



Electronic Weigh Controller

Model T4000



Operation and Maintenance Manual



MAGNUM
S Y S T E M S



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Machine Serial Number: _____

Sales Order Number: _____

Important Information

Conventions

Safety Alert Symbols

The  symbol indicates that important personal safety information follows. Carefully read this text for the warnings information it contains. The signal word next to each safety alert symbol is defined as:



WARNING

Indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.



CAUTION



Indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury, or damage to the equipment. This single word may also be used to identify unsafe practices.



LOCKOUT

This symbol will be used anytime that a procedure requires an electrical lockout.

Static Sensitive Symbols for Equipment Handling Instructions

The  and  symbols indicate important handling guidelines for proper handling of electronic equipment modules and sensitive components for the prevention of potential damage that could be caused by ESD (electrostatic discharge) during routine maintenance, handling and transportation.



ESD NOTICE

To protect against ESD damage to electronic equipment, follow the Standard ESD Prevention Procedures. Failure to use protective measures could result in permanent equipment damage, either immediate or latent, when handling modules.



ESD NOTICE

To protect against ESD damage to electronic equipment containing components, follow the Standard ESD Prevention Procedures. Failure to use recommended protective measures could result in permanent equipment damage, either immediate or latent, when handling components.

Standard Electro-static Discharge (ESD) Prevention Procedures

The Model T4000/T4000A Weigh Controller utilizes electronic components that are susceptible to damage from Electro Static Discharge. Anytime electronic components are serviced, the following precautions should be followed:

1. Wear a commercial grounding wrist strap.
2. Remove power from the machine.
3. Leave all static sensitive components in their protective packaging until it is time to install the component
4. Always hold static sensitive components by their metal mounting tabs, and/or by their edges

Important/Notable Information

While all of the information in this manual is important, there are some pieces of information where special attention needs to be paid to avoid equipment damage, or specific information needs to be emphasized. This information will be handled as follows:

***Important:** Indicates an operating procedure, practice, or condition that, if not strictly followed, may cause equipment damage.*

***Note:** Indicates additional information or emphasizes a topic related to the subject being discussed.*

Personal Safety Instructions

Only qualified personnel should work on or around this equipment. To ensure the highest degree of personal safety, all who use this equipment are required to become thoroughly familiar with all safety instructions contained in this document. Successful and safe operation of this equipment depends upon proper handling, operation, maintenance, and application of associated equipment. Refer to Appendix A of this manual for all safety instructions. Safety instructions are also provided where they apply within the body of this manual.



WARNING

No information in this manual supersedes or replaces your employer's operating rules. If there is a difference in instructions between this manual and the employer's operating rules, follow the most restrictive instruction.

Deliberate misuse or abuse of electronic components may cause personal injury or death.

Warranty Information

Seller warrants that the Products will operate substantially in conformance with Seller's published specifications, when subjected to normal, proper and intended usage by properly trained personnel, for a period of one (1) year from the date of shipment to Buyer (the "Warranty Period"). Seller agrees during the Warranty Period, provided it is promptly notified in writing upon the discovery of any defect and further provided that all costs of returning the defective Products to Seller are pre-paid by Buyer, to repair or replace, at Seller's option, defective Products so as to cause the same to operate in substantial conformance with said specifications. Replacement parts may be new or refurbished, at the election of Seller. All replaced parts shall become the property of Seller. Replacement Parts will be billed at list price, unless they are approved as warranty replacement item(s) by the service technician and the technical services manager.

Lamps, fuses, bulbs and other expendable items are expressly excluded from the warranty. Seller's sole liability with respect to equipment, materials, parts or software furnished to Seller by third party suppliers shall be limited to the assignment by Seller to Buyer of any such third party supplier's warranty, to the extent the same is assignable. In no event shall Seller have any obligation to make repairs, replacements or corrections required, in whole or in part, as the result of (i) normal wear and tear, (ii) accident, disaster or event of force majeure, (iii) misuse, fault or negligence of or by Buyer, (iv) use of the Products in a manner for which they were not designed, (v) causes external to the Products such as, but not limited to, power failure or electrical power surges, (vi) improper storage of the Products or (vii) use of the Products in combination with equipment or software not supplied by Seller. If Seller determines that Products for which Buyer has requested warranty services are not covered by the warranty hereunder, Buyer shall pay or reimburse Seller for all costs of investigating and responding to such request at Seller's then prevailing time and materials rates. If Seller provides repair services or replacement parts that are not covered by the warranty, the Buyer shall pay Seller therefore at Seller's then prevailing time and materials rates. ANY INSTALLATION, MAINTENANCE, REPAIR, SERVICE, RELOCATION OR ALTERATION TO OR OF, OR OTHER TAMPERING WITH, THE PRODUCTS PERFORMED BY ANY PERSON OR ENTITY OTHER THAN SELLER WITHOUT SELLER'S PRIOR WRITTEN APPROVAL, OR ANY USE OF REPLACEMENT PARTS NOT SUPPLIED BY SELLER, SHALL IMMEDIATELY VOID AND CANCEL ALL WARRANTIES WITH RESPECT TO THE AFFECTED PRODUCTS.

Field Service

Magnum Systems can provide field service for start-up assistance, training, maintenance, and replacement/spare parts for new and existing equipment. Contact Magnum Systems at (888) 882-9567.

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Model TRU – Ultrasonic Sealer

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Model T4000 and T4000A – Weigh Controller

Entering Numbers using the Control Panel

Prior to using the control panel, it is important to understand the process for entering a number into a field. When accessing a numbered field, the cursor will be placed in the default position, which is under the digit to the far right. To position the cursor at the desired position, use the left or right arrow keys to move the cursor. Once the cursor is placed in the desired position, use the up arrow key to increase the number, or use the down arrow key to decrease the number. Each press of the key will result in a change increment of one digit. For example, if 0 is displayed, pressing the up arrow key once will change the number to 1. After the desired number has been entered, press the enter key to save the entry.

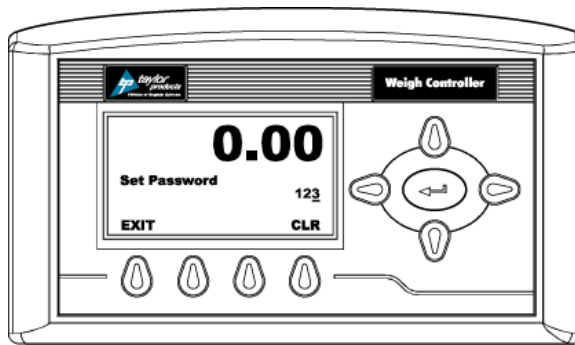


Figure 1 – Cursor Positioned Below Digit On Right

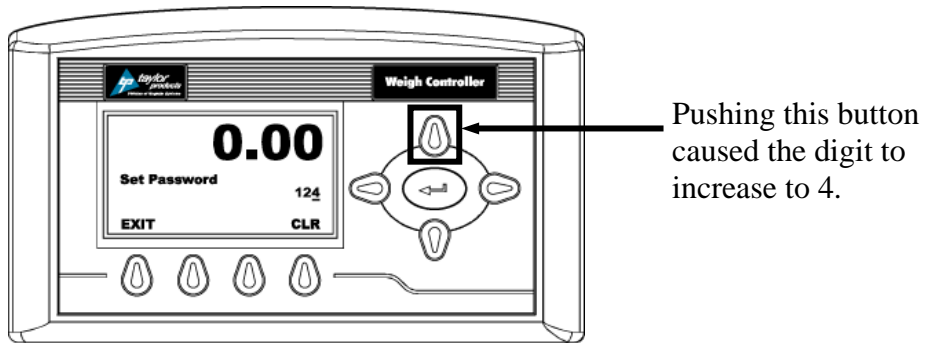


Figure 2 – Operator Has Pressed The Up Arrow Causing Digit On Right To Increase To 4

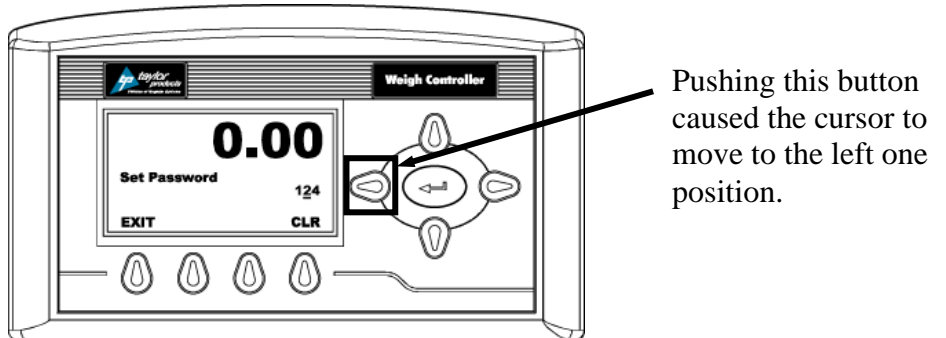


Figure 3 – Operator Has Pressed The Left Arrow Moving Cursor Over 1 Position

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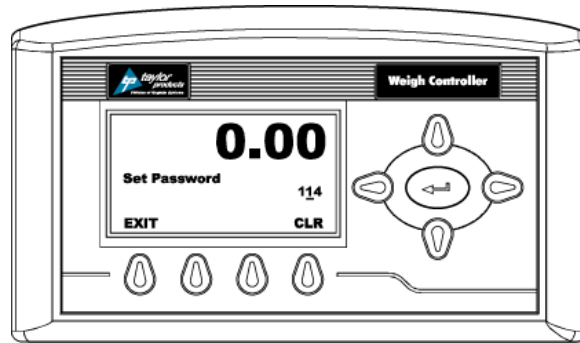


Figure 4 – Operator Has Pressed The Down Arrow Causing Center Digit Decrease To 1

Calibrating The T4000/T4000A

The information that follows provides calibration procedures for the T4000 Weigh Controller. Alternatives to any procedures implied or explicitly contained in this document are not recommended. In order for the Weigh Controller to work properly, it must be calibrated prior to operation. All calibration should be done in the Gross mode.

Additionally, Magnum Systems recommends that a calibration schedule be developed and followed. This schedule will ensure that the machine's weighing mechanism and controller receives a thorough inspection on a regular basis, which should help reduce machine down time and increase overall productivity. It is recommended that the instrument be re-calibrated periodically or when not in use for extended periods of time. Be sure to follow all the procedures completely to insure that the weights read by the controller are accurate. It is very important that the user and service personnel be familiar with the procedures contained in this chapter before installing or operating the T4000 Weigh Controller.

Only those with proper access are allowed to calibrate the T4000/T4000A. This means that a password must be entered to gain access to the calibration function. The password is factory set to 2205.

Pre-Calibration Procedures

Mechanical Check Procedures

1. Check to determine if the load cells have been installed properly.
 - a. Refer to the operation and maintenance manual for the machine being worked on for proper installation instructions.
 - b. On some load cells there is an arrow that indicates the direction of the applied load. If the arrow is pointing in the wrong direction, change the position of the load cell so that it is mounted in the direction of the applied load.
2. Check for Binding on the load cell or other parts of the system.



CAUTION

Binding on a scale/vessel or load cell does not allow the load cell free vertical movement and may prevent the instrument from returning to the original zero reference point.

- a. The load cell must be mounted so that 100% of the load (vessel + contents) is applied vertically to the load cell.

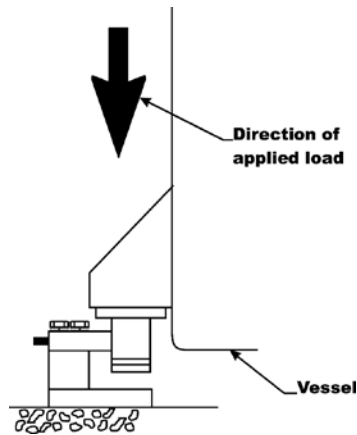


Figure 5 – Load Passing Through Load Cell

- b. Do a visual check to see that nothing is binding the load cell or other parts of the weighing system. Make sure that nothing is draped over the scale/vessel or the load cell, such as a hose, electrical cord, tubes, or other objects.
3. Check to see that nothing comes in contact with the scale/vessel other than service wires and piping that have been properly mounted with flexible connectors.
4. Check to see that there is power to the T4000.
 - a. If there is power to the controller the front panel display should be illuminated.
 - b. If the display appears and a weight value is being displayed, the unit is ready for calibration.
5. Allow the instrument to warm up for about 15 minutes before doing the calibration procedures.
6. Put a load (weight) on the scale or vessel. For a full load test, the operator can put 80 – 100% of the expected weight for their process on the scale or vessel.
7. Check to see if the weight reading changes on the display in the proper direction.
 - a. For example, if the display reads 100 lbs and a 20 lb load is placed on the vessel or scale, the display should read 120 or some value over 100.
 - b. If the display reads 80 lbs and a 20 lb load is placed on the vessel or scaled, the reading is going in the wrong direction and indicates some problem with the system.
 - c. If the display is reading improperly or shows no change there is something wrong with the configuration or the load cells.
8. If the display changes in the proper direction, remove the weight and proceed to calibrate the Weigh Controller.

Note: When calibrating the T4000 for the first time, go from one sub-menu to the next in sequence.

Note: The settings provide below are just an example. The actual settings used will vary based on the specific application.

Calibration

1. Make sure the T4000 has been configured for the intended application. This includes setting the units, decimal point, scale capacity, averages, etc.
2. From the Summary display press the enter button. The Configuration menu appears.
3. Press the down arrow button until the cursor is in front of Calibration.
4. Press the enter button. The Calibration menu appears.
5. Traditional Calibration is the method of calibration that uses test weights. Magnum Systems recommends that the test weights total 80 – 100% of the desired package weight, and that the weight be distributed uniformly on/in the scale.
6. From the Summary display, press the enter button. The Configuration menu appears.
7. Press the down arrow button until the cursor is in front of the Calibration line.

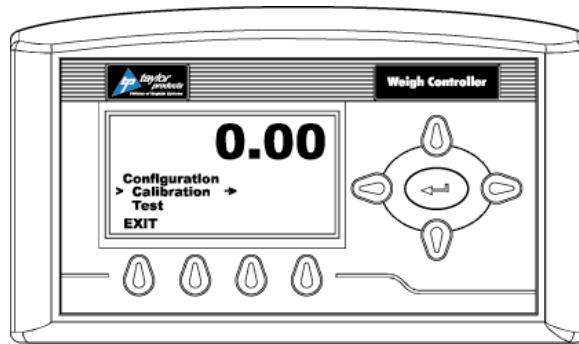


Figure 6 – Placing the Cursor In Front Of Calibration

8. Press the enter button. The Calibration menu appears.
9. Press the down arrow button until the cursor is in front of “Trad Cal”.

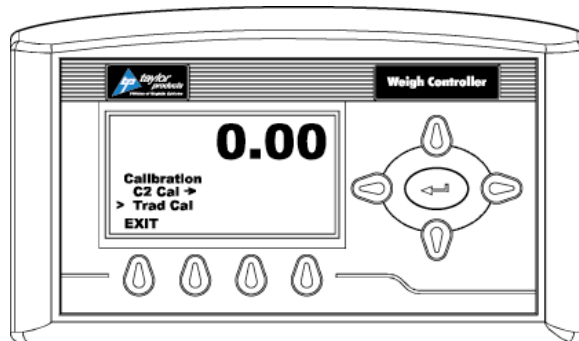


Figure 7 – Placing The Cursor In Front Of Trad Cal

10. Press the enter button. The Trad Cal menu appears.

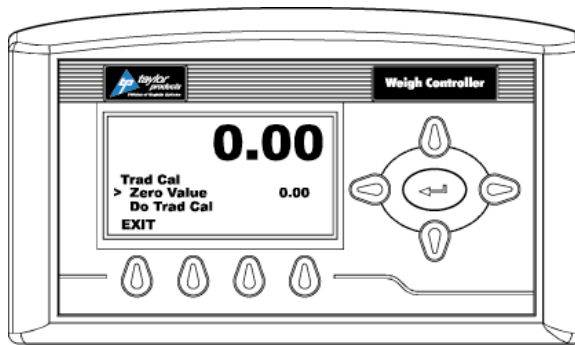


Figure 8 – Placing The Cursor In Front Of Zero Value

11. Press the enter button. The Zero Value weight menu appears.
12. Traditional Calibration requires a zero point and the physical placement of test weights on the scale. To set the Zero Value Weight:
 - a. Remove all weight “live load” from the Scale. The Zero Value should be 0.0.



CAUTION The scale MUST be empty.

- b. Wait 12 seconds or more.
13. Use the left and right arrow buttons to position the cursor. Use the up or down arrow buttons to enter the Zero Value for this instrument.

Note: Most applications will set the Zero Value to 0.00.

14. Press the enter button to save the entry.
15. Press the down arrow button until the cursor is in front of “Do Trad Cal ” (Zero)”.
16. Press the enter button to Do the Cal Trad Cal (Zero).
 - c. A “Cal Completed OK” message appears briefly if the calibration was successful.
 - d. An Error number appears if the calibration was not successful. An Error list is provided with the troubleshooting information later in this guide. Refer to this list in order to correct the error.
17. Press the down arrow button until the cursor is in front of Span Value.
18. Press the enter button. The Span Weight menu appears. The last Span Weight is displayed.

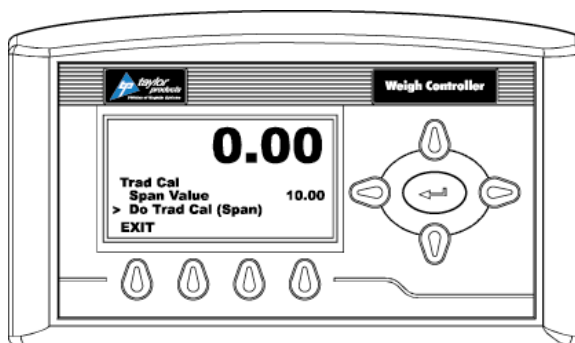


Figure 9 – Span Value Displayed

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19. To set the Span Weight:
 - e. Place a certified test weight on the scale.
 - f. Use the left and right arrows to position the cursor and the up or down arrows to enter the value of the test weight. If a 10 lb. weight is used, enter 10.00.
 - g. Press the enter button to save the entry.
20. Press the down arrow button until the cursor is in front of “Do Trad Cal (Span)”.
21. Press the enter button to Do the Trad Cal (Span).
 - h. A “Cal Completed OK” message appears briefly if the calibration was successful.
 - i. An Error number appears if the calibration was not successful. An Error list is provided with the Troubleshooting information later in this guide. Refer to this list in order to correct the error.
22. The scale is now calibrated.

Setting of Parameters for a Fill Cycle

The T4000/T4000A provides the operator with the ability to quickly and easily change the weight settings for the set points. Use the steps below to change the set points.

1. From the Summary Display, press the SP1 button. The SP1 menu appears.

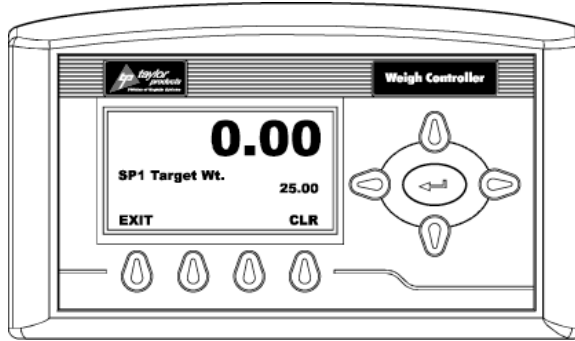


Figure 10 – SP1 Menu

2. Press the function key directly below CLR on the display to clear the current entry.

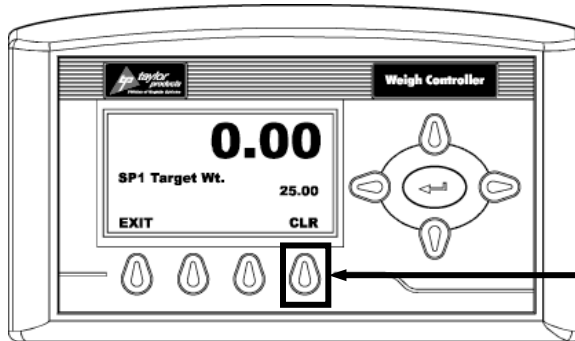


Figure 11 – Clearing the Current Entry

3. Use the left or right arrow buttons to move the cursor left and right. Use the up or down arrow buttons to enter the SP1 weight for this application.

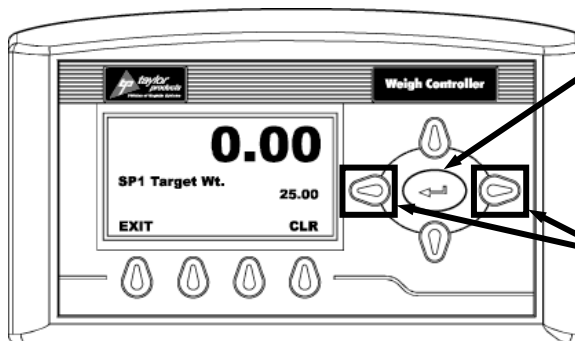


Figure 12 – The Left/Right Arrow Buttons Are Used To Move The Cursor Position

4. Press the enter button to save the entry. The Entry Accepted message will appear briefly and then the Summary display will appear.
5. From the Summary display press the SP2 button. The SP2 menu appears.

Model T4000/T4000A Weigh Controller

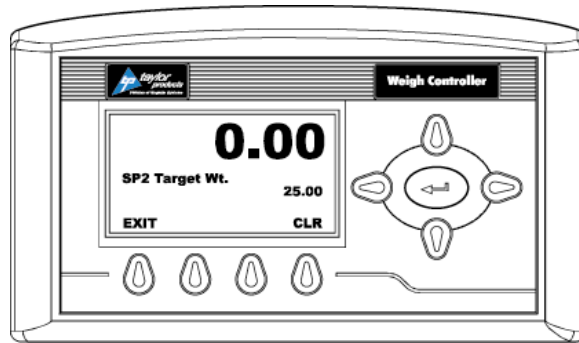


Figure 13 – SP2 Menu

6. Press the function key directly below CLR on the display to clear the current entry.

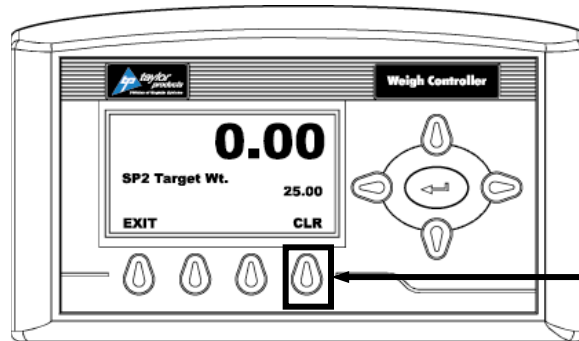


Figure 14 – Clearing The Current Entry

7. Use the left or right arrow buttons to move the cursor left and right. Use the up or down arrow buttons to enter the SP2 weight for this application.

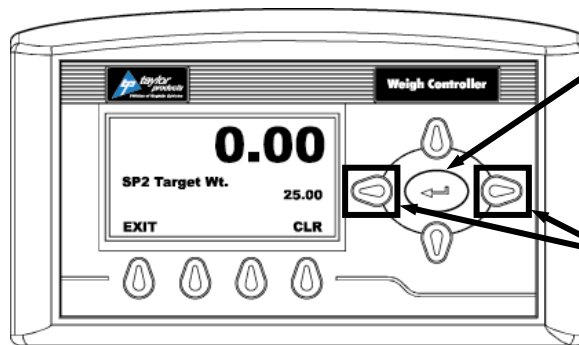


Figure 15 - The Left/Right Arrow Buttons Are Used To Move The Cursor Position

8. Press the enter button to save the entry. The Summary display appears.

General Description

The T4000 series weigh controller is the standard weigh controller used on Magnum Systems packaging equipment. This style of weigh controller is available in two different forms:

- T4000 – Weigh controller equipped with digital input/output (I/O) card
- T4000A – Weigh controller equipped with analog and digital input/output (I/O) card. The analog outputs are used to control a vibratory feeder or an auger feeder.

Components

The controller is comprised of the following components:

- LCD panel
- Key pad
- Cable
- Electrical enclosure

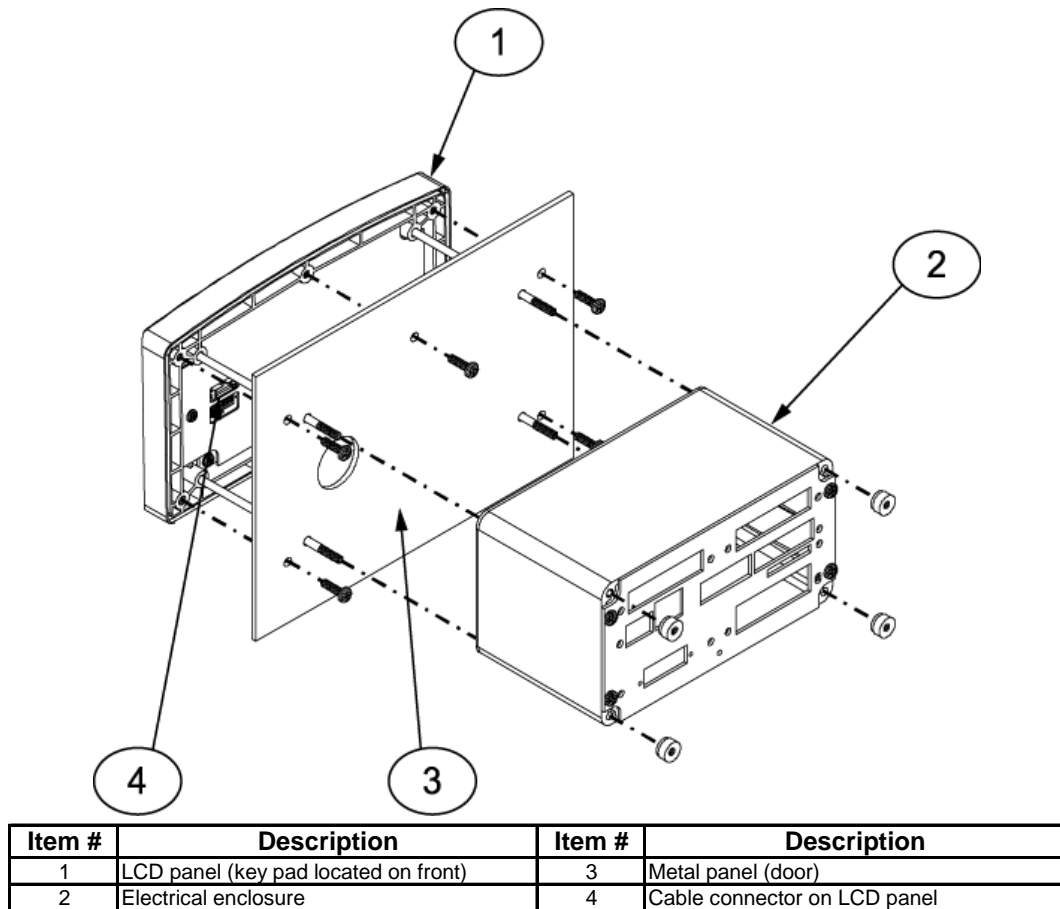
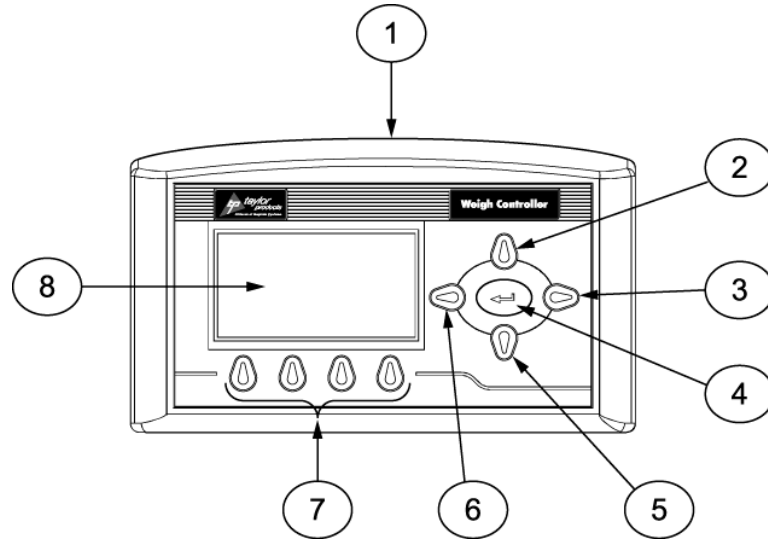


Figure 16 – T4000 (Viewed From Behind)

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Control Panel

The control panel on the T4000/T4000A can be mounted so that it is bolted to the electrical enclosure, or it may be mounted remotely. The control panel has a LCD screen, directional arrows, an enter button, and four function keys.



Item #	Description	Item #	Description
1	Control panel	5	Down arrow key
2	Up arrow key	6	Left arrow key
3	Enter key	7	Function keys
4	Right arrow key	8	LCD screen

Figure 17 – Control Panel

Connections

The electrical connections for the electrical controller are found on the rear of the controller. The connections are used for the following purposes:

- AC power
- DC power
- Ethernet (not used)
- Digital input/output (I/O)
- Remote display
- External inputs and/or printer/scoreboard
- Scale (load cell)

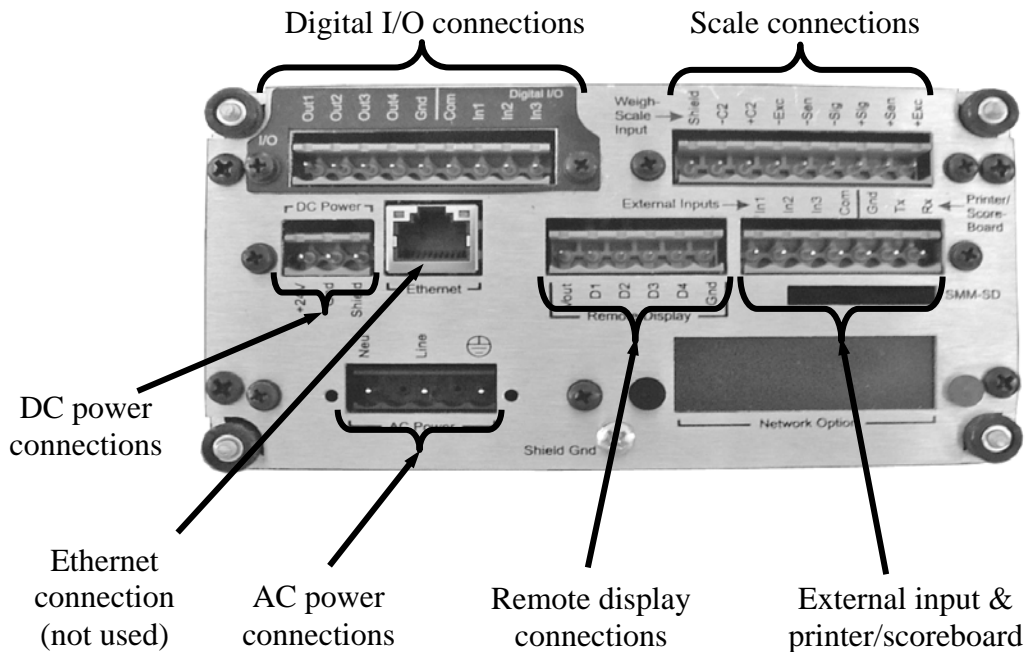


Figure 18 – Electrical Connections

Menu System

A block diagram of the menu system is provided below:

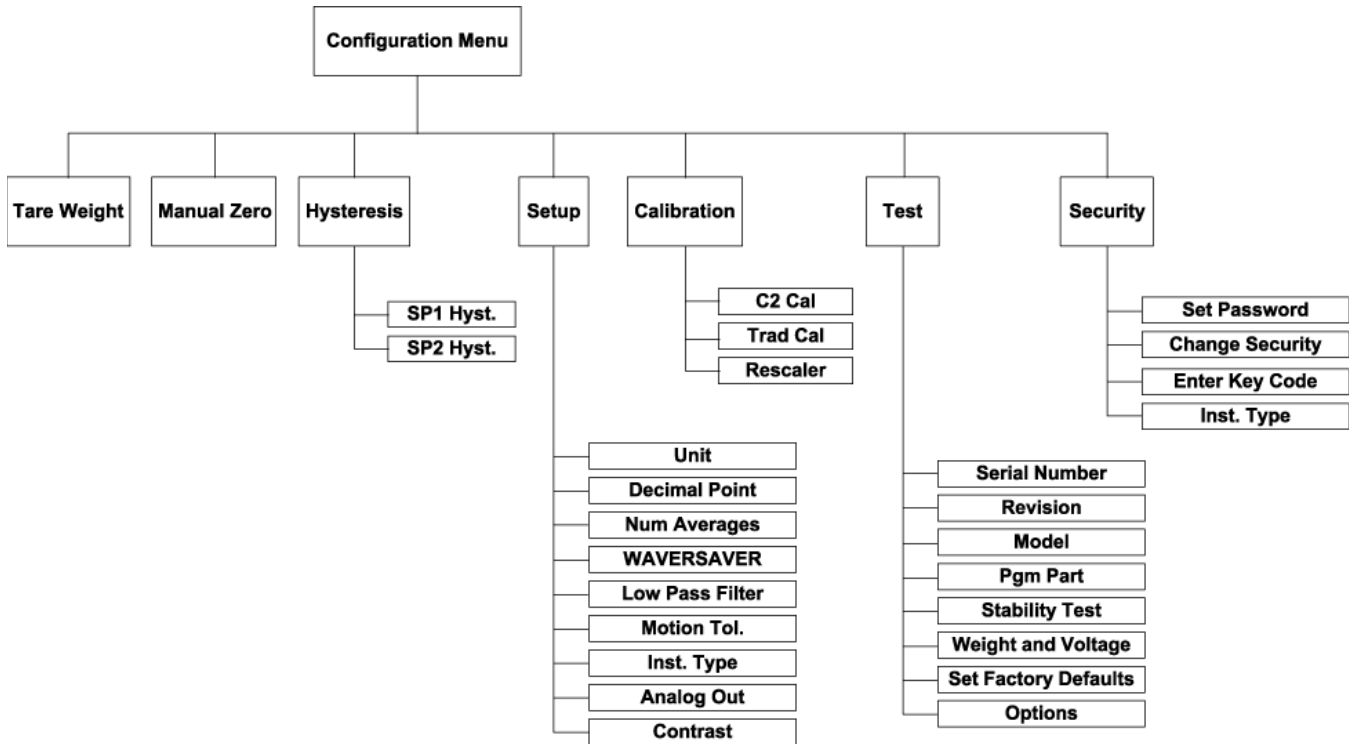


Figure 19 – T4000 Menu Tree

When working with the menu system of the T4000, it is important to understand the terminology that will be encountered. The definitions discussed here will provide some information on different menus and individual settings within the menu system.

- **Auto Zero** – This feature will allow the weigh controller to zero itself after a new package has been installed for filling. When using this feature, it is important that the operator does not have their hand, or anything else coming in contact with any portion of the weigh mechanism. This feature also includes some internal controls to set the Tare Limit and the Min AutoTare.
- **Hysteresis** – The difference between the set point and the relay reset.
- **Rescaler** – This setting allows the operator to specify the parameters at which an input or output is made. For example, if the controller will energize an output when the input goes low, the operator can set the voltage threshold that defines the point at which the controller recognizes the input as low.
- **Units** – This setting allows the operator to switch between several standard or metric units of measure. The choices are pounds (Lb), ounces (Oz), pound-ounces (lb-oz), kilograms (Kg), or grams (G).

- **WAVERSAVER®** – The operator can set how sensitive the controller is to vibration due to mechanical noise (from other machinery within the plant). This vibration may be due to a fork truck operating near by, or other environmental factors. This function allows the controller to differentiate between actual weight data and mechanical noise. When the operator keys in a value, in Hertz (Hz), the controller will filter out any vibration frequencies above that setting. A lower number setting will eliminate most vibrations from affecting the weighment. However, the reaction of the weight display will be very slow. A higher number setting will filter out less vibration, but reaction of the weight display will be quicker. Magnum Systems typically recommends a setting of 3.5 Hz.

The T3000 menu system is designed to allow machine operators to manage the operation of the machines that they are using. The following paragraphs will provide detail on the function of each of the menus and how to make changes to individual parameters.



CAUTION

Never change a parameter without understanding how that change will affect the operation. ALWAYS make note of the current setting before changing it. This will allow the operator to change the parameter back to the original setting in case the change adversely affects the operation of the machine.

- **Tare Weight** – This menu selection allows the operator to set the weigh controller to zero itself after a new package has been installed for filling. When using this feature, it is important that the operator does not have their hand, or anything else coming in contact with any portion of the weigh mechanism. This feature also includes some internal controls to set the Tare Limit and the Min AutoTare.
- **Manual Zero** – This menu selection allows the operator to manually zero the weigh display.
- **Hysteresis** – This menu selection allows the operator to set the Hysteresis value. The Hysteresis value under normal operations will always be a positive value however the Hysteresis value can be set as a negative value should a specific application require it. Hysteresis limits are used to prevent relay chatter once the set point is reached. For example: If a set point value is 100 pounds and the hysteresis is set to 5 pounds, the relay coil is energized at 100 pounds and stays energized until the weight drops to 95 pounds. There are two sub-menus under this selection.
 - **SP1 Hyst.** – This selection allows the operator to set the Hysteresis for SP1.
 - **SP2 Hyst.** – This selection allows the operator to set the Hysteresis for SP2.
- **Setup** – Selecting the Setup menu will allow the operator to adjust several items, including:
 - **Units** – The operator can select lb (pounds), oz (ounces), lb-oz (pound-ounces), kg (kilograms), or g (grams).
 - **Decimal** – The operator chooses how many numbers that will show after the decimal point.
 - **Num Averages** – The operator uses this setting to adjust how sensitive the scale is to vibration, caused by the material flowing into the vessel being weighed. Setting the parameter to its minimum, will result in a faster response from the scale. If weighments are unstable, the parameter should be increased in small increments until a stable reading is achieved.

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- **WAVERSAVER[®]** – This parameter can be configured to ignore noise with frequencies as low as 0.25 Hz. One of four higher additional cut off frequencies may be selected to provide a faster instrument response time. The function is user selectable and can be turned off.
- **Low Pass Filter** – The operator can turn this filter ON or OFF. When this parameter is turned on, the meter provides a more stable weight reading but at the expense of the reaction time. In some applications a more stable reading is desired due to the application. If a slower reaction time is acceptable, turn the Low Pass Filter On. For most applications the Low Pass Filter should remain OFF.
- **Motion Tol.** – Used at the start and the end of the fill cycle, this parameter specifies how close weight readings must be to each other before the scale is considered to no longer be in motion. The controller samples the weight readings at one-second increments. These readings are continuously compared to the motion tolerance value. Lower values will result in increased accuracy, but will also slow the controller significantly. A higher value will result in less accuracy, but the controller will be quicker in providing the final package weight. This parameter **MUST** be set to a number higher than 0. Also, a low setting may result in the controller overriding the Wait Timer.
- **Inst. Type** – This line displays how the controller is configured.
- **Analog Out** – Used only on the T4000A. The operator to adjust the outputs that would be used to control the feed rates of a vibratory feeder or an auger feeder.
 - **Fast A** – Used to set the bulk feed rate during the bulk stage.
 - **Fast B** – Used to set the dribble feed rate during the bulk stage.
 - **Slow A** – Used to set the bulk feed rate during the dribble stage.
 - **Slow B** – Used to set the dribble feed rate during the dribble stage.
- **Contrast** – This selection allows the operator to adjust the contrast of the display to allow optimal viewing.
- **Calibration** – This menu selection is used when calibrating the controller. The Calibration menu has three sub-menus:
 - **C2 Cal** – This menu option is not used.
 - **Trad Cal** – This menu option is used to calibrate the controller.
 - **Rescaler** – Use this option to set the number of channels and the voltage thresholds for input low, input high, output low, and output high.
- **Test** – This menu item allows the operator to check certain system parameters and to perform some basic tests.
 - **Serial Number** – Lists the serial number of the controller.
 - **Revision** – Lists the software revision that is running on the controller.
 - **Model** – This line lists whether the unit is a T4000 or a T4000A.
 - **Pgm Part** – This line shows the part number of the program that is installed in the controller.
 - **Stability Test** – This menu option allows the operator to perform a variance test, raw A/D count, and raw A/D average count.
 - **Weight and Voltage** – This menu selection allows the operator to perform a weight test, test DC voltage signals, and RTZ tests.

- **Set Factory Defaults** – This menu option lets the operator restore ALL of the individual settings back to how they were set when the controller left the factory.

Important: *If the operator chooses to Set Factory Defaults, the current application settings will be lost and CANNOT be restored easily. Make sure that if this is done, that the application specific settings have been written down for recovery purposes.*

- **Options** – Selecting this line will allow the operator to individually select the I/O cards that are installed in the controller. Once the I/O card has been selected, the operator can then check the status of each input and output. This will vary based on machine options.
- **Security** – This menu selection allows management to set or change the security parameters for the controller. The Security menu has the following sub-menus:
 - **Set Password** – The manager can use this sub-menu to set the system password.
 - **Change Security** – The manager can use this sub-menu to turn Security ON or OFF.
 - **Enter Key Code** – Key codes are required to change the configuration of the controller. For example, if the controller is a dual set point unit, and the manager wants to change to a triple set point configuration, the manager may purchase a key code for that specific controller to unlock that feature. The serial number of the controller must be provided to Magnum Systems Customer Service to obtain a key code. The Key code is only for the controller with that serial number. It is not interchangeable with other T4000/T4000A controllers.
 - **Inst. Type** – This line is set at the factory. It requires a key code to be changed.

General Fill Cycle Information

Prior to performing setup procedures, it is important to understand how the fill cycles occur. This description will focus on the two fill speed application, this is known as a dual set point configuration. The fill speeds are named bulk rate and dribble rate. Bulk rate is a faster rate that is used to fill the package quickly, once the package achieves the Set Point 1 (SP1) weight, the fill rate will slow to the dribble rate. Once the package achieves the weight set with Set Point 2 (SP2), the feed mechanism stops. SP2 is typically set just below the target weight setting. This is done to allow for the product that is in free fall. Once the product that is in free fall settles into the package, the package weight should match the target weight.

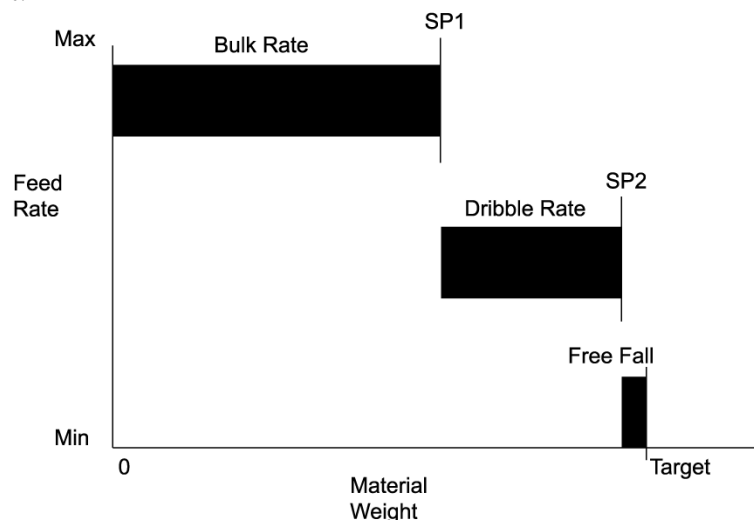


Figure 20 – Fill Cycles

Setup Procedures

The Setup menu and sub-menus are used to set up the instrument for a specific application. The following information is the process for setting up the instrument. Examples given are for illustration purposes only, application settings will differ, based on the specific application.

1. Press the down arrow button until the cursor is in front of Setup.

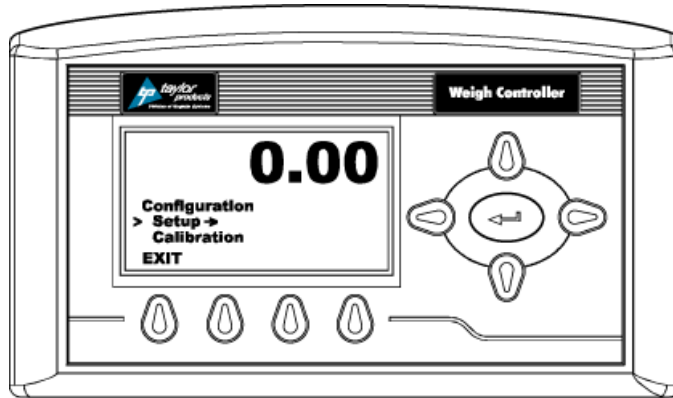


Figure 21 – Placing The Cursor In Front of Setup

2. Press the enter button. The Setup sub-menu appears.
3. Set the unit of measure parameter. The operator has the following choices:
 - Pounds (lb) – default
 - Ounces (oz)
 - Pounds/Ounces (lb/oz)
 - Kilograms (kg)
 - Grams (g)
4. If the cursor is not at the front of the Unit line, press the down or up arrow button until the cursor is in front of the Unit line.

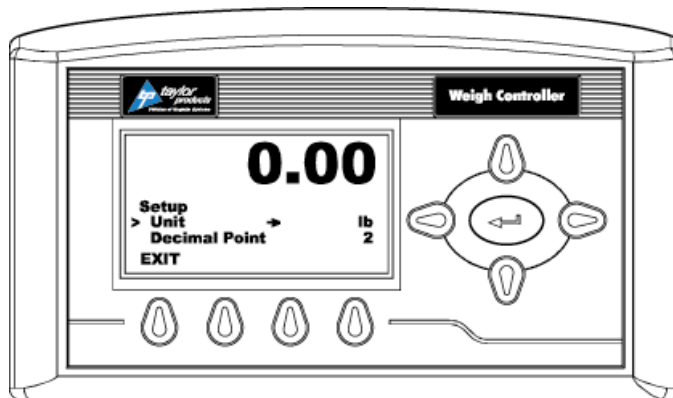


Figure 22 – Placing The Cursor In Front of Unit Line

5. Press the left or right arrow buttons to select the desired unit of measure.
6. Press the enter button to save the selection. An Entry Accepted message will flash briefly on the screen.

7. Set the decimal point position. Press the down arrow button until the cursor is in front of the Decimal Point line. The current number of digits that are displayed to the right of the decimal point.

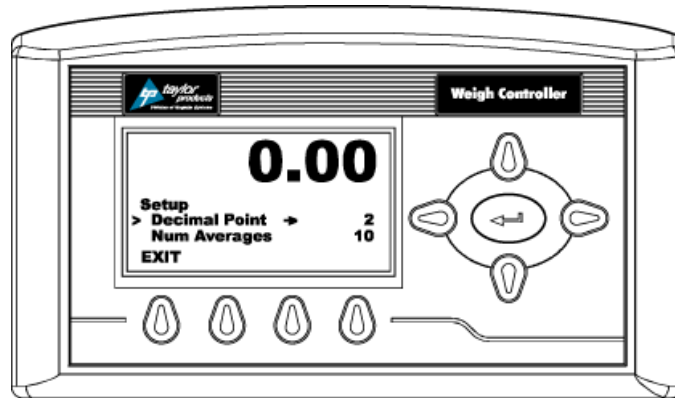


Figure 23 – Placing The Cursor In Front of Decimal Point Line

8. Press the right or left arrow buttons to select the desired number of digits that will appear to the right of the decimal point position for this instrument.
9. Press the enter button to save the selection. An Entry Accepted message will flash briefly on the screen.
10. Set the Num Averages parameter. Press the down arrow button until the cursor is in front of Num Averages. The current number of averages is displayed.

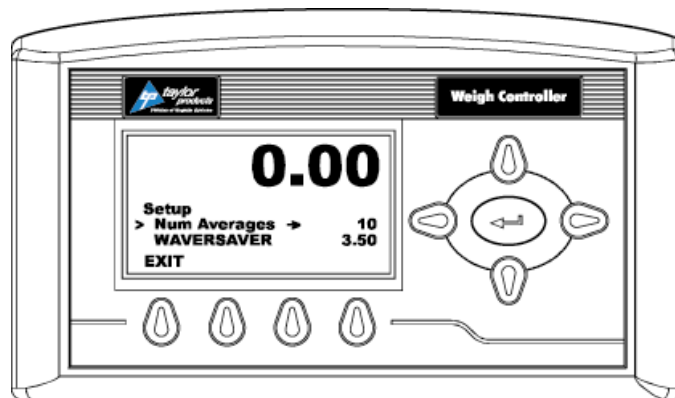


Figure 24 – Placing The Cursor In Front of Num Averages

11. Press the enter button. The Num Averages menu appears.

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- Use the left or right arrow buttons to move the cursor. When the cursor is placed in the desired location, use the up or down arrows to enter the desired number for this application. The following example shows that 10 has been entered for the Number of Averages. If the operator wanted to change the number from 10 to 20, they would move the cursor so it is positioned under the 1, then use the up arrow to increase the number. 255 is the maximum number allowed.

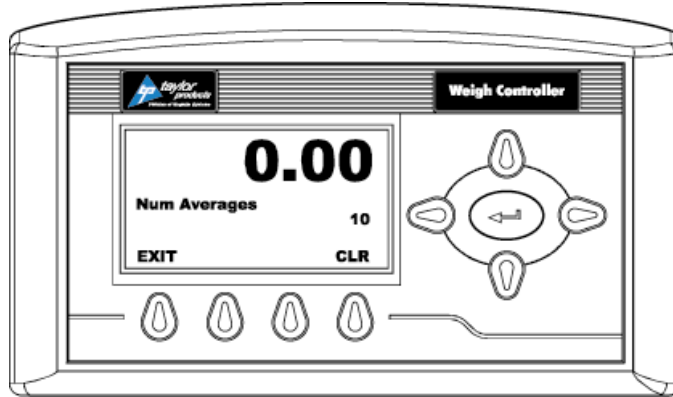


Figure 25 – Setting the Num Averages Parameter

- Press the enter button to save the selection. An Entry Accepted message will flash briefly on the screen.
- Set the WAVERSAVER[®] parameter.
- Press the down arrow button until the cursor is in front of WAVERSAVER. The current WAVERSAVER setting is displayed.

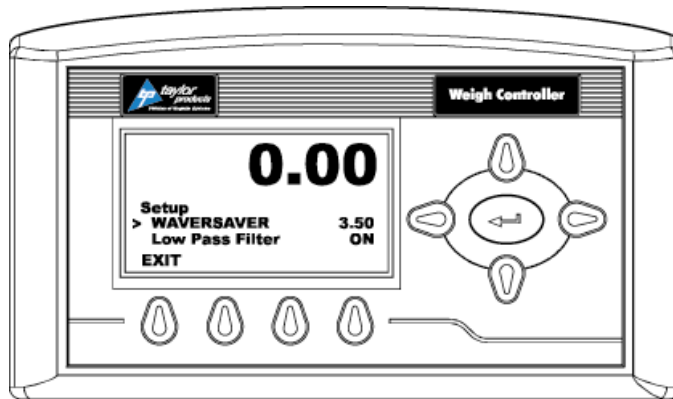


Figure 26 – Placing The Cursor In Front of WAVERSAVER

- Press the right or left arrow buttons to select the desired WAVERSAVER setting for this instrument. The available selections are:
 - OFF
 - 0.25 Hz
 - 0.50 Hz
 - 1.00 Hz
 - 3.50 Hz (recommended by Magnum Systems)
 - 7.50 Hz

17. Press the enter button to save the selection. An Entry Accepted message will flash briefly on the screen.
18. Set the Low Pass Filter parameter.

***Note:** The Low Pass Filter can be toggled ON or OFF. When it is ON it provides a more stable weight reading but at the expense of the reaction time. In some applications a more stable reading is desired due to the application. If a slower reaction time is acceptable, turn the Low Pass Filter ON. For most applications the Low Pass Filter should remain OFF.*

19. Press the down arrow button until the cursor is in front of Low Pass Filter. The state of the low pass filter is displayed. The available selections are ON or OFF.

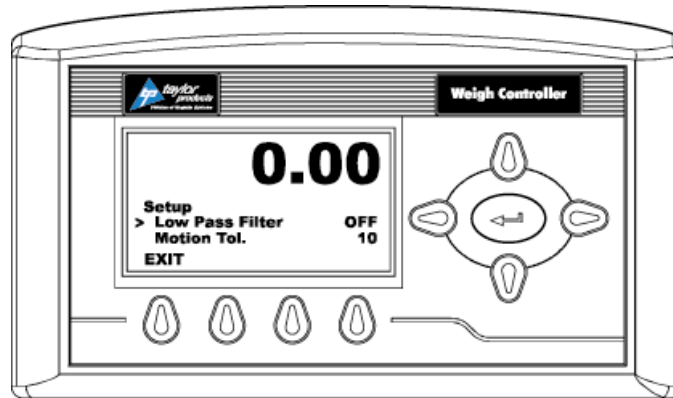


Figure 27 – Placing The Cursor In Front of Low Pass Filter

20. Press the right or left arrow buttons to toggle between ON or OFF.
21. Press the enter button to save the selection. An Entry Accepted message will flash briefly on the screen.
22. Set the Motion Tolerance Parameter.

***Note:** Motion Tolerance is the amount of allowable deviation between consecutive readings before a weighment is accepted as being complete. Setting Motion Tolerance establishes the amount of deviation that will work for a particular process. The base motion number can be calculated by using the following formula:*

$$\text{Base Motion Number} = (\text{Total Load Cell Capacity}/10,000) \times 3$$

***Note:** Motion Tolerance must be greater than or equal to the Graduation Sizes. Magnum Systems recommends three (3) graduation sizes.*

23. Press the down arrow button until the cursor is in front of Motion Tolerance. The present motion tolerance value is displayed.

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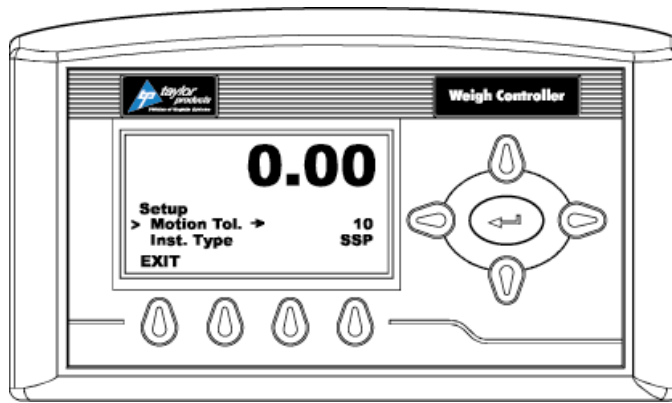


Figure 28 – Placing The Cursor In Front of Motion Tolerance

24. Press the enter button. The Motion Tolerance menu appears.
25. Use the left or right arrow buttons to move the cursor. When the cursor has been placed in the desired location, use the up or down arrows to enter the number and decimal point that is desired for this application.

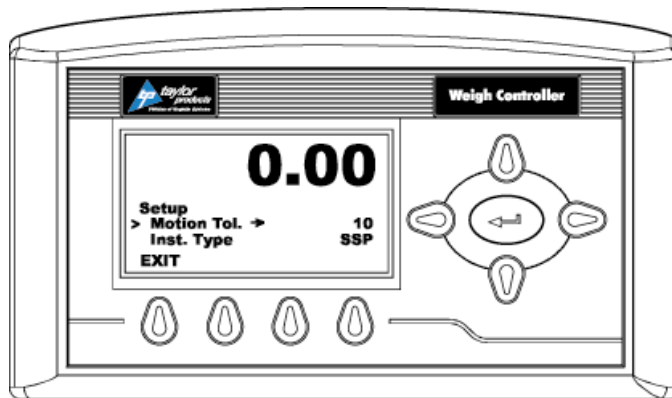


Figure 29 – Motion Tolerance

26. Press the enter button to save the entry. An Entry Accepted message will flash briefly on the screen.
27. If setting up a T4000A, set the Analog Parameter. The analog parameter configures the analog output channels in percentages. The channels are configured as voltage or current outputs. Channels 1 and 3 are voltage output channels (0-10 VDC). Channels 2 and 4 are current outputs (4-20 mA). Depending on the number of speeds configured for the controller, the operator can select output levels for the Dribble speed (Fast Speed, Medium Speed, Slow Speed) for each Analog output, A or B.
28. Press the down arrow button until the cursor is in front of Analog Out.

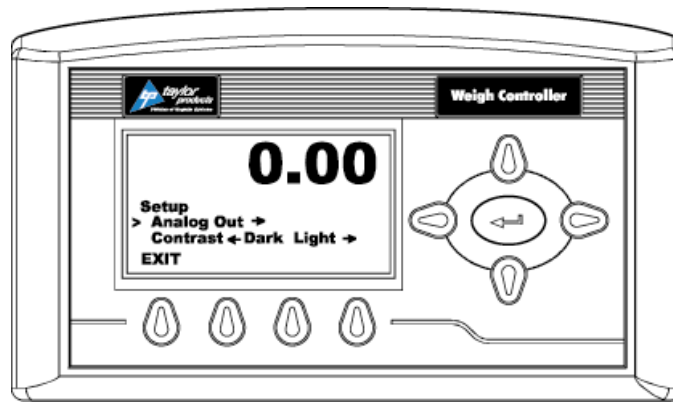


Figure 30 – Placing The Cursor In Front Of Analog Out

29. Press the enter button. The Analog Out sub-menu appears.
30. Press the enter button again. The Fast A sub-menu appears.
31. Use the left or right arrow buttons to move the cursor. Once the cursor has been placed in the desired location, use the up or down arrows to enter the desired number and decimal point for this application. In our example we entered 100% for our Fast A (Channels 1 and 2) output signal.

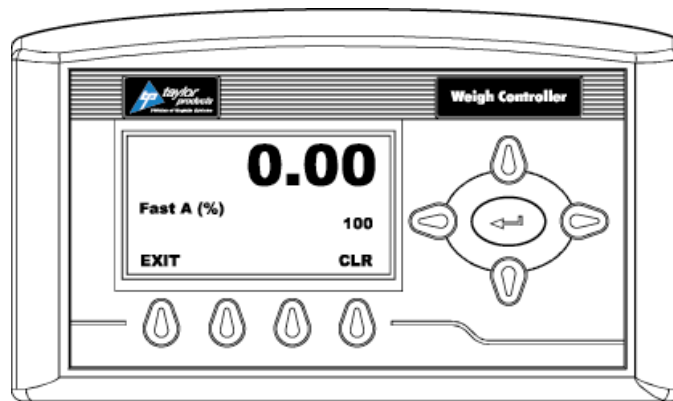


Figure 31 – Setting Fast A

32. Press the enter button to save the setting. An Entry Accepted message will flash briefly on the screen. The Analog Out sub-menu appears.
33. Press the down arrow button until the cursor is in front of Fast B (%).
34. Press the enter button. The Fast B sub-menu will appear.
35. Use the left or right arrow buttons to move the cursor. Once the operator has placed the cursor in the desired location, use the up or down arrows to enter the desired number and decimal point for this application.
36. Press the enter button to save the entry. An Entry Accepted message will flash briefly on the screen. The Analog Out sub-menu appears.
37. Press the down arrow button until the cursor is in front of Slow A.
38. Press the enter button. The Slow A sub-menu will appear.
39. Use the left or right arrow buttons to move the cursor. Once the operator has placed the cursor in the desired location, use the up or down arrows to enter the desired number and decimal point for this application.

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40. Press the enter button to save the entry. An Entry Accepted message will flash briefly on the screen. The Analog Out sub-menu appears.
41. Press the down arrow button until the cursor is in front of Slow B.
42. Press the enter button. The Slow B sub-menu will appear.
43. Use the left or right arrow buttons to move the cursor. Once the operator has placed the cursor in the desired location, use the up or down arrows to enter the desired number and decimal point for this application.
44. Press the enter button to save the entry. An Entry Accepted message will flash briefly on the screen.

Configuring Security

The Security parameters allow management to place security on the instrument and any menu or sub-menu requiring a password before enabling any changes. The Change Security parameter enables all persons to see the security status for a given menu, and selected persons to change that security status for any menu.

1. From the Configuration menu press the down arrow until the cursor is in front of Security.

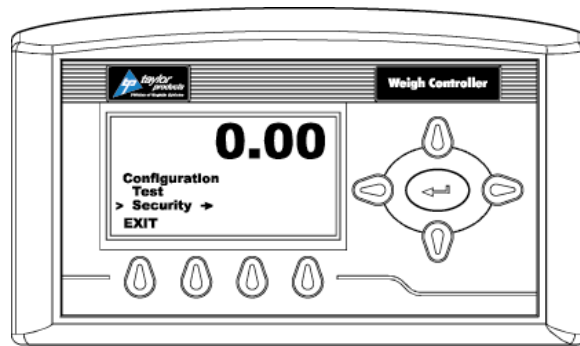


Figure 32 – Placing The Cursor In Front Of Security

2. Press the enter button. The Security menu appears.
3. Set the Password Parameter. The Set Password parameter enables the operator to create a password for entry to secure menus and sub-menus. If the password is 0 there is no security. If the password is anything other than 0 the security is enabled.

Note: It is recommended that the passwords be created before setting security on the various menus.

4. Press the down arrow button until the cursor is in front of Set Password.

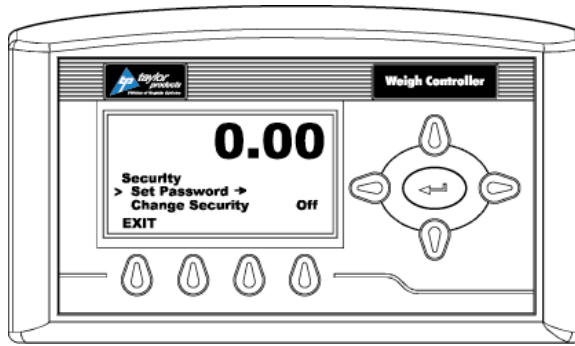


Figure 33 – Placing The Cursor In Front Of Set Password

5. If the password is being set for the first time or if the factory defaults have been reset in the Test menu, enter the default password “2205”. If the password is being reset, and the existing password is known, enter that number. Press the enter button. The Verify Password display appears.
6. Press the enter button. If the password is correct a brief message “Entry Accepted” appears and the Set Password display with the current password appears.

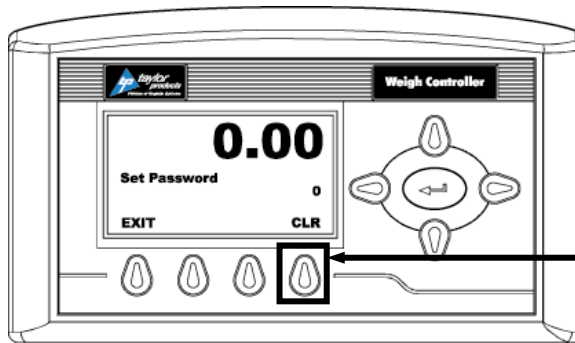


Figure 34 – Set Password Menu

7. Press the function button located directly below the CLR item on the display to clear the entry. Use the left or right arrow buttons to move the cursor left and right. Use the up or down arrow buttons to enter the password number. To delete a single entry, press the left arrow button. In the example below, “123” was entered.

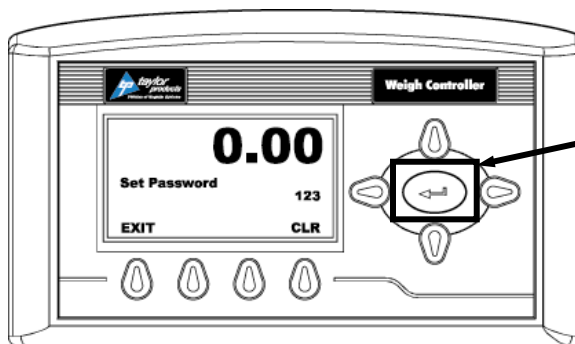


Figure 35 – Password Set To 123

8. Press the right or left arrow buttons to toggle Change Security On. The Verify Password display appears.

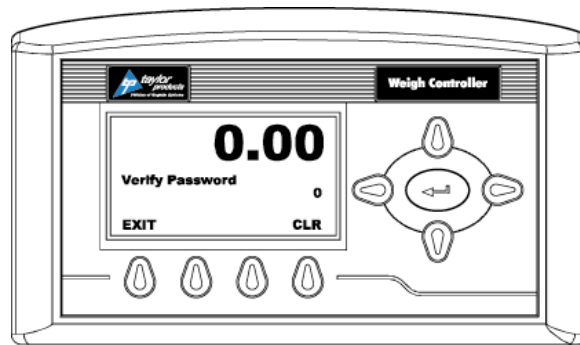


Figure 36 – Verify Password

9. Use the left or right arrow buttons to move the cursor left and right. Use the up or down arrow buttons to enter the password number.

Important: When entering the password, the last digit is entered first, then the next digit to the left and so on. For example, if the password is set to 123, then 3 is entered first, then the 2, and the 1 is entered last.

10. Press the enter button. The Change Security status changes to On. In this instance we turned Change Security ON because we want to change the security of a sub-menu.
11. Now that the Change Security On feature has been turned on, press the function key below the word EXIT on the display to return to the Configuration menu.
12. Use the up or down arrow buttons to go to the desired sub-menu to be secured. In the example below, the Decimal Point sub-menu has been selected. Notice that the display now includes a SECUR menu item above the function keys.

Note: Steps 8-12 will need to be repeated to lock and unlock a parameter.

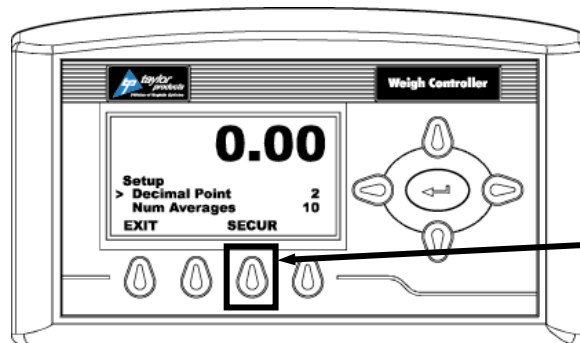


Figure 37 – SECUR Menu Item Shown Above Function Key

13. Press the function key that is positioned below the SECUR item on the display, to view and/or change the security status of this parameter.
14. Press the right arrow button to changed to LOCKED thereby securing this sub-menu.

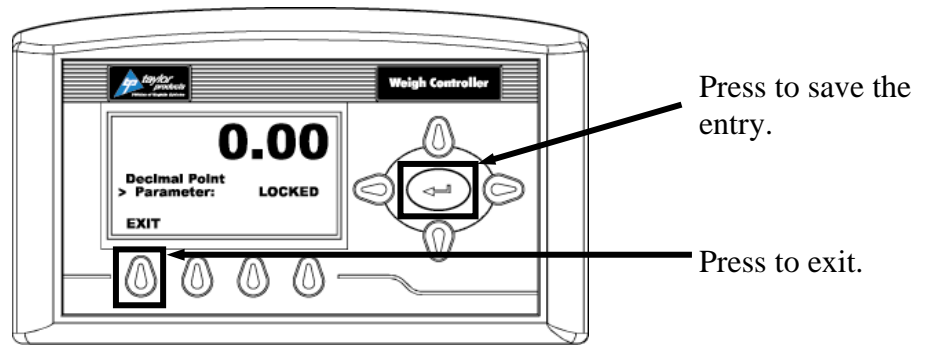


Figure 38 – Parameter Shown Locked

15. Press the enter button to save the entry.
16. Press the function button below EXIT on the screen until the summary display is shown.

Note: To check to see if the security is set on a specific sub-menu, press the EXIT button until the summary display appears. Then re-enter the menus and try to change the secure parameters.

17. Until security has been changed, changing this parameter will require a password (other than 0) to be entered.
18. To turn the Change Security OFF, go back to the Security menu and repeat steps 1-6.

Troubleshooting

Information for troubleshooting the electrical, mechanical and firmware elements of the T4000/T4000A Weigh Controller in the event of a malfunction is included below.



CAUTION

Always disconnect the power cord before disassembling.



WARNING

Failure to disconnect the power cord before disassembling may cause injury and/or property damage.

- Make sure that any disassembly is done in a clean, well ventilated, properly controlled static environment.
- Always make sure that the assemblies and sub-assemblies are well supported and insulated when doing any repairs on the T4000 AND T4000A Weigh Controller.
- Place small fasteners, connectors and electrical parts in closed containers so as not to lose parts during reassembly.
- Read all the disassembly instructions before any disassembly begins. The operator should be familiar with the procedures. If any of the instructions for disassembly are unclear, contact Hardy Instruments, Technical Support Department for additional information and assistance.
- Do not disconnect any electrical plug, connector or terminal unless an identification tag is present or one is attached. Always note where the connector or plug was attached to the electrical component or wiring harness.
- Always install complete hardware groups (Screws, Washers, Lock Washers, Spacers, Etc.) back to the original point of removal.
- Always replace broken or damaged modules or hardware immediately!
- Always check to be sure that no loose parts are sitting on printed circuit boards or electrical connectors or wires when disassembling or reassembling.

Error Messages

- A/D Failure Error! – Internal Electronics Error, Retry.
 - A/D Convert Error! – Load Cells input out of range.
 - Motion Error! – Check Settings and Retry
 - Trad Cal Error! – Error occurred during calibration, re-calibrate.
 - C2 Cal Error! – Error occurred during calibration, re-calibrate.
 - Too Lo Error! – Verify that the load cell signal level is 0-15 mV. Verify that there is enough weight on the scale. Perform Span than go back and Zero.
 - Too Hi Error! – Verify that the load cell signal level is 0-15mV. Verify that there is enough weight on the scale. Perform Span than go back and Zero.
 - No C2 Sensor! – Instrument did not detect a C2[®] Load Sensor. This error should appear if C2[®] Cal is selected, as Magnum Systems does not use C2[®] type load cells.
 - CAL Failed! – Too few counts between Zero and Span.
-

- C2 Caps Unequal! – Different load cell capacities (For example 50 lbs capacity load cell and 100 lbs capacity load cell on one system. Make the load cells even by removing the uneven load cell and replacing it with a load cell that is equal to the others capacity.
- HI/LO Too Close! – Zero and Span are not more than 1,000 counts from each other or there is no change or negative change. Reset either so the counts are more than 1,000 counts of each other.
- Function Error! – Pressed a function button and the Function did not work. Try again. Cycle power.
- Not Allowed! – Value entered is outside the range allowed. Try another value.
- Security Violation! – User signed in with a password that does not allow performance of a certain function or entry to certain menus. Security level of the user identified in the User ID, too low for the menu or function.
- Overrange – Weight over the setpoint target.
- Gross ADC Error – Load cell error has been detected by the controller.

Stability Test ALL

Variance Test

This test looks at the variation of the A/D converted, which is compared to an internal standard. The results are posted as pass or fail and the given variance. This variance is derived from internal calculations based on settings and not any outside input. So this test is valid to help divide the problem into smaller divisions. Unstable test results can be caused by an internal A/D processor fault, grounding, power connection or EMI/RFI above specified CE limits.

Raw A/D Count

These numbers are reflecting weight change at the smallest measurement, the internal analog to digital converter computer register.

Raw A/D Average Counts

These numbers are reflecting weight change at the smallest measurement, the internal analog to digital converter computer register. Except this reading is averaged using the AVERAGES setting parameter from the controller's configuration. Using the maximum number of internal Averages and the 10ms update equals a maximum delay of 2.55 seconds.

Weight and Voltage ALL

This test section looks at the readings from ALL the load cells. This test works for all varieties of load cell connection systems. This will test overall system performance and signal voltage readings. Further investigation to isolate system problems require the use of hand tools and multi-meters or the Integrated Summing Junction Box and using the IT[®] Test section.

Note: IT[®] is a registered trademark of Hardy Instruments Inc.

Weight:

This displays the amount of force seen by all load cells installed in the summing junction box. This force can show an imbalance or weight distribution problems. Review the system to insure proper balance and loading. Further investigation to isolate system problems will require the use of hand tools and Multimeters or the Integrated Summing Junction box and using the IT[®] test section.

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Mv/V and MV:

DC voltage signals are between 0-15 millivolts. Overloads and negative millivolt readings are not shown as actual readings but 15.3 for over voltage and 0.0 for negative voltage. A multimeter with a 200 or 300mVDC range will need to be used to view the out of range voltages, or the Integrated Summing Junction box and the IT Test section.

RTZ (Return to Zero) Tests:

This test is only run when the scale is empty. When the scale is calibrated at the **ZERO** or Reference zero there is a **WAIT** period. During this **WAIT** period the **WEIGHT** readings are collected. When this test is run, after a valid calibration has been completed, there is a comparison of the original weight reading collected and current. If the difference is more than the Motion and the Zero Tolerance parameters the test will fail.

System Integrity Check and Fault Determination From the Front Panel

To determine if an instrument or cabling problem exists, verify the basic operation of the system by performing the following system checks.

About Test

The Test menus enable the technician to get a quick view of how the Weigh Controller and scale are working. For example the operator can check the Serial Number of the instrument, Model number, Firmware revision number, or Program Part Number. This information will be required if the operator needs to download updates from the Hardy Instruments website. By performing the Stability Test the operator can check the A/D Raw count and average. The Test menus allow the operator to perform a Weight and Voltage Test, which provides the total scale input to the instrument such as mV, mV/V and Weight in the units selected (i.e. lbs, kg, oz, g). enables the operator to test each load sensor to determine the source of a problem should one occur.

1. From the summary display press the enter button. The Configuration Display appears.
2. Press the down arrow button until the cursor is in front of Test.
3. Press the enter button. The Test menu appears.
4. Some of the Test menus are read only displays. This information is important:
 - a. Serial Number – To make sure all the correct downloads for the instrument a Hardy Support Technician will need the serial number of the instrument.

Note: The values entered in the Test menu are for illustration purposes only. Specific application values will vary.

- b. Firmware Revision – Often a technician needs to know the program version to determine if the correct version is being used. A Hardy Technical Support Technician will ask what version of software is currently being used to determine the source of a problem.
 - c. Model Number – Lists the model number of the instrument.
 - d. ProgPn# – Program Part Number. This is the part number of the firmware. To order additional copies of the firmware, the Program Part Number will be required. This is also additional information available to a service technician for troubleshooting.
5. The Serial Number is read only, the operator cannot change this value.
 6. To see the Firmware Revision number, press the down arrow button until the cursor is in front of Revision.

7. The Revision number is read only, the operator cannot change this value. However if the complete Revision number does not display and the operator wants to see the complete Revision number press the enter button. The Revision menu appears with the complete Firmware Revisions number.
8. Press the function button below EXIT on the screen to return to the Test menu.
9. To view the Model Number, press the down arrow button until the cursor is in front of Model.
10. To view the Program (Firmware) Part Number press the down arrow button until the cursor is in front of Pgm Part.
11. To perform the Stability Test press the down arrow until the cursor is in front of Stability Test.

Stability Test

The Stability Test switches a fixed signal into the analog to digital converter, and calculates the mean squared variation from the average reading, using 100 samples.

The test passes if the mean squared variation is less than 5.0, and the average reading is between 30237 and 36955.



CAUTION

Do not perform the Stability Test while in operation. The system is checking various elements in the system during the test and may weigh incorrectly.

1. Press the enter button. The instrument performs the test and displays the results.
 - a. If the test indicates the variation is very low and the instrument is stable. The variation is listed in the results of the test.
 - b. If the test indicates a very high variation the instrument is unstable. This means that the Mean Squared Variation is greater than 5.0 and/or the average reading is not between 30237 and 36955.

Important: *If the Mean Squared Variation is outside of acceptable limits, do the following:*

1. *Disconnect the power cord and reconnect the power cord to restart the instrument.*
 2. *Recalibrate the instrument.*
 3. *Repeat the Stability test.*
 4. *If the instrument Stability Test reads high again, contact Magnum Systems, Technical Support for assistance.*
2. To see the AD/Raw Count and the A/D Average press the down arrow button until the cursor is in front of A/D raw count.
3. Press the function button below EXIT on the screen to return to the Test menu.
4. To perform the Weight and Voltage test for the system, press the down arrow until the cursor is in front of "Weight and Voltage".
5. Press the enter button to perform the test. The results appear.
6. To read the rest of the results, press the down button.
7. Press the function button below EXIT on the screen to return to the Test menu.

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Setting Factory Defaults

There may be a point when it may be necessary to restore the T4000 back to the factory defaults. If the factory defaults are restored, all application specific parameter settings that have been set for a specific application will be lost.

1. Press the down arrow button until the cursor is in front of Set Factory Defaults.
2. Press the enter button. The Factory Defaults are set.

Typical Load Cell/Point Input/Output Measurements (EXC & SIG outputs)

1. The T4000 Weigh Controller is designed to supply 5 VDC excitation to as many as eight (8) 350-ohm load cells/points.
2. The expected output from each load cell/point depends on the mV/V rating of the load cell/point and weight.
3. For example a 2 mV/V load cell/point will respond with a maximum of 10 mVDC at full weight capacity of the system, which includes the weight of the vessel and the weight of the product as measured by the load cell/point.
4. If the load cell/point weight capacity is rated at 1000 lbs., the load cell/point output will be 10 mVDC at 1000 lbs, 3.6 mVDC at 750 pounds, 5 mVDC at 500 pounds and so on.
5. A zero reference point will vary from system to system depending on the “Dead Load” of the vessel. “Dead Load” is the weight of the empty vessel and any other components whose weight is passing through the load cell. In our example below we assume the dead load to be 500 lbs.
6. Based on the example, the operating range for this scale is 5-10 mVDC with a 500 lbs. weight. Understand that after zeroing the instrument the 0 reading on the instrument refers to the zero reference point and not absolute 0 mVDC or absolute 0 weight.

Note: Load cell/point measurements can be checked with a digital voltmeter at the J1 connector on the rear panel or at the summing box of the T4000 or use Integrated Technician from Hardy Instruments if using the IT Junction Box.

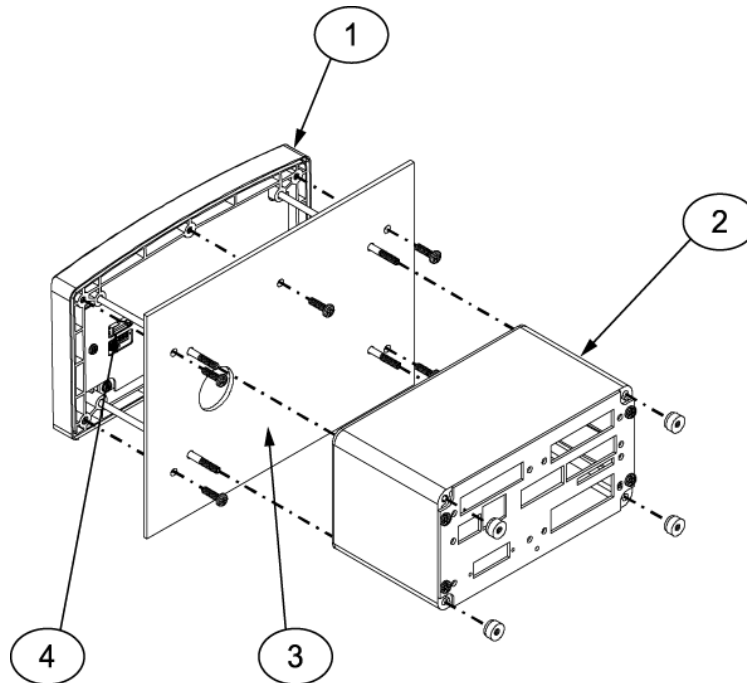
Repair Instructions

LCD Panel Replacement

If the LCD panel becomes damaged and requires replacement, use the following steps to replace it.

LCD Panel Removal

1. Turn the packaging machine off.
2. Disconnect the main electrical and pneumatic connections.
3. Open the door on the electrical panel.
4. Loosen the power connector retaining screws on the power connector that plugs into the rear of the controller.
5. Disconnect the power connector and the other connectors from the rear of the controller.
6. Loosen the four knurled nuts that are found on each corner of the rear of the controller. Back the nuts almost all the way.
7. Slide the electrical enclosure portion of the controller rearward, until it bumps against the knurled nuts.
8. Disconnect the LCD panel cable from the rear of the LCD panel.
9. Slide the electrical enclosure off of the LCD panel studs. Set the electrical enclosure aside.
10. Slide the LCD panel out until the four mounting studs have cleared the door panel.
11. If the LCD panel is to be replaced with a new one, remove the four threaded mounting studs from the rear of the panel.



Item #	Description	Item #	Description
1	LCD panel (key pad located on front)	3	Metal panel (door)
2	Electrical enclosure	4	Cable connector on LCD panel

Figure 39 – T4000 Mounting

LCD Panel Installation

1. If the LCD panel being installed does not already have the four threaded mounting studs installed, screw them in until they bottom out.
2. Hold the LCD panel up to the door panel and line up the four threaded mounting studs with the mounting holes in the door panel.
3. Insert the tips of the threaded mounting studs through the four mounting holes in the door panel and slide the LCD panel all the way in until it contacts the door.
4. Slide the electrical enclosure onto the four studs, until the four studs just protrude out the rear of the enclosure.
5. Route the cable from the electrical enclosure and connect it to the LCD panel.
6. Slide the electrical enclosure toward the LCD panel. While sliding it forward, feed the cable into the electrical enclosure to prevent the cable from being pinched between the LCD panel and the enclosure.



CAUTION

Failure to properly feed the cable into the electrical enclosure may result in the cable being pinched between the enclosure and the panel. This condition may result in the T4000 not operating, or operating incorrectly.

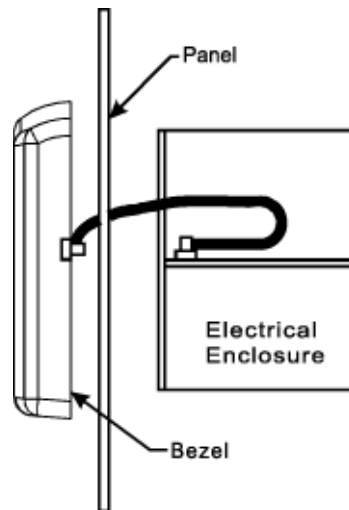


Figure 40 – Threading The Cable Into The Electrical Enclosure

7. Install the knurled nuts onto the threaded studs. Tighten the nuts finger tight.
8. Connect the cable connections to the rear of the electrical enclosure.
9. Tighten the power cable connector retaining screws.
10. Connect the main electrical and pneumatic connections.
11. Turn the machine on and let the controls warm up for thirty (30) minutes.
12. Calibrate the controller. Refer to Calibration.

LCD Panel Cable Replacement

If the LCD panel cable becomes damaged, use the steps below to replace it.

LCD Panel Cable Removal

1. Turn the packaging machine off.
2. Disconnect the main electrical and pneumatic connections.
3. Open the door on the electrical panel.
4. Remove the LCD Panel. Refer to LCD Panel Replacement.
5. Disconnect the LCD Panel Cable from the electrical enclosure.

LCD Panel Cable Installation

1. Connect the LCD Panel Cable to the electrical enclosure.
2. Install the LCD Panel. Refer to LCD Panel Replacement.
3. Close the door on the electrical panel.
4. Connect the main electrical and pneumatic connections.
5. Turn the packaging machine on and test for proper operation.

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Glossary

Term	Definition
AC	Alternating Current. Usually referred to in relation to main power source. The controller plugs into a 120/240 Volt AC electrical outlet.
Analog Signal	An electrical signal that varies in strength. Both AC and DC signals may be analog. However, in Magnum Systems applications, it is more common for analog signals to be AC.
AutoZero	The process where the controller automatically zeros itself, prior to starting the fill cycle.
DC	Direct Current.
Electrical enclosure	The metal box that contains all of the circuit boards and power components for the T4000.
Hysteresis	The difference between the set point and the relay reset point.
Input	A voltage signal that is supplied to the controller.
LCD Panel	A display panel that is comprised of a liquid crystal display
Low Pass Filter	Used in applications where weight instability is a problem to provide a stable weight reading.
Motion Tolerance	The amount of deviation that is allowed between consecutive weighments
Num. Averages	For applications where the process of loading the product itself into the vessel creates unacceptable levels of vibration, adjusting the num. averages parameter may be used to alleviate the condition.
Output	A voltage signal that is sent by the controller that is used to change the state of a device.
Rescaler	Set points that determine when an input/output either becomes active.
SP1	Set point 1. Used to define the first fill transition on a dual set point (DSP) machine. This is the point where the machine will switch from a fast fill rate to a slower fill rate.
SP2	Set point 2. Used to define the second fill transition on a dual set point (DSP) machine. This is the point where the machine will shut off the feed mechanism.
WAVERSAVER®	Used in environments where excessive plant noise affects the ability of the controller to deliver a consistent weighment.

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