Zero Calibration.
Span Calibration	⊗	**SPAN**	Select to start a Span Calibration.
Edit Linearisation Points	⊗	**(Ed.Lin)**	Select to view linearisation setup and start linearisation routines.
Clear Linearisation Points	⊗	**(CLr.Lin)**	Select to view linearisation setup and select linearisation points to clear.
Restore Default Factory calibration.	⊗	**(FAC.CAL)**	Select this to restore default factory calibration. This restores all settings in the Build menu and Cal menu back to factory defaults.

7.7. Communications Options - (SEriAL)

Items within this **Group** set the serial and printing outputs. The **Items** relating to particular task are combined to form a list. To manipulate the list continue to press the **[SELECT]** key to select the item of interest and press the **[CHANGE]** key to edit. Press **[ITEM]** to return to the list.

Items	Display	Use
Serial Output 1	**(Ser1)**	Sets the function of the number 1 serial output. The port can be disabled, or set to run as an automatic output or a network device. ***Off*** *- Disables the output* ***Auto.Lo*** *- Enable auto transmit at 10 Hz* ***Auto.Hi*** *- Enable auto transmit at the maximum possible update rate. (See Sync in Section 7.8 page 31).* ***Single*** *- Single transmission of data triggered by an external input.* ***Net*** *- sets the 5000 to function as a network device.* Default is: net
Serial Output 2	**(Ser2)**	Sets the function of the number 2 serial output. The port can be disabled, or set to run as an automatic output or as a printer driver with DTR handshaking. ***Off*** *- Disables the output* ***Auto.Lo*** *- Enable Auto transmit at 10 Hz* ***Print*** *- enable the output for printer driving* ***Single*** *- Single transmission of data triggered by an external input.* Default is Print
Network Options	**(NEt.OPt)**	This is a list of all items concerned with networking
Serial Address	**(AddrES)**	This will be the address used by this **5000** to identify its printouts. It will also be used as the unique address in network applications. *Selectable from 00 to 31* 31 is the default entry.
Network Type	**(tYPE)**	Select the network protocol. Options are: ***Net A -*** *Standard Rinstrum networking* ***Net b -*** *Modbus networking.*
Auto Transmit Options	**(Aut.OPt)**	This is a list of all items concerned with automatic and single serial transmission of weight data.
Auto Output format	**(tYPE)**	This line sets the type of Auto transmit data format. Description of these formats is given in Section 9.2 page 39. ***(Auto.A)*** *- Format A. Standard Rinstrum output format.* ***(Auto.B)*** *- Format B,* ***(Auto.C)*** *- Format C.* ***(Auto.D)*** *- Format D,* ***(Auto.D)*** *- Format D.* ***(Auto.E)*** *– Format E.* Default : Auto.A (ie. Rinstrum Format)

Items		Display		Use
	Auto output Source		**(Src)**	Select the weight source for the output data from the following: ***(rdg)*** **-** *Displayed reading* ***(GroSS)*** **-** *Gross Weight* ***(nEt)*** **-** *Net weight* ***(Total)*** **-** *Total weight*
	Start Character		**(St.Chr)**	Sets the character sent at the start of the automatic message string. Can be set for any valid ASCII character. If set to Null (00) , no character will be sent in this position. Default is (02) for Start Of Text (STX)
	End Character 1		**(End.ch1)**	Sets the first of the two characters sent at the end of the automatic message string. Can be set for any valid ASCII character. If set to Null (00) , no character will be sent in this position. Default is (03) for End Of Text (ETX)
	End Character 2		**(End.ch2)**	Sets the second of the two characters sent at the end of the automatic message string. Can be set for any valid ASCII character. If set to Null (00) , no character will be sent in this position. Default is (00) for no character sent
Printing Options		**(Prn.OPt)**		This is a list of all items concerned with printing.
	Printer output		**(Prnt.TP)**	This line sets the type of printout sent via the serial port when the **<PRINT>** key is pressed. Descriptions of these printouts are given in Section 9, pg 39. ***(SINg)*** *- Print a single line with no extra line feed* ***(doub)*** *- Print single line output but double spaced* ***(tic)*** *- Print full weight ticket* ***(A.SINg)*** *- Auto print a single line with no extra line feed* ***(A.doub)*** *- Auto print single line output but double spaced* ***(A.tic)*** *- Auto print full weight ticket* ***(totAl)*** *- Totalising printer mode* ***(A,totAl)*** *- Automatic totalising* Default : SINg (ie. Single)
	Ticket Header		**(header)**	The custom ticket header can be entered here. Refer to Section 9.4.6 page 45 for information on the method of entering a custom header.
	Ticket Format		**(Tic.Fmt)**	A custom ticket format can be entered here. Refer to Section 9.4.7 p45 for information on custom ticket format entry.
	Margin Space		**(SPACE)**	The number of rows and columns of space to leave for each printout can be entered here in **cc.rr** format where **cc** is the number of columns of blank space and **rr** is the number of rows of blank space.
Baud Rate		**(bAUd)**		Determines the speed of data transmission. *Setting steps are 300, 600, 1200, 2400, 4800, 9600 and 19,200 bits per second.* Default : 9600

Items	Display	Use
Bitmap pattern, Duplex, and Termination	**(bitS)**	The (bits) menu allows the data transmission bit pattern to be changed. The display will show the current setting in the form (n81-2-) where each character has a meaning as shown below. *n, O, E - parity is set for none, Odd or Even* *8, 7 - The number of data bits* *1, 2 - The number of stop bits* *-, t - enables termination resistors* *2,4 - '2' is RS-232, '4' is RS-485.* **WARNING: It is important that the 2/4 setting is correct for proper operation of networking.** *-,d -DTR handshake disabled/enabled* For most applications, set the display to the factory default of (n81-2-).

7.8. Special Settings Menu - (SPEC)

Items within this **Group** set the Security Code, key locking.

Items		Display	Use
Security passcode for Safe Digital Setup		**Safe.PC**	Set to any number. This number must be entered as a passcode to access the Safe Setup routines. A setting of 000000 bypasses the passcode function and allows free access. Default is 000000.
Security passcode for FULL Digital Setup	⊗	**FULL.PC**	Set to any number. This number must be entered as a passcode to access the Full Setup routines. A setting of 000000 bypasses the passcode function and allows free access. Default is 000000.
Locks or unlocks operating keys	⊗	**(key)**	Set individually for each key except SETUP in the order ZERO, TARE, GROSS/NET, and PRINT. (y) for yes, enable this key (n) for no, this key not allowed. (I) for immediate operation (don't wait for motion for this key)
Operation of the external inputs		**(InP.Fn)**	Set the function of each of the 4 remote inputs provided with the setpoint option card. See Section 11 p58 for a detailed description of each of these functions. Default is - - - -
A/D synchronization frequency (effects calibration)	⊗	**(Sync)**	This sets the primary anti-noise filter of the **5000**. It will deliver optimum stability in a 50Hz environment when set to 50 cps. Set in cycles per second from 15 to 60 (default 50). This also sets the number of new readings taken per second. So a setting of 50 means that the instrument will take 50 readings per second. **WARNING - This setting will affect the calibration of the indicator and should be set before calibration is done.**

7.9. Special Test Section - (tESt)

Items within this **Group** allow access to the testing routines for the **5000**. With these routines the scale base output can be monitored, and the optional accessory cards can be tested.

Items	Display	Use
Scale base test display	**(Scale)**	Used to test the scale base for load cell or connection errors. Sets up the **5000** as a simple test meter to measure the load cell input. Display reads in millivolts per volt, factory calibrated to 0.5% worst case. In TRADE mode this display is only active for five seconds before returning to the menu.
High resolution display (for scale testing)	**(HI.rES)**	Allows the high resolution (x 10) display mode to be turned ON or OFF. Once enabled, the **5000** will remain in high resolution mode until switched back to normal weighing in this step. In safe setup mode the (x10) weight reading is displayed for five seconds before returning to the menu. The high resolution can only be changed permanently in Full Setup.
Force outputs of the Setpoint card	**(Frc.Out)**	Forces each of the output drivers of the Setpoint card in turn. All outputs turn OFF when leaving this step.
Test the inputs of the optional Setpoint card	**(tSt.InP)**	All four inputs are displayed at the same time. The status of the inputs are changed as contact closures are detected. (-) - Input not present (1/2/3/4) - contact closure detected on input 1/2/3/4

7.10. Set Points - (SEt.PtS)

Items within this **Group** set the operational logic of the setpoint system, as well as setpoint target and flight values. Set the 'Active' status of each of the 4 setpoints first. All other menus are based on this initial setup so that unused settings and unavailable combinations are removed. Refer to section 10.5.7 p54 for specific examples.

Items	Display	Use
Enable Setpoints	**(ActivE)**	Sets the role of each of the four setpoints. See section 10.5.1 page 51 for details on all the active modes for the setpoints.
Lock out Operator changes	**(LOC)**	Allows operator access to each setpoint via the **<TARE>** key. A setpoint can be *locked* (L) or left *unlocked* (-).
Weight Data Source	**(SrC)**	Each setpoint can be set to work from either the Gross Weight (G) or the Net Weight (n).
Output Switching Direction	**(dir)**	Sets the direction of action of the outputs. Can be set to either Over (0) or Under (U).
Active Relay Logic	**(LOGIC)**	Determines the sense of the outputs. (H) for active high, (L) for active low.
Alarm	**(Alarm)**	Sets the alarm options for each setpoint. Alarms can be off (-), single beep(S), double beep(d) or continuous(C).

Items	Display	Use
Target Settings	**(Target)**	This lists all active target values: **(Target1)** to **(Target 4)** depending on which setpoints are active. Each of these is the primary weight target for the particular setpoint.
Hysteresis/ Tolerance Settings	**(HYS)**	This lists all Hysteresis values: **(HYS1)** to **(HYS 4)** depending on which setpoints are active. Hysteresis values are also used to specify the weight tolerance for batching. A value of 0 disables tolerance checking.
In-Flight Settings	**(FLt)**	This lists all In-Flight values: **(FLt 1)** to **(FLt 4)** depending on which setpoints are active.
Automatic In-Flight Adjustment	**(Flt Ad)**	In-Flight settings can be automatically adjusted to remove batching errors. The in-flight adjustment sets the percentage of a batch error that is used to correct the in-flight value. Note that an in-flight setting can not be adjusted by more than 50% of its current value regardless of the batching error. Default: 0%
Delay Settings	**(dELAY)**	This list the available delay settings: **(DELAY1) and (DELAY2) -** Delay at the end of material batching: 0.1 to 20.0 seconds. An entry of 0 seconds is used to specify a programmed pause and wait for the operator. **(FINISH) -** Time for finish pulse: 0.1 to 20.0 seconds Default: 2.0 seconds.
Setpoint Options	**(OPt)**	Enter setpoint batching options: **(SEdbF)** **S, A:** Select single batch or automatic restart. **E, - :** Set to pause on Overload, Underload or Error **d, - :** Set to enable 1 second delay at the start of each fill process. **b, - :** Set to display the current batch number at the start of the batch. **F,- :** Set to specify single output feeder control when using multiple feeders. Default: (SEdb-)
Product Labels	**(LAbEL)**	Enter a 10 character label for up to two materials depending on which setpoints are active. Default: “Mat.1”, “Mat.2”

7.11. Analog Settings - (AnALoG)

Items within this **Group** set the options for the optional analog output card.

Items	Display	Use
Reading Source	**(Src)**	Select the reading source for analog transmit. Options are: **(DISP):** Displayed weight reading, either gross or net. **(GROSS):** Gross weight only. **(Net):** Net weight only. Default: DISP
Ouput Type	**(Type)**	Select either voltage or current output. ***(volt)*** *- (-10V to 0 to 10V) voltage output. (0V at 0 weight)* ***(Curr)*** *- 4-20 mA current output* ***(Abs.Cur)*** *– 4 –20 mA current based on absolute weight. Negative weight readings are transmitted with positive current.* Default is Curr.
Calibrate Zero output	**(CAL.Lo)**	This allows a fine calibration of the analog output corresponding to zero weight. (Either 4 mA or 0 V). See Section 12.7 Fine Adjustment of Analog Outputs on page 64 for details on how to use the (CAL.Lo) and (CAL.Hi) items.
Calibrate Fullscale output	**(CAL.Hi)**	This allows a fine calibration of the analog output corresponding to fullscale weight. (Either 20 mA or 10 V).
Test Analog Output	**(Frc.Anl)**	Test analog output. This function forces the analog output either Low (0V or 4 mA) or High (10V or 20mA) so that the analog output function can be tested independent of the weight readings.

7.12. Clock Settings - (CLOC)

Items within this **Group** set the clock/calendar.

Items	Display	Use
Time set	**(TimE)**	The correct time is entered here in the format (00.HH.MM) HH - hours in 24 hour format (00 - 23) MM - minutes (00 - 59)
Date set	**(dAtE)**	The current date is entered here in European format (DD.MM.YYYY). DD.MM is entered first followed by YYYY. DD - Day of month (01 - 31), MM - month of year (01 - 12) YYYY - year (1998 - 2098)
QA Option Setting	**(qA.Opt)**	Turn 'Cal Due' QA date option on or off. ***(OFF)*** *- Turn feature off.* ***(On)*** *- Turn feature on.* Default = Off.
QA Date	**(qA.Date)**	The date that the next calibration check is due is entered here in European format (DD.MM.YYYY) DD - Day of month (01 - 31), MM - month of year (01 - 12) YYYY - year (1998 - 2098)

7.13. Factory Adjustment Menu - (FACtry)

Items		Display	Use
Restore Factory default	⊗	**(dEfLt)**	Restores the digital setup of the **5000** back to the original "new" settings installed at the factory. The main use of this routine is to completely reset a **5000** that is being installed on a different scale.
Factory reset	⊗	**(Fac.rst)**	Factory access only
Licensing Options	⊗	**(COnFiG)**	Use this item to enter licensed access codes to enable optional software features in the **5000**.

7.14. – End – (Leaving Setup)

Refer to Exiting Full or Safe Setup page 24.

8. Calibration

8.1. Introduction and Warnings

The calibration of the **5000** indicator is fully digital. The calibration results are stored in permanent memory for use each time the instrument is powered up.

Some of the digital setup steps can effect calibration. The (BUILD) and (OPTIONS) sections of the digital setup MUST be completed before calibration is attempted. Most importantly, the (TYPE) and (SYNC) settings must not be changed after calibration.

To perform a calibration, select the (CAL) Group using **[GROUP]**. Due to restrictions in Trade Use applications, the Calibration Routines are not available in Safe setup (accessed through the **<GROSS/NET>** key). Calibration can be accessed only through the Full Setup using the hidden **<SETUP>** key behind the seal screw.

The calibration programme will automatically prevent the **5000** from being calibrated into an application outside of its specification. If an attempt is made to calibrate the **5000** outside of the permitted range, an error message will show and the calibration will be abandoned. Refer to Section 13 Error Messages on page 66.

The **5000** has a wide-range amplifier. The non-trade calibration range of the instrument extends well beyond the Trade approved range. It should not be assumed that just because the **5000** has successfully calibrated a scale, that the scale is correct for trade use. Always check the scale build against the approval specification.

8.2. Using Digital Calibration with Test Weights

This type of calibration is used for single range as well as dual range and dual interval modes of operation.

Start from the (CAL) group header.

Press **[ITEM]** to choose the ZERO or SPAN calibration Item. It is important that an initial ZERO calibration is performed before any SPAN calibrations.

8.2.1. (ZErO) - Zero calibration routine

• Press the **[SELECT]** key to start the zero routine running. The display will show the current weight. Remove all weight from the scale structure.
• Press the **[CHANGE]** key to execute Zero Calibration. The display will show (Z.in.P) to show that zeroing is in progress. When the process is complete the display will return to weight to allow the zero to be checked.
• Press the **[ITEM]** key to leave the Zero routine.

8.2.2. (SPAn) - Span calibration routine

• Press the **[SELECT]** key to start the Span setting routine. The display will show the current weight on the scale.
• Add the calibration test mass to the scale. The minimum acceptable span calibration weight is 2% of the scale range. A weight this small may limit calibration accuracy. The closer the test weight is to full range, the better the accuracy.
• Press the **[SELECT]** and **[CHANGE]** keys to change the display reading to equal the calibration weight being used.
• Press the **[ITEM]** key to trigger the Span Calibration routine. The display will show (S.in.P) to show that spanning is in progress. When the process is complete the display will return to weight to allow the new weight reading to be checked.
• When the Span Calibration is complete, press the **[ITEM]** key to leave the routine.

8.3. Direct mV/V calibration

This type of calibration is only used for when the direct mV/V mode of operation is selected from the (Build) group. (See Section 7.4 page 26).

• Press **[ITEM]** to choose the ZERO or SPAN calibration Item.

8.3.1. (ZErO) - Zero calibration routine

• Press the **[SELECT]** key to start the zero routine running. The display will show the current weight.
• Press the **[SELECT]** key to enter the mV/V signal strength reading for zero load. The mV/V signal for the weight on the scale at this time is used as the default. If there is no load on the scale then use the mV/V setting as is, otherwise enter the correct mV/V reading for zero weight by using the **[SELECT]** and **[CHANGE]** keys.
• Press the **[ITEM]** key to leave the Zero routine.

8.3.2. (SPAn) - Span calibration routine

• Press the **[SELECT]** key to start the Span setting routine. The display will show the current weight on the scale.
• Press the **[SELECT]** to enter the mV/V reading for span.
• Press the **[SELECT]** and **[CHANGE]** keys to alter the mV/V reading to equal the calculated span mV/V for the scale. The span mV/V is the calculated difference in signal between zero weight and fullscale weight on the scale base.
• Press the **[ITEM]** key to leave the Span routine.

8.4. Using Linearisation

This section provides instructions on the use of the linearisation. First follow the steps outlined above for zero and span calibration. Both the zero and span calibration points are used in the linearisation of the scale base. These two points are assumed to be accurately set and thus have no linearisation error.

Up to five linearisation points can be set independently anywhere in the operating range of the scale. Unused points may be cleared.

8.4.1. (Ed.Lin) - Edit Linearisation points

• Press the **[ITEM]** key to view the list of linearisation points currently in use.
• Press the **[SELECT]** key to step through the list of points. Each point is shown as 'Ln. ppp' where n is the point number 1 to 5 and ppp is the approximate percentage of full scale where the linearisation is applied. For example L1. 50 designates that linearisation point number 1 is active and was entered at about 50% of full scale. Unused linearisation points are shown with a row of dashes (eg L2. - - - -).
• Add the calibration test mass to the scale. The closer the test mass is to the point of maximum error in linearity the more effective will be the correction.
• Press **[ITEM]** to change the linearisation point selected or press **[GROUP]** to exit without making any changes.
• Press the **[SELECT]** and **[CHANGE]** keys to change the display reading to equal the calibration weight being used.
• Press the **[ITEM]** key to trigger the Linearisation routine. When the process is complete the display will show the weight to allow the new weight reading to be checked before returning to the menus.

8.4.2. Clear Linearisation.

• Press the **[ITEM]** key to view the list of linearisation points currently in use.
• Press the **[SELECT]** key to step through the list of points. Each point is shown as 'Ln. ppp' where n is the point number 1 to 5 and ppp is the approximate percentage of full scale where the linearisation is applied. For example L1. 50 designates that linearisation point number 1 is active and was entered at about 50% of full scale. Unused linearisation points are shown with a row of dashes (eg L2. - - - -).
• Press **[ITEM]** to clear the linearisation point selected or press **[GROUP]** to exit without making any changes.
• This linearisation point is now cleared.

9. Serial Outputs

9.1. Introduction

The **5000** provides a number of serial output options allowing communications with external devices such as printers, computers, PLCs or remote displays. Serial output driving is an optional extra which may be ordered at the time of purchase and enabled at the factory or it may be enabled afterwards by entering the specific license code for the instrument. See section 12.7 Smart Software Licensing Options on page 64 for more information on the information on the **5000** options and licenses.

Two serial outputs are available, each on a separate DB9 connector socket. Serial Port 1 is bi-directional (in RS-232 or RS-485), and can be set for driving Automatic Weight Output, or Networking. Serial Port 2 is RS-232 transmit only, and can be set for Automatic Output or Printing (with DTR handshake). The **5000** requires an external converter to transmit in TTY Current Loop (20mA).

The various printer and serial output options are enabled using the Communications Options Menu (Serial) in the digital setup procedure.

Computer communications can be set from simple automatic “streamed” output, through to multi-drop networked systems. The **5000** can be programmed and calibrated via the network. The calibration counter is incremented when the calibration related steps are accessed via the serial port. This means that calibration via the serial port cannot be carried out without effecting the certification of a trade installation.

The bit pattern of the serial data can be altered, as can the start and end characters of the automatic data strings.

Printer driving allows for three basic printer outputs along with printer totalising. The format of the printer ticket may be changed to suit any application by entering special characters into the custom ticket format definition string. An automatic print mode is available where the **5000** automatically generates printouts at the appropriate time in the weighing process.

9.2. Single and Automatic Weight Output From the 5000

The automatic output is normally used to drive remote displays, a dedicated computer or PLC communications. The output generates a simple, configurable weight message at intervals programmed in the digital setup.

The **5000** Auto Weight String consists of a programmable start character, followed by a weight format string, followed by two programmable end characters. . The weight format string can be one of five standard strings, or a user programmable string. In a standard weight format string, the weight reading is selected according to the weight source (SERIAL:AUT.OPT:SRC) setting. In a user programmable weight format string, the weight source is selected via codes in the string.

Weight format strings have the following format:

Description
<START> <Weight Format String> <END1> <END2>

Where:

- **START:** is the character (SERIAL:AUT.OPT:ST.CHR).
  Default: ASCII 02.
- **END1:** is the 1st end character (SERIAL:AUT.OPT:END.CH1).
  Default: ASCII 03.
- **END2:** is the 2nd end character (SERIAL:AUT.OPT:END.CH2).
  Default: ASCII 00.

Note: START, END1 or END2 characters which have been set to NULL (ASCII 00) are not transmitted. Another common alternative configuration is START = NULL, END1 = CR (ASCII 13), END2 = LF (ASCII 10).

9.2.1. Weight Formats A to F

The five standard weight formats are detailed below. Spaces (ASCII 32) are indicated by a ' '.

Format	Description
A	**<Sign> <WeightA(7)> <Status>**
B	**<Status> <Sign> <WeightA(7)> <Units(3)>**
C	**<Sign> <WeightA(7)> <S1> <S2> <S3> <S4> <Units(3)>**
D	**<Sign> <WeightA(7)>**
E	**<Sign> <WeightB(7)> <S5> <Units(3)> <Mode(4)>**
Custom	**Programmable weight format**

Where:

- **Sign:** is the sign of the weight reading (space for positive, dash (-) for negative);
- **WeightA(7):** is a seven character string containing the current weight including the decimal point. If there is no decimal point, then the first character is a space. Leading zero blanking applies.
- **WeightB(7):** is a seven character string containing the current weight including the decimal point. If no decimal point is used a decimal point follows the 6 digits of weight data. Leading zeros are shown;
- **Status**: provides information on the weight reading. The characters G/N/U/O/M/E represent Gross/Net/Underload/Overload/ Motion/Error, respectively.
- **Units(3)**: is a three character string, the first character being a space, followed by the actual units (Eg. " kg" or " t"). If the weight reading is not stable, the units string is sent as " ".
- **S1:** displays G/N/U/O/E representing Gross/Net/Underload/ Overload/Error, respectively;
- **S2:** displays "M"/' ' representing motion/stable, respectively;
- **S3**: displays "Z"/' ' representing center of zero/non-zero, respectively;
- **S4**: displays "1"/"2"/"-" representing range 1/2 in dual-interval and dual range mode and "-" otherwise;
- **S5**: displays " "/"m"/"c" representing stable/motion/over or under capacity, respectively;
- **Mode(4):** 4 characters '_g_ _' or '_n_ _' for gross or net weight.

9.2.2. Auto Transmit Formatting

The Auto Format (SERIAL:AUT.OPT:AUT.FMT) setting programs the format transmitted when the Auto Format Type is set to Custom. A string of up to 20 characters can be entered. Each ASCII character is either a literal ASCII printed character like 065 ('A') or a special token character like 202 (123.4) that sends the gross weight. ASCII 0 is used to mark the end of the format string. To send an ASCII 0, insert an ASCII 128 into the string.

Qualifiers are tokens that do not cause any characters to be transmitted but setup the format of other tokens to follow.

For example, the following format string would transmit the weight reading in a fixed 7 character field with leading zero suppression and no decimal point:

172 184 188 200

Following is a table of all of the format tokens.

Qualifier Tokens		
ASCII	**Token**	**Comment**
170	5 character field	
171	6 character field	
172	7 character field	
173	8 character field	Default
174	9 character field	
179	No fixed length field for weight data	
180	No sign character sent	
181	Sign character send as space for positive and '-' for negative	Default
182	Sign character send as '+' for positive and '-' for negative	
183	Sign character send as '0' for positive and '-' for negative	
184	No decimal point sent	
185	DP sent as '.'	Default
186	DP sent as ','	
187	Weight sent with leading zeros, eg 000123	
188	Weight sent without leading zeros eg 123	Default
189	Weight readings sent regardless of overload or error status	Default
190	Weight data blanked on error	
191	Weight data send as '- - -' on error	
192	Status characters are upper case	Default
193	Status characters are lower case	

Tokens for weight data transmission		
ASCII	**Token**	**Comment**
200	Selected Weight (SRC)	
201	Displayed Weight	
202	Gross Weight	
203	Net Weight	
204	Tare Weight	
205	Total	

Tokens for weight status		
ASCII	**Token**	**Comment**
210	Units	'kg', 'lb', ' t', ' g'
211	G,N,E,O,U,M	Standard Rinstrum status
212	G,N,E,O,U	Rinstrum status without motion
213	G,N	Gross, Net only
214	M,' '	Motion or ' ' for stable
215	M,S	Motion or stable
216	' ', or units	' ' for motion or weight units
217	M,C,' '	Motion, over-capacity or valid weight
218	M,I,O,' '	Motion, invalid, over-capacity, or valid weight
219	I,O,U	Inscale, overload, underload
220	Z,' '	Centre of Zero
221	' ',1,2	Single range or range/interval 1or2
222	ST,US,OL	Stable, unstable, overload
230	Send time	hh:mm:ss
231	Send Date	dd/mm/yyyy

9.3. Networking the 5000

The standard **5000** protocol supports two levels of networking, **Basic** and **Extended**. The **Basic** level allows for simple weight acquisition by PLC or computer from a number of **5000s** on a simple RS-232 or RS-485 network. The **Extended** network language allows for full control over all functions of the instrument. The section here describes only the **Basic** command structure. The **Extended** structure is described in the Communications manual. In addition the standard protocol the **5000** also supports the industry standard MODBUS ASCII protocol. Details of this protocol may be found in the MODBUS Communications Manual.

9.3.1. Basic Commands

The **5000** may be set to respond to commands sent via the serial port from a PLC or PC. The command structure is:

Description
<STX> <"K"> (Command) <POLL> <ETX>

Where:

- **STX:** Start of transmission character (ASCII 02).
- **"K":** is ASCII upper case letter K (ASCII 75)
- **POLL:** is two digits giving this unit's network address (set in the **AddrESS** Item in the **SEriAL** Group). Eg. '01' for address 1.
- **ETX:** End of transmission character (ASCII 03).

Five Commands are supported at the basic level of networking. The commands are:

"Z" **ZERO** key.
"T" **TARE** key.
"G" **GROSS/NET** key
"P" **PRINT** key
"p" Print. This triggers the transmission of the current weight using the format as set in the (Type.A) item of the (SERIAL) group. Use this command to request weight readings on serial port.

Use the 'P' command to trigger printing from serial port 2.

Extended commands are available to trigger the extended remote functions normally implemented with external keys. The extended commands are:
"r" Start, ("R" = Start long press)
"a" Pause ("A" = Abort)
"D" Dump Enable
"S" Show Total
"C" Clear Total
"U" Undo Last Print
"1" Single Transmit Serial 1
"2" Single Transmit Serial 2
'H' Hold current weight / return to normal weighing
'e' Show Peak weight reading ("E" = clear peak weight reading)

See Section 11 Extended Functions on page 58 for more information on the extended functions

9.3.2. RS-485 Termination Resistors

The termination resistors required by RS-485 networks are built into the **5000**. The resistors are used to terminate the ends of the network to provide a balanced loading.

The termination resistors in the **5000** are enabled in group (SEriAL), item (bitS) of the digital setup.

9.4. Printer Driving

Printing may be initiated by the user pressing the **<PRINT>** key. The **5000** may also be set to auto printing. Auto printing triggers an output when the scale reaches *no motion* with a weight above the *preset Zero 'Dead' Band*. Select (Prnt.tP) from the (Prn.Opt) list in the (SEriAL) group to set the printer output type.

9.4.1. The single line printout

This is intended to produce the most compact printout. A single line of print is output for each **<PRINT>** key press. The printout is as follows.

Output is - Device Address (from digital setup), ID, Time, Date, Weight, Units, Gross or Net. The ID is a 4 digit sequential counter that is incremented with every printout up to a maximum of 999999 before cycling back to 0. This counter is stored in battery backed memory. It is not directly available for the operator to change.

```
000005 05/10/1999 16:47:05     3654 kg G
```

9.4.2. Double Spaced Printout

This is identical to the single line printout above, but the printout is spread over two lines.

```
000005 05/10/1999 16:47:05
                  3654 kg G
```

9.4.3. Full Printed Ticket

This setting produces a full ticket-style printout containing all the weight parameters. It includes the date and time. Allowance is made for a two line header at the top of the ticket. This can be programmed by the user to provide for custom tickets. Up to two lines of 20 characters each is allowed.

The default printed ticket is as shown below. This is the format used if there is no custom ticket format entered.

```
      WEIGHT
      TICKET
05/10/1999  16:50:12
ID: 000008
T:             654 kg
G:            3654 kg
N:            3000 kg
```

9.4.4. Total Ticket Printing

To enable totalising select “Total” or “A.Total” from the Printer Output Menu (see Section 7.7 p29). Select “Print” from the “SER2” menu if the weights and totals are to be physically printed out, otherwise they will only be displayed.

The operation of each press of the **<PRINT>** key causes a single line printout of the current weight that is added to the total weight. When all of the items have been weighed press the **<PRINT>** key for two seconds to print and clear the total. See Section 11.1.4 Totalising on page 58 for extended totalising functions using external keys.

An example of a total printed ticket is shown below:

```
000491  01/01/1999 10:35:08      100.2 kg G
000492  01/01/1999 10:35:08      105.7 kg G
000493  01/01/1999 10:35:08      124.9 kg G
ITEMS:  3    TOTAL:   330.8 kg
```

9.4.5. Printer Space

It is possible to specify the number of columns and rows of space to leave for each printout. In this way each printout can be separated from the next by a number of rows of space and the printouts may be centered on the page. The space data is entered as **cc.rr** where **cc** is the number of columns and **rr** is the number of rows of space. Select (SPACE) from the (Prn.Opt) list in the (SEriAL) group to set the amount of printed space.

9.4.6. Custom Ticket Headers

The 2 lines of 20 characters at the top of the printed ticket can be edited to provide custom headers including such items as company names and phone numbers.

Select (SPACE) from the (Prn.Opt) list in the (SEriAL) group to setup the header.

Within this setting item, the display shows each of the heading characters in turn using the following format:

[L.CC.XXX]

Where:

L is the line number (1 or 2)

CC is the position of the character in that line (01 to 20)

XXX is the ASCII code for the printed character

Use the **[SELECT]** and **[CHANGE]** keys to edit the message one character at a time. When the message is complete use the **[ITEM]** or **[GROUP]** key to return to the setup system. The printer programme can accept all printable ASCII codes.

Example: The following table shows the coded entry for “JOE’S FRUIT & VEG”. The ‘J’ would be entered as 1.08.074 for line 1, column 8, ASCII Code 74.

	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20
1								J	O	E	‘	S								
	32	32	32	32	32	32	32	74	79	69	39	83	32	32	32	32	32	32	32	32
2				F	R	U	I	T		&		V	E	G						
	32	32	32	70	82	85	73	84	32	38	32	86	69	71	32	32	32	32	32	32

9.4.7. Custom Ticket Format

Up to 50 characters of ticket format information can be entered to define the exact style of ticket printout.

Select (Tic.Fmt) from the (Prn.Opt) list in the (SEriAL) group to edit the ticket format.

Within this setting item, the display shows each of the characters in turn using the following format :

[CC.XXX]

Where:

CC is the character number (01 to 50)
XXX is the ASCII code for the format character

Use the **[SELECT]** and **[CHANGE]** keys to edit the format string one character at a time. Enter NULL (ASCII 00) as the last character in the string. Any characters entered after a NULL are ignored. When the message is complete use the **[ITEM]** key to return to the menus. Each format character can be a literal ASCII code (eg 065 for ‘A’) or a special format character (eg 132 for \D for a time\Date field).

The following table shows the available format characters. These same format characters may be sent in a temporary weight string via the network communications to define the format of a single printout.

ASCII Code	Escape Sequence	Effect
128	\.	Print a literal NULL character (NULL can't be entered as 00 as this is used to identify the end of the format string)
129	\A	Print line 1 of custom header only. No CRLF is printed.
130	\B	Print line 2 of custom header only. No CRLF is printed.
131	\C	Print the number of Columns of SPACE specified by the Printer Space settings.
132	\D	Print Date Time field : hh:mm:ss dd:mm:yyy
133	\E	Print End of Line : literally prints CRLF (ASCII 013, 010)
135	\G	Print Gross Weight : "weight(7) units(3) G"
136	\H	Print Custom Ticket Header
137	\I	Print ID number
142	\N	Print Net Weight : "weight(7) units(3) N"
143	\O	Print Total Weight : "weight(7) units(3) G"
146	\R	Print the number of Rows of SPACE specified by the Printer Space settings.
148	\T	Print TARE weight: "weight(7) units(3) T (or PT if pre-set Tare active)
149	\U	Print units
151	\W	Print displayed weight. "weight(7) units(3) G (or N)
155	\+	Print displayed weight as with \W but add weight to total.
156	\-	Undo last \+ operation.

Example: The following table shows the coded entry for a custom ticket. The header is the same as the example custom ticket header entered above.

No.	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
Code	\H	I	D	:	\I	\E	\D	\E					\N	\E	\E	*End*
ASCII	136	073	068	058	137	133	132	133	32	32	32	32	142	133	133	00

```
      JOE'S
   FRUIT & VEG
ID: 000005
01/01/1999  10:25:30
    25.5  kg N
```

9.4.8. ASCII Codes

The following table shows the ASCII codes for control and printable characters.

Code	Char	Code	Char	Code	Char	Code	Char	Code	Char
000	NULL	026	SUB	052	'4'	078	'N'	104	'h'
001	SOH	027	ESC	053	'5'	079	'O'	105	'I'
002	STX	028	FS	054	'6'	080	'P'	106	'j'
003	ETX	029	GS	055	'7'	081	'Q'	107	'k'
004	EOT	030	RS	056	'8'	082	'R'	108	'l'
005	ENQ	031	US	057	'9'	083	'S'	109	'm'
006	ACK	032	' '	058	':'	084	'T'	110	'n'
007	BEL	033	'!'	059	';'	085	'U'	111	'o'
008	BS	034	'"'	060	'<'	086	'V'	112	'p'
009	HT	035	'#'	061	'='	087	'W'	113	'q'
010	LF	036	'$'	062	'>'	088	'X'	114	'r'
011	VT	037	'%'	063	'?'	089	'Y'	115	's'
012	FF	038	'&'	064	'@'	090	'Z'	116	't'
013	CR	039	'''	065	'A'	091	'['	117	'u'
014	SO	040	'('	066	'B'	092	'\'	118	'v'
015	SI	041	')'	067	'C'	093	']'	119	'w'
016	DLE	042	'*'	068	'D'	094	'^'	120	'x'
017	DC1	043	'+'	069	'E'	095	'_'	121	'y'
018	DC2	044	','	070	'F'	096	'`'	122	'z'
019	DC3	045	'-'	071	'G'	097	'a'	123	'{'
020	DC4	046	'.'	072	'H'	098	'b'	124	'|'
021	NAK	047	'/'	073	'I'	099	'c'	125	'}'
022	SYN	048	'0'	074	'J'	100	'd'	126	'~'
023	ETB	049	'1'	075	'K'	101	'e'	127	DEL
024	CAN	050	'2'	076	'L'	102	'f'		
025	EM	051	'3'	077	'M'	103	'g'		

9.4.9. Printer Control

Most printers use embedded control characters to specify different fonts, colours and paper cutting. Consult your printer manual for details of these control characters. Enter the control characters directly into the printer ticket format string to create the desired printing effects.

10. Setpoints

10.1. Introduction

The **5000** is fitted with four built-in setpoints. The status of the setpoints is displayed on four LEDs in the display window. An optional Output Driver card can be fitted to allow each of the setpoints to drive external devices. The LEDs then show the status of the output drivers.

Each of the setpoints provides a simple comparator function that can be modified in the digital setup for switching direction, hysteresis and logic. These settings are all that are required to configure normal level or limit operation. Free-Flight (Free-Fall) functions can be enabled to configure the **5000** for weight-batching applications.

Weight target and flight settings can be preset in the digital setup. This method is used where the settings are changed infrequently, and are to be as tamper-proof as possible. Optionally, weight target and flight settings can be set from the front panel keys. This allows settings to be changed much more readily by the operator.

10.2. The Status LEDs

The display of the **5000** contains four status LEDs labelled 1, 2, 3 and 4. Each of these corresponds to a setpoint status, where the LED number represents the number of the setpoint displayed. Each LED is linked with the output driver in such a way that when the driver is ON (enabled) the LED is ON.

Note that for multi-range instruments the status LEDs are used to show the current range and not setpoint status.

10.3. Connection

Refer to Section 12 Accessories and Options page 61 for the method of connection of the external output drivers.

10.4. Setpoint Settings

Setpoint targets and flights can be entered into the digital setup in the Setpoint Group. The digital setup can be locked with a security code to prevent unauthorized tampering with the preset values.

An alternative method of accessing the setpoint values is via the front keys.

See Section 5.7, page 19 for details on operator access to setpoint parameters.

Any change to a setpoint value will be used immediately.

The following sections describe each of the available setpoint settings

10.4.1. Activity

Each of the setpoints may be disabled in the digital setup. Any setpoint set to be Active will be enabled. Any Inactive setpoint is disabled.

10.4.2. Locking

Individual setpoints can be locked against operator alteration. Setpoints that have been locked cannot have their target or flight values changed via the operator access menus that are linked to the **<TARE>** key.

10.4.3. Source

The Source setting directs each setpoint to operate off either the Gross or Net weight reading.

10.4.4. Direction

This determines the direction of weight movement that the setpoint is intended to trip on. Use 'Over' in applications where the weight increases toward the target value, for example in the filling of a weigh bin. Use 'Under' in applications where the weight decreases towards the target or when using negative targets, for example when weighing out of a silo.

10.4.5. Logic

Logic determines the sense of the output. Logic High is the normal operation of the output. Consider the example of an overload alarm where the output is ON for weights over the target value and OFF otherwise. This corresponds to Logic High operation. Logic Low reverses the operation of the output so it would be ON below the target and OFF above it which is suited to filling operations. Logic is automatically set when using the extended batching features.

10.4.6. Alarm

The **5000** can be set to sound its internal beeper when any particular setpoint output is energized. Three types of warning sounds are available to allow the audible response to be designed to suit the weighing application. Audible alarms can be either continuous (c), sounding once (S), or sounding twice (d), at one second intervals.

10.4.7. Targets

This is the target weight value. The **5000** calculates a trip point based on the values of target, flight and the direction of operation. For increasing weights (Over) the trip point is the target value minus the flight compensation. For decreasing weights (Under) the trip point is the target value plus the flight compensation.

10.4.8. Hysteresis

Hysteresis forces a preset margin in the trip point. This stops the output from 'chattering' due to minor weight fluctuations at the trip point value. For increasing weights (Over) the hysteresis is used below the trip point and for decreasing weights (Under) it is used above the trip point.

10.4.9. Flights

Flight compensation is used in weigh-batching installations to force the feeders to shut off early to allow for the amount of material still in flight between the feeder gate and the surface of material already in the weigh-bin. If a setting of 000000 is entered for the flight, then compensation for that setpoint will be disabled. This value is initially set by the operator. In extended batching it is possible to have the in-flight settings automatically updated at the end of each batch to track out any errors.

The following diagram illustrates the basic operation of a setpoint and the roles of target, flight and hysteresis settings.

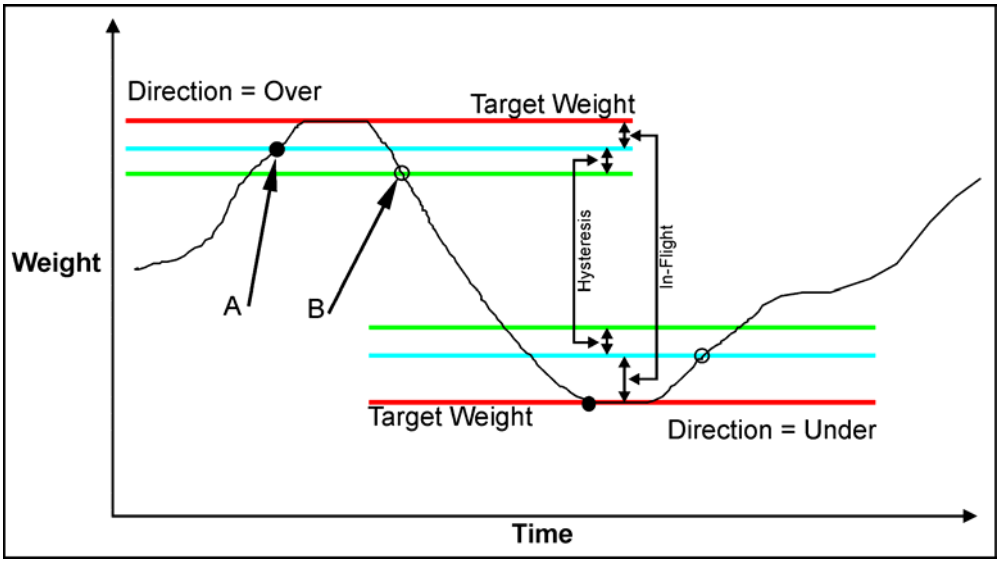


Figure 6: Setpoint Operation – Over vs Under

- **Active Setpoints:** Note the difference between **Over** and **Under** directions.
- If the Logic is set to **High** the output is turned on at point **A** and off again at point **B**.
- If the Logic is set to **Low** the output is turned off at point **A** and on again at point **B**.

Example 1:

Level control of a 2000 kg tank with a shut off delay of 50 kg.

Direction = Over, Logic = Low, Source = Gross, Target = 2000kg, Flight = 50 kg, Hysteresis = 200 kg. Weight initially 0 kg.

Trip point = target - flight = 2000 - 50 = 1950 kg.

The output will initially switch ON at 0kg. The weight in the tank will increase to the trip point of 1950 kg and switch OFF. Due to the shut off delay the final weight in the tank will settle around the 2000 kg target. As product is removed from the tank the weight will drop until it falls below 1750 kg (trip point - hysteresis) at which time the output will turn ON again.

If the tank was gravity fed the logic could be changed to High and the output would then be initially OFF at 0 kg, switch ON at a weight over 1950 kg and switch OFF again as the weight fell below 1750 kg.

Example 2:

Weighing product out of a silo into 100 kg drums.

Direction = Under, Logic = Low, Source = Net, Target = -100kg, Flight = 5 kg, Hysteresis = 1 kg. Weight initially 0 kg net.

Trip point = target + flight = -100 + 5 = -95 kg.

Once the **<TARE>** key is pressed the output will switch ON as 0 kg net is higher than the -95 kg net trip point. Product will leave the silo until the -95 kg trip point is reached and the output will switch OFF. The output will not switch on again until the net weight is higher than -94 kg (ie. trip point + hysteresis).

10.5. Extended Batching Operation

Extended batching is an optional extra with the **5000** and allows the 4 setpoints to be configured to implement a variety of advanced batching control functions. This option may be ordered and installed at the time of purchase or it may be activated by entering the correct license number for the instrument at any time thereafter. For more information about optional extras and license numbers see section 12.7 p64.

In order to effectively use these functions it is necessary to setup the remote inputs to perform Start\Pause\Abort and Interlock functions. Refer to Section 11.1.5 Extended Setpointing Batch Control on page 59 for details of how to setup the remote input functions.

The existing settings like Direction, Logic, Target value etc. are used in exactly the same way with extended batching but the timing and sequence of each process is altered. Following are details of the additional settings available with the extended batching option. These items are all found in the (Set.PtS) group.

10.5.1. Activity (ACtivE)

This setting defines the activity of each of the setpoints. The available options are listed below: Enter the setpoint activity settings first as the other menus present only those settings that suit the particular activities enabled.

Option	Function
-	Disabled
A	Active always. (Eg. Overload Alarm or Tank level controller)
1	Material 1. All setpoints specified as material 1 are combined to produce a multi-feed batch of the first product. These setpoints are inactive until the Start Key is pressed.
2	Material 2. Once all the setpoints linked to material 1 are finished any setpoints allocated to material 2 are activated.
d	Dump process. Any setpoints allocated to the dump process are activated after the material filling is finished. During the dump process the setpoints are activated until the weight reading stabilises within the Zero 'Dead' Band.

Option	Function
F	Finish Pulse Output. Any setpoints specified as F will be energised for the "Finish Delay" time (set from 0.1 to 20.0 seconds). This can be used to alert the operator that the batch is finished, trigger an external process or it may be used as an alternative to the dump process directly. This is particularly useful in applications where the dumping is implemented by a pneumatic ram or similar device that interferes with the weight readings while activated. Select the FINISH item from the DELAY list to specify the period of time for the Finish setpoint to be active.
m	Motion Indication. This type of output is a simple indication of the motion status of the current weight reading.
0	Zero Indication. This type of output is a simple indication that the weight is within the Zero 'Dead' Band setting.
P	Pause Indication. This type of output is active whenever the batching process has been paused. Use this to drive an external alarm or to shut off primary feeders etc. until operator intervention clears restarts the batch.

10.5.2. Hysteresis/Tolerance (HYS)

As with standard setpointing Hysteresis forces a preset margin in the trip point. This stops the output from 'chattering' due to minor weight fluctuations at the trip point value. For increasing weights (Over) the hysteresis is used below the trip point and for decreasing weights (Under) it is used above the trip point.

With extended batching the hysteresis takes on an additional role as the tolerance setting. At the end of a filling process the final weight of material is compared to the target weight and if the error is larger than the hysteresis setting an error is displayed and the batch is paused to allow for manual intervention. To disable tolerance checking simply set the hysteresis/tolerance to 0.

10.5.3. In-Flight Adjustment (FLt)

The in-flight values may be automatically adjusted to track and remove any batching errors. The in-flight adjustment sets the percentage of filling error that is used to correct the in-flight value. This can be set from 0 to 100%. Larger values of adjustment rapidly remove any errors but make the system more sensitive to overshoot and hunting.

To further limit the effect of any one batch, the in-flight values cannot be adjusted by any more than 50% of their current value, regardless of the size of the error.

Example: Target = 100kg, In-flight = 10 kg, In-flight adjustment = 25%.

Suppose product filling finishes with a final weight of 96kg giving an error of -4 kg. The 25% in-flight adjustment gives an adjustment of -1 kg that brings the in-flight value to 9 kg.

10.5.4. Delay Settings (dELAY)

A number of delay settings are available to control the speed of the batching process. These delays allow for material settling and make it easier to follow exactly what is happening.

Delay 1 and 2: Each of materials 1 and 2 has an adjustable delay setting that controls the time delay at the end of the filling process. The time delay may be set from 0.1 to 20.0 seconds. It is also possible to set the delay to 0.0 seconds which forces the program to pause and wait for the operator to resume the rest of the batch.

Finish Delay: Setpoint outputs specified with 'Finish' activity are energised for this amount of time at the end of the batch. The finish delay may be set from 0.0 to 20.0 seconds. These outputs may be used to trigger external processes, alarms or as a direct dump process instead of using usual the 'dump to weight' process.

10.5.5. Batching Options (OPT)

The list of batching options available to control the batching processes are as follows:

(SEdb-)

S,A: 'S 'specifies a single batch resulting from each START key press. 'A' allows automatic restart at the end of each batch so that the first press of the START key starts a continuous batching process.

E,-: 'E' specifies that batching is paused whenever Overload, Underload or Error is detected. '-' allows the batching process to continue regardless.

d,-: 'd' enables an additional 1 second delay at the start of the filling and dump processes. This allows the operator to easily see final weights and the results of automatic tare operations etc. Set to '-' to increase batching speed.

b,-: 'b' enables the current batch number to be shown for two seconds at the start of each batch. Set to '-' to increase batching speed.

-,F: This setting specifies the type of feeder control. 'F' only allows one feeder at a time to be active for a particular material, '-' allows all the feeders for a material to be active at the same time.

10.5.6. Labels (LAbEL)

A ten character label is available for each of the 2 materials. This label is used to identify the material on printouts. These labels are entered in the same way as the ticket header. That is the ASCII code for each character is entered. See section 9.4.7 Custom Ticket Format on page 45 for details of the ASCII codes and how to enter them.

10.5.7. External Keys and Interlock

To control the batching process it is necessary to configure some if not all of the 4 external inputs available on the setpoint card to the following functions:

Start: This is used to start the batching process. Once the batch has been started the start key operates in the same way as the Pause/Abort key. It is possible to control the whole batching process with this single key.

Pause/Abort: This key will pause the batching process if running or resume the process if paused. A long press of the key will abort the batch completely.

Interlock: An interlock input is used to indicate that the dump gate is closed and it is safe to start filling product. If during the filling of material 1 or 2, the interlock signal is lost the batching process is paused and the filling is stopped. Obviously this signal is ignored during the dump process. Do not allocate any of the inputs to this function if you do not wish to use interlocking.

Dump Enable: The dumping process is delayed until a dump enable signal is detected. This signal may be detected anytime after the batch has started. This is used to signal to the batching process that it is ok to proceed with the dumping process as conditions downstream are prepared to accept the product. If no inputs are assigned to this function it is assumed that the dumping process is cleared to proceed at all times.

10.5.8. Messages

A number of messages are used throughout the batching process. These messages are listed below:

START: This is displayed every five seconds at the end of the batch to indicate that the batch is finished and the instrument is waiting for the Start Key to be pressed for the next batch.

DUMP: This is displayed if the dump process is ready to begin but a Dump Enable signal has not been received yet.

PAUSE OPER: This is displayed every five seconds to indicate that the batch has been paused by the operator.

PAUSE OL, PAUSE UL, PAUSE ER: This message indicates that the batch has been paused due to overload (OL), underload (UL) or Error (ER) detection.

PAUSE TOL: This message indicates that the batch has been paused because the filling error in the last material filled is outside the tolerances set by the HYS setting.

PAUSE I.LOC: This message indicates that the batch is paused due to the loss of the interlock signal during the filling of a material.

PAUSE PROG: This message indicates that the batch is paused due to a programmed pause step enabled by entering 0.0 seconds for a material delay.

10.5.9. Printing

When the **5000** is operating as a batching controller there are a number of automatic printouts that are available. The format of these printed tickets is fixed and cannot be freely programmed like the standard printouts. However the ticket format string is used at the end of each of the printed tickets. In this way it is possible to extend the standard printouts to add printer control characters etc. All other printer settings operate as normal.

To setup for setpoint printing set the SER2 item to 'Print' and set the PRNT.TP item to either 'Single', 'Double' or 'Ticket'. The automatic printing options (A.Sing, A.Doub. and A.tic) generate printouts of the current weight whenever the weight reading settles and are not recommended for use with setpointing.

Information is printed at the start of the batch, and at the end of filling for each product. Material Labels are programmable.

Pressing the **<PRINT>** key triggers the output of the accumulated number of batches and product totals. A long press of the **<PRINT>** key clears these accumulated totals.

- **Single line printout**

At the start of the batch the batch number is printed and a single line of information containing the weight of product weighed, along with units etc. is printed at the end of each product fill for the batch.

```
Batch 00005
Cement:      100 kg N
   Water:    1500 kg N
```

- **Double Line Printout**

This is identical to the single line printout above, but the product information is spread over two lines and includes the target weight.

```
Batch 00005
Cement:
   Target:      100 kg N
   Actual:        99 kg N
Water:
   Target:     1500 kg N
   Actual:     1501 kg N
```

- **Full Printed Ticket**

This format is similar to the double line printout but the programmed header and date are printed out at the start of the batch.

```
ACME Concreting
PH 33333111
23/06/1999   11:00:07
Batch 00005
Cement:
   Target:     100 kg N
   Actual:       99 kg N
Water:
   Target:    1500 kg N
   Actual:    1501 kg N
```

- **Product Totals**

The total amount of product weighed for material 1 and 2 along with the total number of batches can be printed manually by pressing the **<PRINT>** key. The totals are cleared by holding the **<PRINT>** key for two seconds.

The format of the product total printout is similar to the individual product tickets with differences depending on which format is specified. If using Full Ticket format the header and date are printed first followed by the totals. Single and Double line formats are the same but don't include the header or date.

Example: Full Ticket Total printout.

```
ACME Concreting
PH 33333111
23/06/1999   11:00:07
   Batches:   00025
   Total Cement:   2469 kg N
   Total Water:    37452 kg N
```

- **Printout due to Batch Abort**

If a batch is aborted after starting then the amount of product partially filled is printed followed by the following:

```
Batch 0005 Aborted
```

10.5.10. Examples

- **Example 1**

Single Material feeder with a tip dump activated by a one second pulse from a pneumatic actuator.

Activity: 1-FP, Direction: O - - -, Source: G - - -,

Target = 2.000kg, Flight = 0.050 kg, Hysteresis = 0 kg.

Output 1 is set for the material 1 feed, output 2 is unused, output 3 is set for the finish pulse used to dump the material, and output 4 is set to warn if the batch is paused. Set options like automatic restart and overload checking etc via the OPT menu item (described above). Set the 1.0 second finish time via the DELAY/FINISH setting.

Set the hysteresis weight other than zero to specify the acceptance tolerance of each batch. Eg Hysteresis = 0.020 kg would pause any batch where the final weight was different than the target by more than 20 g.

- **Example 2**

Two material batch with dual feed on material 1 filling into a hopper with a dump gate. The dump cycle must not proceed until an acknowledge signal is received from the operator.

Activity: 112d, Direction: OOO-, Source: GGn-,

Target1 = 200kg, Target 2 = 250 kg, Target 3 = 120 kg.

Flight 2 = 5 kg, Flight 3 = 2 kg,

Hysteresis 2 = 10 kg, Hysteresis 3 = 1 kg.

Outputs 1 and 2 are set for the material 1 fast and slow feed, output 3 is set for material 2, and output 4 is set for dump. Set options like feeder control, automatic restart and overload checking etc via the OPT menu (described above).

- **Example 3**

Weigh out from a silo.

Activity: 1 - - -, Direction: U - - -, Source: n - - -,

Target = -200kg, Flight = 10 kg, Hysteresis = 5 kg.

Output 1 is set for material feed. After the start key is pressed the weight is tared and material is released from the silo until a net weight of -190 kg is reached. At this time the material feed is shut off and the target weight should settle to -200kg +/- 5 kg. Set options like feeder control, automatic restart and overload checking etc via the OPT menu (described above).

11. Extended Functions

11.1. Introduction

The **5000** has up to four independent remote input functions that may be triggered by external keys connected to the optional setpoint card. The function of each of these keys may can be configured to any of the options detailed below. See Section 7.8 Special Settings Menu - (SPEC) on page 31 for details on how to configure the remote input functions.

11.1.1. Front Panel Keys

The function of each of the front panel keys may be implemented with the remote keys. The Front Panel keys are designated ‘0TGP” to match Zero, Tare, Gross/Net and Print.

11.1.2. Blanking

This function designated ‘b’ for blanking allocates the selected input as a blanking input. When active this input causes the front display to be blanked to “- - - - - -“ and blocks the operation of the front keys. This function is intended for use with tilt sensors on mobile weighing platforms to block operation of the weight indicator if the scale is not level.

11.1.3. Locking

This function designated ‘L’ for locking allocates the selected input as a locking input. When active all keys, including the remote keys are blocked. This may be used with a keylock switch to lock the instrument when not in use.

11.1.4. Totalising

Select (Prnt.tP) from the (Prn.Opt) list in the (SEriAL) group and set the printer output type to either Total or A.Total to enable totalising.

When Total Printing is enabled, the **<PRINT>** key is used not only to print the current weight but to add that weight to the current total. The **5000** displays “count” followed by the number of items in the total. After this “total” is displayed followed by the current total weight. If the total weight is too large to display in 6 digits, it is shown in two sections labelled as “TOT.HI” for the upper 6 digits and “TOT.LO” for the lower 6 digits. A long press of the **<PRINT>** key causes the total accumulated weight to be printed and then cleared.

Three other functions are available remotely. These are Show Current Total (‘S’), Clear Total (‘C’) and undo last print (‘u’). Show Current Total forces the indicator to display the number of items in the total followed by the current total weight. There is no printout. Clear Total prints the current total and clears it. Undo Last subtracts the last item added to the current total and prints “Last Entry Cancelled”.

See Section 9.4.4 Total Ticket Printing on page 44 for details of the printed output from totalising.

11.1.5. Extended Setpointing Batch Control

Four functions are available to control extended setpointing from the remote keys. These are Start (r), Pause/Abort (A), Interlock (i) and Dump Enable (d).

The Start Key is used to start a batch running and must be enabled if using the extended batching functions for any sort of filling process. Once the batch has been started the start key operates in the same way as the Pause/Abort key.

The Pause/Abort key is used for manual control over the batching process. The Pause key causes the currently running batch to be paused with the “Pause Oper” message displayed every five seconds. A second press of the Pause Key or a press of the Start Key will resume the batching. A long press of the Pause Key causes the current batch to be aborted and a message printed. The amount of material filled up until the batch was aborted is still added to the total weight filled and the total number of batches includes aborted batches in the count.

The Interlock input is used to guard against the filling of product if the dump gate is open. If this option is used material filling is only carried out while the interlock signal is active. If the interlock signal is lost the batch is paused and “Pause I.Loc” message is displayed every five seconds until the batch is resumed.

The Dump Enable input is used to delay the start of the dump process. If the Dump Enable signal is detected at any time after the start of the batching, the dumping process is cleared to proceed. The Dump Enable input can be used to allow an operator to signal that the container to be filled is safely in place or it may be used to synchronise multiple instruments sharing the same dump shute.

The total amount of material filled is updated with each new batch in two separate total accumulators - one for each material. To print the totals and number of batches press the **<PRINT>** key. A long press of the **<PRINT>** key or a press of the Clear Total key will cause the totals and number of batches to be printed and cleared.

11.1.6. Single Serial Transmission

Two functions (‘1’ and ‘2’) are available to implement a single transmission of weight data from either of the serial ports. Use ‘1’ to specify serial port 1 and ‘2’ for serial port 2. To use this feature it is also necessary to configure the respective serial port for SINGLE operation. See Section 7.7 Communications Options - (SEriAL) on page 29 for details.

Each time a single serial key is pressed the instrument transmits one weight message from the serial port. The format of the message is setup in the AUT.OPT menus and is exactly the same format as for an equivalent automatic transmission message.

The single serial transmission functions are a convenient way to implement simple PLC communications and logging without the complexity of setting up two way communications on the serial ports.

11.1.7. Hold Functions

Two functions (‘H’ and ‘E’) are available. ‘H’ implements a manual hold function and ‘E’ implements a Peak hold function. The instrument annunciator flashes to indicate that the displayed weight is a held weight and not the current weight.

Press the manual hold key once to hold the current displayed weight. Press the manual hold key again to return the display to normal weighing.

Press the peak hold key once to show the absolute peak weight reading. Press the peak hold key again to return the display to normal weighing. A long press of the peak hold key clears the peak value back to 0. The largest absolute weight (either positive or negative) is stored in the peak value.

All printouts that print the displayed weight will use the held weight reading if it is currently begin displayed. The single and double line printouts use displayed weight but, the standard ticket format prints gross, net and tare weights regardless of the displayed weight. Use the \w format character to specify displayed weight when using formatted ticket printing.

12. Accessories and Options

12.1. Introduction

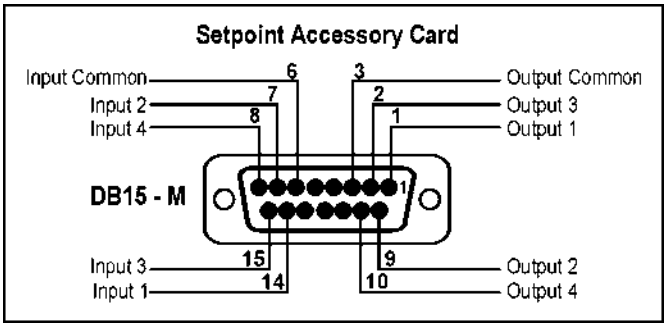
The **5000** can be expanded by the installation of optional accessory cards. Three different cards are available, the analog output card, the setpoint card and the combo card.

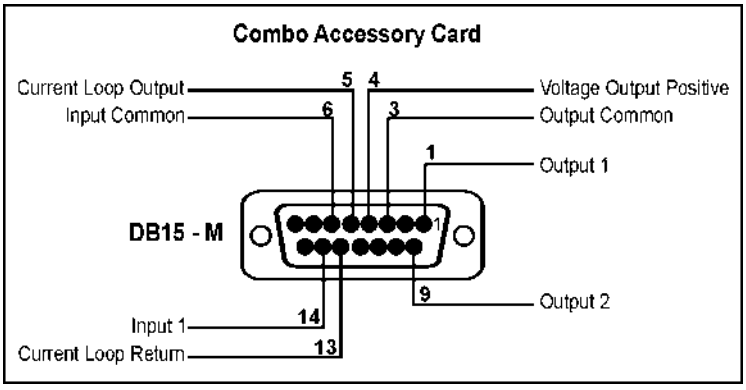
12.2. Installing Option Cards

- Isolate the **5000** from the power before attempting to install an accessory card. Avoid excess handling of the accessory card as each card contains static sensitive devices. Hold the card by the edges or mounting plate as much as possible.
- Each option card is installed into a slot in the back panel of the **5000**. The slot is accessed by removing the cover plate at the top left. The connector lead is attached to the inside of this plate. Separate the lead from the plate taking care not to lose the lead inside the **5000**. Discard the plate, but retain the two mounting screws. Clean any remnants of tape from the lead connector.
- Plug the lead connector onto the four pin socket on the accessory card. The connector only fits one way round.
- Slide the card into the slot in the back of the **5000**, cable end first, until the mounting plate is fitted against the back plate. Re-install the two retaining screws.

VERY IMPORTANT: The EMC resistance of the accessory card depends on a sound electrical connection between the support plate and the case of the **5000**. Make sure that this connection is as sound as possible when refitting the two retaining screws.

12.3. Accessory Card Connection



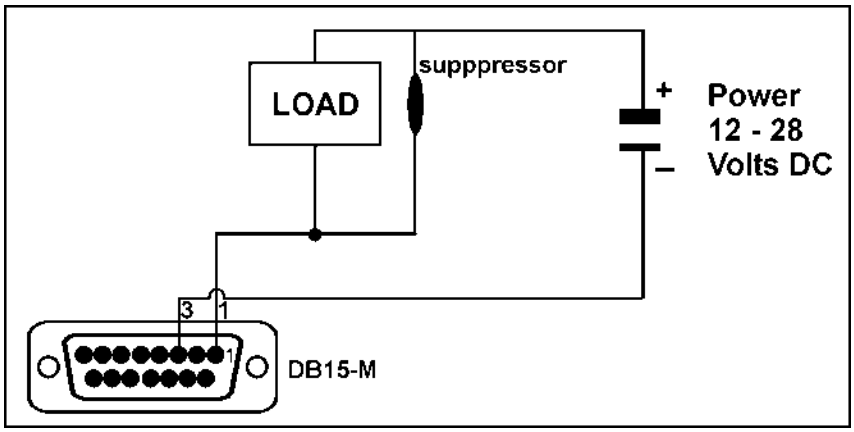


12.4. Setpoint Card

The standard **5000** displays the results of checkweigh or setpoint function on the front panel annunciator LEDs only. These signals can be used to drive external devices by installing an output driver card. The card carries four independent opto isolated open-collector transistor drivers. These can be used to operate external devices such as relays, signal lamps or PLC inputs. The card also has four opto-isolated remote inputs. The function of each input can be selected. See Section 11 Extended Functions on page 58.

12.4.1. Output Drivers

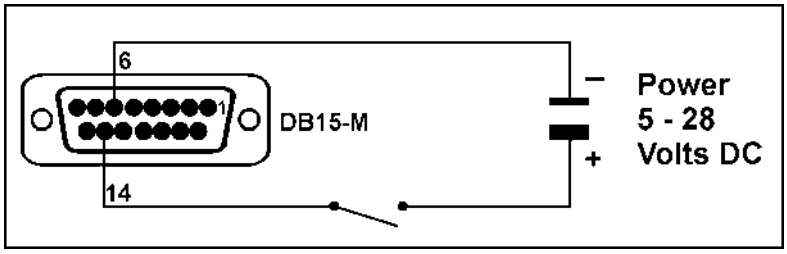
The output stage does not contain a power source and must be powered externally. The external supply should be from 12 to 28 volts DC and the maximum load current must be less than 0.5A .



The circuit diagram above shows a typical connection for one of the outputs. Each driver is protected against electrical noise, but it is strongly recommended that spark suppressors are fitted across any inductive loads such as relay and solenoid coils.

12.4.2. The Remote Inputs

Each input is opto-isolated, and requires a voltage input of between 5 and 28 volts DC to trigger. The following diagram shows a typical input circuit.



The following table shows the connections for the I/O card.

Pin No.	Function	Description	Connect To
1	OUT 1	Output 1	Load 1
9	OUT 2	Output 2	Load 2
2	OUT 3	Output 3	Load 3
10	OUT 4	Output 4	Load 4
3	OUTCOM	Output Common	Output Supply Negative
6	INCOM	Input Common	Input Supply Negative
14	IN 1	Remote Function 1	Contacts 1
7	IN 2	Remote Function 2	Contacts 2
15	IN 3	Remote Function 3	Contacts 3
8	IN 4	Remote Function 4	Contacts 4
SHELL	CH.GND	Chassis Ground	Cable Shield

12.5. The Analog Output Card

The card provides both a 4 to 20 mA and a 0 to +10 volt output proportional to the displayed reading. The two outputs are optically isolated from the internal circuits of the **5000**, but are not isolated from each other.

The current loop driver is active and supplies the source of power for the loop. The maximum circuit impedance must not exceed 350 ohms.

The Voltage output can drive into loads down to 2,000 ohms. Shielded cable should be used for connecting the analog outputs to external devices.

The connections for the two outputs are given in the following table.

Pin No.	Function	Description	Connect To
1	I (-)	Current Loop Return	
2	I (+)	Current Loop Output	Maximum load 350 ohms
4	V (+)	Voltage Output Positive	Minimum load 2000 ohms
5	V (-)	Voltage Output Negative	
SHELL	GND	Chassis Ground	Cable Shield

The analog outputs are factory adjusted and should not require further adjustment in the field. At no time should the analog card be removed while the power is connected as this may permanently damage the indicator.

12.6. 'Combo' Card

This card provides either a -10 to 10 Volt analog output or a 4 to 20 mA analog output. In addition it also provides two outputs and 1 input as per the setpoint card. The outputs are isolated from the input and the analog outputs. For more information on the connection of the outputs and input see details on the setpoint card above.

The current loop driver is active and supplies the source of power for the loop. The maximum circuit impedance must not exceed 500 ohms. The range of output is extended to include 0 to 24mA that allows for readings outside 0 to fullscale to be detected.

The Voltage output can drive into loads down to 2,000 ohms. The voltage output can be used with negative as well as positive weights with 0V representing zero weight and 10 V representing fullscale weight.

Shielded cable should be used for connecting the analog outputs to external devices.

With the Combo-card either voltage or current output must be selected. It is not possible to drive both simultaneously. Fine adjustment of the analog output is possible using the Cal.Lo and Cal.Hi options in the analog menu.

The following table shows the connections for the Multi card.

Pin No.	Function	Description	Connect To
1	OUT 1	Output 1	Load 1
9	OUT 2	Output 2	Load 2
3	OUTCOM	Output Common	Output Supply Negative
6	INCOM	Input Common	Input Supply Negative
14	IN 1	Remote Function 1	Contacts 1
4	V (+)	Voltage Output Positive	Minimum load 2000 ohms
5	I (+)	Current Loop Output	Maximum load 500 ohms
12	V(-)	Voltage Output Negative	
13	I (-)	Current Loop Return	
SHELL	CH.GND	Chassis Ground	Cable Shield

12.7. Fine Adjustment of Analog Outputs

The analog outputs from either the combo card or Analog Output card are factory calibrated and can be used directly as shipped. However in some applications it is necessary to fine tune the output to achieve maximum performance.

From the (AnALOG) group select the (CAL.Lo) and (CAL.Hi) items to calibrate the low(0V or 4mA) and high outputs(10V or 20mA) respectively.

Calibrate the low output first followed by the high output. Use the (Frc.Anl) item to force the output Lo and Hi as a final check.

The fine adjustment procedure is carried out as follows:

- Use an external instrument to measure the analog output.
- Select (CAL.Lo) or (CAL.Hi) from the (AnALOG) group by pressing **[ITEM]**.
- Press the **[SELECT]** key to start the fine adjustment and switch between **"uP"** and **"dn"** to either increase or decrease the analog output.
- Press the **[CHANGE]** key to make the adjustment. The analog output is increased ("up") or decreased ("dn") every time the **[CHANGE]** key is pressed. For large changes hold the **[CHANGE]** key down and it will repeat at about 10 times per second.
- Press the **[ITEM]** key to save the changes and return to the menu.

12.8. Smart Software Licensing Options

Serial Communications, Enhanced Setpoint Batching and Modbus Network Support are optional extras with the **5000**. The standard instrument does not have these options enabled. To enable any of these options it is necessary to purchase a license code which may be entered into the instrument by the factory at the time of purchase or it may be entered via the setup menus at any time thereafter.

This system provides for the maximum amount of flexibility. The **5000** can still be purchased at very competitive prices without paying for options you don't need and if at a later date the options are required, the upgrade can be made on site without the need to return the instrument to the factory. This also makes it far easier to take advantage of bulk discounts.

The license codes are unique to each instrument. To purchase a license code for an existing instrument, the serial number (see sticker on rear of the instrument) must be obtained.

Follow the procedure below to check to see what options are fitted or to install another option. If the code is entered correctly the updated licensing options are displayed and you are returned to the menus.

• Enter Setup by pressing the SETUP key on the front of the instrument.
• Press The **<ZERO>** key (marked GROUP) to advance from “build” to the “Factory” group.
• Press **<TARE>** key to advance from “deflt” to “Config”.
• Press the **<TARE>** key (marked ITEM) to enter the next level of the menus.
• Press **<GROSS/NET>** key (marked SELECT) to enter the new code. The options currently enabled are displayed momentarily followed by “000000”.
• Using **<PRINT>** (marked CHANGE) and **<GROSS/NET>** keys, enter the new code as follows:
• Press the **<PRINT>** key to scroll from 0 to 9.
• Press the **<GROSS/NET>** key to advance to the right, one digit at a time.
• When the code is entered correctly press the <TARE> key to accept it. If the code is incorrect “No Entry” is displayed, otherwise the updated list of options is displayed. To enter the code again, or enter another code go back to step 5.
• Press the **<ZERO>** key to advance to –END-.
• Press the **<TARE>** key to exit the setup.

Software Option	Display	Features
0202 Serial Communications	"Serial"	Needed to enable the use of Ser1 or Ser2 for printing, remote display driving, networking etc.
0211 Intelligent Setpointing	"Setpnt"	Full batching capabilities for up to 2 materials.
0213 Modbus Communications	"Modbus"	Enables the use of the Modbus ASCII network protocol. Requires the Serial Communications option as well.

13. Error Messages

A number of error messages may be displayed to warn of operation outside of acceptable limits. These messages are given below. Short messages (xxxxx) will appear as a single message on the display. Longer messages (xxxxx)(yyyyy) will appear on the display in two parts, first the (xxxxx) part, then the (yyyyy) part.

13.1. Weighing Errors

These messages show status messages or errors that have occurred during the normal weighing operation.

Error	Description
(U - - - - -)	The weight is below the minimum allowable weight reading.
(O - - - - -)	The weight is above the maximum allowable weight reading. Warning - overloading may damage mechanical scale elements. (Check the condition of loadcell connections. Check for damaged load cell.)
(ZERO) (ERROR)	The weight reading is beyond the limit set for Zero operation. The operation of the **<ZERO>** key is limited in the setup during installation. Zero cannot be done at this weight. (Use TARE instead.)
(STABLE) (ERROR)	Scale motion has prevented a Zero, Tare or Print operation from occurring on command. (Try the operation again once the scale is stable.)
(PRINT) (ERROR)	A printer problem has prevented the printout from being completed. (Look for loss of printer power, no paper or cable fault.)
(CAL) (DUE)	The “calibration due” date has been set and the current date exceeds this limit. Press any key to clear the warning for 1 hour. To clear the warning permanently, recalibrate the instrument and set a new ‘calibration due’ date. See Section 7.12 page 34.

13.2. Setup Errors

These messages warn of setup entries that are not acceptable to the **5000** programme.

Error	Description
(RES) (LO)	The scale build is configured for less than 100 graduations. (Check the resolution (count-by) and Capacity settings)
(RES) (HIGH)	The scale build is configured for more than 100,000 graduations. (Check the resolution (count-by) and Capacity settings)

13.3. Calibration Errors

These messages warn of incorrect calibration technique, or of attempts to calibrate the **5000** beyond it’s specification.

Error	Description
(ZERO) (HI)	The load cell output is beyond allowable zero calibration range. (Check for incorrect scale connection. Reduce the dead load, or shunt the load cells.)
(ZERO) (LO)	The load cell output is below allowable zero calibration range. (Check for incorrect scale connection. Increase the dead load, or shunt the load cells.)
(SPAN) (LO)	The load cell signal range (span) is too small for these settings. (Incorrect span weight entered. Scale wiring incorrect. Wrong load cell capacity [too large]. Wrong or no calibration weight added to scale.)
(SPAN) (HI)	The load cell signal range (span) is too large for these settings. (Incorrect span weight entered. Scale wiring incorrect. Load cell capacity too small for application.)
(NO) (ZERO)	There is no valid zero calibration so the span calibration cannot proceed.

13.4. Diagnostic Errors

The **5000** continually monitors the condition of the internal circuits. Any faults or out-of-tolerance conditions are shown on the display as an E type error message. In the table below the following terms are used:

- Check = this item can be checked on site by service personnel.
- Service = the **5000** must be returned for factory service.

Error	Description	Resolution
E0001	The power supply voltage is too low.	Check supply
E0002	The power supply voltage is too high.	Check scale / cables
E0004	The load cell excitation voltage is too low.	Check scale/supply
E0008	The load cell excitation voltage is too high.	Check scale/supply
E0010	The temperature is outside of allowable limits.	Check location
E0020	Scale build is incorrect. The number of graduations has been set < 100 or greater than 100000.	Fix up scale build
E0040	The positive sense line is not connected.	Check connection
E0080	The negative sense line is not connected.	Check connection
E00C0	Neither sense line is connected	Check connection
E0100	The digital setup information has been lost.	Re-enter setup
E0200	The calibration information has been lost.	Re-calibrate
E0300	All setup information has been lost	Enter setup and calibrate
E0400	The factory information has been lost.	Service
E0800	The EEPROM memory storage chip has failed	Service
E2000	The Clock Calendar chip has failed	Service
E8000	The EPROM memory storage chip has failed	Service

The **E** type error messages are additive. For example if a condition is detected where the power supply voltage is low, resulting in a reduction of excitation voltage, the resulting Error messages will be **E0005** (0001 + 0004). The numbers add in hexadecimal as follows:

1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - A - B - C - D - E - F

(For example, 2 + 4 = 6, or 4 + 8 = C

14. Setup Menu Quick Reference

GROUP	(BUILD)	SCALE BUILD	Sect 7.4	Page 26
(tyPE)	Display Type			
(dP)	Decimal Point Position			
(CAP 1)	Max1 capacity (lower range)			
(E1)	Resolution (lower range)			
(CAP 2)	Max2 Capacity (upper range)			
(E2)	Resolution of upper range			
(UNItS)	Weighed units			

GROUP	(OPtion)	SCALE OPTIONS	Sect 7.5	Page 27
(USE)	Scale Use			
(FILTR)	Reading average			
(JittEr)	Anti jitter weight stabilization			
(MotiOn)	Motion Detection			
(AutO.Z)	Auto-Zero on Startup			
(Z.trac)	Zero Tracking sensitivity			
(Z.rAngE)	Allowable Zero Operating Range			
(Z.bAnd)	Zero 'Dead' Band			

GROUP	(CAL)	SCALE CALIBRATION	Sect 7.6	Page 28
(ZErO)	Zero calibration			
(SPAn)	Span calibration			
(Ed.Lin	Edit Linearisation points			
(CLr.Lin)	Clear Linearisation points			
(FAC.CAL)	Restore Factory Default Calibration			

GROUP	(SERIAL)	COMMUNICATIONS OPTIONS	Sect 7.7	Page 29
(SEr.1)	Serial Output 1			
(Ser.2)	Serial Output 2			
(nEt.OPt)	Network Options			
(Aut.OPt)	Automatic Output Options			
(Prn.OPt)	Printing Options			
(bAUd)	Baud Rate			
(bitS)	Bitmap pattern, Termination etc			

GROUP	(SPEC)	SPECIAL SETTINGS MENU	Sect 7.8	Page 31
(Full.PC)	Security passcode for Fulll Setup			
(Safe.PC)	Security passcode for Safe Setup			
(Key)	Locks or unlocks operating keys			
(InP.Fn)	Function of Remote Inputs			
(Sync)	A/D synchronization frequency			

GROUP	(TEST)	SPECIAL TEST FUNCTIONS	Sect 7.9	Page 32
(Scale)	Scale base test display			
(HI.rES)	High resolution display			
(Frc.Out)	Force the Digital outputs			
(tSt.InP)	Test the Digital Inputs			

GROUP	(SEt.PtS)	SET POINTS	Sect 7.10	Page 32
(ACtIvE)	Enable Setpoints			
(LOC)	Lock out Operator changes			
(SrC)	Weight Data Source			
(dir)	Output Switching Direction			
(LOGIC)	Active Relay Logic			
(Alarm)	Setpoint Alarm options			
(target)	Setpoint Targets			
(HyS)	Setpoint Hysteresis/Tolerance			
(FLt)	Setpoint In-flight			
(FLt Ad	Automatic In-flight adjustment			
(DELAY)	Time Delay settings			
(OPt)	Batching options			
(LABEL)	Material Labels			

GROUP	(AnALOG)	ANALOG SETTING	Sect 7.11	Page 34
(Src)	Select source (Gross, Net etc)			
(Type)	Select Output Type (Volt or Current)			
(CAL.Lo)	Fine Calibration of Low Output			
(CAL.Hi)	Fine Calibration of High Output			
(Frc.Anl)	Force Analog Output for test			

GROUP	(CLOC)	CLOCK SETTING	Sect 7.12	Page 34
(TimE)	Time set			
(dAtE)	Date set			
(qA.OPt)	“Cal Due” Option			
(qA.DAtE)	“Cal Due” Date			

GROUP	(FACtry)	FACTORY SETTINGS	Sect 7.13	Page 35
(dEfLt)	Restore Factory default			
(FAC.rSt)	Factory reset			
(COnFiG)	Licensed access code entry			

GROUP	(-End-) Exiting Setup	Sect 7.2	Page 24

Notes:

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SMART WEIGHING SOLUTIONS

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