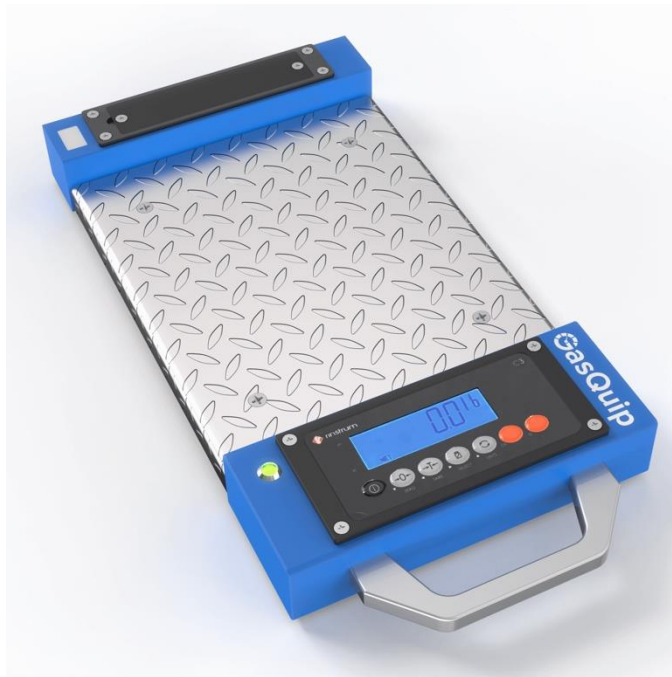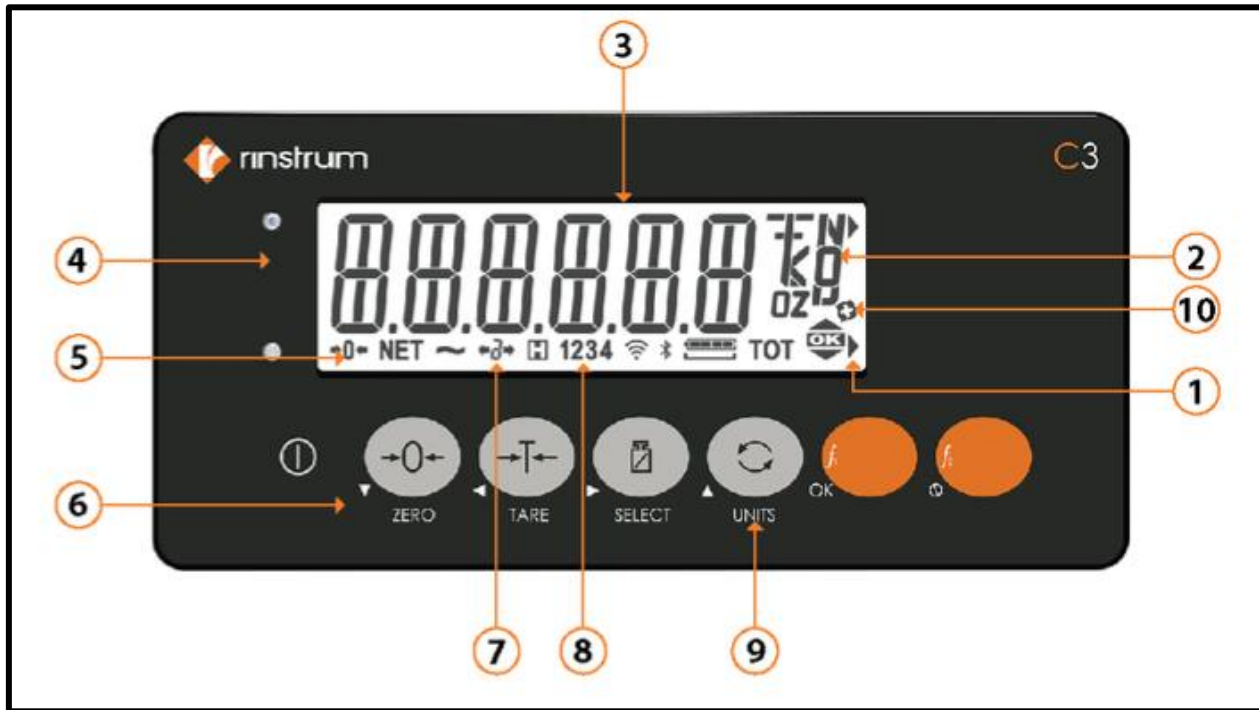# Gas Cylinder Scale
GQ-CWS-V3

Version 1.0.0
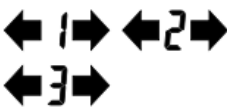
Display

1. Check Weight Status	2. Units Indicator	3. Six-Digit Line Segment RGB LCD Display	4. rinLINK Attachment	5. Weighing Status	6. Seven Key Keypad
7. Multiple Range/ Interval Status	8. Output Status	9. Units Key	10. Function Enable		

- Display (3): weight readings, errors, information, & setup

- Units Indicator (2): units for the weight reading (pounds *lb* & kilograms *kg*)

- Status indicators (1), (5), (7), & (8): The weighing status (5) shows the displayed reading. The multirange status (7) shows the current multirange operation.

Display

|	
➡0⬅	Lit when the displayed reading is within $\pm\frac{1}{4}$ of a division of true zero.
〜	Lit when the displayed reading is in motion.
NET	Lit when the displayed reading represents net weight.
⌴	Lit when the displayed reading is within the zero band.
H	Lit when the display reading has been held.
⬅1➡ ⬅2➡ ⬅3➡	Ranges 1, 2 and 3 (multiple range/interval modes only)
1 2 3 4	1 and 2 lit to indicate when the outputs are active.
OK	Lit to indicate various states during checkweigh.
TOT	Lit to indicate that the displayed weight is a total
▮▯▯▯	Lit when operating on battery, to indicate the charge level of the battery
↻	Lit to indicate function enable

Has a key been locked?

A single press of each key triggers the weighing operation printed on it. The instrument allows individual keys to be disabled in the setup. All keys are enabled at the factory, but some keys may have been intentionally disabled (locked) during installation. If a key has been locked, a long beep sounds when it is pressed. If, however, they key beeps normally, but does not appear to trigger the <u>desired </u>action desired action, it may be waiting for the weight reading to settle before the action can proceed.

Stability – What is a "Error Motion"?

Once a <ZERO>, <TARE> or <PRINT> key is pressed the instrument waits for a stable valid reading before performing the associated operation. If the weight readings remain unstable or invalid due to some diagnostic error for longer than 10 seconds, the operation is cancelled and the ERROR MOTION message is displayed.

Power Key

Power Key		⏻
Normal function	Power	The <POWER> key is used to turn the instrument on and off. To initially turn the instrument on, press the <POWER> key. The display will show the following: • Display segments will light and then clear. • Software Version (e.g. V4.0). • Calibration Counter (e.g. C.00010). Refer to Calibration Counter ⌐56 for more information. • Configuration Counter (e.g. F.00015). • The current weight will then display. To turn the instrument off, press and hold the <POWER> key for three seconds. The instrument will display OFF followed by the 3s countdown. Locking: The key can be locked to prevent the instrument being turned off from the front keypad using KEY.LOC (Front Panel Key Locking) ⌐32 in General option Settings or using the power override switch in the back of the indicator.
Long press function	Turn off	Display the power off countdown, then turn off.
Automatic Operation		The key has a memory function associated with it. This means that the power state is remembered even if external power is
		interrupted. It is therefore possible to turn the instrument on in the safe knowledge that it will operate whenever external power is available and will not need to be manually turned on again if the power is interrupted.

Zero Key

Zero Key		ZERO
Normal function	Zero	When an empty scale has drifted away from a true zero reading, this <ZERO> key is used to perform a zero adjustment on the scale display. The zero adjustment is stored when power is removed and is re-used when next powered up. The amount of weight that may be canceled by the <ZERO> key is limited via an item in the Setup of the instrument. Refer to Z.RANGE (Allowable Zero Operating Range) ⌷38 for more information. Locking: The key can be locked to prevent the normal function is being performed from the front keypad. Refer to KEY.LOC (Front Panel Key Locking) ⌷32 for more information.
Long press function		

Tare Key

Tare Key		TARE
Normal function	Tare	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 weight tared is deducted from the allowable range of the scale, reducing the maximum weight that can be displayed. Locking: The key can be locked to prevent the normal function is being performed from the front keypad. Refer to KEY.LOC (Front Panel Key Locking) ⌷32 for more information.
		If PT.CLR ⌷39 is OFF then it is possible to first set a PRESET TARE on the device and then set a separate TARE that operates along with the PRESET TARE. NET = GROSS – PT – TARE . There is a new weight source

Tare Key (continued)

		called NET.PT which is equal to GROSS – PT. When printing it is necessary to print GROSS, PRESET TARE, TARE and NET when using this mode. It is not possible to change the PRESET TARE value if there is an active TARE value set on the instrument. Both TARE and PRESET TARE are cleared when ZERO is pressed. The key application for this is filling/discharging vessels where there is a known TARE weight of the empty vessel that is entered and the NET.PT value is then the amount of material remaining in the vessel. In order to add/remove material from the vessel it is tared and the net change can be displayed. Instead of going back to GROSS though when TARE cleared we can go back to NET.PT as an indication of material available in the vessel.
Long Press		This feature allows the operator to manually enter the tare weight. After setting the preset tare value, indicator will display Pt followed by selected preset tare value. When a preset tare weight is being used the instrument will display Pt before displaying the net weight. A long press of the <TARE> key will allow editing of the Preset Tare value. Press the <OK> key to enter the Preset Tare setting. Change the Preset Tare setting using the <ARROWS> keys.
		The Preset Tare setting can be cleared by one of three means: • Using a long press of the <TARE> key and editing the preset tare value to zero. • While the gross load is zero; Using a short press of the <TARE> key to re-tare the instrument in the usual manner. • OR, Using a short press of the <ZERO> key to zero the instrument in the usual manner.
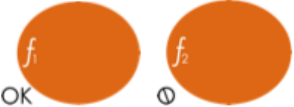
Select Key

Select Key		SELECT
Normal function	Gross / Net	This key is used to toggle the weight display between the Gross weight and the Net weight (provided that a Tare has previously been acquired using the <TARE> key). Locking: The key can be locked to prevent the normal function from being performed from the front keypad. Refer to KEY.LOC (Front Panel Key Locking) ⬚32.
Long Press	Setup Menus	This will allow to access the Setup Menus ⬚26.

Unit Key

Unit Key		UNITS
Normal function	Change units	The units key is used to convert primary (calibrated) unit to alternative units (2 secondary units available). The short press will step through and display up to three units as per setup. Locking: The key can be locked to prevent the normal function from being performed from the front keypad. Refer to KEY.LOC (Front Panel Key Locking) ⬚32 for more information.
Long Press	Piece count	When piece counting is enabled (using P.COUNT setting) pieces (p) is one of the available units and the long press varies. When there is no piece counting, a long press has no function. Refer UNITS ⬚66 Section for more information.

Function 1 & 2 Keys

Function Keys		
Normal function	Configurable	The function of this key can be selected from a number of distinct functions including totalisation, unit switchin, etc. Refer to Special Functions (FUNC) [61] page for details of the available functions. Locking: The key can be locked to prevent the normal function is being performed from the front keypad. Refer to KEY.LOC (Front Panel Key Locking) [32] for more information.
Long Press		A long press of the key may be used for certain functions depending on the primary function of the key.

Error Messages:

Overview

Several error messages may be displayed to warn of operation outside of the acceptable limits. These messages may appear on either the primary or the secondary display.

Short messages (XXXXXX) will appear as a single message. Longer messages (XXXXXX) (YYYYYY) will appear on the display in two parts, first the (XXXXXX) part, then the (YYYYYY) part.

Weighing Errors

These messages show status messages or errors that may occur during normal weighing operation.

Error	Description	Resolution
(U.LOAD)	The weight is below the minimum allowable weight reading.	Increase the weight or decrease the minimum allowable weight reading.
(O.LOAD)	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.
(ERROR) (RANGE)	The weight reading is beyond the limit set for Zero operation. The operation of the <ZERO> key is limited in the setup during installation. The indicator cannot be Zeroed at this weight.	Increase the Zero Range (Z.RANGE) or use the <TARE> key instead.
(ERROR) (MOTION)	Scale motion has prevented a <ZERO> or <TARE> operation from occurring on command.	Try the operation again once the scale is stable.
(ERROR) (ADC)	An error with the ADC has prevented a <ZERO> or <TARE> operation from occurring on command.	Ensure loadcell cabling is correct.

Calibration (Scale:Cal)

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

Note: The BUILD and OPTION settings MUST be configured before calibration is attempted.

To perform a calibration, when in Full Setup select SCALE:CAL. The calibration program will automatically prevent the instrument from being calibrated into an application outside of its specification. If an attempt is made to calibrate outside of the permitted range, an error message will display and the calibration will be abandoned. The instrument has a wide-range A/D converter. The industrial calibration range of the instrument extends well beyond the Trade approved range.

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

Performing a Digital Calibration with Test Weights
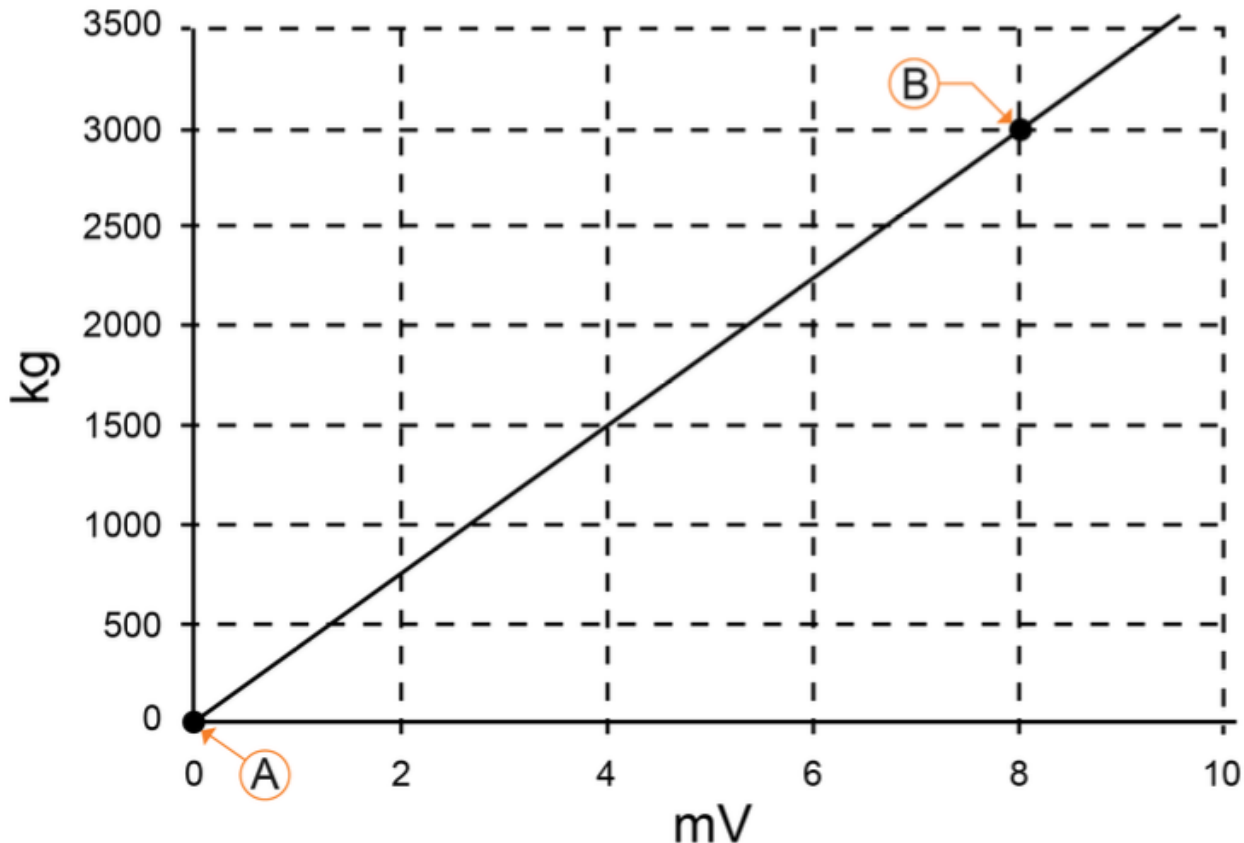
Figure 16: Zero and Span Points to Interpolate Weight from Load Cell

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 full scale) used to convert the A/D readings into weighing units (e.g. 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 zero and span points are used to interpolate a weight reading from the load cell reading.

Notes:

1. Calibration points (Zero, Span and Linearization) must be spaced by at least 2% of Full scale from each other.
2. First span point must be 10% of full scale or greater for successful calibration.

CAL:ZERO (Zero Calibration Routine)

- Press the <OK> key to start - the display will show the current weight.
- Remove all weight from the scale structure.
- Press <OK> to start a Zero Calibration routine - the display will show Z in P to indicate that zeroing is in progress.
- When complete the display show the weight
- Press the <OK> key to leave the routine and return to the CAL menu - use the menu navigation to finish setup.

CAL:SPAN (Span Calibration Routine)

- Press <OK> to start. The display will show the current weight. (*)
- Add the calibration test mass to the scale where the closer the test weight is to full scale the better the accuracy. (The minimum acceptable span calibration weight is 2% of the scale range but a weight this small may limit calibration accuracy)
- Press <OK> to show the calibration weight and enter into edit mode.
- Use the <ARROW> keys to update the calibration weight.
- Press <OK> to start the Span Calibration routine - the display will show **S in P** to indicate that spanning is in progress
- When complete the display will show the weight.
- Press the <OK> key to leave the routine and return to the CAL menu - use the menu navigation to finish setup.

(* Use CAL:CLR.LIN to clear linearization points as required)

Performing a Calibration with Direct mV/V Entry (K304, K306)

In applications where test weights are not easily available, it is possible to calibrate the instrument directly by entering the mV/V signal strength at Zero and full scale Span. The Direct Zero setting (CAL:DIR.ZER) specifies a gross zero point for the scale. The Direct Span setting (CAL:DIR.SPN) specifies the mV/V signal strength corresponding to an applied mass equal to the full scale reading. This calibration technique is not compatible with linearization. Clearly the accuracy of this type of calibration is limited to the accuracy of the direct mV/V data.

DIR.ZER (Direct Zero Calibration Entry)

- Press the <OK> key to start. The display will show the current weight.
- Press the <OK> key to enter the Direct Zero setting - change the mV/V setting to the correct value for Zero using the <ARROW> keys - display DONE
- Press the <OK> key to store the new zero calibration - the display will show DONE and then the weight.
- Press the <OK> key to leave the routine and return to the CAL menu - use the menu navigation to finish setup.

DIR.SPN (Direct Span Calibration Entry)

- Press the <OK> key to start - the display will show the current weight.
- Press the <OK> key - change the weight to the correct value and press the <OK> key - the display will show the current mV/V.
- Change the mV/V setting to the correct value and press the <OK> key - the display will show DONE and then the weight.
- Press the <OK> key to leave the routine and return to the CAL menu - use the menu navigation to finish setup.

Using Linearization (ED.LIN)

Linearization 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 linearization applied is a poor approximation to the real characteristic. By applying one or more linearization points, more accurate weight readings can be achieved.

To perform a linearization, a calibration of the zero and full-scale span points must have been performed. Both the zero and full-scale calibration points are used in the linearization of the scale base. These two points are assumed to be accurately set and thus have no linearization error.

Multiple linearization points can be set independently between zero and full scale depending on the indicator. Unused or unwanted points may also be cleared (CAL:CLR.LIN). The maximum correction that can be applied using a linearization point is + / - 2%.
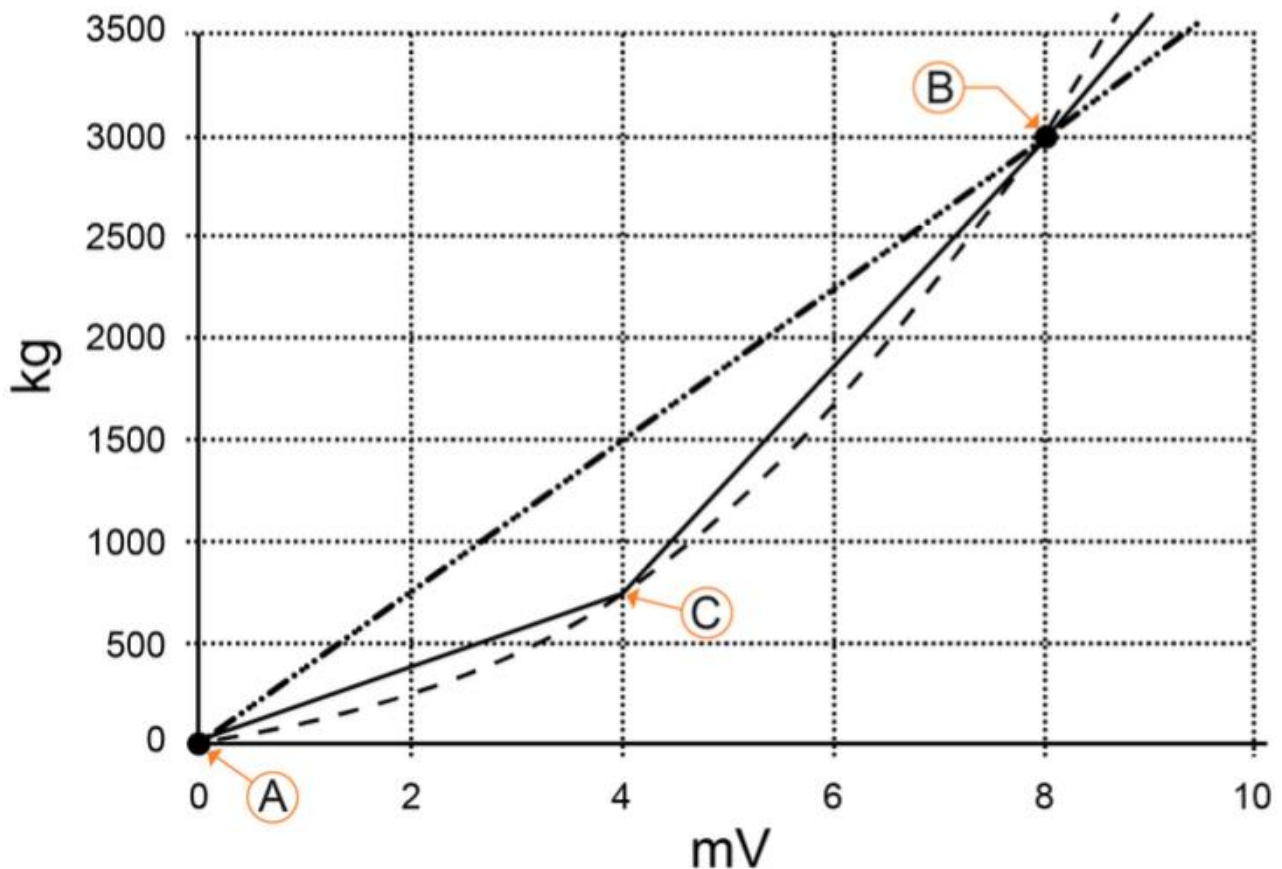

Figure 17: Non-Linear Characteristic for Load Cell Output

Using Gravity Compensation (GRAVITY)

To use this feature, the gravitational acceleration of the factory (G.FAC) and the installation location (G.INST) must be known. The indicator uses these 2 settings to compensate for the change in gravitational acceleration between locations.

The following procedure can be used when a scale is to be calibrated at one location and then installed at a different location.

1. Set the factory gravitational acceleration (G.FAC) to that of the location the scale is being calibrated at.
2. Perform a Zero and Span calibration. Note: When a Zero or Span calibration is performed the G.INST setting is reset to equal G.FAC.
3. Set the G.FIRST setting to ON. This enables the user prompt.

The scale can then be sent to the installation location. When the indicator is powered up the user will be prompted to enter the gravitational acceleration of their location (G.INST). At this prompt, the user can enter this setting one time only without affecting the calibration counter. Once a valid setting has been entered, the user will not be prompted again.

The G.INST setting can be edited directly in the calibration menu however this will result in the calibration counter being incremented.

Error Codes

Error	Description	Resolution
(E0001)	The power supply voltage is too low.	Check supply
(E0002)	The power supply voltage is too high.	Check scale / cables
(E0004)	Positive sense voltage out or range.	Check scale connections and SCALE:BUILD:CABLE setting.
(E0008)	Negative sense voltage out or range.	Check scale connections and SCALE:BUILD:CABLE setting.
(E0010)	Temperature is outside of allowable limits	Check location
(E0020)	Module Error	Replace Module
(E0080)	Language file corrupted	Reload translation files
(E0200)	The calibration information has been lost.	Re-calibrate
(E0400)	The factory information has been lost.	Return for Service
(E0800)	Application settings have been set to defaults.	Check and re-enter application settings
(E2000)	ADC Out of Range Error. This may be caused from a broken load cell cable.	Check BUILD:CABLE setting. Check load cell cable, wiring, etc.

Error	Description	Resolution
(E00100)	The digital setup information has been lost.	Re-enter setup and Check settings
(E01000)	Change in ADC or DSD library checksum	Re-enter setup
(E04000)	Runtime database has been lost	Check zero and Tare settings

The E type error messages are additive. For example, if instrument is running off batteries and the temperature drops, the battery voltage may be too low. The resulting error messages will be E 0011 (0001 + 0010). 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)

Calibration Errors

Error	Description	Resolution
(FAILED) (BAND)	An attempt has been made to calibrate with a weight or signal which is not in the valid range.	Check weights and retry.
(FAILED) (ERROR)	An attempt has been made to calibrate while the scale signal is not valid.	Check loadcell connection and the 4-wire/6-wire setting.
(FAILED) (TIMEOUT)	For an unknown reason, the calibration was unable to complete.	Retry.
(FAILED) (RES)	An attempt has been made to calibrate the scale to a resolution which is too high for the instrument.	Check weights and retry.
(FAILED) (TOO CLOSE)	An attempt has been made to add a linearisation point too close to zero, span or another linearisation point.	Check weights and retry.

For more information on calibration & setup of the indicator, visit
https://www.rinstrum.com/product/c320-weighing-indicator/