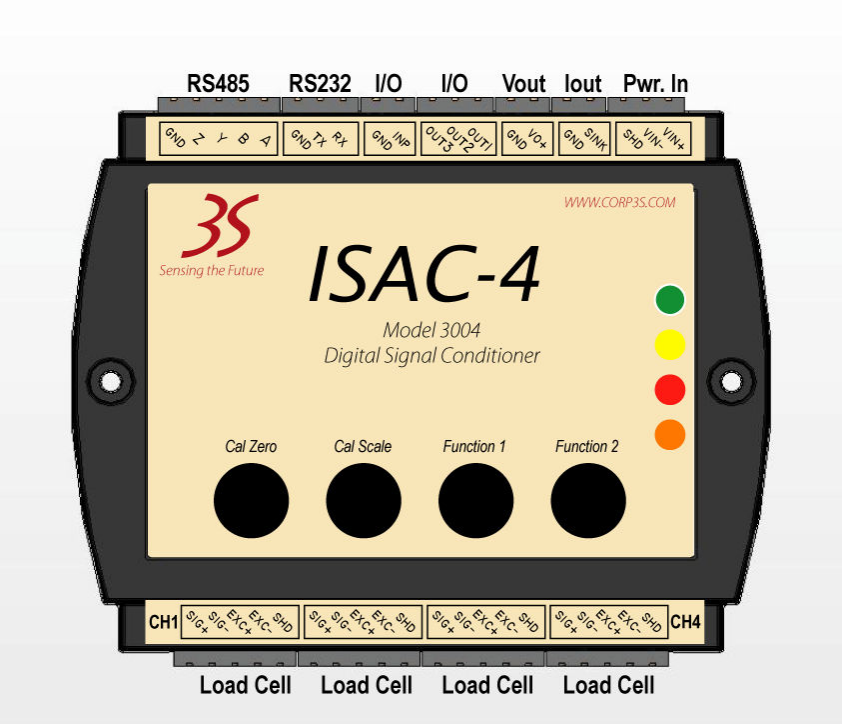
secosys

Model 3004 Intelligent Signal Conditioner

Installation and Operation Manual



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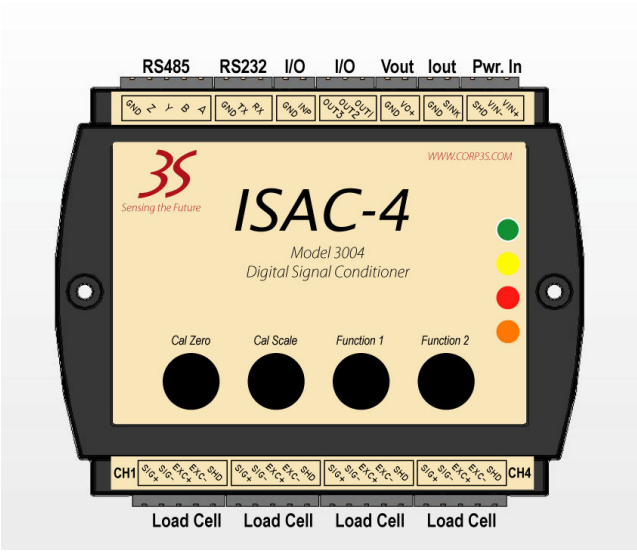
Model 3004 Overview

The Model 3004 is a four input, intelligent load cell controller that features:

- **Voltage output and current loop signal conditioning**
- **Serial communications to host systems through an RS232 connection**
- **Multi-drop RS485 Networking**
- **Digital Outputs triggered by user defined setpoints**
- **Bluetooth wireless communications with optional Bluetooth card**
- **Configurable for four individual scales or a single multi-load cell scale**
- **TrimCal routine for summing and trimming of load cells when configured for multi-cell platforms**

The 3004 Connector Block and Keypad

There are two connector banks on the 3004. The bottom bank of connectors contains four, five pin pluggable terminal blocks for connection to load cells. The top bank contains seven, field terminals that include:



1. RS485 multi-drop connection
2. RS232 serial communications
3. Digital input connection
4. Transistor switch output connection
5. 0-5vdc or 0-30mv conditioned signal voltage output
6. 4-20 ma conditioned signal current loop
7. Supply power input (5.5 to 24 Vdc)

The 3004 includes a keypad that is used to calibrate an attached scale and to perform diagnostic tests.

The keypad key functions are as follows:

- **Cal Zero: Pressing then releasing this key will zero the scale if the zero function is enabled. Holding this key down for approximately 6 seconds will put the 3004 into calibration mode**
- **Cal Scale: When the 3004 is in calibration mode this key is used to calibrate the span of the attached scale**
- **Function 1: This key toggles the digital outputs for test purposes.**

- **Function 2: This key is used to set the conditioned signal outputs to zero and full scale. This feature is handy when calibrating an attached display or system testing.**

There are four LED windows on the 3004 keypad. From top to bottom the LED assignments are as follows.

- **Green LED: This LED illuminates when the 3004 is powered on. This LED flashes when a temperature driven or time driven self-calibration is taking place.**
- **Yellow LED: This LED illuminates when a user defined setpoint is reached. This LED is also used to indicate sequence steps when performing calibrations or exercising the Function keys. This LED is also used to indicate a load cell error.**
- **Red LED: This LED illuminates when a user defined setpoint is reached. This LED is also used to indicate sequence steps when performing calibrations or exercising the Function keys. This LED is also used to indicate a step sequence error.**
- **Amber LED: This LED flashes when serial communications via RS232 connection or Bluetooth wireless connection is established.**

Connecting the Model 3004

Power Input:

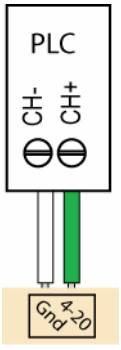
The 3004 will accept DC power supply voltages of 6 to 24 Vdc. Supply power is connected to the Power Input Connector. The positive supply line is connected to VIN+. The Negative (Ground) line is connected to VIN-. If available connect the shield wire to SHD.

Voltage Output Operation

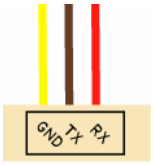
The Model 3004 provides a conditioned voltage output signal that is jumper selectable for 0-30mv or 0-5vdc operation. This voltage output is available at the Vout + and Gnd terminals of the voltage output connnector.

Current Loop Operation

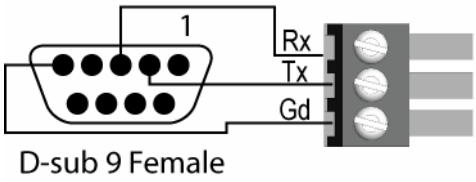
The Model 3004 provides a sourced 4-20ma current loop. The current loop is available at the 4-20 and Gnd terminals of the Model 3004 current loop connector. The adjacent illustration shows a typical connection to a current loop device such as a PLC.



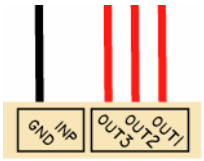
RS232 Operation



The Model 3004 can be supplied with an optional serial communications cable terminated with a female DB9 connector. Typical RS232 cable color code is yellow, brown, and red for Gnd, Tx and Rx connections. The female DB9 terminated cable plugs into the DB9 male serial port connector on typical desktop or laptop computers. If the desktop or laptop does not have a DB9 serial port but only USB ports instead, a USB to RS232 serial interface adapter must be used. Connection directly to a process instrument can be made with 3-conductor shielded cable. See illustration.



Hookup for Using the Digital Output



The Model 3004 provides three transistor switched outputs that can drive light loads or provide an enable/inhibit signal for process equipment.

The outputs are capable of driving a 50ma load at 50vdc. These outputs can be configured to trigger at a user defined setpoints using the Model 3004 eWeigh program or the PDAWeigh wireless PDA application.

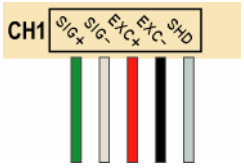
RS485 Multi-Drop

Up to sixteen 3004s can be networked through the RS485 connection.

Load Cell Connection

Up to four load cells can be connected to the 3004. Load cell connection follows standard color code convention as follows:

- **Green: Signal out positive**
- **White: Signal out negative**
- **Red: Excitation positive**
- **Black: Excitation negative**
- **Shield**

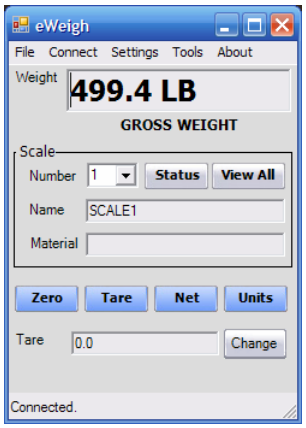


If a tension type load cell is used in compression (or vice versa) the white and the green wire connections are swapped.

eWeigh

eWeigh provides a simple means for configuring, calibrating and monitoring ISAC devices. eWeigh is designed to run on either a PC or PDA, and communicates to ISAC devices through RS232 or a Bluetooth connection. The eWeigh program is available on CD or downloadable from the 3S website .

The eWeigh **Home Screen** is a front panel representation of a typical weight indicator. eWeigh can be configured to open displaying a four scale panel or a single scale panel as depicted above. When the **View** button is selected for a scale in the four scale panel the single scale panel will display.



The single scale panel includes information on the selected scale and functions that can be performed. Included on this screen are:

- **Weight: The real-time weight reading in Gross weight or Net Weight**
- **Number: A dropdown box for selecting other scales that have been defined**
- **Status: A button that displays a summary of scale status including error messages.**
- **View All: This button puts the display into the four scale view panel.**
- **Name: The name given to the scale displayed**
- **Material: The material that the scale is weighing**
- **Zero: Zeroes the scale reading**
- **Tare: Applies a Tare value to the weight reading. There are three types of Tare functions that can be defined for this button.**
- **Net/Gross: Toggles between Net and Gross weight readings**
- **Units: Toggles between user defined weight units**
- **Tare/Content: A box that displays an entered value used for the Tare function.**
- **Change: This button when activated is used to change the value of the Tare/Content box.**

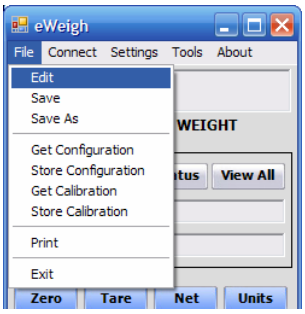
The Dropdown Menus

There are five dropdown menu selections:

- **File**
- **Connect**
- **Settings**
- **Tools**
- **About**

File

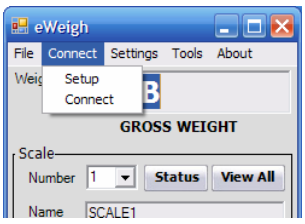
The **File** menu includes:



- **Edit: Used to Edit a saved Configuration or Calibration file**
- **Save: Used for saving a configuration/calibration file**
- **Save As: Used to save a opened configuration/calibration file under another name**
- **Open Configuration: Used for opening a configuration file that can be downloaded a connected device**
- **Save Configuration: Used to Save the configuration file for the connected device**
- **Open Calibration: Used to open a saved calibration table**
- **Save Calibration: Used to store the calibration table for the connected device**
- **Print Preview: Used to preview a weighment report. These are customized reports developed by 3S based on customer requirements. This selection is ghosted if no reports are available.**
- **Print: Used for printing a custom report**
- **Exit: Used for exiting out of the eWeigh program**

Connect

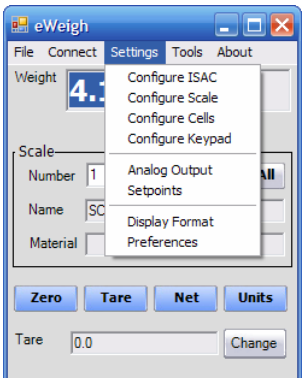
The **Connect** menu selection includes:



- **Setup: Used to assign the Comport that the device is connected to**
- **Connect/Disconnect: Used to Connect or Disconnect from a device.**

- **Settings**

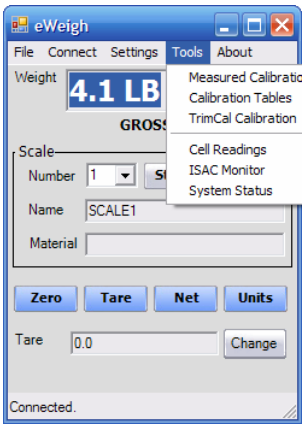
The Settings menu includes:



- **Configure ISAC: Used to define the parameters specific to the connected ISAC**
- **Configure Cells: Used to set the parameters for the connected load cells and to assign the load cell to scales**
- **Configure Scales: Used to define and set the operating parameters of scales that have been associated with load cells**
- **Configure Keypad: Used to configure the Keys and actions of the ISAC keypad**
- **Analog Outputs: Used for defining and controlling analog outputs**
- **Setpoints: Used to set the conditions and levels that trigger setpoints**
- **Display Format: Used to modify the real-time readings display to suit the user application.**
- **Preferences: Used to set the appropriate defaults on how the eWeigh program starts up.**

Tools

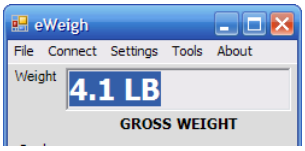
The Tools menu includes:



- **Measured Calibration: Used for performing a multipoint calibration on a scales connected to the ISAC device**
- **Calibration Tables: Used for viewing the calibrations table for a selected scale**
- **TrimCal Calibration: Used for performing 3S routine for trimming and calibrating a multi-load cell platform**
- **Cell Readings: Used for displaying the real-time load cell readings of connected scales**
- **ISAC Monitor: Used to display the operating parameters of the connected ISAC device**
- **System Status: Displays all status conditions for attached scales and the load cells associated to the scales**

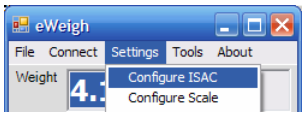
About

The About menu provides information about the software version number and release date.

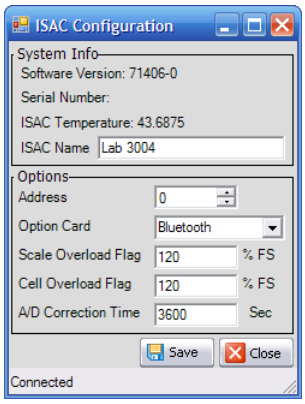


Configuring a 3004 (ISAC) with eWeigh

Configure ISAC



From the eWeigh main screen select **Settings** then select **Configure ISAC**. The ISAC Configuration screen will display.



In the **System Info** fields are the following:

- **Software Version:** This is a read-only field that displays the code version of the connected ISAC
- **Serial Number:** This is read-only field that displays the serial number given to the connected ISAC
- **ISAC Temperature:** This is a read-only field that displays the board temperature of the connected ISAC
- **ISAC Name:** This is an entry field for where a name for the connected ISAC is entered. This name will display in on the eWeigh main screen and will be the name associated with the Bluetooth device if an optional Bluetooth card is installed on the ISAC

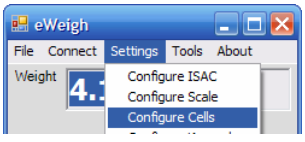
In the Options fields are the following:

- **Address:** This dropdown where an address is assigned to the ISAC for multidrop 485 installations. The dropdown menu will provide address number selection from 0 to 14
- **Option Card:** This Selection dropdown is for selecting the Bluetooth Option Card if it is Installed
- **Scale Overload Flag:** This setting determines when a flag that generates a scale overload error is generated. The setting is entered as a percentage of overcapacity allowed.
- **Cell Overload Flag:** This setting determines when a flag that generates a load cell overload error is generated. The setting is entered as a percentage of overcapacity allowed.
- **A/D Correction Time:** This setting determines the interval at which the ISAC Analog-to-Digital-Converter does an internal offset correction.

This is the material that the attached scale is weighing,

Configure Cells

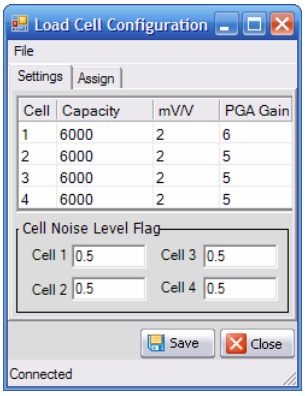
From the eWeigh main screen select **Settings** then select **Configure Cells**. The Load Cell Configuration screen will display.



There are two folders in Load Cell Configuration:

- **Settings**
- **Assign** (Ghosted if the connected device is an ISAC-1)

Settings



In the **Settings Folder** parameters specific to each load cell are entered. In the upper table are listed the possible load cells that are allowed for the connected ISAC. For an ISAC-4, four load cells will be listed in the Cell column. For an ISAC-1, one cell will be listed. The columns in the upper table are:

- **Capacity:** This is a user entry field where the capacity of the load cell is entered. This entry is used along with the Cell Overload Flag entry made in ISAC Configuration above to set the value at which the cell overload flag triggered.
- **mV/V:** This is a user entry field where the load cell sensitivity is entered. This value is used to determine if load cells are providing greater output than expected. Such a condition would suggest potential load cell
- **PGA Gain:** This is a dropdown selection box where the gain of the A/D input is selected. The selections available are:
  - 0 - +/- 1.25 Vdc
  - 1 - +/- .625 Vdc
  - 2 - +/- .312 Vdc
  - 3 - +/- .156 Vdc
  - 4 - +/- 78 mV
  - 5 - +/- 39 mV
  - 6 - +/- 19.5 mV
  - 7 - +/- 9.8 mV

The load cell excitation voltage provided by ISAC is 3.25 Vdc. To determine what gain level provides the optimum A/D resolution of the measured load cell signal multiply 3.25 by the load cell sensitivity to determine the expected load cell output at full scale load. Add any expected load cell offset and tolerable overload conditions. As an example if the load cell sensitivity is 2 mV/V then the expected load cell output at full scale is 6.5 mV. Hence a gain setting of 7 would be optimum. However if the load cell has a 2 mV offset and the load cell must be measured at up to 1.5 times capacity then the load cell signal is: 1.5x6.5 +2 = 11.8 mV. With these conditions the optimum gain setting is 6.

In the **Cell Noise Level Flag** fields are entered noise limits for each load cell. These values, if exceed, will set an error flag that triggers a

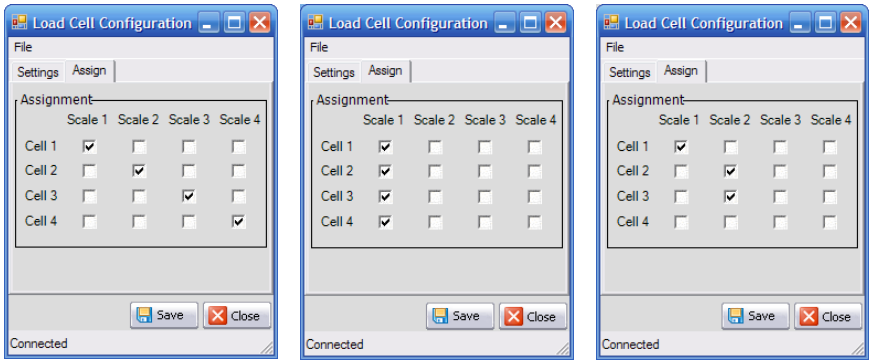
ISAC status led. This flag status can also be read through an ISAC serial connection if an intelligent host is used.

Assign (ISAC-4 only)

The **Assign** folder is used to assign load cells to the scales they occupy. An ISAC-4 can be configured so that it supports up to four single load cell scales or scales that have multiple load cells.

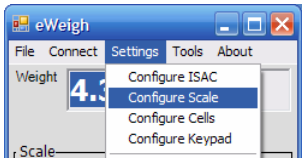
To assign a load cell to a scale the load cell checkbox in the scale column is selected. When selected a checkmark is placed in the checkbox. To remove a checkmark from a checkbox select the marked checkbox.

Checkmarks should be placed only for load cells that exist. A checkmark for a load cell that does not exist will cause measurements to occur on an ISAC-4 channel to which nothing is connected creating error messages for that channel.



In the screen shots above the left screen shows an ISAC-4 defined for four individual scales. The middle screen shows the ISAC-4 defined for a single scale comprised of four load cells. The right screen shows the ISAC-4 defined for a single load cell scale and a two load cell scale.

Configure Scales



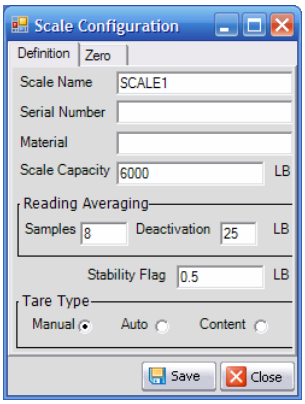
Once the ISAC and load cells have been configured the scales to which the load cells have been assigned can be configured. To start the scale configuration process **Configure Scales** is selected from the **Settings** menu.

The Scale Configuration screen contains two folders:

- **Definition**
- **Zero**

Definition

In the Definition folder are the following:



- **Scale Name:** This is a user entry field where a name for the is entered. The name can be 22 Characters in length.
- **Serial Number:** This is a user entry field that allows a connected scale to be identified by its serial number.
- **Material:** This is a user entry field that allows a material to be assigned to the scale. This field is typically used if a specific material type is being weighed and processed. This entry is made when the eWeigh program is used to monitor the scale or an intelligent host capable of reading and displaying this data field is used.
- **Scale Capacity:** This is a user entry field where the scale capacity is entered. For single load cell scales the capacity figure is typically the same as the load cell capacity. For multiple load cell scales this figure is typically a value determined by the scale manufacturer. This entry is used along with the Scale Overload Flag entry made in ISAC Configuration above to set the value at which the scale overload flag triggered.

The following fields are framed by the Reading Averaging box

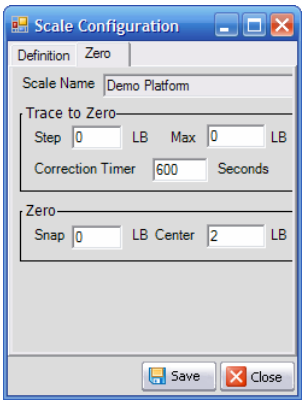
- **Samples:** In this field the number of readings to be averaged is entered
- **Deactivation:** In this field the weight deviation that must occur between readings for the averaging to be turned off. A value entered here allows scales that are dynamically loaded to quickly get to a stable reading,
- **Stability Flag:** This is a user entry field where a value in entered that represents the tolerable weight variation between scale readings. This value, if exceed, will set an error flag that triggers a ISAC status led. This flag status can also be read through an ISAC serial connection if an intelligent host is used.

The following radial buttons framed by the **Tare Type** box are used to determine the tare type that will be executed when selecting the **Tare** button available on the Home Screen or when the Tare button is pressed on the ISAC keypad. Available Tare types are:

- **Manual:** A value is entered that will be subtracted from the measured weight. This tare type is used if the weight of an empty vessel is known and must be subtracted from the weight reading so that vessel contents is the resultant Net measurement.
- **Auto:** The measured weight will be subtracted from itself.
- **Content:** A value is entered that represents the contents of a vessel. The connected ISAC will calculate the required tare to

display this value. This type of tare function is used if the content weight of a vessel is known and the empty vessel weight is not.

Zero



The Zero folder is used to set the zero (no load conditions for the scale. Entries in this screen are:

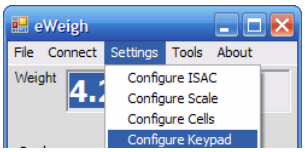
- **Scale Name:** This is a read only field that displays the name of the scale for which the zero conditions are set.

The following fields framed by the Track to Zero box are used for zero tracking. Zero tracking enables the scale to automatically zero out readings due to light loads that are not part of a weighment. As an example, if a scale frequently accumulates debris the weight of the debris can be automatically removed to ensure accurate product weighing. Entries in the Track to Zero frame are:

- **Step:** This is the weight increment for that zero corrections will be made in.
- **Max:** This is the maximum allowable zero correction to be made.

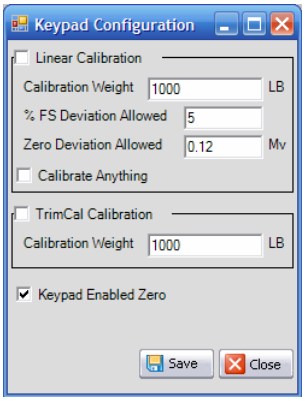
Configure Keypad

Scale calibration can be performed from the ISAC keypad. The setup conditions for calibration are established from the Keypad Configuration screen.



The fields in the Keypad Calibration are as follows:

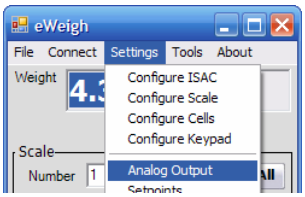
- **Linear Calibration:** This box is checked if a two point linear calibration is to be performed through the ISAC keypad. The Linerar Calibration fields establish the criteria for allowing a keypad calibration.



- **Calibration Weight:** This is the weight that will be used whenever a scale is calibrated.
- **% FS Deviation Allowed:** This is the maximum (slope) deviation subsequent calibrations are allowed. An entry here can prevent calibrations occurring using an incorrect calibration weight is used or if a problem exists with the scale.
- **Zero Deviation Allowed:** The maximum weight value that is allowed to be zeroed out by pressing the Cal Zero key on the keypad.
- **Calibrate Anything:** This box is checked for the keypad should ignore the conditions set above.

- **TrimCal Calibration:** This box is checked if the 3S TrimCal calibration is to be performed through the keypad. The TrimCal calibration process performs load cell trimming and linear calibration simultaneously. This process use only if the scale attached to the ISAC has multiple load cells
- **Calibration Weight:** This is the value of the weight that will be used during a TrimCal calibration
- **Keypad Enabled Zero:** Checking this box enables the keypad to zero the connected scale

Analog Output

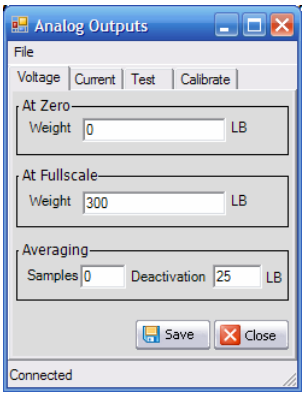


ISAC devices can be equipped with optional analog output modules with outputs of:

- 0-5 Vdc output
- 4-20 mA sourcing current loop

To configure and calibrate the analog modules the **Analog Output** menu is used.

The Analog Output screen contains four folders:



- **Voltage**
- **Current**
- **Test**
- **Calibrate**

Voltage

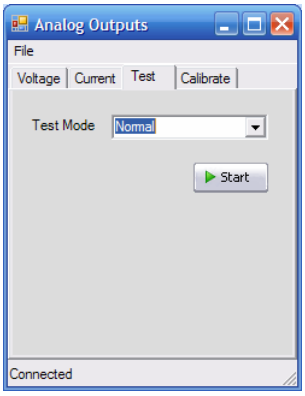
The Voltage folder is where entries for a voltage output module are set.

- **At Zero Weight:** This is the weight that when applied on the scale will provide a 0 Vdc output. This entry is typically 0.
- **At Fullscale Weight:** This is the weight applied to the scale that will provide a Fullscale voltage output. This entry is typically equal to the capacity of the scale
- **Averaging Samples:** This is the number of sample that will be averaged for the analog output.
- **Deactivation:** In this field the weight deviation that must occur between readings for the analog averaging to be turned off. A value entered here allows scales that are dynamically loaded to quickly get to a stable reading,

Current

The **Current folder** is where entries for a Current output module are set. The entries in the **Current** folder are identical to those made for the **Voltage** folder above.

Test

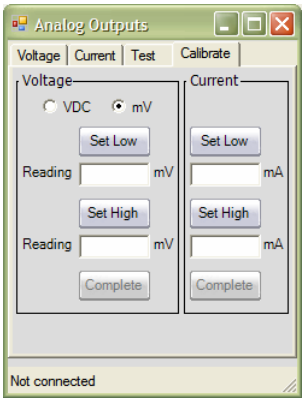


The Test folder allows various tests to be run on the analog outputs. The test type is selected through the Test Mode dropdown. Tests options are

- **Normal:** Used to set normal operation
- **Sweep:** Sweeps the analog outputs between low values and fullscale value
- **Zero:** Sets the analog output to low level output
- **Fullscale:** Sets the analog output to fullscale

To run a test the type of test is selected from the dropdown and the Start Button is selected. To terminate the test Normal is selected and the Start button is selected. The Test menu can be used for diagnostic purposes as well as facilitating calibration of analog equipment attached to that ISAC analog outputs,

Calibrate



The analog outputs can be recalibrated using the Calibrate folder. The Voltage box is used for calibrating the voltage output and the Current box is used to calibrate the current loop output.

Voltage output calibration

- To calibrate the voltage output first select the Voltage output radial button that the ISAC-4 jumpers are set to. This will be either VDC for 0-5VDC output or mV for 0-20 mV output.
- With a DVM on the voltage output leads press Set Low.
- Record the voltage output in the Reading box below the Set Low button.
- Press Set High
- Record the voltage output in the box under the Set High button.
- Press the Complete Button

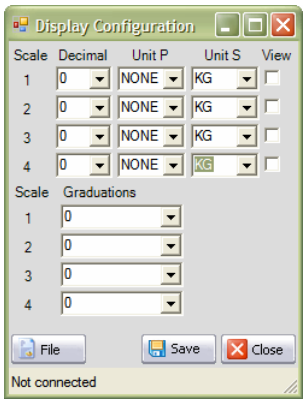
Current loop calibration

- To calibrate the current output first a current meter on the ISAC-4 current output terminals
- Press Set Low.
- Record the current output in the Reading box below the Set Low button.
- Press Set High

- Record the current output in the box under the Set High button.
- Press the Complete Button

Display Format

From the eWeigh main screen select Settings then select Display Format.



Enter the Display Configuration Parameters for each defined scale as follow:

- Decimal: Select the decimal position from the dropdown
- Unit P: This is the primary unit of measure in which the measurement will be displayed
- Unit S: This the secondary unit of measure in which the measurement will be displayed when the Units button is pressed from the Main Screen.
- Scale Graduation: Not used in this current version

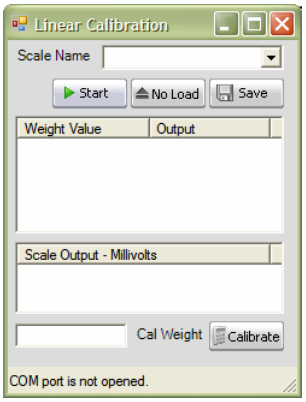
Preferences

The Preference selection contains the following checkbox options:

- Discover ISAC device first: This option is checked if the user wants to select from a list of discoverable Bluetooth devices before the eWeigh program is launched
- Auto connect to last used device. This option is checked if the user wants to automatically connect to the previous Bluetooth device that eWeigh was connected to.
- Display single scale screen: This option is checked if a single scale is defined for the ISAC and the user wants to see only the defined scale when the eWeigh program opens.

Calibrating a Scale

Measured Calibration

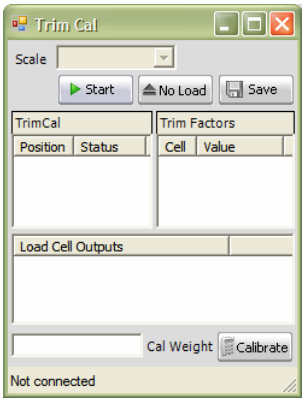


To perform a measured calibration with eWeigh the Measured Calibration selection is chosen from the Tools Dropdown Menu.

The Linear Calibration Table will display. This calibration tool allows calibration of up to five points. To perform a calibration the following steps are performed:

1. Remove all weight from the scale
2. Press Start
3. Press No Load
4. Enter the value for the first calibration weight
5. Place the calibration weight on the scale
6. Press measure
7. Step 6 can be repeated with increasing weights up to four times to create a calibration liberalization table.
8. Press Complete
9. Press Close

TrimCal

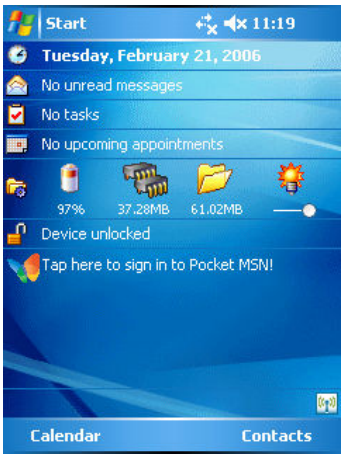


The TrimCal routine combines the process of scale calibration with load cell trimming. This routine is used if the 3004 is configured for a single scale with multiple load cells The TrimCal process is as follows:

1. Remove all weight from the scale
2. Enter the value of the weight that is being used for calibration.
3. Press Start button
4. Press the No Load button
5. Place the calibration weight at any corner of the scale. Position does not have to be exact.
6. Press the Calibrate button
7. Repeat this process for the number of load cells in the scale. If there are four load cells in the scale the process will be repeated four time. Ensure that the weight is repositioned for each measurement step. If a step is completed correctly the Status will read Pass for the Step performed.
8. Once all positions have been calibrated select Save
9. The 3004 will calculate load cell normalization values and report them to the TrimCal table.
10. Exit the TrimCal menu

Turning on Bluetooth

Before eWeigh can connect to a 3004 the 3004 the Bluetooth Radio must be turned on the PDA..



From the main PDA Window select the Bluetooth icon on the bottom right of the screen by tapping it with the stylus.

The Bluetooth panel will display. Make sure the check boxes are checked as indicated Press the Bluetooth Button