SCALEHAWK

DIGITAL INDICATOR Reference Manual

For use with Software Versions 2.0 & above

2100-600 Rev 2.0

TABLE OF CONTENTS

SPECIAL NOTE — TRADE USE OF THE SCALEHAWK

This manual may occasionally make reference to Trade Use settings of the **Indicator**. Properly marked Trade Certified versions of the can be used in **Legal for Trade** applications. Trade Certification is available only with software Versions 2.0 and above.

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

1. Introduction

The **SCALEHAWK** is a precision digital indicator using the latest 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 (eg. **<ZERO>**, **<TARE>**, **<CLOCK>**, etc.), are retained when power is removed. There is a built-in clock for date-stamping printed outputs and the current time can be set to display at the top right of the instrument display.

The instrument has up to three internal setpoints with status display on the front panel. There are three Input/Output points on the auxiliary connector. Each one may be configured as a remote input or as a setpoint drive output.

The Communications software option extends the operation of the single RS-232 port. This allows communication with external computers, PLCs, printers and remote displays. Optional RS-232 to Current Loop or RS-485 converters are also available which convert the RS-232 output to either passive 20mA current loop or RS-485 communications.

The Special Function feature enables special functions (eg. peak-hold, livestock averaging, batching, etc.). The Batching feature enables the single material batching function. This allows for a single or dual speed feed with an optional dump to weight function. Automatic taring and negative weighing modes are also supported. Special functions can be assigned to the function key on the front panel or to any of the remote inputs.

The **indicator** has a soft power on/off key to automatically power down after a specified period of inactivity. The on/off key may also be bypassed inorder to power up automatically whenever power is available. There is a rechargeable battery pack available that mounts directly onto the rear of the indicator.

1.1. Weight Indicator Illustration

Figure 1: SCALEHAWK Weight Indicator

1.2. The Manuals

This Reference Manual is part of a set of manuals covering the setup and operation of the Indicator. The set includes the following:

- **Reference Manual** (this book) - Contains detailed information on the calibration and setup. This manual is intended for use by Scale Technicians who are installing the instrument.
- **Operator's Manual** - Aimed at the operation and covers the day to day operation of the unit. This includes details of the operation of the front panel and external key functions.
- **Quick Start Manual** - Intended for Scale Technicians. Simply a quick reference to menu options and connection diagrams, etc.

1.3. Document Conventions

The following document conventions (typographical) are used throughout this Reference 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 trade critical and the trade counter will be incremented if this setting is changed.
®	Functions marked with ® are only suitable for remote inputs.

2. Specifications

Performance		
Display		Backlit alphanumeric LCD with six 27mm high digits
Backlight		LED backlight with adjustable brightness
Display Resolution		Up to 30,000 divisions, minimum of 0.25μV/division (Trade 6000 divisions at 1μV/division)
Count-by		1, 2, 5, 10, 20, 50, 100 (Entered in Displayed Weight)
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 < 0.05μVp-p
Operating Environment		Temperature: –10 to +50°C ambient, 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 100 consecutive readings
Zero Range		Adjustable from +/– 2% to +/–20% of full capacity
A/D Converter		
Type		24bit Sigma Delta
Resolution		8,388,608 internal counts
A/D Sync Filter		Selectable 25/30Hz, FIR filter > 80dB
Load Cells		
Excitation		8 volts for up to 8 x 350 ohm load cells (6-wire + shield)
Serial Comms		(Software option 0224)
Serial output		Single RS-232 as automatic transmit, network or printer drive
Power Input		
Standard	General	9 to15VDC (60mA to 400mA depending on load cells and backlight) ON/OFF key with override and Auto-Off software
Variants	AC DC Battery	AC Power: 110/240VAC 50/60Hz 10VA fitted in s/s housing DC Power: 12-24VDC 10VA fitted in s/s housing Rechargeable: 12VDC Battery fitted in s/s housing (Refer to page 15 for more details of 2100 Indicator Variants.)
Dimensions		
Body size		189mm (L) x 99mm (H) x 23mm (D)
Panel cutout		Flush mounted with cable holes drilled separately (template provided)
Features		
Standard Features		Five point linearity correction
		Assignable function key for operator use
		3 remote inputs and lb/kg switching fitted as standard
		Battery backed clock and calendar fitted as standard
Approvals		NSC S403 approval (6000 divisions at 1μV/division). NMI TC6033 approval (6000 divisions at 1μV/division). C-tick approved and CE approved.
R-SMART" Soft ware Options		0224 RS-232 serial output for Auto, Printing or Network 0225 3 outputs with check-weighing software (shared with remote inputs)
Hardware Options		0080 (RS-232 / RS-485 Converter)
		0227 (Relay Output Module)
Spare Parts		0330 (110/240 VAC Power Supply)
		0331 (12-24VDC Power Supply)
		0332 (Rechargeable Battery)
		0348 Panel Gasket

3. Installation

3.1. Introduction

The **SCALEHAWK'S** precision electronics must not be subject to shock, excessive vibration or extremes of temperature, either before or after installation.

The inputs are protected against electrical interference, but excessive levels of electro-magnetic radiation and RFI may affect the accuracy and stability of the instrument. Electronics 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. For EMC immunity, termination of the load cell shield is important (ie. with a sound connection to the case via the DB9 backshell).

3.2. Panel Mounting

The simplest way to mount the **unit** is to use the drill template supplied. The template indicates positions for the drill holes for the two 4mm mounting screws through the panel. Also displayed on the template is the position of the rectangular hole that should be cut to allow for the connection of cables and also to display connection instructions. The drill template supplied with the indicator allows for front or rear machining of the panel.

An optional gasket (P/No 0348) is available for panel mounting installation.

3.3. DC Power Supply

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

Note that the rated voltage of most plug–packs is specified for loads close to but less than their rated output. If substantially lower loads are used the voltage output rises. Conversely if the plug pack is run at its maximum load the voltage will drop and it will run very hot. Typically plug packs with a rating of 9VDC to 12VDC with current outputs of 0.5 to 1A are fine. The Plug Pack 500mA, option (P/No 0110) is recommended for use with the **2100**. The Plug Pack 1.0Amp option (P/No 0121) is available for use with the rechargeable battery pack.

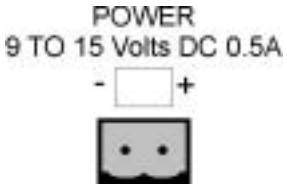


Figure 2: Power Connection

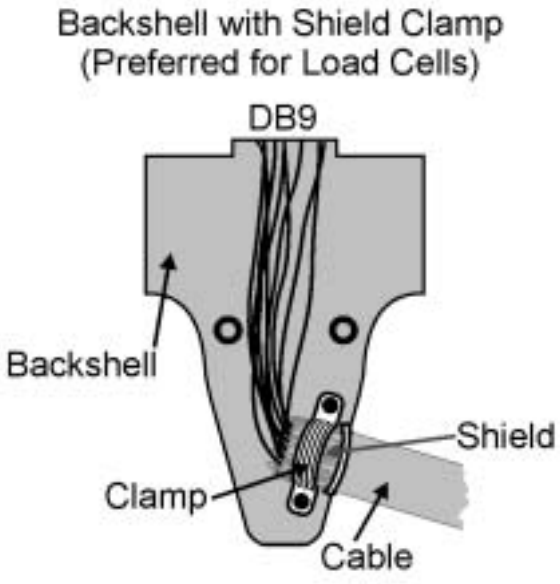
3.4. Load Cell Signals and Scale Build

Very low output scale bases can be used with this unit 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.

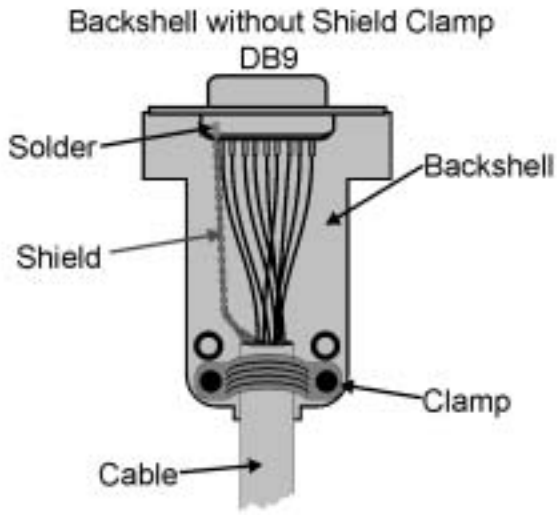
The **unit** has a milliVolt-per-Volt reading available which can be used to check scale base signal output levels. For more information refer to SCALE (Scale Base Test Display) page 35.

3.5. Connecting Shields

To obtain full EMC resistance with the **UNIT**, the load cell shield MUST be connected electrically to the metal shell of the DB9 connector.



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.



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

3.5.1. Cable Shield Connection and Earthing

- Care should be taken when connecting shields to maximise EMC immunity and minimise earth loops and cross-talk (interference) between instruments.
- For EMC immunity, termination of the load cell shield at the **UNIT** end is important (ie. with connection to the **UNIT** case via the shield connection).
- The **UNIT** enclosure is directly connected to the shield connections on the cables.
- The **UNIT** 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).
- The unit complies with relevant EMC standards provided case ground connection is correctly made. Resistance measured between t**he** case and nearest earth point should be less than 2 ohms.

3.6. 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.

3.7. Load Cell Connection

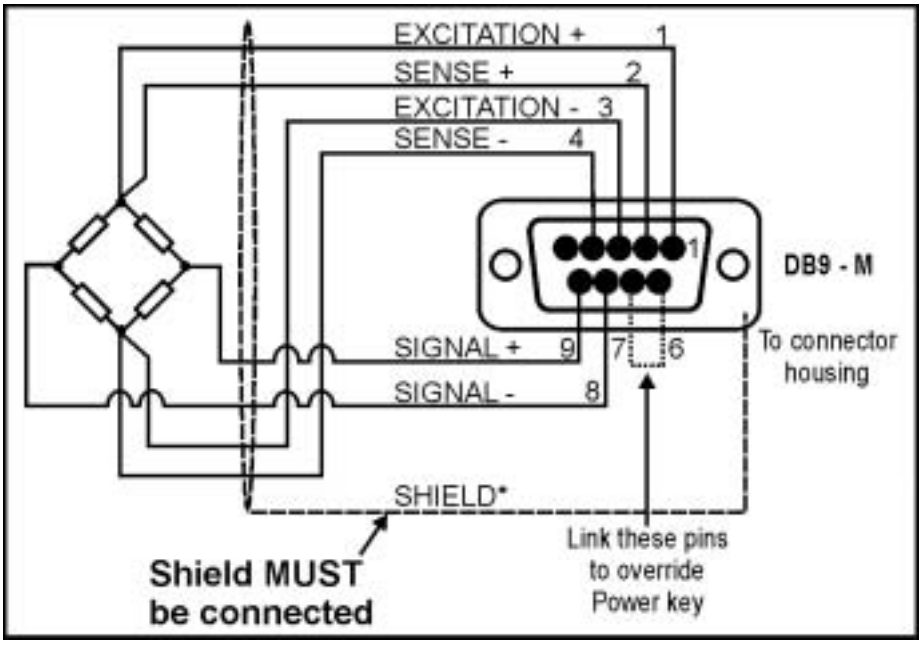
The following provides information on 6–wire and 4–wire connections.

3.7.1. 6-Wire Connection

The connection is made using a standard DB9 male plug that is supplied with the indicator. The load cell is wired for a 6-wire system as follows:

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

Table 1: 6-Wire Connections



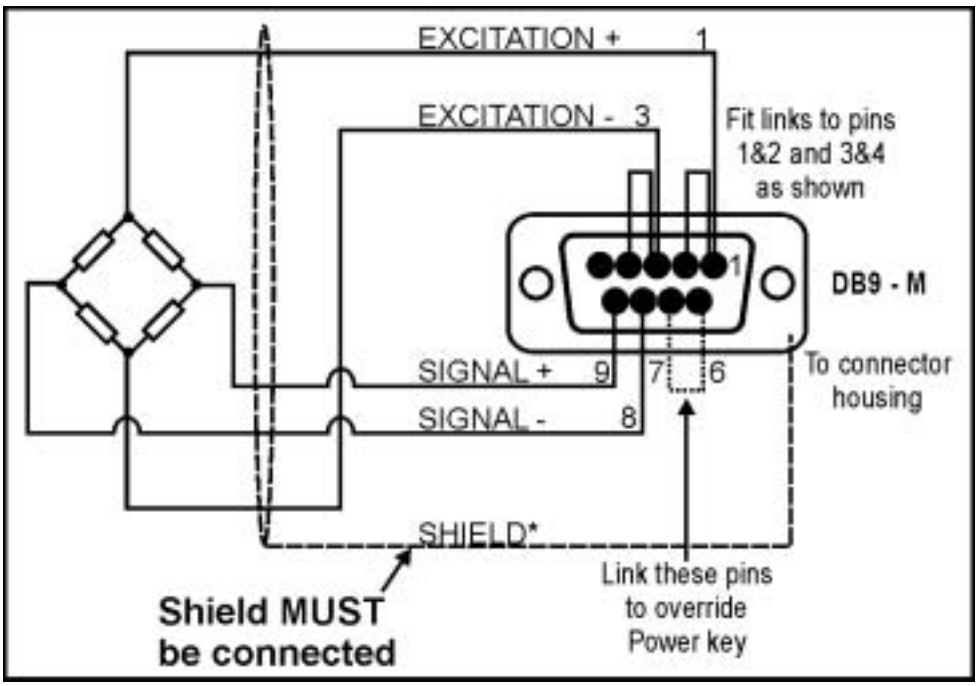
* For more information on Connecting Shields refer to page 9.

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).

3.7.2. 4-Wire Connection

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. This is to ensure that the excitation voltages are fed into the sense inputs (pins 2 and 4). Failure to do this will result in the incorrect operation of the unit.



* For more information on Connecting Shields refer to page 9.

Figure 5: 4-Wire Connection

3.7.3. ON/OFF Power Override

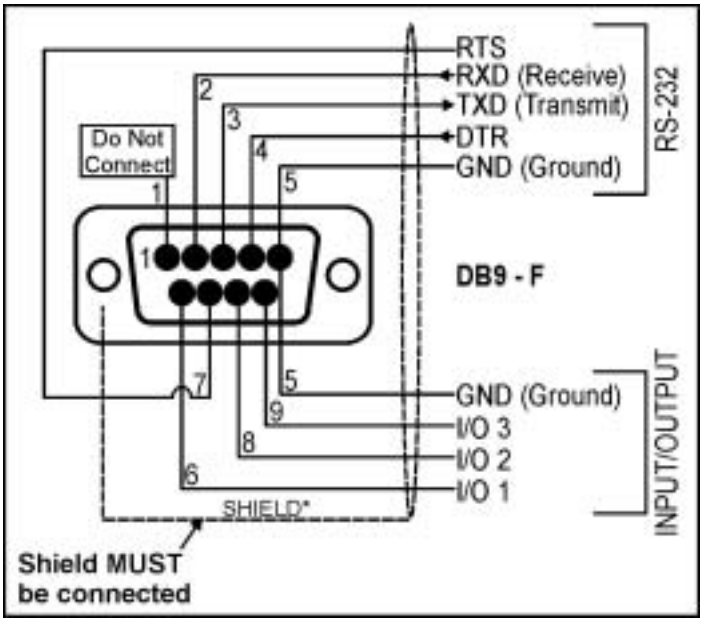
Pins 6 and 7 of the load cell connector provide a means to override the operation of the front panel ON/OFF key. If pins 6 and 7 are shorted on the load cell cable connector, the **UNIT** will automatically turn on as soon as power is available and not need to be turned on manually with the ON/OFF key. This is most easily done with a solder bridge on the back of the DB9 connector.

3.8. Auxiliary Connection

The **UNIT** has a male DB9 auxiliary connector which includes the RS-232 Serial Port and the three Input/Output connections.

Pin	Function	Description	Connect To
1	PWR	Power for communication accessory options	DO NOT CONNECT
2	RXD	RS-232 Receive Line	External Device Transmitter (Usually Pin 3 on PC DB9)
3	TXD	RS-232 Transmit Line	External Device Receiver (Usually Pin 2 on PC DB9 or Pin 3 on Printer DB25)
4	DTR	DTR Handshake Line	External Device Busy Line (Usually Pin 20 on printer DB25)
5	GND	RS-232 Digital Ground I/O Common	External Device Digital Ground (Usually Pin 5 for DB9 or Pin 7 for DB25)
6	IO1	Input or Output 1	
7	RTS	Request to Send	Used by 0080 RS-232/RS-485 converter
8	IO2	Input or Output 2	
9	IO3	Input or Output 3	

Table 2: Auxiliary Connection



Remote Display	
2100 Pin	**Remote Display Plug**
3 (TXD)	**RXD / Receive**
5 (GND)	**GND / Ground**

Printer	
2100 Pin	**Printer Plug – DB25F**
3 (TXD)	**RXD – Pin 3**
5 (GND)	**GND – Pin 7**
4 (DTR)	**DTR – Pin 20**

Direct Computer Link	
2100 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)**

Do not connect unused pins.

For more information refer to page 9.

* For more information on Connecting Shields refer to page 9.

Figure 6: Auxiliary Connection

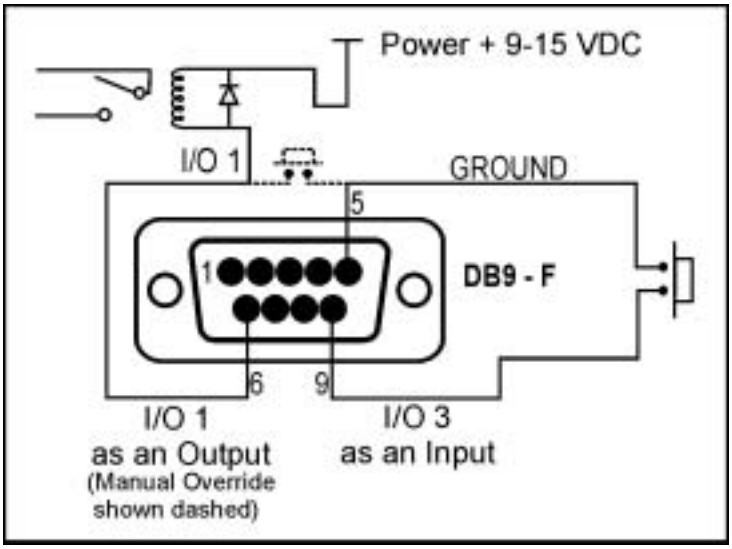


Figure 7: Connection of I/O Pins

3.8.1. Inputs

The unit assumes the I/O pin to be connected to GND (Pin 5) to register an active input (key press, etc.). Otherwise it assumes an open circuit.

3.8.2. Outputs

The output drivers of the unit are non-isolated open collector transistor drives which are capable of driving no more than 100mA each. For most applications this means that external relays will be needed. Use the same power supply for the external relays as for the **2100** itself. Connect a good quality bypass diode across the coil of any relays used as shown. (1N4004 diodes are suitable for most applications).

3.8.3. Manual Override of Outputs

Due to the way the unit drives the outputs, it is possible to connect an external key from the I/O Pin to GND to implement a manual override for the output. The key state cannot be detected by the unit when the I/O pin is configured as an output, but the key can be used to directly drive the output load. This is useful for providing operator manual override in many filling operations.

3.9. "SCALEHAWK" Software Options

Serial Communications and **Setpoint Batching** are optional extras with the unit. The standard unit does not have these options enabled. To enable any of these options it is necessary to purchase a software option 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 a maximum amount of flexibility. For example the unit can be purchased at a very competitive price, without paying for options you don't need. If, at a later date, the options are required, the upgrade can be made on site without the need to return the unit to the factory. This also makes it far easier to take advantage of bulk discounts.

The software option codes are unique to each instrument. To purchase a software option code for an existing instrument, contact Ranger Instruments and identify the instrument's serial number (see sticker on rear of the instrument).

3.9.1. Procedure to Enter a Software Option Code into the SCALEHAWK INDICATOR

- Press the **<POWER>** key to turn the unit on.
- Press and hold the **<POWER>** and **<FUNCTION>** keys together for two seconds.
- The currently installed software options are displayed and you will be prompted to enter the 6-digit software option code.
- Use the **<SEL>** and **<EDT>** keys to enter the code.
- Press **<OK>** when done.
- Continue entering all of the option codes required or to exit this procedure enter a code of **0** by pressing **<OK>**.

3.9.2. 0224 Serial Communications RS-232: (SERIAL)

This software option provides the **2100** with printer support or automatic weight transmission at 10 readings per second for connection with external remote displays, etc. Support for the Ranger Viewer software for the **2100** is always available regardless of whether this option is installed.

3.9.3. 0225 Setpoint – 3 Input / 3 Output: (SETP)

This software option enables the setpointing functions of the **2100**. The I/O pins can be used as inputs with or without this option but can only function as outputs if the software option is installed.

3.10. Hardware Options

Each of the hardware options for the unit comes complete with its own detailed installation instructions. The hardware options available for the unit are as follows:

3.10.1. 0080 (RS-232 / RS-485 Converter)

This device connects directly to the unit auxiliary port and converts the RS-232 signals into RS-485 signals. No external power is required for the **0080**.

3.10.2. 0227 (Relay Output Module)

The relay output module mounts directly to the rear of the unit case. This module houses three 240VAC 2A relays that are driven directly by the unit I/O pins.

The auxiliary port is still available from the side of the **0227**, which enables connection of remote inputs and serial communications. When remote inputs are used with the 0227, the relays operate whenever the inputs are active. This can be very useful for implementing manual overrides for batching applications.

3.10.3. SCALEHAWK Indicator Variants

There are five variants of the **SCALEHAWK Digital Indicator**:

Code	Description
2100 /H	NSC Indicator, clock/calendar/ram/inputs, 9-15 VDC power input, fitted with 0329 S/S IP65 Housing and desk/wall bracket.
2100 /DC	NSC Indicator, clock/calendar/ram/inputs, fitted with 0331 12-24 VDC Power Supply and 0329 S/S IP65 Housing and desk/wall bracket.
2100 /AC	NSC Indicator, clock/calendar/ram/inputs, fitted with 0330 110-240 VAC Power Supply and 0329 S/S IP65 Housing and desk/wall bracket.
2100 /B	NSC Indicator, clock/calendar/ram/inputs, fitted with 0332 re-chargeable battery, 0329 S/S IP65 Housing and desk/wall bracket (needs 0121 battery charger option).
2100 /EX	For Hazardous Area Applications, NSC Indicator - needs external safe power or optional 0334 safe battery pack and/or optional 0335 EX safe power supply, 240 VAC.

The following spare parts all include the Stainless Steel Rear Housing (0329):

3.10.4. 0330 (110/240 VAC Power Supply)

The 110/240VAC power supply enables the **2100** to be run directly from mains power.

3.10.5. 0331 (12-24VDC Power Supply)

The 12/24VDC power supply enables the unit to be run essentially from any DC power source from 10 to 28VDC or from a low voltage AC power source of 9 to 15VAC. The power supply is compatible with the Relay Output Module (**0227**) with both options fitting into the stainless steel rear housing.

3.10.6. 0332 (Rechargeable Battery)

With this option fitted the unit is able to run for up to 20 hours with a four hour re-charge. The recharge circuitry is able to work from 11 to 15VDC so it is possible to recharge the battery from another 12VDC source. Option **0121** is a 12VDC 1A plug pack that is capable of running the unit directly and charging the battery at the same time. The battery is based on LEAD ACID technology and can be left on charge indefinitely.

4. Application Configuration Issues

4.1. General Setup Information

The unit configuration and calibration can be performed entirely from the front panel, using the digital setup facility. When Setup is used, all menu items are accessible and care must be taken to ensure no accidental changes are made to calibration and trade settings.

Setup can be passcode protected to prevent unauthorised or accidental tampering. If the scale has been passcode protected, the setup menus cannot be accessed until the correct code has been entered.

In addition to the **Full Digital Setup Passcode** there is a separate **Operator Passcode** that can be entered to restrict access to the Operator Menu. The Operator Menu provides separate access to batching target and flight settings. Refer to Passcodes page 19 for more information.

4.2. Basic Weighing Terminology

The following terms are used throughout the setup procedure. Knowledge of these basic weighing terms is beneficial in setting up and calibrating the unit.

Note: Detailed descriptions of these and other terms used in this Reference Manual are described in the

Glossary page 55.

Term	Definition
Units	Units of measurement (kilograms, tonnes, pounds, etc.).
Range	Total change in weight between zero gross load and full capacity gross load
Resolution or Count-by	Smallest change in weight units that the display can show.
Graduations	Maximum number of display steps between zero gross load and full capacity gross load. It is equal to the range divided by the count-by.
Division	A single graduation.

Example

A 10,000kg 2.0mV/V load cell is used in an application requiring a 5000kg range, with weight displayed in 5kg increments.

The values are:

- Units = kg
- Range = 5000
- Count-by = 5

Calculating the graduations:	Graduations = $\frac{\text{Range}}{\text{Count-by}} = \frac{5000}{5} = 1000\text{divisions}$
Signal voltages can be calculated as follows:	
Calculating the full scale signal (load cell):	Full Scale Signal = $\frac{\text{Range}}{\text{Load Cell Capacity}} = \frac{5000}{10000} \times 2.0\text{mV/V} = 1.0\text{mV/V}$
Since the **2100** uses 8V load cell excitation, the absolute signal voltage is:	Absolute Signal Voltage = 8V x 1.0 mV/V = 8.0mV
Calculating the signal resolution:	Signal Resolution = $\frac{8.0\text{mV}}{1000\text{divisions}} = 0.008\text{mV / division} \equiv 8\mu\text{V / division}$

4.3. Filtering Techniques

There is a trade off between noise filtering and the step-response time of the system. The step-response is defined as the time between placing a weight on the scale and the correct stable weight reading being displayed. This does not affect the number of readings per second that are taken. It simply defines the amount of time that is required to determine a final weight reading.

4.3.1. FIR (Finite Impulse Response) Filter and Reading Rate

The first level of filtering provided is a FIR filter that is linked to the measurement rate. The measurement rate is selectable at 25/30Hz on the unit. This filter is a very high performance **tuned** filter that provides up to 180dB of attenuation at multiples of the sync frequency and broad band filtering of between 40 and 80dB. For example the FIR filter provides 180dB of noise rejection at frequencies of 25, 50, 75 … Hz. The FIR filter introduces a delay of three samples to the step-response (or 120msec).

4.3.2. Digital Averaging

In addition to the FIR filter the unit has 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 can be configured in steps from one reading to 100 readings and is set using the FILTER item in the OPTION group. Each reading in the average adds a delay to the step-response equal to the measurement period or 40msec. For example, an average of ten readings results in the following total step-response:

(10 + 3)samples x 40milliseconds = 520milliseconds

4.4. Trade vs Industrial Mode

The unit may be operated in Trade or Industrial mode. The following table lists the operation differences for each of the two modes:

Element	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
De-Zero	Not available	Clear the zero setting with a 2 second press of the Zero Key
Test Modes	Limited to 5 seconds	Unlimited time allowed

Table 3: Trade vs Industrial Mode

4.5. Setup Counter

Within Setup there are a number of critical steps that can affect the calibration and/or trade performance of the unit. If any of these steps are altered, the trade certification of the scale could be voided.

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

The value of this counter is written on the tamperproof trade label on the front of the indicator for trade-certified applications and functions as an electronic seal. If any trade critical settings are changed on the instrument, the current value of the trade counter will be different from the recorded value and the seal is broken. In this manual items marked with ⊗ indicate that the setting is trade critical.

4.6. Passcodes

The unit has two levels of passcodes to provide a security lock on Setup.

- **Restricting All Access to Setup (Full):** Refer to FULL.PC (Security Passcode for Digital Setup) page 30 for more information.
- **Allowing Partial Access to Setup (Operator Menu):** Refer to OP.PC (Security Passcode for Operator Menu Access) page 30 for more information.

4.7. Data Entry

Throughout the unit setup and operator interface, different data entry methods are used. Each method is described below:

4.7.1. Numeric Entry

A numeric entry box allows the input of a number. When entering a number the display will show digits with the currently selected digit flashing. The **<SEL>** key is pressed to select a digit to change. When the digit is selected the **<EDT>** key is pressed to change the digit from **0** through **9**. The left most digit can also be changed to a dash (-) to enter a negative number. The **<OK>** key is pressed to accept the number that has been entered.

Upper and lower limits are placed on some entries and an entry outside this range will cause the unit to display dashes (ie. - - - - - -).

Example 1: When in Setup follow the steps below to set Build, Max Capacity.

- Press **<GRP>** repeatedly to display the **BUILD** group.
- Press **<ITM>** repeatedly to display the **CAP** item.
- Press **<SEL>** to select **CAP** and display the current setting (eg. 0000.00kg).
- The currently chosen digit will be flashing. Press **<SEL>** to advance to the next digit.
- When the digit to edit is flashing press **<EDT>** repeatedly to cycle from **0** through **9**.
- When the new digit to be set is flashing either press **<SEL>** to move to the next digit to edit and repeat the previous step; or press **<OK>** to accept all of the displayed digits (including the flashing digit) and re-display the item name.

4.7.2. Selections and Options

A selection entry requires the choice of a single option from a list. When a Group and Item have been chosen, the **<SEL>** key is used to display the current setting for that item. The **<EDT>** key can be used to cycle through the options for that item. When the desired option is displayed the **<OK>** key can be pressed to accept the displayed option and re-display the item name.

Example 1: When in Setup follow the steps below to set Special Settings, Backlight.

- Press **<GRP>** repeatedly to display the **SPEC** group.
- Press **<ITM>** repeatedly to display the **B.LIGHT** item.
- Press **<SEL>** to select **B.LIGHT** and display the current setting.
- Press **<EDT>** to cycle through the options for that item.
- Press **<OK>** to accept the displayed option and re-display the item name.

Example 2: When in Setup follow the steps below to set Serial, Bits.

- Press **<GRP>** repeatedly to display the **SERIAL** group.
- Press **<ITM>** repeatedly to display the **BITS** item.
- Press **<SEL>** to select **BITS** and display the current settings.
- The currently chosen digit will be flashing. Press **<SEL>** to advance to the next digit.
- When the digit to be set is flashing press **<EDT>** to cycle through the options for that digit.
- When the desired digit option is flashing press **<OK>** to accept the setting and re-display the item name.

5. Basic Operation

In the most basic configuration, the unit provides a simple weight readout. More advanced configurations allow for serial communications, batching and various special functions.

5.1. User Interface Display and Controls

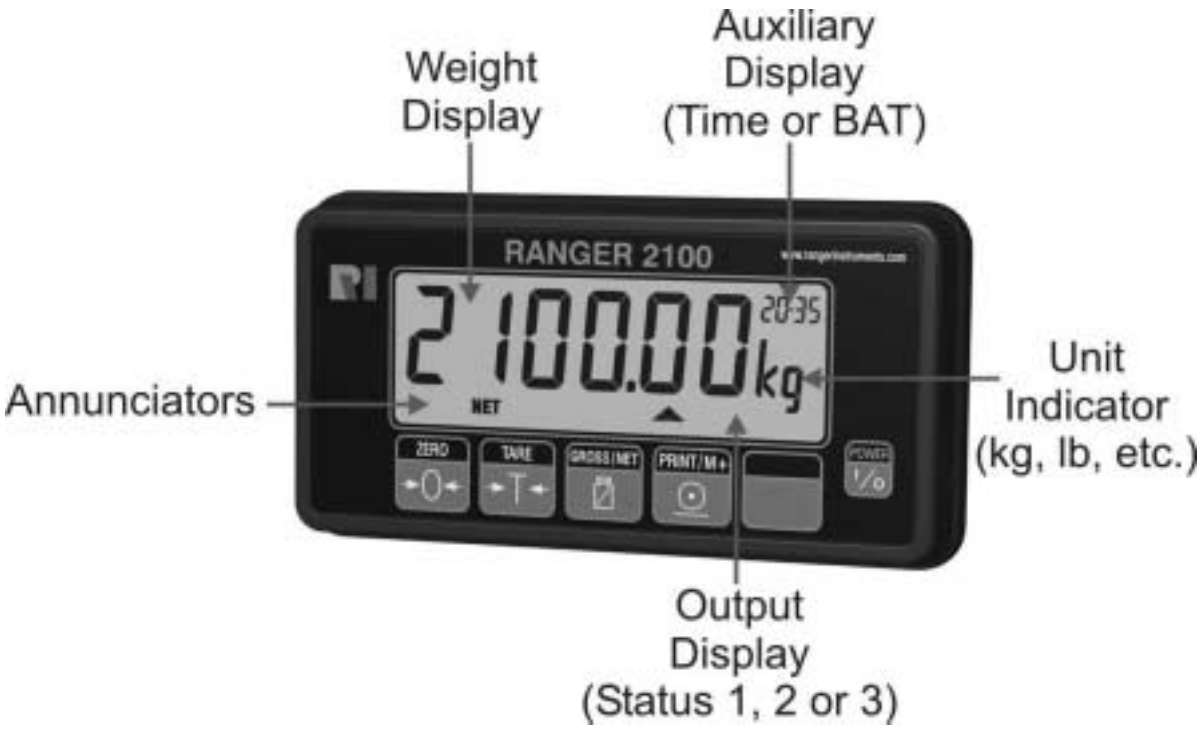


Figure 8: SCALEHAWK User Interface Display and Controls Illustration

5.1.1. Front Panel: Visual Display

The front panel of the unit has a six digit LCD display. Figure 8 shows the main elements of the front panel.

The unit has five main display sections for the visual output of weight information. Each display section is described below:

- **Weight Display**

  The Weight Display indicates the weight readings, setup information, errors and warnings.

- **Auxiliary Display**

  This Auxiliary Display is used to show the current time in 24 hour format. If the **2100** is setup for battery operation **BAT** will flash on the auxiliary display when low battery is detected.

- **Unit Indicator**

  The Unit Indicator displays the units of the weight reading as either grams (g), kilograms (kg), pounds (lb), tonnes (t) or none ( ). If the instrument is set up for counting the units will show pieces (p). The unit's indicator will flash if the display is held.

- **Output Display**

  The Output Display shows the output status of the three possible outputs (ie. 1, 2 or 3).

- **Annunciators**

  Status annunciators show the following:

Annunciator Symbol	Key Name	Description
→0←	**ZERO**	Lit when the displayed reading is within ± ¼ of a division of true zero.
NET	**NET**	Lit when the display reading represents NET weight.
≈	**MOTION**	Lit when the displayed reading is not stable.
▲	**OVER**	Lit when the weight is over setpoint target.
◆	**PASS**	Lit when the weight is between under and over setpoint targets.
▼	**UNDER**	Lit when the weight is under the setpoint target.
⌴	**ZERO BAND**	Lit when the displayed weight is within the zero dead band setting.

Table 4: Editing Annunciators

When in Setup the editing annunciators are shown to identify the function of the front panel keys (ie. **GRP, ITM, SEL, EDT** and **OK**). For more information refer to unit Setup Display page 26.

5.2. Primary Function Keys

The unit has five primary function keys:

- ZERO
- TARE
- GROSS/NET
- PRINT
- FUNCTION (User Assignable Key)

The **Zero, Tare, Gross/Net** and **Print** Function keys are fixed to perform necessary weighing functions. The **Function** key may be assigned by the user to perform a range of desired operations. These operations include peak hold, batch start/pause/abort, etc. Each of the primary function keys has two separate functions:

- **Primary Function:** Available during normal weighing. This function is printed in white at the top of the key.
- **Editing Function:** Available during setup and calibration. The editing annunciators (above each key) display these functions, when the **2100** is in Setup mode.

5.2.1. Using the Primary Key Functions

A single press of each key triggers the weighing operation printed on it. The unit 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.

5.2.2. Stability Considerations

Once a **<ZERO>**, **<TARE>** or **<PRINT/M+>** key is pressed the unit 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 10 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. Refer to OPTION (Scale Options) page 28 for more information.

5.2.3. ZERO Key

When an empty scale has drifted away from a true zero reading, this key is used to perform a zero adjustment on the scale display. The zero adjustment is stored by the **2100** 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 via an item in the Setup of the unit. Refer to Z.RANGE (Allowable Zero Operating Range) ⊗ page 29 for more information.

5.2.4. TARE Key

This key is used to temporarily set the scale to zero (such as canceling the weight of a carton before performing a filling operation). The display will show the 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. A 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.

Long Press: A long press of the **<TARE>** key allows Operator Menu access to the setpoint targets, flight and hysteresis settings without the need to step through the full digital setup menu. A passcode can be entered to prevent unauthorized use of this feature. Refer to Passcodes page 19 for more information.

5.2.5. 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).

5.2.6. PRINT Key

If a printer or computer has been attached to the unit and the manual print function has been selected, the **<PRINT/M+>** key will trigger an output of the current weight reading. **Print** is displayed while waiting for the printer to accept data. If the printer is offline the **Print** prompt will remain for a maximum of 10 seconds before the operation is cancelled. Each weight printed is automatically added to an internal Total Weight (ie. the unit has a memory as indicated on the key label by **M+**).

Long Press: A long press of the **<PRINT/M+>** key will print the total. The total weight is then cleared.

5.2.7. FUNCTION Key

When leaving the factory, the function key is blank and has no primary function pre-programmed. The primary role of this key can be selected from a number of different functions including peak-hold, counting, batching, etc. Refer to Special Functions page 49 for details of the available functions. Each primary function has an associated overlay sticker that should be applied to the function key to label the function.

Long Press: A long press of the Function Key may be used for certain functions depending on the primary function of the key.

5.3. POWER Key

The **<POWER>** key is used to turn the instrument on and off. To initially turn the instrument on press and hold the **<POWER>** key until the display starts up. The instrument will beep three times. To turn the instrument off, press and hold the **<POWER>** key for three seconds. The instrument will display **OFF** followed by the three second countdown.

If using auto backlighting a short press of the power key is a convenient way to turn the backlight on. Refer to B.LIGHT (Backlight Operation) page 31 for more information.

- **Full Digital Setup**

  To enter full Digital Setup (eg. for calibration) it is necessary to press the **<POWER>** key together with the **<ZERO>** key for two seconds. The instrument must first be turned on.

- **Software Options**

  To enter Software Options press and hold the **<POWER>** key together with the **<FUNCTION>** key for two seconds. The instrument must first be turned on.

- **Bypass**

  It is possible to bypass the operation of the **<POWER>** key and have the instrument automatically power up whenever power is available. To do this, pins 6 and 7 of the load cell connector need to be bridged out. The **<POWER>** key itself will still work for the purposes of entering setup, etc., but it will no longer turn the instrument on or off.

6. Setup

The unit digital setup facility provides the means to configure and calibrate the instrument. The **2100** is an advanced instrument providing a large number of facilities. To simplify configuring the unit, all setup options in the unit are organised in a tree structure made up of **Groups** and **Items**. Refer to Setup Menu Quick Reference page 54 for a list of Groups and Items.

The unit provides two methods to access the Setup area. The **Full Digital Setup** method provides access to all functions in Setup. The **Operator Menu Setup** method provides access to only the Operator Menu (Setpoint Targets, Flight and Hysteresis).

6.1. Accessing Full Digital Setup

To access Full Digital Setup, first ensure the instrument is on. Then press and hold both the **<ZERO>** and **<POWER>** keys together for two seconds.

The unit will beep twice and then display the following:

- Setup
- Software Version (eg. V2.0)
- Setup Access Count (eg. C 00010)
- If a passcode has been configured, the setup passcode must be entered to gain access. Refer to FULL.PC (Security Passcode for Digital Setup) page 30 for more information.
- The first item in the Group list (ie. **BUILD**) will then display.

6.1.1. Exiting Full Digital Setup

There are two methods for exiting Full Digital Setup and returning to the Operator Interface.

- **Method 1:** Press and hold both the **<ZERO>** and **<POWER>** keys together for two seconds.
- **Method 2:** Press the **GRP** key repeatedly. When **- End -** displays press **OK**.

6.2. Accessing Operator Menu Setup

To access the Operator Menu Setup, first ensure the instrument is on. Then press and hold the **<TARE>** key for two seconds. If a passcode has been configured, the OP.PC setup passcode must be entered to gain access. Refer to OP.PC (Security Passcode for Operator Menu Access) page 30 for more information. The unit will beep twice and then display the first item in the Operator Menu (ie. **Targ A** in the **SET.PTS** Group).

6.2.1. Exiting Operator Menu Setup

There are two methods for exiting Operator Menu Setup and returning to the Operator Interface.

- **Method 1:** Press and hold the **<TARE>** key for two seconds.
- **Method 2:** Press the **ITM** key repeatedly. When **- End-** displays press **OK**.

6.3. SCALEHAWK Setup Display

The following figure illustrates a sample display when the unit is in Setup. The editing annunciators display only when in Setup and provide a means to make choices when setting up and calibrating the instrument. When in Setup an editing annunciator is chosen by pressing the keypad key beneath.

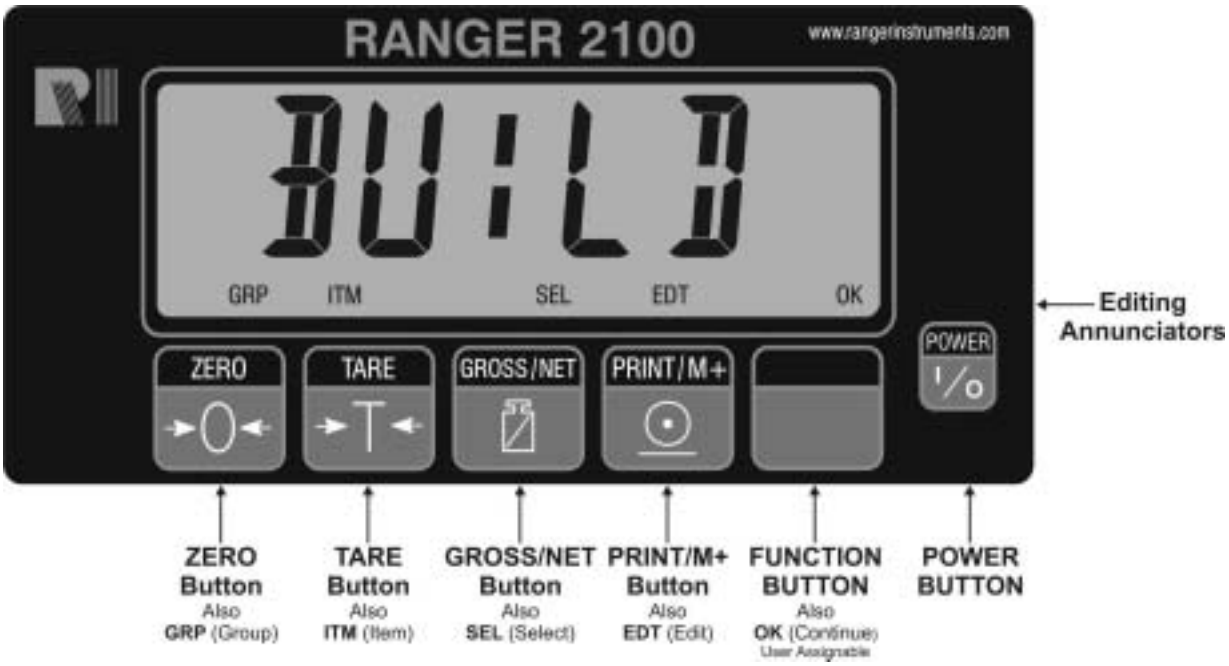


Figure 9: SCALEHAWK Setup Display and Controls Illustration

6.4. Setup: Groups and Items

All setup options in the unit are organised in a tree structure made up of **Groups** and **Items**. The Setup Menu Quick Reference page 54 lists the Groups and their subsequent Items. In Figure 9 the Group option **(BUILD)** is displayed. To simplify explanations, the following notation is used throughout the manual to identify the location of an item: (GROUP:ITEM).

6.4.1. GRP (Groups)

Setup is divided into a series of **Groups**. Each group has a distinctive group title. All options in any one group have related functions. The **<GRP>** key can be used to cycle through the available groups.

6.4.2. ITM (Items)

Each group is divided into individual **Items**. Each item represents a parameter that can be changed. Pressing the **<ITM>** key will enter the displayed group, allowing access to the items within the group. The **<ITM>** key can be used to cycle through the available items. The **<SEL>** key is then used to edit the item.

6.4.3. Using the Editing Key Functions

The role of each of the primary keys during editing is displayed on the editing annunciator above each of the keys. When in Setup, a single press of each key triggers the editing annunciator function. These functions are as follows:

Annunciator	Key Name	Description
GRP	ZERO	Steps through the list of Groups.
ITM	TARE	Steps through the list of items.
SEL	GROSS/NET	Moves the editing cursor in some editing modes.
EDT	PRINT	Steps through the available options when editing a particular item.
OK	FUNCTION	Press this key to edit an item or to save changes and return to the menus.

The following sections describe the setup parameters of each of the Groups and Items in Setup.

6.5. BUILD (Scale Build)

Settings 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. Later changes to items within this group may invalidate the current calibration data. Items marked with ⊗ indicate that the setting is trade critical and the trade counter will be incremented if this setting is changed.

6.5.1. DP (Decimal Point Position) ⊗

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
- Default: 000000

6.5.2. CAP (Maximum Capacity) ⊗

Sets the nominal maximum capacity (or Range) of the scale. 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, CAP is set to 500.0, and RES is set to 0.5.

6.5.3. RES (Count-by Resolution) ⊗

Sets the resolution (or Count-by) of the display. The resolution is the number by which the indicator will count. This is set in weighing units with the decimal point in place.

- Options are: Values of 1, 2, 5, 10, 20, 50 or 100
- Default: 1

6.5.4. UNITS (Weighed Units) ⊗

Sets the units for display and printing.

- Options are: (g) grams, (kg) kilograms, (lb) pounds, (t) tonnes, (oz) Ounces, (none) other units.
- Default: kg

6.5.5. HI.RES (High Resolution x10 mode) ⊗

Sets the instrument to display weight at 10 times resolution. This is intended for test purposes but may be used for non-trade weighing.

- Options are: ON or OFF
- Default: OFF

6.6. OPTION (Scale Options)

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 affecting the calibration accuracy. Items marked with ⊗ indicate that the setting is trade critical and the trade counter will be incremented if this setting is changed.

6.6.1. USE (Scale Use) ⊗

This is where the basic use of the scale is set. This setting configures the unit for either Industrial or Trade operation. Refer to Trade vs Industrial Mode page 19 for more information.

- Options are: TRADE or INDUST
- Default: TRADE

6.6.2. FILTER (Reading Average)

The unit 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.

- Options are: 1, 2, 5, 10, 25, 50, 75 and 100
- Default: 10

6.6.3. MOTION (Motion Detection) ⊗

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 or 1.0 graduations) per time period (0.2 to 1.0 seconds). Motion can be set from 0.5 graduations per 0.5 second (fine) to 5.0 graduations per 0.2 second (coarse). When set to **NONE**, the Motion Detection is ignored and Zero, Tare and Print actions are instantaneous.

- Options: NONE, 0.5–1.0t, 1.0–1.0t, 0.5–0.5t, 1.0–0.5t, 0.5–2.0t, 1.0–0.2t, 5.0–0.2t
- Default: 0.5–1.0t (0.5 graduations per 1.0 second)

6.6.4. AUTO.Z (Auto-Zero on Startup)

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.

- Options are: ON or OFF
- Default: OFF

6.6.5. Z.TRAC (Zero Tracking Sensitivity) ⊗

Zero tracking allows the display to adjust for minor changes in the zero balance of the scale. When enabled theunit will track weight readings within the zero dead band back to exactly zero at a maximum rate of 0.5, 2.0 or 10 graduations per second.

- Options are: OFF, SLOW, MED, FAST
- Default: OFF

6.6.6. Z.RANGE (Allowable Zero Operating Range) ⊗

This setting restricts the range over which the Zero functions can operate.

- Options are: –2% to +2%, –1% to +3%, –20% to +20%.
- Default: –02 to 02 (–2% to +2%)

6.6.7. Z.BAND (Zero Dead 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 unit to determine **Zero Load** (eg. a setting of 4 specifies that readings between –4.5 and 4.5 are considered to be zero).

When the displayed weight reading is within this band the unit displays the **zero band** annunciator. Refer to Annunciators page 22.

- Settable over the full weight range. Always enter a number in multiples of display units Refer to RES (Count-by Resolution) ⊗ page 27 for more information.
- Default: 0 (ie. –0.5 to 0.5 graduations)

6.7. CAL (Scale Calibration)

Items within this group perform various calibration routines. For detailed scale calibration procedures refer to Calibration page 36. Certain items in the Scale Build can affect 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 marked with ⊗ indicate that the setting is trade critical and the trade counter will be incremented if this setting is changed.

6.7.1. ZERO (Zero Calibration) ⊗

Select to perform Zero Calibration. While the zeroing is in progress the display will show **Z.in.P**.

6.7.2. SPAN (Span Calibration) ⊗

Select to perform Span Calibration. While the span calculation is in progress the display will show **S.in.P**.

6.7.3. ED.LIN (Edit Linearisation Points) ⊗

Select to view linearisation setup and start linearisation routines. Refer to Using Linearisation page 37 for more information.

6.7.4. CLR.LIN (Clear Linearisation Points) ⊗

Select to view linearisation setup and select linearisation points to clear. Refer to Using Linearisation page 37 for more information.

6.7.5. FAC.CAL (Restore Default Factory Calibration) ⊗

Select this choice to restore default factory calibration. This restores all settings in the **BUILD** and **CAL** menus back to factory defaults.

6.8. SPEC (Special Settings Menu)

Settings within this group control features including passcodes, key locking, key functions and display settings. Items marked with ⊗ indicate that the setting is trade critical and the trade counter will be incremented if this setting is changed.

6.8.1. OP.PC (Security Passcode for Operator Menu Access)

The **OP.PC** (Operator Passcode) allows partial access to Full Digital Setup (ie. access to the Operator Menu Setup). For the Operator Passcode to function, the FULL.PC passcode must also be set. During normal weighing the Operator Menu is entered with a long press of the **<TARE>** key. It allows the settings for the Setpoint Targets (A, B and C), Flight and Hysteresis to be entered without accessing the Full Digital Setup. The default passcode setting is **000000** which allows free access. Any other four digit number will enable the passcode functions and restrict access.

Note: The passcode must contain two leading zeros.

- Range 000000 to 009999
- Default: 000000

6.8.2. FULL.PC (Security Passcode for Digital Setup)

The **FULL.PC** (Full Passcode) for Digital Setup can be set to restrict access to all Setup functions. This passcode is used to prevent unauthorised or accidental tampering in the instrument setup. The default passcode setting is **000000** which allows free access. Any other four digit number will enable the passcode functions and restrict access.

Note: The passcode must contain two leading zeros.

- Range 000000 to 009999
- Default: 000000

It is important to note that when restricting Full access to Setup the passcode must not be forgotten. It is only possible to circumvent the passcode at the factory. Care must be taken with the use of the Full Digital Setup Passcode to ensure that the instrument does not become permanently locked.

6.8.3. KEY.LOC (Front Panel Key Locking) ⊗

This item allows individual keys to be locked and unlocked. The display shows **ZTGP** to indicate each of the front panel keys (eg. **<ZERO>**, **<TARE>**, **<GROSS/NET>, <PRINT/M+>**). A locked key will show a dash (-) instead of a letter. For example **-TG-** means that the **<ZERO>** and **<PRINT/M+>** keys are locked.

6.8.4. KEY.FN (Key Functions)

The functions of the unit keypad function key and up to three external inputs can be selected here. There are four positions to choose key functions. The left most position determines the function of the front keypad function key. The following three positions determine Input 1, 2 and 3. Each function is identified by a single letter abbreviation. The front keypad function key cannot be set to any of the other front panel key functions (ie. ZERO, TARE, GROSS/NET or PRINT). Refer to Special Functions page 49 for details of the available key functions.

- Default: - - - -

6.8.5. B.LIGHT (Backlight Operation)

Sets the operation of the backlight.

Options are:

- OFF: Backlight is off
- ON: Backlight is always on
- AUTO: Backlight turns off after 10 seconds of idle time. **Note:** A short press of the **<POWER>** key will turn the backlight on.
- Default: ON

6.8.6. BRIGHT (Backlight Brightness)

The brightness of the LED backlight of the unit can be controlled with this setting. Lower brightness reduces the power consumption of the indicator.

- Options are: 1 to 10 with 1 = 10% and 10 = 100% of the maximum power consumption of the backlight. Each brightness step will add between 10mA and 15mA to the current consumption of the indicator depending on the voltage of the power supply.
- Default: 10

6.8.7. AUT.OFF (Auto Power Off / Battery Operation)

The unit can be set up to automatically power down after a period of no activity. Weight, motion or any press of the keyboard is enough to keep the instrument powered on.

Options are:

- NEVER: Never power off automatically.
- 20s, 30s, 60s, 300s, 600s: Auto Power off after 20 seconds to 600 seconds (10mins).
- Default: NEVER

When using battery power always set this option to a setting other than **NEVER**. The automatic power down will conserve battery power but more importantly the unit will monitor battery voltage and warn the operator when it is time to recharge. If the battery is not recharged the unit will automatically power down when the battery voltage drops to 10.5V. This protects the battery from damage.

6.8.8. AUX.DSP (Auxiliary Display Setting)

The auxiliary display of the unit can be set to remain blank or display the current time in 24 hour format.

- Options are: OFF or TIME
- Default: OFF

6.8.9. SYNC (A/D Frequency) ⊗

Sets the sync (A/D Frequency). This setting may affect calibration.

- Options are: 25Hz and 30Hz
- Default: 25Hz

6.9. SERIAL (Serial Communications Options)

Settings within this Group determine the serial and printing outputs. Refer to Serial Outputs page 39 for more information on Serial configuration.

6.9.1. TYPE (Serial Output Type)

Sets the function of the first serial output. The port can be disabled or set to run as an automatic output or a network device.

Options are:

- OFF: Disables serial output.
- NET: Sets the unit to function as a network device.
- AUTO: Enables automatic transmission at 10Hz.
- PRINT: Enables printer driving.
- MASTER: Send contents of LCD display to 2101 remote display.
- Default: NET

6.9.2. ADDR (Serial Address)

This is used to set the address of the unit (used in network applications).

- Range 00 to 31
- Default: 31

6.9.3. BAUD (Serial Baud Rate)

The baud rate determines the serial data transmission speed.

- Options are: 1200, 2400, 4800, 9600 and 19200
- Default: 9600

6.9.4. BITS (Serial Format Options)

The Bits options allow the data transmission bit pattern and interface to be changed. The display will show the current setting in the form (**n81-**) where each character has a meaning as shown below.

Options are:

- n, O, E: Parity bit
- 8, 7: Number of data bits
- 1, 2: Number of stop bits
- -, d: DTR handshake disabled or enabled
- Default: n81-. For most applications the default setting is applicable.

N 8 1 -			
none	**8 bits**	**1 stop**	**- none**
Odd	7 bits	2 stop	DTR
Even			

6.10. SET.PTS (Setpoint Settings)

Settings within this group configure the operational logic of the setpoint system.

Refer to Setpoints page 44 for a detailed explanation of batching and setpoints.

6.10.1. OPTN A, OPTN B, OPTN C (Setpoint Options)

This is where the five options are set for each setpoint.

Refer to Setpoints page 44 for full details of all of these options.

- G O H -				
- none	**Gross**	**Over**	**High**	**- none**
Active	Net	Under	Low	Single
Batch*****	Reading			Double
Pass******	Held			Flash

***** There are different **batching** functions for each output. These are:

- OPTN A: Slow Fill
- OPTN B: Fast Fill
- OPTN C: Dump (by weight or time)
  ****** Pass available only in OPTN C.
- Default: -GOH-

6.10.2. TARG A, TARG B, TARG C (Targets for each of the three setpoints)

This is where the targets are set for each setpoint.

- Range: –99999 to 999999
- Default: 000000

6.10.3. FLIGHT (In-Flight Weight)

This is used to enter in-flight weight. The in-flight weight is only used with the slow speed fill output. The fast speed fill and active setpoints do not use this parameter.

- Range: 000000 to 999999
- Default: 000000

6.10.4. HYS (Hysteresis)

This is used to enter the hysteresis.

- Range: 000000 to 999999
- Default: 000000

6.10.5. D.TIME (Dump Time)

This is where the dump time (in seconds) is entered.

- Range: 00000.0 to 000020.0 seconds
- Default: 00000.0

6.11. CLOCK (Clock Settings)

Items within this group set time and date related functions. Items marked with ⊗ indicate that the setting is trade critical and the trade counter will be incremented if this setting is changed.

6.11.1. TIME (Set Time)

The correct time may be entered in this item. The time is entered in the format (00.HH.MM), where HH is the hours in 24 hour format (00-23) and MM is the minutes (00-59).

6.11.2. DATE (Set Date)

The current date may be entered in this item. The date is entered in European format (DD.MM.YYYY), where DD is the day of the month (01 – 31), MM is the month of year (01 – 12) and YYYY is the year (2000 – 2079). The unit requests the day and month first, followed by the year.

6.11.3. QA.OPT (QA Option Setting) ⊗

Enables/disables the Quality Assurance Calibration Due alarm. When enabled the unit will display **QA DUE**, from the day after the date set in the QA.DATE item below.

Options are:

- OFF: Turn feature off.
- ON: Turn feature on.
- Default: OFF

6.11.4. QA.DATE (QA Date) ⊗

The date when the next calibration check is due may be entered in this item. The date is entered in European format (DD.MM.YYYY), where DD is the day of the month (01 – 31), MM is the month of year (01 – 12) and YYYY is the year (1998 – 2097).

- Default: 01/01/2001

6.12. TEST (Special Test Functions)

Items within this Group allow access to the testing routines for the unit. With these routines the scale base output can be monitored and the inputs and outputs can be tested.

6.12.1. SCALE (Scale Base Test Display)

This is used to test the scale base for load cell or connection errors. It sets up the unit as a simple test meter to measure the load cell signal output. The display reads in milliVolts-per-Volt, factory calibrated to 0.1% worst case. When accessing this item, initially there should be no weight on the scale. In TRADE mode this display is only active for five seconds before returning to the menu.

6.12.2. FRC.OUT (Force Outputs)

Forces each of the output drivers in turn. Only those I/O pins that are not specified as inputs will actually be driven. All outputs turn OFF when leaving this step. The **<EDT>** key will advance through each output. Pressing **<OK>** will turn all outputs off and exit the test.

6.12.3. TST.INP (Test Inputs)

The input test allows the function of each of the inputs to be tested. All three external inputs are displayed at the same time. The status of each input is changed as contact closures are detected. A dash (-) indicates an input is not present. A number 1 to 3 indicates a particular input is active. For example, **- - 3** would indicate that input number three is active.

6.13. FACTRY (Factory Adjustment Menu)

6.13.1. DEFLT (Restore Factory Defaults)

Restores the digital setup of the unit back to the original **new** settings installed at the factory. The main use of this routine is to completely reset a unit that is being installed on a different scale. Restoring the factory defaults does not affect the calibration. To reset the calibration to factory condition, the Restore Factory Calibration (CAL:FAC.CAL) should be used. Refer to FAC.CAL (Restore Default Factory Calibration) ⊗ page 30.

6.13.2. CONFIG (Software Options)

Use this item to enter software option codes to enable optional features in the unit. Refer to “SCALEHAWK” Software Options page 14 for detail on the different software options and how to enter the codes.

6.13.3. – End – (Leaving Setup)

Refer to Exiting Full Digital Setup page 25 or Exiting Operator Menu Setup page 25.

7. Calibration

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

Note: Some of the digital setup steps can affect calibration. The BUILD and OPTIONS groups of the digital setup MUST be configured before calibration is attempted.

To perform a calibration, select the **CAL** Group using the **<GRP>** key.

The calibration programme will automatically prevent the unit from being calibrated into an application outside of its specification. If an attempt is made to calibrate the unit outside of the permitted range, an error message will display and the calibration will be abandoned. Refer to Error Messages page 52.

The unit has a wide-range amplifier. The non-trade calibration range of the instrument extends well beyond the Trade approved range.

Note: It should not be assumed that just because the unit has successfully calibrated a scale, that the scale is correct for trade use. Always check the scale build against the approval specification.

7.1. Performing a Digital Calibration with Test Weights

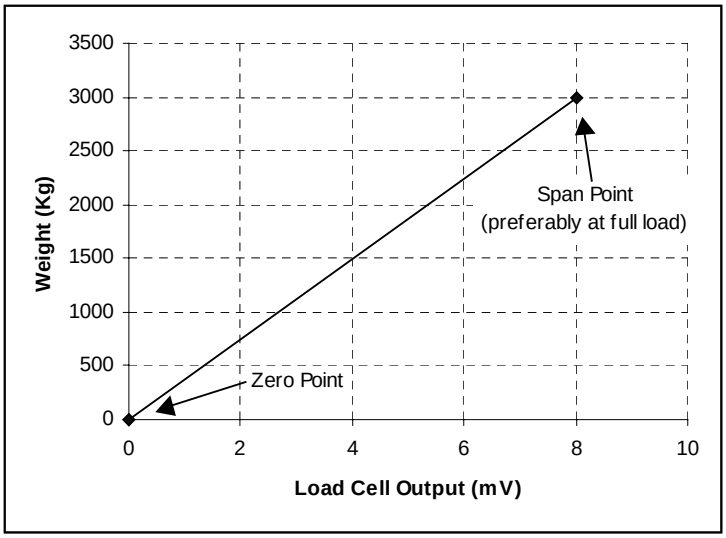


Figure 10: Chart - Zero and Span Points to Interpolate Weight from Load Cell

The Zero setting (CAL: ZERO) specifies a gross zero point for the scale. The Span setting (CAL:SPAN) specifies a second point (preferably close to fullscale) used to convert the A/D readings into weighing units (eg. kg). Select either of the Zero (CAL:ZERO) or Span (CAL: SPAN) calibration items. It is important that an initial Zero calibration is performed before any SPAN calibrations. The chart shown here demonstrates how the unit uses the zero and span points to interpolate a weight reading from the load cell reading.

7.1.1. ZERO (Zero Calibration Routine)

- Press the **<OK>** key to perform the Zeroing routine. The display will show the current weight. Remove all weight from the scale structure.
- Press the **<OK>** key again to execute a Zero Calibration. The display will show **Z.in.P** to indicate 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 **<ITM>** key to leave the Zeroing routine or **<OK>** to repeat the operation.

7.1.2. SPAN (Span Calibration Routine)

- Press the **<OK>** key to perform 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 the limit calibration accuracy. The closer the test weight is to full range the better the accuracy.
- Press the **<OK>** key to show the calibration weight value. Change this to the correct calibration weight using the **<SEL>** and **<EDT>** keys.
- Press the **<OK>** 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 **<ITM>** key to leave the Spanning routine or press **<OK>** to repeat the operation.

7.2. Using Linearisation

This section provides instructions on the use of the linearisation. Linearisation is used to approximate the weight output to a non-linear scale. The chart below shows a non-linear characteristic for the load cell output. From the chart, it can be seen that the trace with no linearisation applied is a poor approximation to the real characteristic. By applying one or more linearisation points, more accurate weight readings can be achieved.

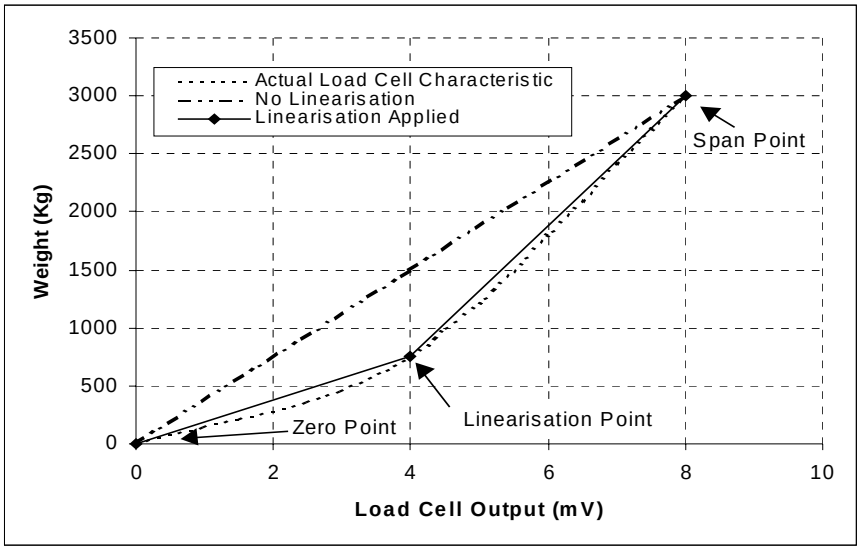


Figure 11: Chart - Non-Linear Characteristic for Load Cell Output

To perform a linearisation, a calibration of the zero and span points must have been performed. Both the zero and fullscale 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.

A maximum of five linearisation points can be set independently anywhere in the operating range of the scale. Unused/unwanted points may be also cleared.

7.2.1. ED.LIN (Edit Linearisation Points)

- Press the **<OK>** key to view the list of linearisation points currently in use.
- Press the **<SEL>** 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, **L1.050** indicates that linearisation point one is active and was entered at about 50% of full scale. Unused linearisation points are shown with a row of dashes (eg. L2.---).
- Press **<OK>** to change the linearisation point selected or press **<ITM>** to exit without making any changes.
- After pressing **<OK>**, the current weight reading is displayed. 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 **<OK>** to enter a corrected weight value for this point or **<ITM>** to exit without making changes.
- Use the **<SEL>** and **<EDT>** keys to enter the correct value of the calibration weight being used.
- Press the **<OK>** 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. Press **<ITM>** to leave the routine or **<OK>** to repeat the operation.

7.2.2. CLR.LIN (Clear Linearisation)

- Press the **<OK>** key to view the list of linearisation points currently in use.
- Press the **<SEL>** 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, **L1.050** designates that linearisation point one is active and was entered at about 50% of full scale. Unused linearisation points are shown with a row of dashes (eg. L2. ---).
- Press **<OK>** to clear the linearisation point selected or press **<ITM>** to exit without making any changes.
- Once **<OK>** has been pressed, the linearisation point will be cleared, and the display will return to **CLR.LIN**.

Note: All linearisation points are cleared by restoring the default calibration of the instrument. The zero and span settings are also cleared by this process.

8. Serial Outputs

Theunit 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 enabled at a later date by entering the specific software option code for the instrument. Refer to “RANGER SMART” Software Options page 14 for more information on the unit options and software options.

For wiring connections and pinouts, refer to Auxiliary Connection page 12. The unit has only a single RS-232 output and requires an external converter to transmit in TTY Current Loop (20mA) or with RS-485. The Serial Port is bi-directional (in both RS-232 and RS-485 but not 20mA loop). The functions available include:

- Automatic Weight Output
- Networked Communications
- Printing

All serial output options are enabled and configured using the Serial Communications Options in the digital setup procedure.

Computer communications can range from simple automatic **streamed** output, through to multi-drop networked systems. The unit can be programmed and calibrated via the network. The setup 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 affecting the certification of a trade installation.

8.1. Automatic Weight Output from the "SCALEHAWK" INDICATOR

The automatic output is normally used to drive remote displays, a dedicated computer or PLC communications.

Auto Weight Format String

The weight format string has the following format:

STX Sign Weight(7) Status ETX

Where:

STX	is ASCII 02.
ETX	is ASCII 03.
Sign	is the sign of the weight reading (space for positive, dash (-) for negative).
Weight	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.
Status	provides information on the weight reading. The characters G/N/U/O/M/E represent Gross/Net/Underload/Overload/ Motion/Error, respectively.

8.2. Networking

The unit may be configured to respond to commands received via the serial port from a PLC or PC. The serial setup (SERIAL:TYPE) must be configured to NET, and the address of the unit must be set from the SERIAL:ADDR item.

8.2.1. Command Structure

The command structure for networking is:

STX CMD POLL ETX

Where:

CMD is the serial command

POLL is two digits giving this unit's network address (eg. **01** for address **1**)

Some commands result in a response from the unit**.** All responses are in the following format:

RESPONSE CR LF

Where:

Response is a string of characters that may be a weight reading or an acknowledgment of some action.

CR is the ASCII character 13

LF is the ASCII character 10

8.2.2. Command Types

- **Key Commands K: Kx**

  Key commands allow the unit to be operated via the network by simulating the actual pressing of it's keys.

  A key command is a two character command with the first character being capital **K**. The second letter specifies which key is pressed.

CMD	Description
Ka	Zero
Kb	Tare
Kc	Gross/Net
Kd	Print
Ke	Function
Kf	External Key 1
Kg	External Key 2
Kh	External Key 3

CMD	Description
Second letter capitals (below) simulate long two second key press	
KA	Zero
KB	Tare
KC	Gross/Net
KD	Print
KE	Function
KF	External Key 1
KG	External Key 2
KH	External Key 3

CMD	Description
Two key sequence (below) used to enter calibration menus	
KX	Simulates <POWER> + <ZERO>

Example: **STX K a 01 ETX** will simulate pressing the **<ZERO>** key on instrument 01

CMD	Description
Kp	Special key command that requests the current displayed weight from the unit. The returned weight information is the same format as for an auto output with the exception that there are no **STX** or **ETX** characters sent. Instead of the **STX ETX** characters a **CR LF** (as with all other network responses) follows the weight information.

Example: **STX Kp00 ETX** will return **" 100.5G *CR LF* "**

- **Read Targets R: Rx**

All of the Setpoint targets can be read using these commands. This is a two letter command with the first letter being capital **R** and the second letter specifying which target.

CMD	Description	Response
RA	Read Target 1	Target 1 *CR LF*
RB	Read Target 2	Target 2 *CR LF*
RC	Read Target 3	Target 3 *CR LF*
RG	Read In-Flight	In-Flight *CR LF*
RH	Read Hysteresis	Hysteresis *CR LF*

- **Set Targets S: Sxddd**

  All of the Setpoint targets can be set using these commands. This is a two letter command with the first letter being capital **S** and the second letter specifying which target. Following this is the actual target data, which is sent as an ASCII string of digits without any decimal point.

  Example: a target of **100.5 kg** would be set as **SA1005**

CMD	Description	Response
SAddd	Set Target 1	SA *CR LF*
SBddd	Set Target 2	SB *CR LF*
SCddd	Set Target 3	SC *CR LF*
SGddd	Set In-Flight	SG *CR LF*
SHddd	Set Hysteresis	SH *CR LF*

Note: All commands require a two digit Poll address at the end of the command. The characters **00** are used to specify any unit, or use the address setting of the instrument. The full command to set the target in the above example would be:

STX*SA100500*ETX

8.3. Printing

The **2100** has a single fixed printing format which is as follows:

```
0001 01/01/2001 10:30
             100.5 kg G
```

The first line contains a four digit print ID that is automatically incremented with each printing, up to a maximum of 9999. The first line also contains the current date and time, printed in European format.

The second line shows the displayed reading, units and **G** for Gross or **N** for Net.

If counting is active, the printout has a third line for the counting information as follows:

```
25 p
```

Whenever a new sample is taken when counting, the **2100** prints the following:

```
SAMPLE:   100 p =  12.5 kg
```

In addition to the printout, the unit adds the weight and pieces printed to internal weight and count totals. A long press of the **<PRINT/M+>** key will print and clear these totals. The four digit ID count is also cleared. Following is a sample of a total ticket:

```
0001 01/01/2001 10:30
          100.5 kg G
0002 01/01/2001 10:30
          110.2 kg G
0003 01/01/2001 10:30
          115.7 kg G
0004 01/01/2001 10:30
          120.0 kg G
TOTAL: 446.4 kg
```

If counting is active each of the individual printouts would have a third line as discussed above and the **TOTAL** would have an additional line as follows:

```
QTY:  125p
```

If running a batch there are also a number of automatically generated printouts that are described in Setpoint Printing page 48.

8.4. Master Serial Output

In **Master** mode the unit sends out the entire contents of the LCD every 100msec. This is essentially the same as AUTO output but the format of the output string is designed to allow a **2101** remote display to exactly copy the contents of the unit LCD including all of the Annunciators and User Prompts, etc.

9. Setpoints

The unit is capable of working with three internal setpoints. The status of these setpoints is displayed on the LCD. Each setpoint can be configured to perform a particular function and may be associated with a physical output driver or simply used as an indicator.

Note: Resources are shared with inputs and outputs.

9.1. Connection

Refer to Auxiliary Connection page 12 for the method of connection of the external output drivers.

9.2. Basic Setpoint Operation

In order to use a batching system, it must first be configured from the Full Digital Setup menus, under the Setpoints group (SET.PTS). Once the configuration has been performed, operator parameters (eg. targets and flight settings) can be entered from the Full Digital Setup menus or can be accessed later through the Operator Menu Setup. Refer to Setup page 25.

The sections following provide details on each of the available setpoint settings.

9.2.1. Configuring a Setpoint

Setpoints define logical outputs that are activated when certain conditions are met. Generally, each setpoint will have a corresponding physical output. However, it is possible to configure an I/O pin as an input and operate the setpoint purely to control the display annunciators and alarms.

An active setpoint operates at all times, whereas fill and dump setpoints are active only at specific times during a batch sequence. The operation of active weight setpoints is demonstrated in Figure 12 below. Also illustrated are the roles of target, in-flight and hysteresis settings. The operation of targets for filling, etc., are very similar to that of active setpoints.

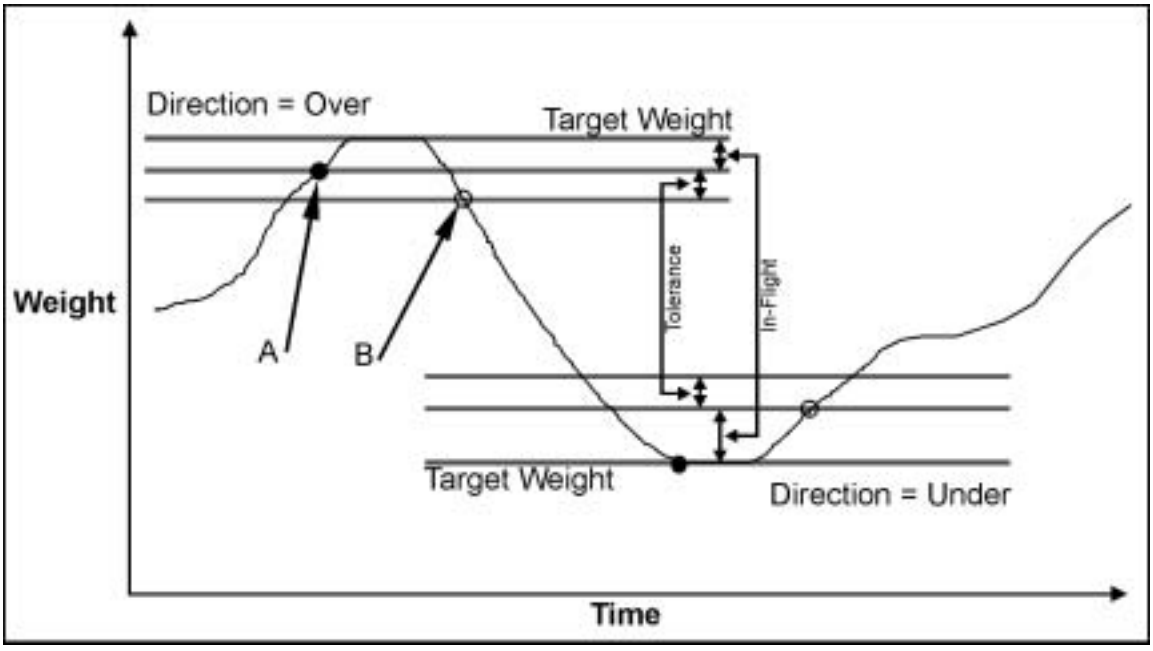


Figure 12: Setpoint Operation – Over vs Under

- **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**.
- For **Over** setpoints, the switch point is the target weight minus the in-flight. With **Under** setpoints, the switch point is the target weight plus the in-flight. Similar differences apply to the role of the tolerance setting.

9.3. Setpoint Options

To increase flexibility of the setpointing system, a number of options are available for each type of setpoint. These options are set using an option entry item. A description of each option is given below.

		- G O H -		
Type	**Source**	**Direction**	**Logic Level**	**Alarm**
- none	**Gross**	**Over**	**High**	**- none**
Active	Net	Under	Low	Single
Batch*****	Reading			Double
Pass	Held			Flash

Table 5: Setpoint Options

9.3.1. TYPE (None, Active, Batch, Pass)

This setting determines the type of setpoint operation. The batch setting is different for each of the three setpoints and is marked with an asterisk (*****).

- **(-) None**

  This is the default setting and disables the setpoint when not in use.

- **(A) Active**

  Setpoints of this type are always active regardless of whether a batch is running or not. Active setpoints are applicable to level control and overload alarms, etc.

- ***(S) Slow Fill – Batch Setting**

  The Slow Fill is the primary single material fill setpoint and is only available on setpoint 1. The target for this setpoint represents the final material fill weight for a batch. This type of setpoint requires a Batch start command to activate.

- ***(F) Fast Fill – Batch Setting**

  The Fast Fill setpoint must be used in conjunction with a slow speed fill. The slow speed fill specifies the final target weight of the fill while the target for the fast fill specifies a preliminary weight in the filling process. This means that the fast fill target specifies how much weight before final target that the fast fill operates.

  Example: The final target (target 1) is 100kg and the fast fill is set to 20kg. The **2100** will activate the fast fill setpoint (setpoint 2) for the first 80kg (ie. 20kg less than final target) and then activate the slow fill (setpoint 1) for the remainder.

- ***(d) Dump – Batch Setting**

  This is a dump to weight setpoint. If set the target weight for this setpoint type will be ignored. After the filling part of a batch is completed, the dump setpoint will be activated until the weight returns within the zero dead band (or negative weight) and there is no motion.

  Note: It is possible to set the dump to a specific time rather than a weight. Refer to D.TIME (Dump Time) page 34 for more information.

- **(P) PASS**

  Pass is available for setpoint 3 only and is a special setpoint type that does not use the targets, etc. This setpoint is active only when all other setpoints are off. It is intended for use in a check weigh application where the other setpoints represent out of tolerance conditions. The Pass output can then be used to indicate that the other overweight or underweight conditions are not present.

  If a Pass output is used, other Active outputs are inhibited when the weight is within the zero dead band of the instrument. This is used to prevent an underweight output from being active when there is nothing on the scale.

9.3.2. SOURCE (Gross, Net, Reading, Held)

This is used to select whether this setpoint uses gross weight, net weight, displayed weight (gross or net), or a held weight. Use Held in conjunction with peak hold, manual hold or livestock modes to generate limit outputs for these held weights.

When filling and using the Net source, the indicator performs a Tare operation at the start of a sequence and weighs to a net weight target.

If a Dump setpoint is using Gross weight, the unit will change the displayed reading to gross weight during the dump process. Otherwise the unit will leave the display unchanged and dump to net zero weight.

The Fast Fill source is automatically set to be the same as the Slow Fill source.

9.3.3. DIRECTION (Over, Under)

Choose Over if the weight increases towards the setpoint target. Choose Under for a reduction in weight toward the setpoint. Note that an Under setpoint with a Net Source requires a negative net weight target to be entered in the Full Digital Setup or Operator Menu Setup.

Fast Fill Direction is automatically set to be the same as the Slow Fill Direction.

9.3.4. LOGIC LEVEL (High, Low)

This option determines the logical 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. When filling, the logic level is selected automatically to suit the fill application.

Fast Fill Logic Level is automatically set to be the same as the Slow Fill Logic Level.

9.3.5. ALARM (None, Single, Double, Flash)

The alarm setting is used to configure an alarm to activate while a setpoint is active. The alarms can be single beeps, double beeps or display flashing (without beeping).

9.3.6. D.TIME (Dump Time)

The dump time determines the amount of time (in seconds) to operate Option C when dumping. When set to 0.0, Option C dumps to a zero weight. When set to anything other than 0.0, Option C dumps to the specified time.

Acceptable settings range from 0.0 to 20.0. The default setting is 0.0, which corresponds to standard dump functionality. A setting >0.0 activates a “finish pulse” at the end of the dump cycle. The “finish pulse” starts when motion stops and maximum weight is registered. The “finish pulse” ends when the D.TIME setting times out. Note: The “finish pulse” times out independently of motion or weight.

9.4. Operator Parameters

These settings can be accessed via the Full Digital Setup or Operator Menu Setup.

9.4.1. Targets

This is the target weight value. The unit 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.

Targets may be entered as positive or negative values. When weighing out of a hopper the targets are usually set as negative net weights.

9.4.2. In-Flight

In-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. This value is initially set by the operator but is automatically updated to track the actual flight observed. After each batch the actual fill is compared with the target weight and the in-flight is adjusted. To avoid “hunting”, only 50% of the error of the batch is used and the maximum single change is limited to five divisions of weight.

9.4.3. Hysteresis

The hysteresis/tolerance value 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.

9.5. Setpoint Printing

When the unit is operating as a batching controller and printing is enabled the following printout will be automatically generated for each batch.

```
        0001 TGT:  100.0 RDG:  100.5 kg
```

Each weight reading is added to a total when it is printed. Pressing the **<PRINT/M+>** key for two seconds will print and clear the total. The following is a sample of a total batch ticket.

```
        0001 TGT:  100.0 RDG:  100.5 kg
        0002 TGT:  100.0 RDG:  100.2 kg
        0003 TGT:  100.0 RDG:  100.1 kg
        0004 TGT:  100.0 RDG:  100.4 kg
        TOTAL: 401.2 kg
```

10. Special Functions

10.1. Introduction

The unit has up to three independent remote input functions that may be triggered by external keys connected to the auxiliary port. In addition there is a single general purpose function key on the front panel of the unit. The function of each of these keys may be configured to any of the options detailed below. See KEY.FN (Key Functions) page 31 for details of how to configure the function key and remote input functions. Not all remote functions are available on the front panel function key. Functions that are only suitable for remote inputs are marked with ® below. Each function is identified by a single letter abbreviation identified below in brackets. For example a setting of **SZTP** in the **SPEC:KEY.FN** option would indicate **Show Total** on the front panel function key, and **<ZERO>**, **<TARE>** and **<PRINT/M+>** functions on the three external inputs.

Note: Resources are shared with inputs and outputs.

10.2. Key Functions

® Front Panel Keys ZERO (Z), TARE (T), GROSS.NET (G), PRINT (P)

The function of each of the front panel keys may be implemented with the remote keys.

10.2.1. UNITS (U)

Use this key to switch the displayed reading between lb and kg. This will affect the displayed and printed weight but not any data entry. Targets, etc., must be entered in the primary units of the indicator (ie. lb or kg).

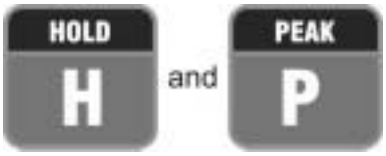
10.2.2. COUNT (C)

Use this key to implement parts counting. Press the **<COUNT>** key to switch between weight display and counts display. The units annunciator shows **p** for pieces.

To record a new sample do the following:

- Tare off any containers.
- Place the sample on the scale
- Press and hold the **<COUNT>** key for two seconds. The default number of items in the sample will be displayed.
- Use the **<SEL>** and **<EDT>** keys to alter the number of items.
- Press **<OK>** and the current sample will be stored against the entered items.
- If printing is enabled the sample quantity and weight will be printed.

10.2.3. HOLD (H) and PEAK (E)



The **HOLD** key implements a manual **Hold** function. The **PEAK** key implements a **Peak Hold** function (ie. the largest absolute weight (either positive or negative) is stored in the peak value). The units of the display flash to indicate that the displayed weight is a held weight and not the current weight.

To perform the **HOLD** function do the following:

- 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.

To perform the **PEAK** hold function do the following:

- 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**.

All printouts that print the displayed weight will use the held weight reading if it is currently being displayed.

10.2.4. LIVE WT (L)

The **LIVE WT** key stands for **Live Weight**.

Use this key to enable Live Weight averaging. With this feature it is possible to determine the weight of a continually moving mass.

- Press and hold the **<LIVE WT>** key to switch between normal weighing and live weight mode.

During normal weighing this key operates exactly like a manual **Hold** key.

In Live Weight mode use this key to force a resample of the weight. While the weight is being sampled the unit displays dashes (ie. - - - - - -). Once a weight has been determined the unit beeps to indicate the reliability of the reading.

- A single beep indicates that the sample is too unreliable and has been discarded.
- A double beep indicates that the sample is reliable but is made up of a long term average of readings.
- A triple beep indicates that the sample was taken as a result of no motion and is very reliable.

10.2.5. TOTAL (S)

The **TOTAL** key stands for **Show Total**.

The **PRINT** key is used not only to print the current weight but to add that weight to the current total.

- When the **<TOTAL>** key is pressed the unit displays **count** followed by the number of items in the total.
- After this **TOTAL** is displayed followed by the current total weight.
- If counting is active **QTY** is also displayed along with the total quantity of items in the total.

If the total weight is too large to display in six digits, the weight is shown in two sections labeled with the upper six digits displayed before the lower six digits.

A long press of the **<PRINT/M+>** key causes the total accumulated weight to be printed and then cleared. The serial option must be activated for this function.

Refer to Printing page 42 for details of the printed output from totalising.

10.2.6. BATCH (B)

Use this key to control the operation of the batching function. A single press is used to **Start** the batch or **Pause\Restart** the batch once it is running. A long press aborts the batch. The setpoint option must be activated for this function.

10.2.7. ® BLANK (K)

This function allocates the selected input as a blanking input. When active this input causes the front display to be blanked to dashes (ie. - - - - - -) 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. Appendix

11.1. Error Messages

A number of error messages may be displayed to warn of operation outside of the acceptable limits. These messages are described 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.

11.1.1. 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 load cell 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/M+>** operation from occurring on command. (Try the operation again once the scale is stable.)
(QA.DUE)	The **calibration due** date has been set and the current date exceeds this limit. Press any key to clear the warning for one hour. To clear the warning permanently, recalibrate the instrument (CAL (Scale Calibration) page 29) and the set a new **calibration due** date (QA.DATE (QA Date) ⊗ page 34).

11.1.2. Battery Operation

When the unit is setup for battery operation **BAT** will be flashed on the auxiliary display when the battery requires recharging. If the battery is not recharged the unit will automatically power off when the battery voltage falls below 10.5V. Refer to AUT.OFF (Auto Power Off / Battery Operation) page 31 for more information.

11.2. Diagnostic Errors

The unit 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 unit must be returned for factory service

Error	Description	Resolution
(E 0001)	The power supply voltage is too low.	Check supply
(E 0002)	The power supply voltage is too high.	Check scale / cables
(E 0004)	The load cell excitation voltage is too low.	Check scale / supply
(E 0008)	The load cell excitation voltage is too high.	Check scale / supply
(E 0010)	The temperature is outside of allowable limits.	Check location
(E 0020)	Scale build is incorrect. The number of graduations has been set less than 100 or greater than 30000.	Fix up scale build
(E 0100)	The digital setup information has been lost.	Re-enter setup
(E 0200)	The calibration information has been lost.	Re-calibrate
(E 0300)	All setup information has been lost	Enter setup and calibrate
(E 0400)	The factory information has been lost.	Service
(E 0800)	The EEPROM memory storage chip has failed	Service
(E 2000)	ADC Out of Range Error. This may be caused from a broken load cell cable.	Check load cell cable
(E 4000)	The battery backed RAM data has lost data.	Re-enter setup
(E 8000)	The FLASH program memory is incorrect	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 **E 0005** (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)

11.3. Version 2.1 Software Updates

The updates in the Ver 2.1 software include adding the SYNC item to the SPEC group and adding the D.TIME item to the SET.PTS group

Group	New Item Added	Notes
SPEC	SYNC	Refer to SYNC (A/D Frequency) page 32.
SET.PTS	D.TIME	Refer to D.TIME (Dump Time) page 34.

11.4. Setup Menu Quick Reference

Group (GRP)	Item (ITM)
BUILD (Scale Build) page 27	DP (Decimal Point Position) ⊗ page 27
	CAP (Maximum Capacity) ⊗ page 27
	RES (Count-by Resolution) ⊗ page 27
	UNITS (Weighed Units) ⊗ page 28
	HI.RES (High Resolution x10 mode) ⊗ page 28
OPTION (Scale Options) page 28	USE (Scale Use) ⊗ page 28
	FILTER (Reading Average) page 28
	MOTION (Motion Detection) ⊗ page 28
	AUTO.Z (Auto-Zero on Startup) page 29
	Z.TRAC (Zero Tracking Sensitivity) ⊗ page 29
	Z.RANGE (Allowable Zero Operating Range) ⊗ page 29
	Z.BAND (Zero Dead Band) ⊗ page 29
CAL (Scale Calibration) page 29	ZERO (Zero Calibration) ⊗ page 29
	SPAN (Span Calibration) ⊗ page 29
	ED.LIN (Edit Linearisation Points) ⊗ page 30
	CLR.LIN (Clear Linearisation Points) ⊗ page 30
	FAC.CAL (Restore Default Factory Calibration) ⊗ page 30
SPEC (Special Settings Menu) page 30	OP.PC (Security Passcode for Operator Menu Access) page 30
	FULL.PC (Security Passcode for Digital Setup) page 30
	KEY.LOC (Front Panel Key Locking) ⊗ page 31
	KEY.FN (Key Functions) page 31
	B.LIGHT (Backlight Operation) page 31
	BRIGHT (Backlight Brightness) page 31
	AUT.OFF (Auto Power Off / Battery Operation) page 31
	AUX.DSP (Auxiliary Display Setting) page 32
	SYNC (A/D Frequency) ⊗ page 32
SERIAL (Serial Communications Options) page 32	TYPE (Serial Output Type) page 32
	ADDR (Serial Address) page 32
	BAUD (Serial Baud Rate) page 32
	BITS (Serial Format Options) page 33
SET.PTS (Setpoint Settings) page 33	OPTN A, OPTN B, OPTN C (Setpoint Options) page 33
	TARG A, TARG B, TARG C (Targets for each of the three setpoints) page 33
	FLIGHT (In-Flight Weight) page 34
	HYS (Hysteresis) page 34
	D.TIME (Dump Time) page 34
CLOCK (Clock Settings) page 34	TIME (Set Time) page 34
	DATE (Set Date) page 34
	QA.OPT (QA Option Setting) ⊗ page 34
	QA.DATE (QA Date) ⊗ page 34
TEST (Special Test Functions) page 35	SCALE (Scale Base Test Display) page 35
	FRC.OUT (Force Outputs) page 35
	TST.INP (Test Inputs) page 35
FACTRY (Factory Adjustment Menu) page 35	DEFLT (Restore Factory Defaults) page 35
	CONFIG (Software Options) page 35
-END- (Leaving Setup)	To return to Operator Interface. Refer to Exiting Full Digital Setup page 25 or Exiting Operator Menu Setup page 25.

11.5. Glossary

Term	Definition
Count-by	The smallest change in weight units that the display can show. See also Resolution.
Division	A single graduation.
EEPROM	Electrically Erasable Programmable Read-Only Memory
EMC	Electromagnetic Compatibility Regulation
FIR	Finite Impulse Response
Fullscale	The maximum gross weight allowed on the scale. This is used to detect overload and underload conditions, etc.
Graduations	The maximum number of display steps between zero gross load and full capacity gross load. It is equal to the Fullscale divided by the resolution.
LED	Light Emitting Diode
OIML	International Organization of Legal Metrolology
PLC	Programmable Logic Controller
Range	Total change in weight between zero gross load and full capacity gross load (ie. the nominated total capacity of the scale). It is always given in displayed weight units.
Resolution	The smallest change in weight units that the display can show. See also Count-by.
RFI	Radio Frequency Interference
RS-232, RS-485	Standards for communications hardware layers.
Step-Response	The step-response is the time between placing a weight on the scale and the correct weight reading being displayed.
SYNC Frequency	The sampling frequency of the analog-to-digital converter. It is selectable at 25/30Hz on the unit and defines the FIR filter response.
Transients	A temporary voltage oscillation or spike caused by a sudden change of load (or other external influence).
Units	The actual units of measurement (kilograms, tonnes, pounds, etc.).

11.6. List of Figures and Tables

12. Index

Notes:

CE

N2708

This document is designed as a guide to the operation of the product. It shall not form any contract. The specifications of the product may be altered without notice.