

# Weigh II Installation and Operation Manual

## CAUTION

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It is essential that all instructions in this manual be followed precisely to ensure proper operation of the equipment.

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# NOTICE

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# CAUTION

Follow these rules if welding is done on the vessel after installation of Kistler-Morse sensors/transducers. The electrical current of the welder may pass through the sensor/transducer, causing damage to it, and possibly to the signal processor. To avoid damage, follow these precautions.

1. Disconnect the sensor/transducer cables from the signal processor.
2. Ground the welder as close to the welding joint as possible.
3. Always ground the welder so that the welding current does not go through the sensor/transducer.

## *Note*

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High temperatures can damage sensors/transducers. If you are welding in the vicinity of a sensor/transducer, monitor the temperature of the metal adjacent to the sensor/transducer. If it becomes too hot to touch, stop welding immediately, and remove the sensor/transducer before continuing. Prior to reinstalling the sensor/transducer, verify that no damage has occurred.

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# Chapter 1. Weigh II Introduction



Figure 1-1. The Kistler-Morse Weigh II Strain Measurement Signal Processor

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## Introduction

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The Weigh II is a multichannel signal processing and display system that will receive analog inputs and digital serial communications from a master device. The Weigh II can monitor up to four vessels instrumented with Kistler-Morse L-Cells, Microcells, Load Stand II's, Load Disc II's, or Load Links, or with full bridge, foil gage sensors from other manufacturers. The Weigh II has an integral, weather-sealed membrane keyboard and a large LCD display that provide easy access for programming and viewing parameters and allows the user to input their own unique vessel identifications. The enclosure is NEMA-rated, and is wall-mounted. The Weigh II is available in both AC-powered and DC-powered versions.

### Modular PCBs

The Weigh II's modular design provides for easy system configuration to the specific needs of your application and allows for expansion to meet future requirements. Kistler-Morse's flexible system allows easy interconnection to a variety of Programmable Logic Controllers (PLCs).

The motherboard inside the Weigh II enclosure has three Printed Circuit Board (PCB) card positions. Optional, modular PCBs plug onto the motherboard and are accessed through the front of the enclosure for wiring.

The PCBs available to make up a Weigh II are:

#### Standard PCBs —

- Display PCB (mounted on inside of enclosure door)
- Motherboard PCB with an RS-232/RS-422/RS-485 serial port (monitors one vessel)

#### Optional PCBs —

- 4-channel multivessel PCB; monitors up to four vessels
- 5-channel or 8-channel Setpoint PCB
- 2-channel, 4-channel, or 8-channel Current Transmitter PCB (for use only with the AC power version of the Weigh II)
- Combi-Card PCBs for Setpoint and Current Transmitter functions, in the following combinations:
  - 2 Setpoints and 1 Current Output
  - 4 Setpoints and 1 Current Output
  - 4 Setpoints and 2 Current Outputs
- Allen-Bradley RIO PCB
- Profibus DP
- Remote Tare PCB (up to 4 channels)

### Sentry™

Vibrations in a vessel can cause changes in a signal processor's weight display, even though no material is moved, because the vibrations affect the vessel's structural response. The Weigh II's unique Sentry™ feature digitally detects, processes, and filters those vibrations, reducing the fluctuations in weight readings.

## **Methods of Operation**

The Weigh II has two methods of operation:

- Vessel Monitoring — vessel parameters (weight, level, or some other indication of vessel contents) are displayed on the LCD. Vessel monitoring can be set to monitor and display information on each of the vessels in the system (Auto Mode) sequentially or on only one vessel (Manual Mode). When in the Manual Mode, use of the keyboard allows the user to manually scroll to other vessels.
- Menu Operation — system parameters for display, input/output, calibration, and troubleshooting can be viewed and modified.

### *Note*

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Throughout this manual, the term “weight” is used to refer to an indication of the quantity of material in the vessel. However, the Weigh II can be set up to display weight, level, volume, percentage, voltage, or current associated with the material quantity (see Chapter 4, Display). If you are using some measure other than weight, all inputs must be consistent with your chosen measure.

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## **Manual Conventions**

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Three kinds of special explanations appear throughout the manual — **WARNING**, **CAUTION**, and *Note*. The format and significance of each is defined below:

### **WARNING**

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**Possible danger to people. Injury may result if this information is ignored.**

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### **CAUTION**

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Possible risk to the product. The Weigh II or other equipment may be damaged if this information is ignored.

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### *Note*

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Contains additional information about a step or feature critical to the installation or operation of the Weigh II.

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# Chapter 2. Hardware Installation

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## General Information

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This chapter provides instructions on how to install and wire the Weigh II.

### WARNING

**If the Weigh II has been connected to power, disconnect it before proceeding. Deactivate power to the controlled devices to prevent equipment damage or personal injury.**

Read all instructions before beginning installation. It is important that all instructions are followed carefully to ensure that the equipment is properly mounted and wired.

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## Unpacking and Inspection

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Carefully remove the components of the Weigh II from the shipping container and place them on a flat surface. Visually inspect for damage that may have occurred during shipment. If any damage is evident, note it on the shipping receipt. Report the damage to the carrier and to Kistler-Morse immediately. Store the shipping container and packing material for later use in the event the Weigh II must be returned to the factory.

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## Mounting the Weigh II

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When mounting the Weigh II, be sure there is enough clearance to open the front door. Removal and insertion of the modular PCBs as well as wiring of the sensors and the PCBs are done through the front of the unit.

The hardware used to mount the Weigh II is provided by the customer. The Weigh II enclosure dimensions are shown in TI-SP.W2-01 in Appendix F, Technical Drawings. Refer to Appendix A, Product Specifications, for environmental specifications before mounting the Weigh II.

Follow this procedure to mount the Weigh II:

1. Hold the Weigh II enclosure against the wall in the desired location and mark the positions of the mounting holes. Place the Weigh II in a safe place.
2. Drill the mounting holes in the wall.
3. Attach the Weigh II to the wall using hardware that will secure it firmly in place.

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## Wiring the Weigh II

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This section describes how to wire power to the Weigh II and how to wire the optional PCBs. Installation and wiring of the Kistler-Morse sensors are described in the applicable sensor installation manuals.

Wire routing requirements for the AC and DC versions of the Weigh II differ, as described below:

- **AC Version** — Route the AC power cable and the setpoint cables separate from the low-level signal cables. Doing so will avoid electrical interference in the sensor signals and the communications signals.
- **DC Version** — Route the DC power cable separate from any AC power cable and coaxial cable. Route the setpoint cables separate from the DC power cable and the low-level signal cables. Doing so will avoid electrical interference in the communication signals. Note that you can route the DC power cable with the low-level signal cables.

## Drilling Holes in Enclosure

### CAUTION

Remove the electronics before drilling holes in the enclosure. Drill the holes through the bottom or through the side of the enclosure. DO NOT drill holes through the top as this may allow moisture seepage, which can damage the electronics.

The Weigh II enclosure has no openings through which to route cables or install conduit. Before you begin wiring, drill entry holes through the enclosure where it is most convenient to route your conduit or cables. Hole location is critical for proper PCB installation. Check clearances to ensure fittings and wire routing will not interfere with the motherboard, option cards, or enclosure door. Refer to the following drawings in Appendix F for locations and wiring of the optional PCBs:

- 4-channel multivessel PCB — TI-SP.W2-03
- 5-channel or 8-channel Setpoint PCB — TI-SP.W2.RLY-01
- 2-channel, 4-channel, or 8-channel Current Transmitter PCB (for use only with the AC power version of the Weigh II) — TI-SP.W2.XMIT-01
- Combi-Card PCBs for Setpoint and Current Transmitter functions — TI-SP.W2.CMB-01 (AC version) or TI-SP.W2.CMB-02 (DC version)
- Remote Tare PCB (up to 4 channels) — TI-SP.W2.RTI-01
- Allen-Bradley RIO PCB — refer to *A-B RIO Manual for Sonologic II and Weigh II*
- Profibus DP — refer to *Profibus Interface Manual for Ultra-wave, Sonologic II/Weigh II*.

## Wiring Power

### WARNING

**When connecting power to the Weigh II, adhere to the following:**

- **Power wiring must comply with the national wiring requirements for the country in which the equipment is installed.**
- **The ground conductor must be connected to the Protective Earth (PE) terminal.**

The specifications of the power supply for the Weigh II are as follows:

### AC-Powered Versions

- 100 VAC, or
- 115/230 VAC switch selectable

### DC-Powered Version

24 V ± 10% 2A

Refer to the following drawings in Appendix F: TI-SP.W2-02 for single-point system or TI-SP.W2-03 for multi-point system. The wiring procedure for connecting the external power source to the Weigh II follows:

1. Route the cable from the power source to TB1 on the motherboard.
2. Connect the Ground lead to the ground terminal, the Hot lead to the 'L' terminal, and the Neutral lead to the 'N' terminal.

### Note

The standard lead colors for AC power in North America are:

- Ground = Green
- Hot = Black
- Neutral = White

3. Restore the power supply.
4. Turn On the On/Off switch (SW1) in the Weigh II and verify that the LCD activates. If the LCD does not activate, check that the wiring is correct and that the power supply meets specifications.

## Wiring for Optional PCBs

Refer to the PCB drawings listed above for wiring the optional PCBs.

### Note

See TI-SP.W2.02 (single-point) or TI-SP.W2.RTI-01 (multi-point) in Appendix F, Technical Drawings for wiring details for the Weigh II's remote tare function. To tare the vessel from the remote station, hold the remote tare push button for 1 second.

## Sealing Openings in Enclosure

After you have completed installation of the conduit and cables, seal around the openings in the Weigh II enclosure to prevent moisture seepage. Use Sikaflex 1A polyurethane sealant or RTV 738.

### CAUTION

Only use Sikaflex 1A polyurethane sealant or RTV 738. Other sealants may contain acetic acid, which is

harmful to electronics.

## Power Fuse Information

There are two power fuse locations in the Weigh II. Refer to Table 2-1 for specification information on each fuse.

Fuse	Part No.	Purpose	Voltage	Current
F1	18-1002-01	AC	250 V	1.0 A
F2	18-1033-13	DC	50 V	1.85 A

Table 2-1. Power Fuse Information

## Installing PCBs

The Weigh II arrives from Kistler-Morse with the specified PCBs installed. However, you can expand your system by purchasing optional PCBs and installing them into vacant positions on the motherboard. There are three positions on the motherboard of the Weigh II that accept optional PCBs. Note the following restrictions on PCB positions in the Weigh II:

- **Position 1**  
4-channel multivessel PCB
- **Position 2**  
5-channel or 8-channel Setpoint PCB  
Allen-Bradley RIO PCB  
Remote Tare PCB (up to 4-channels)
- **Position 3**  
5-channel or 8-channel Setpoint PCB  
Allen-Bradley RIO PCB  
Profibus DP  
2-channel, 4-channel, or 8-channel  
Current Transmitter PCB (for use only with the AC power version of the Weigh II)  
Combi-Card PCBs  
(2 setpoints and 1 current output;  
4 setpoints and 1 current output;  
or 4 setpoints and 2 current outputs)

A new PCB from Kistler-Morse comes with the following items:

- PCB
- Two 4-40 x 1/4 PHS screws to secure the PCB to the Weigh II motherboard

Refer to the applicable drawing in Appendix F for PCB slot locations and wiring details and follow this procedure to install a PCB into the Weigh II:

1. Disconnect power to the Weigh II.
2. Open the door of the Weigh II.
3. Place the PCB in the designated position on the motherboard. Be sure the PCB connector inserts completely into the motherboard connector.
4. Secure the PCB in place with the two 4-40 x 1/4 PHS screws supplied with the PCB.
5. Connect the field wiring to the PCB.
6. Restore power to the Weigh II. Close the door. Installation is complete.

If you add a 4-channel multi-vessel PCB to the Weigh II, you must use the *Enab* and *Dflt* functions in the *ADC* Menu of the *Service* Menu to bring the new channels on-line. Refer to Chapter 7, *Service*, for the use of those functions.

### Note

Before you use the *Dflt* function to bring the new channels on-line, **write down all calibration and setup parameters**. The *Dflt* function will erase all existing calibration and setup parameters. Reenter the parameters after the new channels are on-line.



# Chapter 3. Menu Tree, Keyboard Functions, and Quick Start

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## Introduction

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This chapter describes the Weigh II's Main Menu, contains a diagram of the menu tree structure, and describes all of the keyboard functions. Additionally, this chapter provides a list of the steps you need to take to get a "Quick Start" on using the Weigh II.

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## Menu Tree

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The menu tree of the Weigh II is used to enter and view settings, set up, calibrate, and troubleshoot for the system. There are four submenus listed in the *Main* Menu:

- *Disp* — to enter and view display settings
- *I/O* — to enter and view setpoint parameters, current output parameters, serial port configurations, printer functions, and PLC interface parameters
- *Cal* — to calibrate the system
- *Service* — to troubleshoot the system; adjust gain, resolution, and excitation; set up filtering and tracking functions to reduce the effect of "noise" and drift; reset parameters to default values; calibrate 0/4-20 mA output; and set up a user access code

The menu tree in Figure 3-1 shows the *Main* Menu in Menu Level 1 and the submenus in Menu Levels 2 – 5. The menu tree is a quick reference guide to help you find the functions you want to perform. For example, if you want to change setpoint parameters, the menu tree shows you that setpoints are set up in the *I/O* Menu. Level 2 shows the submenus that are displayed when *I/O* is selected. Level 3 shows the submenus that are displayed when a selection is made from Level 2, etc.

Chapters 4, 5, 6, and 7 provide detailed information on the function and use of the *Disp*, *I/O*, *Cal*, and *Service* submenus, respectively.

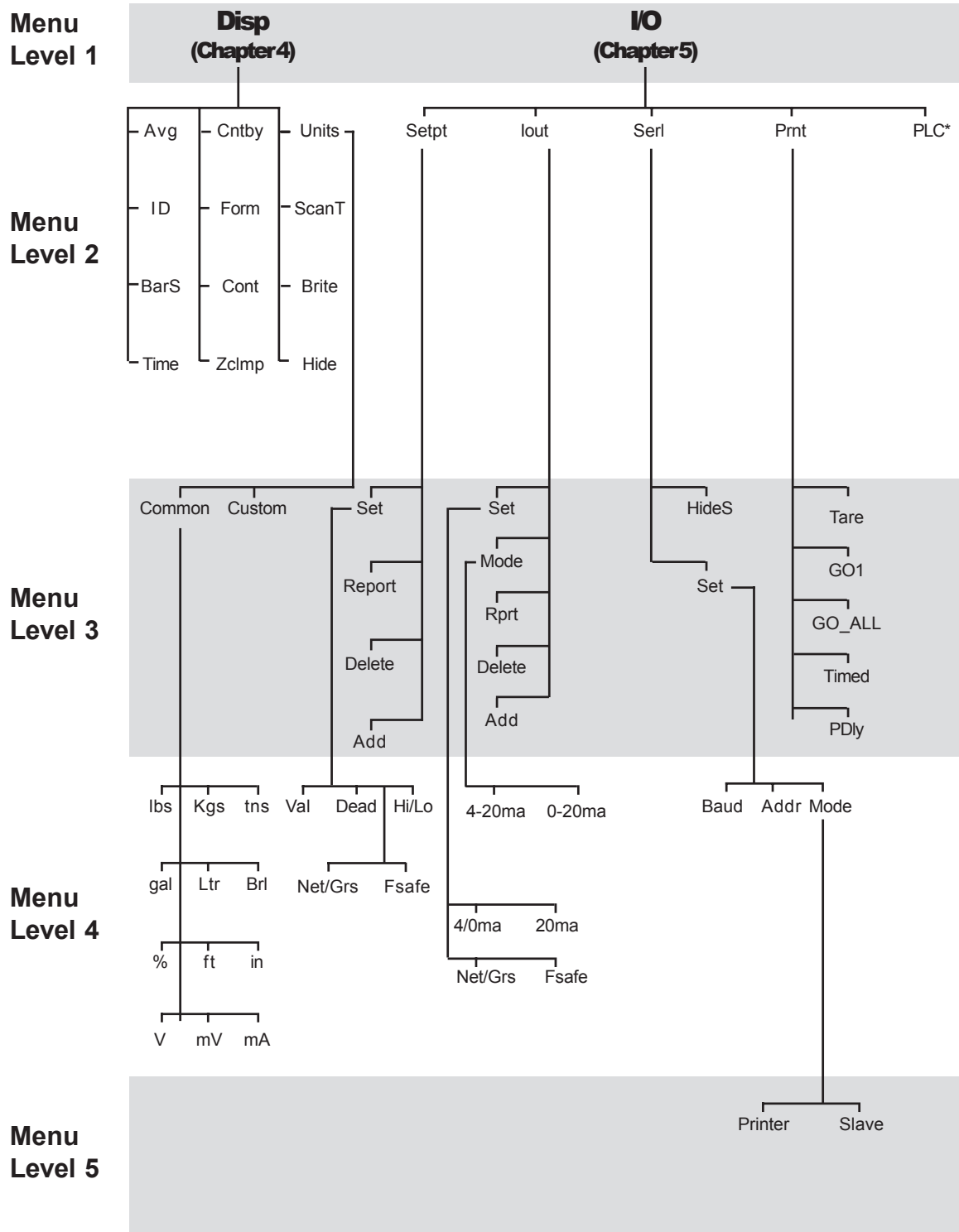
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### Note

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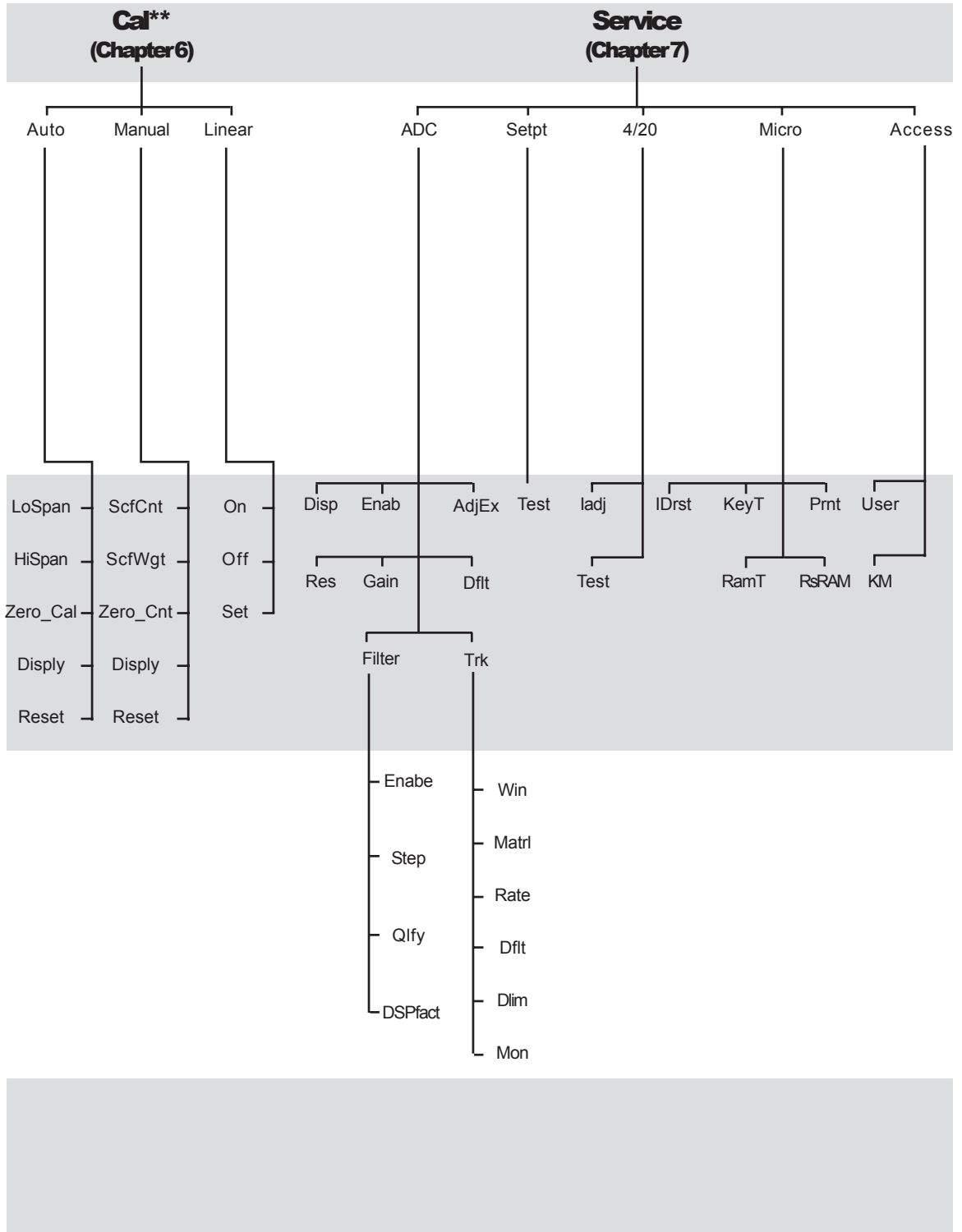
Some of the submenus are not shown in the menu tree in Figure 3-1 due to space constraints. For example, if you select *Disp* in Level 1 and *ScanT* in Level 2, a menu will come up with several values to select from for the *ScanT* function. For more detail on submenus, see the appropriate chapter in this manual.

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\* Submenus are available for PLC only if your Weigh II includes an Allen-Bradley RIO PCB, or a Profibus PCB. See *A-B RIO Interface Manual for Ultra-wave, Sonologic II and Weigh II* for detailed information or Profibus Interface manual for Ultra-wave/Sonologic II/Weigh II.

Figure 3-1. Weigh II Menu Tree



\*\* If in a Math Channel, the *Cal* Menu is replaced by the *Math* Menu. See Chapter 8, Math Channels, for detailed information.

Figure 3-1. Weigh II Menu Tree (continued)

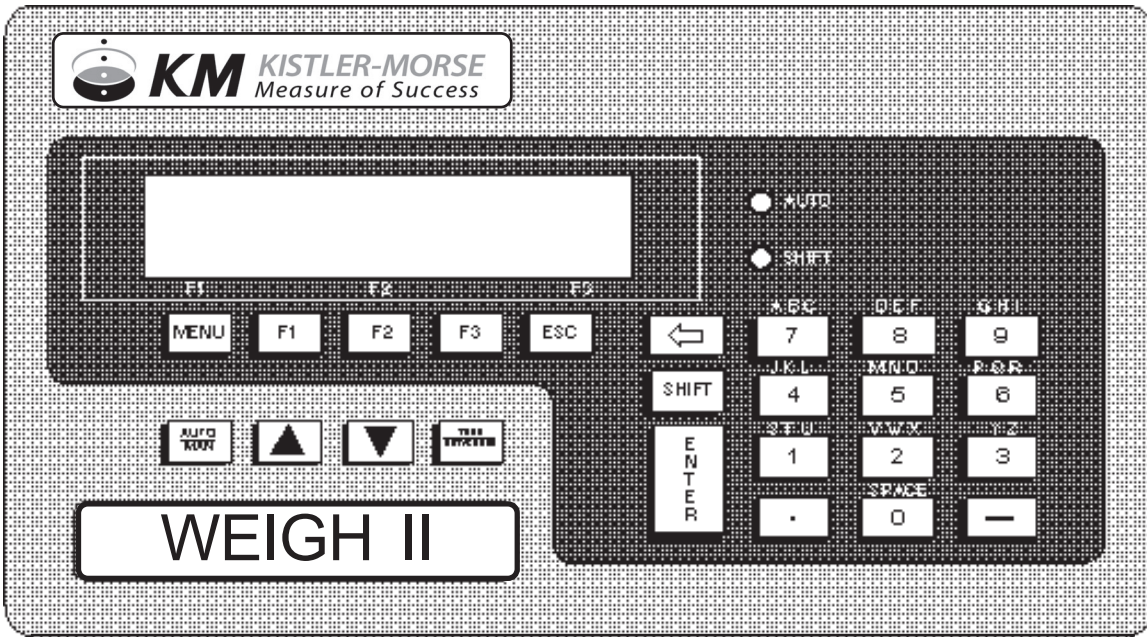


Figure 3-2. Weigh II Faceplate and Display

## Display and Keyboard

The Weigh II (Figure 3-2) has a liquid crystal display (LCD) panel made up of two 16-character lines, and an integral, weather-sealed membrane keyboard. The LCD displays the vessel ID, material weight numerically or in a bar graph format, menu selections, and error messages.

The Weigh II keyboard is used to access the different menus, scroll through the vessel monitoring display screens, input setup and calibration parameters, label the vessel for easy identification, etc. The function of each key on the keyboard is described below.

### Auto/Man Key

When vessel monitoring, the Weigh II displays the factory-set ID number (or the customer-defined ID, if input) and material weight. The Weigh II display can be set up to scroll automatically through the display screens for each vessel (Auto Mode) or remain fixed on a selected vessel (Manual Mode). The Auto/Man Key toggles between Auto and Manual Modes:

- When the Weigh II is in the Auto Mode, the display remains on one vessel for a preset period of time before scrolling to the next vessel. The preset display time can

be changed to suit the operator needs, using the *ScanT* function (see *ScanT* in Chapter 4, Display). The Auto LED to the right of the LCD is illuminated when the Weigh II is in the Auto Mode.

- When the Weigh II is in the Manual Mode, the display remains fixed on a selected vessel and must be scrolled manually with the Up Arrow and Down Arrow Keys to display information on another vessel. The Auto LED is off when the Weigh II is in the Manual Mode.

The Auto/Man Key is also used to exit any function in the menu tree and return the display to vessel monitoring in the Manual Mode.

### Up Arrow and Down Arrow Keys

The Up Arrow and Down Arrow Keys are used to manually scroll the display through the vessels when the Weigh II is vessel monitoring in the Manual Mode.

These keys are also used to scroll to desired values when in the menu tree, entering setup and calibration parameters. For example, when setting the *Lo Span* and *Hi Span* values in the *Auto Cal* Menu, the Up Arrow and Down Arrow Keys can be used to scroll to a desired value.



## Tare/Net/Gross Key

The Tare/Net/Gross Key is used when vessel monitoring in the Manual Mode (Auto LED off). This key works in conjunction with the Shift Key:

- When the Shift Key is on (Shift LED illuminated), the Tare Key is enabled. Pressing this key 'tares' the vessel on the display, setting the net weight value to zero. The tare function is useful when you want to monitor how much material is added or removed from the vessel from a given point. To tare the vessel, hold the Tare Key for 1 second.
- When the Shift Key is off (Shift LED off), the Net/Gross Key is enabled. Pressing this key toggles the display between net weight (weight added or removed from the vessel since the last time the Tare Key was enabled) and gross weight (total weight of material in vessel).

### Note

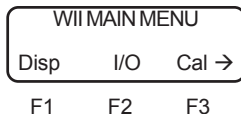
The Weigh II also has a remote tare function. See TI-SP.W2-02 (single-point) or TI-SP.W2.RTI-01 (multi-point) in Appendix F, Technical Drawings for wiring details. To tare the vessel from the remote station, hold the remote tare push button for 1 second.

## Menu Key

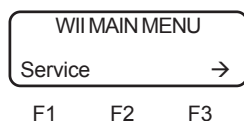
### Note

The Weigh II must be vessel monitoring in the Manual Mode (Auto LED off) to access the menus.

Pressing the Menu Key accesses the *Main* Menu. If there are multiple pages to a menu, pressing the Menu Key again scrolls the display to the next page. For example, the *Main* Menu has two pages. The first page shows:



The → signifies that there are additional page(s) to the menu. Pressing the Menu Key again displays the second page:



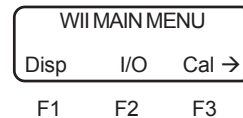
Notice that the second page also has a →, to indicate that there are additional page(s) (in this case, you have already viewed the other page). Pressing the Menu Key again returns the display to the first page.

The Menu Key has the same scrolling function when a submenu is accessed. Pressing the Menu Key scrolls through the different pages of a submenu. Pressing the Esc Key backs through the submenus one level at a time and returns to the vessel monitoring display.

## F1, F2, and F3 Keys

The Function Keys — F1, F2, and F3 — are used to select the items on the menus. The faceplate has F1, F2, and F3 labeled underneath the LCD. When a menu is displayed, the menu items are located above these labels. Pressing the Function Key that corresponds to the desired menu item provides access to the menu item.

For example, when the *Main* Menu is displayed, the selections are:



*Disp* is above the F1 label on the faceplate, *I/O* is above the F2 label, and *Cal* is above the F3 label. Pressing the F3 Key accesses the submenu under *Cal*.

## Esc Key

The Esc Key has several functions:

- The Esc Key is used to back through the submenus one menu level at a time. Pressing this key while in the *Main* Menu returns the display to vessel monitoring in the Manual Mode.
- The Esc Key also has another function. The Weigh II arrives from the factory with a factory-set ID number assigned to each channel. If you replaced the ID number with a customer-defined ID while in the *Disp* Menu, pressing the Esc Key while the display is vessel monitoring in the Manual Mode (Auto LED off) briefly displays the factory-set ID.

## ⇐Key

The ⇐Key is used to back up the cursor on the LCD display when using the alphanumeric keypad.

## Shift Key

The Shift LED, located below the Auto LED on the faceplate, illuminates when the Shift Key is on. The Shift Key has several functions:

- The Shift Key is used in conjunction with the Alphanumeric Keys. When the Shift Key is on, the keypad types the letters labeled above the Alphanumeric Key (see Alphanumeric Keys below for information on toggling between the letters). When the Shift Key is off, the keypad types the number labeled on the key. The Shift Key is also used in conjunction with other keys on the panel to provide additional alphanumeric characters.
- The Shift Key is also used in conjunction with the Tare/Net/Gross Key.

## Enter Key

The Enter Key has several functions:

- The Enter Key is used to save in memory any parameter set up in the menus. For example, if you enter a value in the *Cal* Menu, pressing the Enter Key saves it to memory. The value remains in memory until a new value is entered.
- When typing in a vessel ID, the Enter Key advances the cursor one space to the right.
- When the Weigh II is displaying a numerical value for gross weight in the Manual Mode, pressing the Enter Key toggles the display from numerical format to bar graph format. The display remains in the bar graph format (even if the Weigh II is turned off and back on again) until the Enter Key is pressed to toggle back to the numerical format.

## “.” (Period) Key

When the Weigh II is vessel monitoring in the Manual Mode, pressing the “.” Key briefly displays the current Weigh II software revision letter and the date of the release.

The “.” Key also functions as a decimal point when entering numbers in the math channel.

## Alphanumeric Keys

The Alphanumeric Keys are used to type in numbers during setup and calibration.

When the Shift Key is on (Shift LED is

Key	Character Shift LED On	Character Shift LED Off
1	S T U	1
2	V W X	2
3	Y Z	3
4	J K L	4
5	M N O	5
6	P Q R	6
7	A B C	7
8	D E F	8
9	G H I	9
0	Space	0
.	:	.
-	-	-
Menu	+ * / @ % # &	a b c d e f g h
F1	() {} [] <>	i j k l m n o p
F2	! ^ \$ x ' , ? ;	q r s t u v w x
F3	⇒ < ° & ! α σ	y z , “ ’ ! ;
Auto/Man	- o • ° Ö Ü è ∞	

Note: Additional characters (parentheses and symbols) are available using the F1, F2, and F3 Keys, the Auto/Man Key, the Up and Down Arrow Keys, and the Tare/Net/Gross Key.

Table 3-1. List of Characters Available for Customer-Defined ID

illuminated), the letters above the keys are accessed for use in inputting a customer-defined ID. Pressing an Alphanumeric Key repeatedly toggles the display through the three letters listed above the key. When the desired letter is displayed, pressing the Enter Key or a different Alphanumeric Key advances the cursor one space to the right. Table 3-1 shows the characters available for a customer-defined ID.

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## Quick Start

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This section provides a list of the steps you need to take to get a “Quick Start” on using the Weigh II.

1. Read the *Avg*, *Cntby*, *Units*, and *Form* sections in Chapter 4, Display. Follow the procedures provided for selecting these parameters for each vessel.
2. Calibrate the system for each vessel, using one of the following methods:
  - If you can move at least 25% of the vessel's maximum live load as part of the calibration procedure, read the *Auto* section in Chapter 6, Calibration. Follow the procedures provided for performing the calibration.
  - If you cannot move at least 25% of the vessel's maximum live load as part of the calibration procedure, read the *Manual* section in Chapter 6, Calibration. Follow the procedures provided for performing the calibration.

That's it — you can begin to use your Weigh II to monitor the contents of your vessel(s). However, it is recommended that you read the entire manual for a thorough understanding of the operation of the Weigh II and the available options. The manual explains in detail how to set up setpoints, current outputs, and serial communications.



# Chapter 4. Display

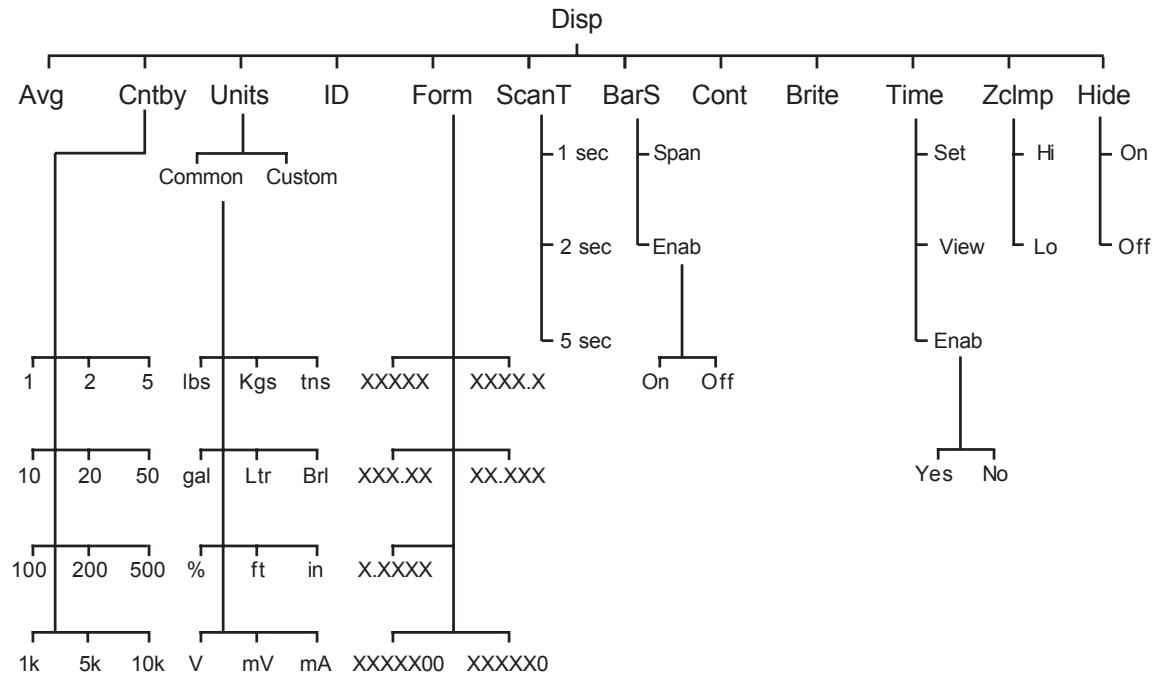


Figure 4-1. The Display Menu Tree

## Introduction

The Display (*Disp*) Menu is used to set up the parameters that govern the display functions when vessel monitoring. This chapter covers the functions in the *Disp* Menu. Explanations of each of the functions are provided. Additionally, detailed navigation procedures through the menu tree are provided for a few of the functions to help the user become familiar with the use of the keyboard functions described in Chapter 3, Menu Tree, Keyboard Functions, and Quick Start.

Unless otherwise noted, the display function for each channel (such as units, ID, etc.) can be set differently. The descriptions below for each function note those that are global in nature and that affect the display for all channels.

As shown in Figure 4-1, the *Disp* Menu has twelve submenus.

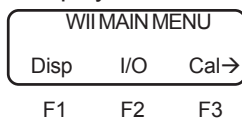
## Avg

This menu is used to set the number of individual readings (from 1 to 255) the Weigh II averages for each display reading while vessel monitoring. The Weigh II calculates a running average. The larger the number of individual readings in the running average, the smaller effect a variation in signal will have on the average. This results in fewer variations on the display reading and an easier to read display. *Avg* affects the value seen on the display as well as setpoints, current outputs, and serial outputs. The default value for *Avg* is 1.

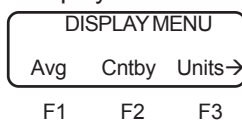
The number shown upon entry into this menu is the channel's current averaging factor. This number can be modified by using the Up and Down Arrow Keys or by direct entry with the Alphanumeric Keys. When the desired number is shown, pressing the Enter Key saves the new value.

Follow this procedure to modify the averaging factor.

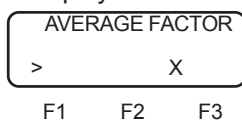
1. If the Weigh II is in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the system in Manual Mode. The Auto LED turns off.
2. Use the Up Arrow or Down Arrow Keys to scroll to the desired channel.
3. Press the Menu Key to display the *Main* Menu. The display shows:



4. Press the F1 Key to access the *Display* Menu. The display shows:

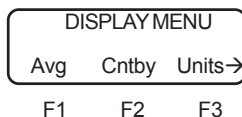


5. Press the F1 Key to access the *Avg* Menu. The display looks like this:



In place of 'X' is the current averaging factor.

6. Use the keypad or the Up and Down Arrow Keys to input the value for the averaging factor. Press the Enter Key to save the value in memory. The display flashes a message acknowledging your selection and returns to:



7. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return the display to vessel monitoring.

## Cntby

This menu is used to set up the display to count by increments of 1, 2, 5, 10, 20, 50, 100, 200, 500, 1000, 5000, or 10000. For example, a *Cntby* of 1 would show the rightmost active digit on the display changing by increments of 1. A *Cntby* of 100 would show the rightmost three active digits on the display changing by increments of 100 units. Use *Cntby* to adjust the display to a resolution consistent with the accuracy of the system and reduce display flickering.

**Example:** For a 10,000 lb maximum weight with a *Form* of XXXXX, a *Cntby* of 1 would only be meaningful if your system accuracy was +/-0.01% of maximum load. A more typical accuracy would be +/-3%. Since 3% of 10,000 lbs is 300 lbs, a more realistic *Cntby* for this system would be 200.

Note that the selection for *Form* affects how the Weigh II interprets the *Cntby* value. Table 4-1 shows some examples of how these are related.

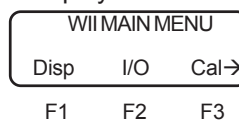
<i>Form</i>	<i>Cntby</i>	Example Value (incremented digit underlined)
xxx.xx	1	397. <u>2</u> 5
xxx.xx	100	39 <u>7</u> .00
xxxxx	1	397 <u>2</u> 5
xxxxx	100	39 <u>7</u> 00
xxxxx00	1	3972 <u>5</u> 00
xxxxx00	100	39 <u>7</u> 0000

Table 4-1. Interaction of *Form* and *Cntby*

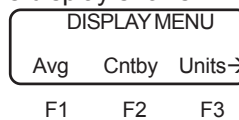
The default value for *Cntby* is 1. The current selection is indicated by an asterisk. The *Cntby* function only affects the value seen on the display. Setpoints, current outputs, and serial outputs are unaffected by *Cntby*.

Follow this procedure to modify *Cntby*.

1. If the Weigh II is in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the system in Manual Mode. The Auto LED turns off.
2. Use the Up Arrow or Down Arrow Keys to scroll to the desired channel.
3. Press the Menu Key to display the *Main* Menu. The display shows:



4. Press the F1 Key to access the *Display* Menu. The display shows:



5. Press the F2 Key to access the *Cntby* Menu. The display shows:

```

CHOOSE COUNTRY
*1      2      5->
F1      F2      F3
  
```

An asterisk indicates the current selection.

6. If the displayed menu does not have the desired country, press the Menu Key to display the second page of the menu. The display shows:

```

CHOOSE COUNTRY
10      20      50->
F1      F2      F3
  
```

Continue to press the Menu Key until you see the desired country (there are four pages to the *Cntby* Menu).

7. Press the F1, F2, or F3 Key to select the desired country. The display acknowledges your selection and then returns to:

```

DISPLAY MENU
Avg     Cntby  Units->
F1      F2      F3
  
```

8. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return the display to vessel monitoring.

---

## Units

---

This menu allows you to select the unit of measure for the vessel monitoring display. In the *Common* submenu, you can select from *lbs* (pounds), *Kgs* (kilograms), *tns* (tons), *gal* (gallons), *Ltr* (liters), *Brl* (barrels), *%* (percent), *ft* (feet), *in* (inches), *V* (volts), *mV* (millivolts), and *mA* (milliamps). In the *Custom* submenu, you can type in a custom three-character unit of measure. The default unit is *XXX*.

Follow this procedure to select a *Common* unit of measure.

1. If the Weigh II is in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the system in Manual Mode. The Auto LED turns off.
2. Use the Up Arrow or Down Arrow Keys to scroll to the desired channel.
3. Press the Menu Key to display the *Main* Menu. The display shows:

```

WII MAIN MENU
Disp    I/O    Cal->
F1      F2      F3
  
```

4. Press the F1 Key to access the *Display* Menu. The display shows:

```

DISPLAY MENU
Avg     Cntby  Units->
F1      F2      F3
  
```

5. Press the F3 Key to access the *Units* Menu. The display shows:

```

UNITS OF MEASURE
common  custom->
F1      F2      F3
  
```

6. Press the F1 Key to access the *common* Menu. The display shows:

```

PRE-DEFINED UNIT
lbs     Kgs     tns->
F1      F2      F3
  
```

7. If the displayed menu does not have the desired unit, press the Menu Key to display the second page of the menu. The display shows:

```

PRE-DEFINED UNIT
gal     Ltr     Brl->
F1      F2      F3
  
```

Continue to press the Menu Key until you see the desired unit (there are four pages to the *Common* Menu).

8. Press the F1, F2, or F3 Key to select the desired unit. The display acknowledges your selection and then returns to:

```

DISPLAY MENU
Avg     Cntby  Units->
F1      F2      F3
  
```

9. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return the display to vessel monitoring.

---

## ID (Identification)

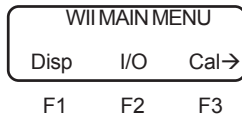
---

This menu allows you to type in a 16-character alphanumeric title to identify each channel on the display in a meaningful manner. The Weigh II arrives from Kistler-Morse with a factory-set ID number assigned for each channel in the system.

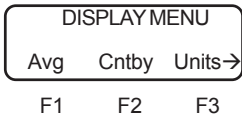
After you have input a customer-defined ID, you can still view the original factory-set ID when vessel monitoring in the Manual Mode by pressing the Esc Key.

Follow this procedure to input a customer-defined ID.

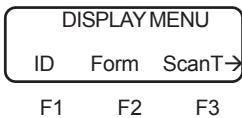
1. If the Weigh II is in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the system in Manual Mode. The Auto LED turns off.
2. Use the Up Arrow or Down Arrow Keys to scroll to the desired channel.
3. Press the Menu Key to display the *Main* Menu. The display shows:



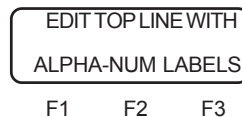
4. Press the F1 Key to access the *Display* Menu. The display shows:



5. Press the Menu Key to display the second page of the menu. The display shows:



6. Press the F1 Key to provide a customer-defined ID. The display shows:



The top line of the display then changes to the factory-set ID, the Shift LED automatically comes on, and the Weigh II is ready for you to input the customer-defined ID.

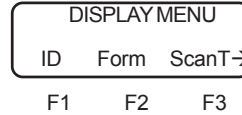
7. Type in the first alphanumeric of the desired ID. Press the Enter Key or press the next alphanumeric in the ID (if it is on a different key than the previous one) to accept the displayed alphanumeric. The cursor advances one space to the right.

#### Notes

1. Type in the first letter of the desired ID, using an Alphanumeric Key. Press the Alphanumeric Key repeatedly to toggle the display through the three letters listed above the key until the desired alphanumeric is displayed.
2. If you want to include a number(s) in the ID, press the Shift Key; the Shift LED turns off. Press the desired Alphanumeric Key.
3. Use the  $\leftarrow$  Key to back up the cursor to correct an entry.

8. Repeat Step 7 until the display shows the

- entire customer-defined ID.
9. Press the Esc Key to enter the entire ID in memory. The display returns to:



10. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return the display to vessel monitoring.

## Form

This menu allows you to set up the numerical format by selecting the number of digits to be displayed to the left and right of the decimal point while vessel monitoring. Listed below are the seven different formats available (x is a place holder):

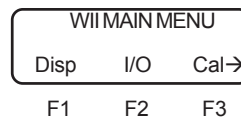
xxxxx (default)	xxxx.x
xxxx.xx	xx.xxx
x.xxxx	
xxxxx00	xxxxx0

On the display, an asterisk indicates the format that is currently being used.

*Form* is used with *Cntby* and *Avg* to provide a stable display for the operator, and to provide meaningful results consistent with the system accuracy. For example, you do not want to have the display showing weights like 1000.01 lbs if the system accuracy is only +/- 20 lbs.

Follow this procedure to modify *Form*.

1. If the Weigh II is in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the system in Manual Mode. The Auto LED turns off.
2. Use the Up Arrow or Down Arrow Keys to scroll to the desired channel.
3. Press the Menu Key to display the *Main* Menu. The display shows:



4. Press the F1 Key to access the *Display*



Menu. The display shows:

```

  DISPLAY MENU
  Avg  Cntby Units→
  F1   F2   F3
  
```

5. Press the Menu Key to access the second page of the *Display Menu*. The display shows:

```

  DISPLAY MENU
  ID   Form ScanT→
  F1   F2   F3
  
```

6. Press the F2 Key to access the *Form Menu*. The display shows:

```

  CHOOSE COUNTRY
  *1    2    5→
  F1   F2   F3
  
```

An asterisk indicates the current selection.

7. If the displayed menu does not have the desired form, press the Menu Key to display the second page of the menu. The display shows:

```

  CHOOSE FORMAT
  XXXXX*  XXXX.X→
  F1   F2   F3
  
```

Continue to press the Menu Key until you see the desired form (there are four pages to the *Form Menu*).

8. Press the F1, F2, or F3 Key to select the desired form. The display acknowledges your selection and then returns to:

```

  DISPLAY MENU
  ID   Form ScanT→
  F1   F2   F3
  
```

9. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return the display to vessel monitoring.

## ScanT

This menu allows you to choose the amount of time the Weigh II displays vessel monitoring information before scrolling to the next channel when in the Auto Mode. Scan time can be set to 1 second, 2 seconds, or 5 seconds. The default value is 2 seconds. The current selection is indicated by an asterisk.

The value for *ScanT* is selected while in the menu tree for *any* channel, and applies to *all* of the channels in the system.

## BarS

You can choose to view a numerical display of the weight or a bar graph of a vessel's contents while vessel monitoring. The maximum span for the bar graph and the selection of the bar graph as the display option is set with this menu.

The bar graph displays the vessel contents as a numerical percentage to the left of the graph, as shown below:

```

  01
  50% !!!!!.....!
  
```

The 0% point of the bar graph is always 0. The 100% point of the bar graph is set by direct entry using the Alphanumeric Keys or by scrolling to the desired value with the Up and Down Arrow Keys. For example, entering the vessel's maximum capacity of 5000 lbs as the *BarS* value results in a bar graph with 0% corresponding to 0 lbs and 100% corresponding to 5000 lbs. If the gross weight in the vessel falls outside of the range, the bar graph display does the following:

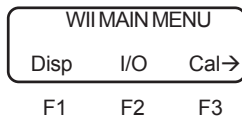
- If the gross weight falls below 0 (caused by inaccuracies in the calibration, vibration, sensor drift, etc.), the graph remains at 0%, and the numerical percentage remains at 0%.
- If the gross weight goes above the *BarS* value, the graph remains at 100%, and the numerical percentage reflects the actual weight. For example, if the *BarS* value is 5000 lbs and the gross weight is 7500 lbs, the numerical percentage displayed is 150% while the graph remains at 100%.

The default for the display is bar graph *Off* (bar graph not displayed when vessel monitoring). The current selection is indicated by an asterisk.

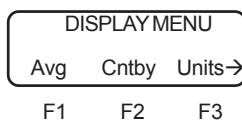
If enabled, the bar graph displays for the vessel while vessel monitoring in both Manual and Auto modes. While in Manual mode, pressing the Enter Key toggles the display between bar graph and numerical display.

Follow this procedure to set the BarS value and change the bar graph display option.

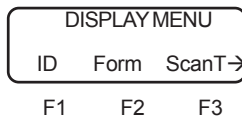
1. If the Weigh II is in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the system in Manual Mode. The Auto LED turns off.
2. Use the Up Arrow or Down Arrow Keys to scroll to the desired channel.
3. Press the Menu Key to display the *Main* Menu. The display shows:



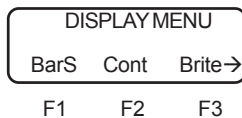
4. Press the F1 Key to access the *Display* Menu. The display shows:



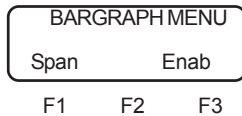
5. Press the Menu Key to display the second page of the menu. The display shows:



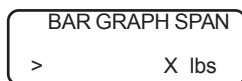
6. Press the Menu Key to display the third page of the menu. The display shows:



7. Press the F1 Key to access *BarS*. The display shows:

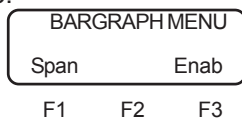


8. Press the F1 Key to set the *Span*. The display looks like this:



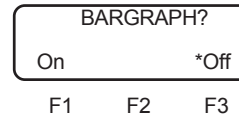
The unit you set up in the *Units* Menu shows in place of lbs.

9. Use the keypad or the Up and Down Arrow Keys to enter the desired value. Press the Enter Key to save the value in memory. The display flashes a message acknowledging your selection and returns to:



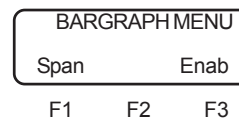
10. Press the F3 Key to access *Enab*.

The display shows:



An asterisk indicates the current selection.

11. Press the F1 Key to turn the Bargraph function on; press the F3 Key to turn the Bargraph function off. This sets the default display option for the vessel (the default display option can be overridden while vessel monitoring in Manual Mode by pressing the Enter Key). The display flashes a message acknowledging your selection and returns to:



12. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return the display to vessel monitoring.

---



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## Cont

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---

The contrast of the display is adjusted in this menu. The displayed number ranges from 0 (darkest) to 255 (lightest). The default value is 127. The Up and Down Arrow Keys are used to make fine adjustments, while the F2 and F3 Keys are used to make coarse adjustments. The display contrast changes immediately as you make the adjustments. When the desired results are attained, pressing the Enter Key saves the new value.

The value for *Cont* is selected while in the menu tree for *any* channel and applies to *all* of the channels in the system.

---



---

## Brite

---



---

The brightness of the display is adjusted in this menu. This menu is functional only with the purchase of the Backlight option.

The displayed number ranges from 0 (darkest) to 255 (lightest). The default value is 127. The Up and Down Arrow Keys are used to make fine adjustments, while the F2 and F3 Keys are used to make coarse adjustments. The display brightness changes immediately as you make the adjustment. When the desired results are attained, pressing the

Enter Key saves the new value.

The value for *Brite* is selected while in the menu tree for *any* channel and applies to *all* of the channels in the system.

---

## Time

---

Time and date are set, displayed, and enabled in this menu. Accuracy is better than +/- 1 minute per month, and timekeeping is maintained for more than 10 years without power. The date and time are included on printed output from the Weigh II, so setting and enabling these functions can help you maintain good documentation on vessel contents.

When in the *Set* Menu, the number/character displayed directly to the right of the flashing cursor is modified with the Up and Down Arrow Keys. Pressing the Enter Key advances the cursor to the next number/character field. Pressing the Esc Key when completed setting the time and date enters the values in memory. Once set, the clock must be enabled to function. On the display, an asterisk indicates whether *Enab* is *On* or *Off*.

*Time* is set while in the menu tree for *any* channel and applies to *all* of the channels in the system.

---

## Zclmp

---

This menu allows the user to set a window around zero for the gross weight. When the gross weight value falls within the specified range (usually indicating a negligible amount of material in the vessel), the display is forced to zero.

The user can specify a different range for gross weight above zero (*Hi* value) and gross weight below zero (*Lo* value). For example, if the user enters a *Lo* value of -200 and a *Hi* value of 100, all measured gross weights between -200 and +100 will appear as zero on the display. If you do not set a non-zero *Lo* value, the display may show a small negative gross weight when the vessel is near empty if the calibration of the system is not 100 percent accurate. The *Zclmp* function only affects the value seen on the display. Set-

points, current outputs, and serial outputs are unaffected.

*Hi* can range from 0 to 255; *Lo* can range from 0 to -255. The default values for both are 0. The values can be modified by using the Up and Down Arrow Keys or by direct entry with the Alphanumeric Keys. When the desired number is shown, pressing the Enter Key saves the new value.

Note that when you input the value for *Zclmp*, the display automatically shows any fixed zeroes or decimal point, consistent with your selection for *Form*. Table 4-2 shows some examples of the maximum value for *Zclmp*.

<i>Form</i>	Maximum Value for <i>Zclmp</i>
xxx.xx	2.55
xxxxx	255
xxxxx00	25500

Table 4-2. Interaction of *Form* and *Zclmp*

---

## Hide

---

This menu allows you to 'hide' a channel(s) from the scanning sequence on the display. The Weigh II continues to monitor the channel(s) that is hidden, but does not display it. This function is useful if you are not using all of the available channels to monitor vessels, want to observe specific channels without taking the other channels in the system off-line, or want to hide math channel(s) that contain intermediate results. The default for *Hide* is *Off* (i.e., the channel is not hidden).

Follow this procedure to hide channels.

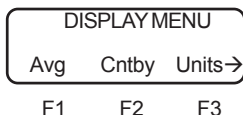
1. If the Weigh II is in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the system in Manual Mode. The Auto LED turns off.
2. Use the Up Arrow or Down Arrow Keys to scroll to the desired channel.
3. Press the Menu Key to display the *Main* Menu. The display shows:

```

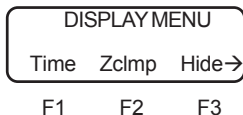
WII MAIN MENU
Disp  I/O  Cal->
F1    F2    F3

```

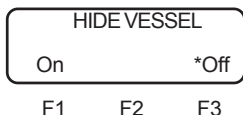
4. Press the F1 Key to access the *Display* Menu. The display shows:



5. Press the Menu Key three times to access the fourth page of the Display Menu. The display shows:

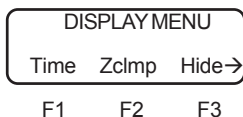


6. Press the F3 Key to access the *Hide* Menu. The display shows:



An asterisk indicates the current selection.

7. Press the F1 Key to hide the channel. The display acknowledges your selection and then returns to:



**Note**

---

The Weigh II will not hide any channel until you enable the *Hide* function, described below in Step 8.

---

8. Press the Esc Key two times or press the Auto/Man Key to return to vessel monitoring. While in vessel monitoring in the Manual Mode, press the Shift Key (Shift LED illuminated) and then press the '9' Key to enable the *Hide* function. The display acknowledges that Hide is enabled. All channels that have *On* selected in the *Hide* menu will not display until you disable the Hide function (see Step 9 below).
9. To display the hidden channels again, while vessel monitoring in Manual Mode press the Shift Key (Shift LED illuminated) and then press the '9' Key. The display acknowledges that Hide is disabled, and the display will now show all channels again.

# Chapter 5. Inputs and Outputs

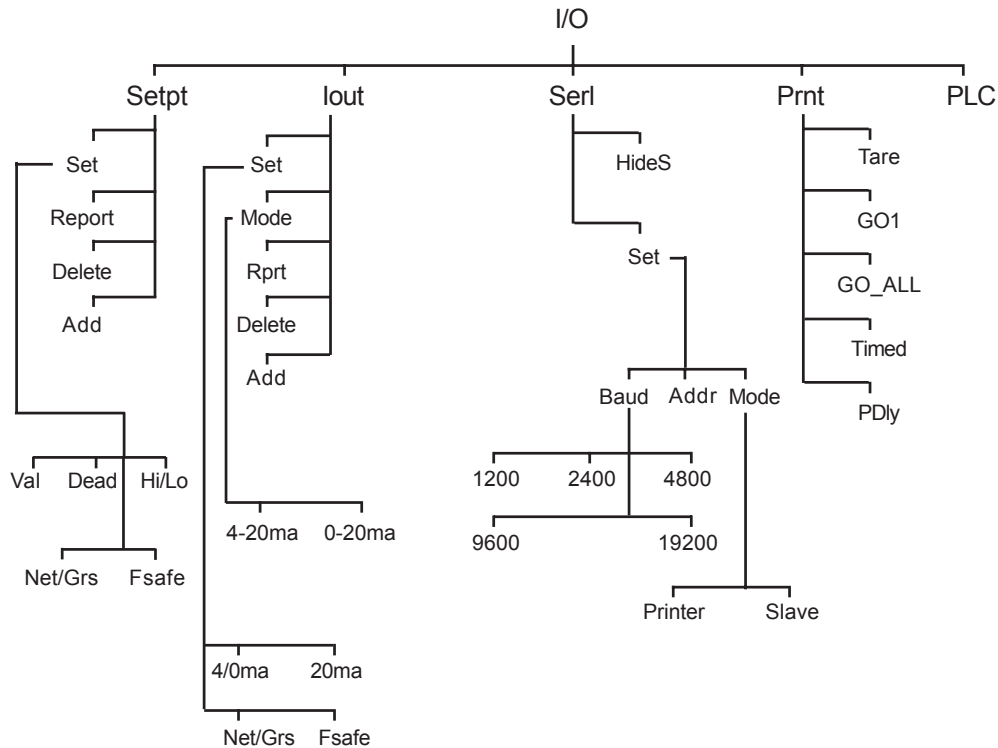


Figure 5-1. The Input/Output Menu Tree

## Introduction

The *I/O* Menu is used to enter parameters for setpoints, current output (4-20 mA, 0-20 mA), serial port configuration, printer functions, and PLC interface. This chapter covers the functions in the *I/O* Menu. Explanations of each of the functions are provided. Additionally, detailed navigation procedures through the menu tree are provided for the setpoint and current output functions.

As shown in Figure 5-1, the *I/O* Menu has five submenus:

1. *Setpt* — used to set up setpoints to activate or deactivate a relay
2. *Iout* — used to set up current outputs
3. *Serl* — used to set up serial communications settings for use with a PLC, printer, etc.
4. *Prnt* — used to direct output to a printer
5. *PLC* — used to set up communications with a PLC

## SetPt

The setpoint value is the weight measurement in a vessel where you wish a device (for example, a pump) to activate or deactivate. The setpoint setup functions for each vessel are accessed in this menu. They include adding and deleting setpoints and selecting activation levels, high or low activation, deadband values, fail-safe parameters, and net or gross weight.

The *Descriptions* section defines each of the parameters. The *Setting Up the Setpoint* and *Setpoint Report* sections provide the detailed procedures for using the Weigh II.

## Descriptions

### Set

This menu is used to select the setpoint to be set up for the displayed vessel. Depending on the options you selected for your Weigh II, up to eight setpoints can be assigned per

vessel or math channel. These are labeled SP1 for setpoint 1 through SP8 for setpoint 8.

**Note**

Depending on the options you selected, up to a total of 16 setpoints can be assigned in the Weigh II, with a maximum of 8 setpoints for one vessel or math channel.

Once you have selected a setpoint to set up, the activation value (*Val*), the point where the setpoint relay changes state, can be entered. This value is entered directly with the Alpha-numeric Keys or scrolled to with the Up and Down Arrow Keys. The “-” Key is used to toggle between the positive and negative value of the number entered. Setpoint relays can be configured to change state either above (*Hi*) or below (*Lo*) the setpoint value.

The deadband (*Dead*) value determines the point at which a setpoint relay returns to its normal on/off state **after** the relay has been activated. The deadband value equals the amount of material that will be added or removed from the vessel before the setpoint relay is deactivated. Kistler-Morse recommends the use of a non-zero deadband to prevent relays from oscillating. The value is entered directly or scrolled to with the arrow keys. The default value is 10. Pressing the Enter Key saves the new value.

The setpoint relays can be set to activate from the net weight or the gross weight (*Net/Grs*) of the material in the vessel. Activating based on the gross weight is the default mode of the Weigh II.

**Example:** See Figure 5-2. A vessel with a 9,300 lb capacity has setpoint 1 (*SP1*) set at 9,000 lbs gross weight. The *Hi/Lo* function is set to *Hi* and the deadband (*Dead*) is set at 1,000 lbs. When the contents exceed 9,000 lbs, the setpoint energizes, activating a pump to remove material from the vessel. The pump continues to operate until the setpoint de-energizes at a material weight of 8,000 lbs (9,000 lbs minus the 1,000 lb deadband).

This vessel also has a setpoint 2 (*SP2*) set at 2,000 lbs gross weight. The *Hi/Lo* function is set to *Lo* and the deadband (*Dead*) is set at 500 lbs. When the contents falls below 2,000 lbs, the setpoint energizes, activating a pump to fill the vessel. The pump continues to operate until the setpoint de-energizes at a

material weight of 2,500 lbs (2,000 lbs plus the 500 lb deadband).

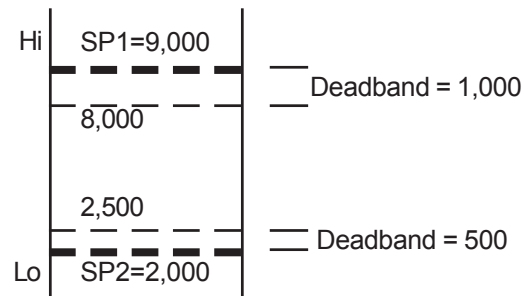


Figure 5-2. Setpoint Example

If the Weigh II detects a problem, one of three fail-safe (*Fsafe*) conditions can be applied to a setpoint:

1. *On*
2. *Off* — default
3. *NC* (no change)

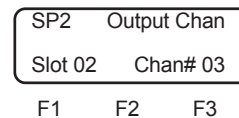
The *On* setting energizes the setpoint in a fail-safe condition. The *Off* setting de-energizes the setpoint in a fail-safe condition. The *NC* setting means no change is made to the setpoint condition in a fail-safe condition (i.e., whatever was energized before the problem was detected will continue to be energized). A fail-safe condition remains in effect until the problem has been corrected.

The following are examples of conditions of fail-safe conditions:

- ADC (analog-to-digital converter) overrange/underrange condition
- Engineering units overrange

**Report**

When this menu is accessed, the display shows all setpoints assigned to the current vessel. A typical display looks like this:



- *SP2* is the setpoint label
- *Slot 02* is the slot number of the setpoint PCB
- *Chan# 03* is the relay channel of the setpoint on the setpoint PCB

Pressing any key other than the Esc Key or Auto/Man Key cycles through the reports for all other assigned setpoints for this vessel.

## Delete

This menu allows previously added setpoints to be removed from the current vessel. The top line of the display shows an assigned setpoint number. The bottom line shows the slot number of the setpoint PCB and the channel number for the setpoint on the setpoint PCB.

To delete a setpoint, cycle through the setpoints by pressing any key other than Esc, Auto/Man, or Enter until the setpoint you want to delete is displayed. Then, press the Enter Key. To prevent accidental deletion, the display requests verification that you want to delete the setpoint channel. If the response is *Yes* then *I/O Channel Deleted* displays to confirm the deletion. This setpoint channel is now available for use again.

## Add

This menu is used to add setpoints (up to eight) for the current vessel. Note that the setpoint must be added before the *Set* parameters (*Val*, *Dead*, etc.) can be input. The top line of the display shows the first available setpoint number. The bottom line shows the slot number of the setpoint PCB and the channel number for the setpoint on the setpoint PCB. Pressing any key other than Esc, Auto/Man, or Enter cycles through all other unassigned setpoint channels. Pressing the Enter Key adds the setpoint.

## Setting Up the Setpoints

Follow this procedure to add and set up setpoints.

1. If the Weigh II is in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the system in Manual Mode. The Auto LED turns off.
2. Use the Up Arrow or Down Arrow Keys to scroll to the desired channel .
3. Press the Menu Key to display the *Main* Menu. The display shows:

```

  WII MAIN MENU
  Disp   I/O   Cal →
  F1     F2   F3
  
```

4. Press the F2 Key to access the *I/O* Menu. The display shows:

```

  INPUT/OUTPUT MENU
  Setpt  Iout  Ser1 →
  F1     F2   F3
  
```

5. Press the F1 Key to access the *Setpt* Menu. The display shows:

```

  SETPOINTS
  Set     Report →
  F1     F2   F3
  
```

6. Press the Menu Key to display the second page of the menu. The display shows:

```

  SETPOINTS
  Delete  Add →
  F1     F2   F3
  
```

7. Press the F3 Key to add a setpoint. The Weigh II displays the next available setpoint, slot, and channel #. The display looks like this:

```

  ADD SETPOINT/SP1
  Slot XX  Chan# YY
  F1     F2   F3
  
```

Press any key (other than Esc, Auto/Man, and Enter) to cycle through the unassigned setpoint channels until the one you want is displayed. Press the Enter Key to accept. The display flashes a message acknowledging your selection and returns to:

```

  SETPOINTS
  Delete  Add →
  F1     F2   F3
  
```

8. Add up to eight setpoints, and then press the Menu Key to return to the first page of the *Setpoints* Menu. The display shows:

```

  SETPOINTS
  Set     Report →
  F1     F2   F3
  
```

9. Press the F1 Key to select *Set* and set up a setpoint. The display looks similar to this (depending on the number of setpoints you added to the channel):

```

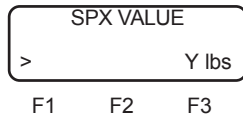
  SELECT SETPOINT
  SP1     SP2  SP3 →
  F1     F2   F3
  
```

10. Press the F1, F2, or F3 Key to select the desired setpoint. The display shows:

```

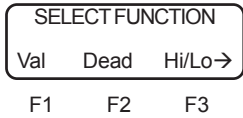
  SELECT FUNCTION
  Val     Dead  Hi/Lo →
  F1     F2   F3
  
```

11. Press the F1 Key to select *Val*. The display looks like this:

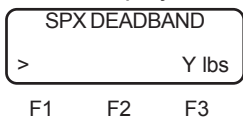


The unit of measure you set up in the *Units* Menu shows in place of lbs.

12. Use the keypad or the Up and Down Arrow Keys to input the value where you want the setpoint to activate. Press the Enter Key to save the value in memory. The display flashes a message acknowledging your entry and returns to:

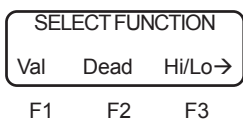


13. Press the F2 Key to select *Dead*, to set up a deadband for the setpoint. The deadband value determines the point at which a setpoint relay returns to its normal on/off state. The display looks like this:

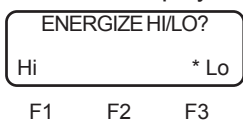


The unit of measure you set up in the *Units* Menu shows in place of lbs.

14. Use the keypad or the Up and Down Arrow Keys to input the deadband value. Press the Enter Key to save the value in memory. The display flashes a message acknowledging your entry and returns to:

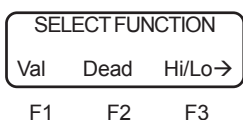


15. The setpoint relays can be configured to change state either above (*Hi*) or below (*Lo*) the setpoint value. Press the F3 Key to select *Hi/Lo*. The display shows:



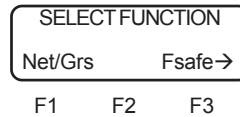
An asterisk indicates the current selection.

16. Press the F1 Key to select *Hi* or the F3 Key to select *Lo*. The display flashes a message acknowledging your selection and then returns to:

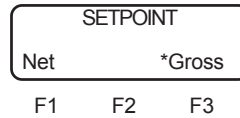


17. Press the Menu Key to access the

second page of the menu. The display shows:

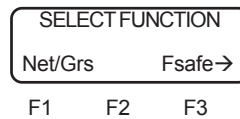


18. Press the F1 Key to access *Net/Grs*. The display shows:

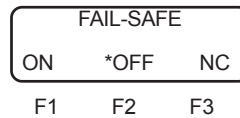


An asterisk indicates the current selection.

19. Press the F1 Key to select *Net* or the F3 Key to select *Grs*. The display flashes a message acknowledging your selection and then returns to:

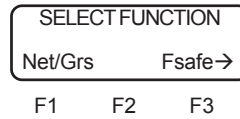


20. Press the F3 Key to select *Fsafe*. The display shows:

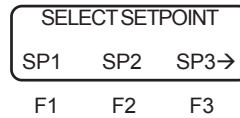


An asterisk indicates the current selection.

21. Press the F1, F2, or F3 Key to select the desired fail-safe condition. The display flashes a message acknowledging your selection and then returns to:



22. Press the Esc Key. The display returns to:



23. Repeat Steps 10 through 22 to set up additional setpoints if desired.

24. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return the display to vessel monitoring.

## Setpoint Report

The Weigh II allows you to view the slot and channel number of the setpoints of any channel in the system. Follow this procedure.



1. If the Weigh II is in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the system in Manual Mode. The Auto LED turns off.
2. Use the Up Arrow or Down Arrow Keys to scroll to the desired channel.
3. Press the Menu Key to display the *Main* Menu. The display shows:

```

WII MAIN MENU
Disp  I/O  Cal->
F1    F2    F3

```

4. Press the F2 Key to access the *I/O* Menu. The display shows:

```

INPUT/OUTPUT MENU
Setpt  Iout  SerI->
F1     F2     F3

```

5. Press the F1 Key to access the *Setpt* Menu. The display shows:

```

SETPOINTS
Set      Report->
F1     F2     F3

```

6. Press F3 to access the *Report* Menu. The display flashes a message stating:

```

SETPOINTS
REPORT ON ID#X
F1     F2     F3

```

The display then changes to:

```

SPX Output Chan
Slot YY  Chan# ZZ
F1     F2     F3

```

7. Press any key other than the Esc Key and the Auto/Man Key to toggle through the setpoints to view their slot and channel numbers.
8. Press the Esc Key to return the display to:

```

SETPOINTS
Set      Report->
F1     F2     F3

```

9. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return the display to vessel monitoring.

---

## Iout

---

Current output is typically used to retransmit continuous weight data to a remote display or PLC/Distributed Control System (DCS). The current output setup functions are accessed in this menu. The functions include adding and deleting current outputs, and selecting

fail-safe, net/gross, and operating modes. Depending on the options you selected, up to two sets of current outputs can be assigned per vessel or math channel. The *Descriptions* section defines each of the parameters. The *Setting Up the Current Output* and *Current Output Report* sections provide the procedures for using the Weigh II.

## Descriptions

### Set

This menu is used to select the current outputs, assign values to determine the points where the transmitter outputs the currents, designate those values as net or gross weights, and define a fail safe condition for the current outputs.

The *4/0ma* Menu sets the low current (4 mA or 0 mA) operation point. The value entered determines the weight where the transmitter outputs the minimum current. The *20ma* Menu sets the high current (20 mA) operation point. The value entered determines the weight where the transmitter outputs the maximum current. For both the *4/0ma* and *20ma* Menu, the '-' Key toggles between positive and negative for the value entered.

Current outputs may be set to interpret the value entered for the low current and high current operation points as either the net or the gross weight (*Net/Grs*). An asterisk indicates the current net or gross condition of the output. Transmitting current based on the gross weight is the default mode.

### Note

---

The value entered for the 4/0 mA operation point does **not** have to be smaller than the value entered for the 20 mA operation point.

---

**Example 1:** You want an early warning via a current output to a PLC/DCS that a 20,000 lb capacity vessel is nearly full or empty. You enter 3,000 lbs as the low current value and 17,000 lbs as the high current value, both as gross values, for a 4-20 mA operation. When the gross weight is 3,000 pounds, 4 mA current is transmitted, providing an early warning that the vessel is close to being empty. When the gross weight is 17,000 lbs, 20 mA is transmitted, providing an early warning that the vessel is close to being full.

**Example 2:** You want to monitor how much material is being added to or removed from a vessel, and transmit a current output to a remote display. You enter -5,000 lbs as the low current value and 7,000 lbs as the high current value, both as net values, for a 0-20 mA operation. When the net weight is -5,000 lbs (5,000 lbs has been removed since you last tared the vessel), 0 mA current is transmitted. When the net weight is +7,000 lbs (7,000 lbs has been added since you last tared the vessel), 20 mA current is transmitted.

If the Weigh II detects a problem, one of three fail-safe (*Fsafe*) conditions can be applied to a current output:

1. *Lo* — default
2. *Hi*
3. *NC* (no change)

The *Lo* setting forces the current output to be 0 (in 0-20 mA operating mode) or 4 mA (in 4-20 mA operating mode) in a fail-safe condition. The *Hi* setting forces the output to be 20 mA. The *NC* setting means no change is made to the current output in a fail-safe condition (i.e., whatever was being transmitted before the problem was detected will continue to be transmitted). A fail-safe condition remains in effect until the problem has been corrected.

The following are examples of fail-safe conditions:

- ADC overrange/underrange condition
- Engineering units overrange

## Mode

The current transmitter can be set up to output 0-20 mA or 4-20 mA. This menu is used to select one of the two operating modes. The Weigh II default current operating mode is 4-20 mA.

## Rprt

When this menu is accessed, the display shows the current outputs assigned to the displayed vessel. The top line of the display shows an assigned output number. The bottom line shows the slot number of the 4/0-20 PCB and the channel number for the current output on the 4/0-20 PCB. Pressing any key other than Esc or Auto/Man toggles between the assigned current output channels.

## Delete

This menu allows previously added current outputs to be removed from the displayed vessel. The top line of the display shows an assigned current output number. The bottom line shows the slot number of the 4/0-20 PCB and the channel number for the current output on the 4/0-20 PCB.

To delete a current output, cycle through the current outputs by pressing any key other than Esc, Auto/Man, or Enter until the one you want to delete is displayed; then press the Enter Key. To prevent accidental deletion, the display requests verification that you want to delete the current output channel. If the response is *Yes* then *I/O Channel Deleted* displays to confirm the channel deletion. This current output channel is now available for use again.

## Add

This menu is used to add current output channels (up to two) to the displayed vessel. The top line of the display shows the first available current output. The bottom line shows the slot number of the 4/0-20 PCB and the channel number for the current output on the 4/0-20 PCB. Pressing any key other than Esc, Auto/Man, or Enter cycles through all other unassigned current output channels. Pressing the Enter Key adds the current output channel.

## Setting Up the Current Output

Follow this procedure to add and set up current outputs.

1. If the Weigh II is in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the system in Manual Mode. The Auto LED turns off.
2. Use the Up Arrow or Down Arrow Keys to scroll to the desired channel .
3. Press the Menu Key to display the *Main* Menu. The display shows:

```

WII MAIN MENU
Disp  I/O  Cal->
F1    F2    F3

```

4. Press the F2 Key to access the I/O Menu.

The display shows:

```

INPUT/OUTPUT MENU
Setpt  Iout  Ser1→
F1     F2     F3
    
```

5. Press the F2 Key to access the Iout Menu. The display shows:

```

CURRENT OUTPUT
Set  Mode  Rprt→
F1   F2   F3
    
```

6. Press the Menu Key to display the second page of the menu. The display shows:

```

CURRENT OUTPUT
Delete      Add→
F1     F2     F3
    
```

7. Press the F3 Key to add a current output. The Weigh II displays the next available slot and channel #. The display looks like this:

```

ADDAN OUTPUT
SLOT XX  CHAN# YY
F1     F2     F3
    
```

Press any key other than Esc, Auto/Man, and Enter to cycle through the unassigned channels. Press the Enter Key to accept. The display flashes a message acknowledging your selection and returns to:

```

CURRENT OUTPUT
Delete      Add→
F1     F2     F3
    
```

8. Add up to two current outputs, and then press the Menu Key to return to the first page of the Current Output Menu. The display shows:

```

CURRENT OUTPUT
Set  Mode  Rprt→
F1   F2   F3
    
```

9. Press the F2 Key to access the Mode Menu. If you added only one output, go to Step 10. If you added two outputs the display looks like this:

```

SELECT OUTPUT
X/20#1      Y/20#2
F1     F2     F3
    
```

Either a '4' or a '0' will be in place of the 'X' and 'Y.' Press the F1 Key to set the mode for output #1 or the F3 Key to set the mode for output #2.

10. The display looks like this:

```

SLOT XX  CHAN# YY
4→20mA*  0→20mA
F1     F2     F3
    
```

An asterisk indicates the current selection.

11. Press the F1 Key for the current output range to be 4 to 20 mA or the F3 Key for 0 to 20 mA. The display flashes a message acknowledging your selection and returns to:

```

CURRENT OUTPUT
Set  Mode  Rprt→
F1   F2   F3
    
```

12. Press the F1 Key to access the Set Menu. If you added one output, proceed to Step 13. If you added two outputs, the display looks like this:

```

SELECT OUTPUT
X/20#1      Y/20#2
F1     F2     F3
    
```

Either a '4' or '0' will be in place of the 'X' and 'Y.' Press the F1 Key to set up output #1 or the F3 Key to set up output #2.

13. The display looks like this:

```

SET:
XmA      20mA→
F1     F2     F3
    
```

Either a '4' or a '0' will be in place of the 'X.'

14. Press the F1 Key to access 4/0mA. The display looks like this:

```

X/20#Y  LO VALUE
>          Z lbs
F1     F2     F3
    
```

Either a '4' or a '0' will be in place of the 'X.' The unit of measure you set up in the Units Menu shows in place of lbs.

15. Use the keypad or the Up and Down Arrow Keys to input a value for the weight where you want the current transmitter to output 4 mA (0 mA if applicable). Press the Enter Key to save the value in memory. The display flashes a message acknowledging the entry and returns to:

```

SET:
XmA      20mA→
F1     F2     F3
    
```

16. Press the F3 Key to access 20mA. The display looks like this:

```

X/20#Y HI VALUE
>                Z lbs
F1   F2   F3
    
```

Either a '4' or a '0' will be in place of the 'X.' The unit of measure you set up in the *Units* Menu shows in place of lbs.

17. Use the keypad or the Up and Down Arrow Keys to input a value for the weight where you want the current transmitter to output 20 mA. Press the Enter Key to save the value in memory. The display flashes a message acknowledging the entry and returns to:

```

SET:
XmA          20mA->
F1   F2   F3
    
```

18. Press the Menu Key to access the second page of the menu. The display shows:

```

SET:
Net/Grs      FSafe->
F1   F2   F3
    
```

19. Press the F1 Key to access *Net/Grs*. The display shows:

```

OPERATION MODE
Net          *Gross
F1   F2   F3
    
```

An asterisk indicates the current selection.

20. Press the F1 Key to select *Net* or the F3 Key to select *Gross*. The display flashes a message acknowledging your selection and returns to:

```

SET:
Net/Grs      FSafe->
F1   F2   F3
    
```

21. Press the F3 Key to select *Fsafe*. The display shows:

```

FAIL-SAFE MODE?
Lo*   Hi   NC
F1   F2   F3
    
```

An asterisk indicates the current selection.

22. Press the F1, F2, or F3 Key to select the desired fail-safe condition. The display flashes a message acknowledging your selection and returns to:

```

SET:
Net/Grs      FSafe->
F1   F2   F3
    
```

23. Press the Esc Key to return to the *Current Output* Menu and repeat Steps 9 through 22 to set up additional outputs if desired.

24. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return the display to vessel monitoring.

## Current Output Report

The Weigh II allows you to view the slot and channel number of the 4/0-20 mA current outputs of any vessel in the system. Follow this procedure.

- If the Weigh II is in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the system in Manual Mode. The Auto LED turns off.
- Use the Up Arrow or Down Arrow Keys to scroll to the desired channel.
- Press the Menu Key to display the *Main* Menu. The display shows:

```

WII MAIN MENU
Disp   I/O   Cal->
F1     F2   F3
    
```

- Press the F2 Key to access the *I/O* Menu. The display shows:

```

INPUT/OUTPUT MENU
Setpt  Iout  SerI->
F1     F2   F3
    
```

- Press the F2 Key to access the *Iout* Menu. The display shows:

```

CURRENT OUTPUT
Set    Mode  Rprt->
F1     F2   F3
    
```

- Press the F3 Key to access the *Rprt* Menu. The display flashes a message stating:

```

CURRENT OUTPUT
REPORT ON ID#:X
F1     F2   F3
    
```

The channel number you previously scrolled to will be displayed after ID#. The display then changes to:

```

1ST CURRENT OUTPUT
Slot XX  Chan# YY
F1     F2   F3
    
```

Use the Arrow Keys to cycle between the outputs.

7. Press the Esc Key to return the display to:

```

CURRENT OUTPUT
Set  Mode  Rprt→
F1   F2   F3

```

8. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return the display to vessel monitoring.

## SerI

The *SerI* Menu is used to set up serial communications between the Weigh II and external equipment, such as a printer, PLC, Kistler-Morse MVS, etc. The Weigh II is the master to a printer, but can only be the slave to all other external equipment. The Weigh II has one COM port for serial communications. Refer to Appendix F, Technical Drawings, for information on how to serially connect the Weigh II to various external equipment.

The Weigh II's built-in serial communications settings are 8 data bits, 1 stop, no parity. These values are fixed, and cannot be modified by the user. The adjustable serial communications settings — baud rate, address, and mode of operation — can be modified by the user, as described below under those menu items. When connecting the Weigh II to external equipment, all of the serial communications settings must match for the equipment to communicate. As necessary, modify the default settings for baud rate, address, and mode of operation of the Weigh II. Modify the data bits, stop, and parity settings in the external equipment to match the Weigh II's built-in settings.

*SerI* has two submenus, described below.

### HideS

*HideS* disables or enables channels from serial communications. This allows you to provide only the desired information through the serial port, such as sending math channel data without vessel monitoring channel data.

### Set

The *Set* Menu is used to modify the serial communications settings. It has three submenus, described below.

### Baud

The baud rate (bits per second) is set up in the *Baud* Menu. The baud rate determines the speed with which the Weigh II communicates with the PLC, printer, etc. There are five baud rates available:

1200 2400 4800 9600 (default) 19200

### Addr

External equipment may have many signal processors daisy chain wired to it. The base address of the signal processor identifies the signal processor and the associated vessels to the external equipment. Each device on the same serial connection must have a different base address. The base address of the Weigh II's serial port is set up in the *Addr* Menu. The base address can be expressed in two ways — decimal form (ranging from 0 to 255) and hexadecimal form (ranging from 0 to FF). The default setting is 01 in decimal form (01 in hexadecimal form).

#### Note

If you are connecting the Weigh II to a Kistler-Morse MVS signal processor, do not use a base address above 120 (decimal form). The MVS does not recognize a base address above 120.

When *Addr* is selected, a typical display looks like this:

```

BASE ADDRESS
> 01 Dec/ 01 Hex
F1   F2   F3

```

The lower line of the display shows two number fields. The first number is the base address in decimal form. The second number is the hexadecimal equivalent. The keypad is used to input a number directly, or the Arrow Keys can be used to scroll to a number. Only the decimal form of the address can be altered by the user; the hexadecimal form changes automatically to correspond to the decimal form. Pressing the Enter Key saves the new value in memory.

Each channel in the Weigh II has a unique serial address, based on the base address of the Weigh II and the factory-set channel ID number. The serial address of any channel is calculated with the formula:

$$\text{Channel Serial Address (hexadecimal form)} = \text{Base Address (hexadecimal form)} + \text{Channel ID\#} - 1$$

To view the serial address for a channel, press the Esc Key while vessel monitoring in the Manual Mode.

## Mode

The serial port mode of operation, *Printer* or *Slave*, is set up in the *Mode* Menu. The default is *Slave*. When *Slave* is selected, the Weigh II can respond to serial commands from a master device, such as a PC running a Kistler-Morse ROPE system or another signal processor configured as a master. The Weigh II cannot initiate serial communications. When *Printer* is selected, the Weigh II can send data to a printer.

---

---

## Prnt

---

---

The *Prnt* Menu is used to direct output data to a printer. It has five submenus, described below.

### Tare

This menu allows the user to set up the Weigh II to print out the current gross weight and current net weight data for the selected vessel every time the user performs a tare operation on the vessel. The default is *No* (does not print upon tare operation). The printout shows the factory-set ID, customer-defined ID, gross weight, net weight, time, and date.

### GO1

This menu allows the user to print out the current gross weight and net weight for the selected vessel. The printout shows the factory-set ID, customer-defined ID, gross weight, net weight, time, and date.

### GO ALL

This menu allows the user to print out the current gross weight and net weight for *all* enabled vessels. The printout looks the same as for *GO1*.

### Timed

This menu allows the user to print out the gross weight and net weight data for *all*

enabled vessels at designated increments of time. The time increment can range from 0 to 65,535 seconds (18.2 hours). The time is entered using the keypad or the Up and Down Arrow Keys. Pressing the Enter Key saves the new value to memory.

## Pdly

The Weigh II does not use hardware or software handshaking to control data flow to the printer. If the data overruns the print buffer, you may see garbled or overwritten printouts. *Pdly* allows the user to input a delay so that the data being sent to the printer won't overrun the print buffer.

The default delay is 0 seconds. Values can range from 0 to 25.5 seconds. The desired value is entered using the keypad or with the Up and Down Arrow Keys. Pressing the Enter Key saves the new value to memory.

---

---

## PLC

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The Weigh II can provide communications through the A-B RIO PCB (optional). Refer to the *A-B Remote I/O Interface Manual for ultra-wave/Sonologic II and Weigh II* to connect the Weigh II to a PLC.

The Weigh II can provide communications through the Profibus DP-Slave PCB (optional).

Refer to the Profibus Interface manual for Ultrawave/Sonologic II/Weigh II to connect the Weigh II to a PLC.

# Chapter 6. Calibration

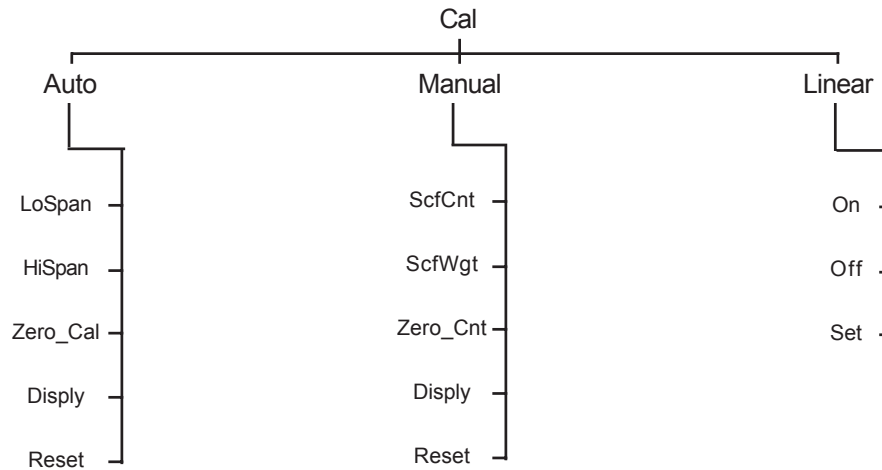


Figure 6-1. The Calibration Menu Tree

## Introduction

The *Cal* Menu is used to set up and calibrate the Weigh II with the sensors wired to the Weigh II (for example, L-Cells, Microcells, Load Stand II, Load Disc II, and Load Link). This chapter covers the functions in the *Cal* Menu. Explanations of each of the functions are provided. Additionally, detailed navigation procedures through the menu tree are provided for each type of calibration.

As shown in Figure 6-1, the *Cal* Menu has three submenus, described below.

1. *Auto* — used to set the lo span, hi span, and zero calibration values while moving material into or out of the vessel.
2. *Manual* — used to manually set the scale factor counts, scale factor weight, and zero counts. Use manual calibration to pre-calibrate the system, fine-tune the calibration, or re-enter previous calibration data.
3. *Linear* — used to set up and turn on and off the linearization table. Use of this function may be required if your vessel's structure responds non-linearly, but consistently, to changes in load, resulting in consistent, incorrect weight readings after the system has been correctly calibrated.

## Auto

There are three different methods for performing automatic calibration:

- High-Accuracy Calibration
- Calibration by Adding a Known Quantity of Material
- Calibration by Subtracting a Known Quantity of Material

The latter two methods do not provide as high accuracy calibration as the first method. However, these lower accuracy calibrations can be later refined to increase the accuracy (see the topic *Refining the Calibration by Setting Zero* in this section).

### Note

See Appendix H, Error Messages, for an explanation of error messages you may encounter while performing an Auto Calibration.

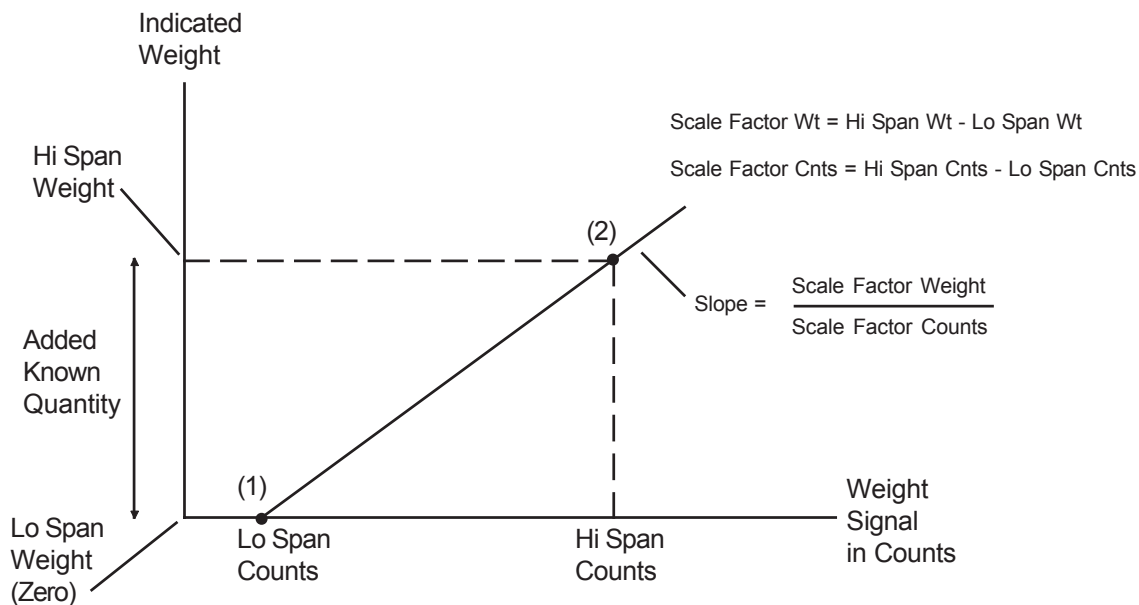


Figure 6-2. High-Accuracy Calibration

### High-Accuracy Calibration

The high-accuracy calibration procedure provides the highest accuracy, but requires that the vessel be completely empty to start. The principle behind the calibration follows.

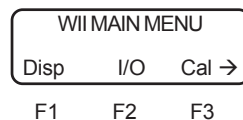
The vessel is completely emptied, and the *Lo Span* is set to zero [point (1) in Figure 6-2]. A known quantity of material, representing at least 25% of the vessel's total capacity, is then added to the vessel. That quantity is entered as the *Hi Span* value [point (2) in Figure 6-2]. The Weigh II saves in memory the Lo and Hi Span weights as well as the digital counts associated with each weight. These values define the straight line shown in Figure 6-2. The slope of the line is called the Scale Factor, which is calculated internally.

The accuracy of the calibration improves the greater the known quantity of material added during the calibration procedure. For example, adding 50% of the vessel's total capacity results in greater accuracy than adding 25% of the total capacity.

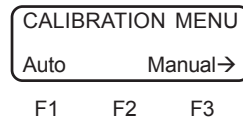
Follow this procedure to perform a high-accuracy calibration.

1. Completely empty the vessel.
2. If the Weigh II is in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the system in Manual Mode. The Auto LED turns off.
3. Use the Up Arrow or Down Arrow Key to scroll to the desired vessel .

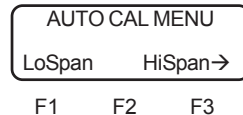
4. Press the Menu Key to display the *Main* Menu. The display shows:



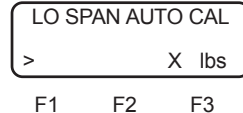
5. Press the F3 Key to access the *Cal* Menu. The display shows:



6. Press the F1 Key to access the *Auto* Menu. The display shows:

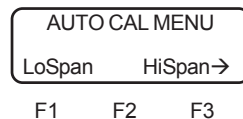


7. Press the F1 Key to access *LoSpan*. The display looks like this:



The unit of measure you set up in the *Units* Menu shows in place of lbs.

8. Use the keypad or the Up and Down Arrow Keys to input zero as the *Lo Span* value. Press the Enter Key to save the value in memory. *Lo Span* is now set [point (1) in Figure 6-2]. The display flashes a message acknowledging your entry and returns to:





9. Add a known quantity of material, representing at least 25% of the vessel's total capacity, to the vessel.
10. Press the F3 Key to access *HiSpan*.  
The display looks like this:

```

HI SPAN AUTO CAL
> _____ X lbs
F1      F2      F3
  
```

The unit of measure you set up in the *Units* Menu shows in place of lbs.

11. Use the keypad or the Up and Down Arrow Keys to input a value that represents the quantity of material added to the vessel. Press the Enter Key to save the value in memory. *Hi Span* is now set [point (2) in Figure 6-2]. The display flashes a message acknowledging your entry and returns to:

```

AUTO CAL MENU
LoSpan  HiSpan→
F1      F2      F3
  
```

The Weigh II is now calibrated to the highest accuracy for the selected vessel.

12. Press the Esc Key to go up the menu tree or press the Auto/Man Key to return the display to vessel monitoring.

## Calibration by Adding a Known Quantity of Material

This method provides calibration that is accurate enough for most applications and does not require the vessel to be completely empty. The principle behind the calibration follows.

A value estimated to be the quantity of material in the vessel is entered as the Lo Span value [point (1) in Figure 6-3]. A known quantity of material, representing at least 25% of the vessel's total capacity, is added to the vessel. The sum of the known quantity plus the estimated quantity is entered as the Hi Span value [point (2) in Figure 6-3]. The Weigh II saves in memory the Lo and Hi Span weights as well as the digital counts associated with each weight. These values define the dashed straight line and the calculated zero weight shown in Figure 6-3. The slope of the line is called the Scale Factor, which is calculated internally.

The slope of the line is reasonably accurate, because it is calculated based on the known difference between the Lo Span and Hi Span weights and counts. However, if the estimated Lo Span value is incorrect, the actual "location" of the line is incorrect, resulting in errors in vessel monitoring. The greater the error in the estimated Lo Span, the greater the resulting error. The "location" of the line can be adjusted to the solid line by setting zero [point (3) in Figure 6-3] (see *Refining the Calibration by Setting Zero* in this section).

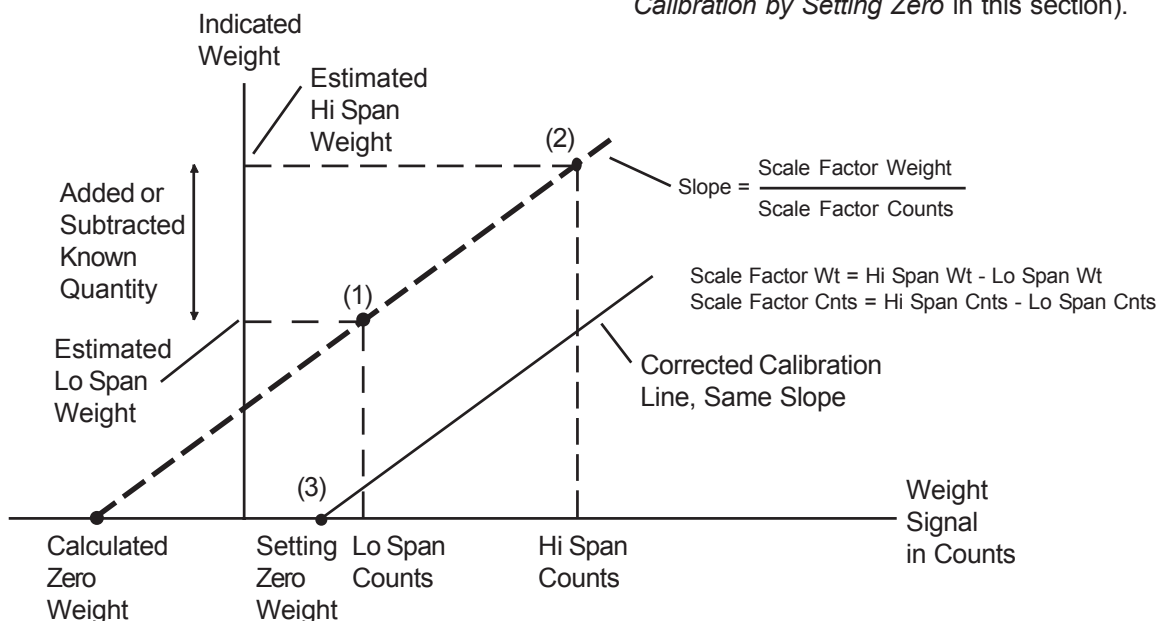
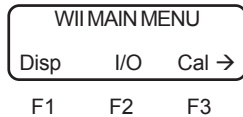


Figure 6-3. Calibration by Adding or Subtracting a Known Quantity of Material

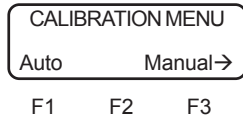
The greater the known quantity of material added during the calibration procedure, the greater the accuracy of the calibration. Adding 50% of the total capacity results in greater accuracy than adding 25% of the total capacity.

Follow this procedure to calibrate by adding a known quantity of material.

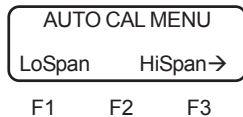
1. If the Weigh II is in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the system in Manual Mode. The Auto LED turns off.
2. Use the Up Arrow and Down Arrow Keys to scroll to the desired vessel.
3. Press the Menu Key to display the *Main* Menu. The display shows:



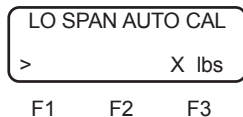
4. Press the F3 Key to access the *Cal* Menu. The display shows:



5. Press the F1 Key to access the *Auto* Menu. The display shows:

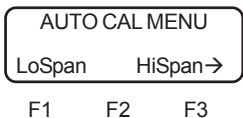


6. Press the F1 Key to access *LoSpan*. The display looks like this:



The unit of measure you set up in the *Units* Menu shows in place of lbs.

7. Use the keypad or the Up and Down Arrow Keys to input a value that represents the estimated quantity of material in the vessel as the *LoSpan* value. Press the Enter Key to save the value in memory. *Lo Span* is now set [point (1) in Figure 6-3]. The display flashes a message acknowledging your selection and returns to:



8. Add a known quantity of material, repre-

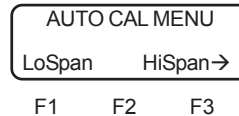
senting at least 25% of the vessel's total capacity, to the vessel.

9. Press the F3 Key to access *HiSpan*. The display looks like this:



The unit of measure you set up in the *Units* Menu shows in place of lbs.

10. Using the keypad or the Up and Down Arrow Keys, input the value equal to the sum of the known quantity (Step 8) and the estimated quantity (Step 7). Press the Enter Key to save the value in memory. *Hi Span* is now set [point (2) in Figure 6-3]. The display flashes a message acknowledging your entry and returns to:



11. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return the display to vessel monitoring.

**Note**

Shifting the line from the dashed line to the solid line in Figure 6-3 is accomplished by setting zero. The procedure to set zero is described in *Refining the Calibration by Setting Zero* in this section. Set zero when the vessel contains a known quantity of material (usually none) at a later date.

**Calibration by Subtracting a**

## Known Quantity of Material

This method provides calibration that is accurate enough for most applications, and does not require the vessel to be empty. This method of calibration is appropriate when it is easier to remove material from the vessel than to add it. The principle behind the calibration follows.

A value estimated to be the quantity of material in the vessel is entered as the Hi Span value [point (2) in Figure 6-3]. A known quantity of material, representing at least 25% of the vessel's total capacity, is removed from the vessel. The estimated Hi Span value minus the known quantity that is removed is entered as the Lo Span value [point (1) in Figure 6-3]. The Weigh II saves in memory the Lo and Hi Span weights as well as the digital counts associated with each weight. These values define the dashed straight line and the calculated zero weight shown in Figure 6-3. The slope of the line is called the Scale Factor, which is calculated internally.

The slope of the line is reasonably accurate, because it is calculated based on the known difference between the Lo Span and Hi Span weights and counts. However, if the estimated Hi Span value is incorrect, the actual "location" of the line is incorrect, resulting in errors in vessel monitoring. The greater the error in the estimated Hi Span, the greater the resulting error. The "location" of the line can be adjusted to the solid line by manually setting zero [point (3) in Figure 6-3].

Similarly to the other calibration methods, the greater the known quantity of material moved during the calibration procedure, the greater the accuracy. Removing 50% of the total capacity results in greater accuracy than removing 25% of the total capacity.

Follow this procedure to calibrate by subtracting a known quantity of material.

1. If the Weigh II is in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the system in Manual Mode. The Auto LED turns off.
2. Use the Up Arrow or Down Arrow Keys to scroll to the desired vessel.
3. Press the Menu Key to display the *Main*

Menu. The display shows:

```

  WII MAIN MENU
  Disp   I/O   Cal →
  
```

4. Press the F3 Key to access the *Cal* Menu. The display shows:

```

  CALIBRATION MENU
  Auto   Manual →
  F1     F2     F3
  
```

5. Press the F1 Key to access the *Auto* Menu. The display shows:

```

  AUTO CAL MENU
  LoSpan HiSpan →
  F1     F2     F3
  
```

6. Press the F3 Key to access *HiSpan*. The display looks like this:

```

  HI SPAN AUTO CAL
  >                X lbs
  F1     F2     F3
  
```

The unit of measure you set up in the *Units* Menu shows in place of lbs.

7. Use the keypad or the Up and Down Arrow Keys to input a value that represents the estimated quantity of material in the vessel as the *HiSpan* value. Press the Enter Key to save the value in memory. *Hi Span* is now set [point (2) in Figure 6-3]. The display flashes a message acknowledging your entry and returns to:

```

  AUTO CAL MENU
  LoSpan HiSpan →
  F1     F2     F3
  
```

8. Remove a known quantity of material, that represents at least 25% of the vessel's total capacity, from the vessel.
9. Press the F1 Key to access *LoSpan*. The display looks like this:

```

  LO SPAN AUTO CAL
  >                X lbs
  F1     F2     F3
  
```

The unit of measure you set up in the *Units* Menu shows in place of lbs.

10. Using the keypad or the Up and Down Arrow Keys, input a value equal to the estimated quantity (Step 7) minus the known quantity (Step 8). Press the Enter Key to save the value in memory. *Lo Span* is now set [point (1) in Figure 6-3]. The display flashes a message acknowledging your entry and returns to:

```

  AUTO CAL MENU
  LoSpan    HiSpan→
  F1      F2      F3
  
```

11. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return the display to vessel monitoring.

#### Note

Shifting the line from the dashed line to the solid line in Figure 6-3 is accomplished by setting zero. The procedure to set zero is described in *Refining the Calibration by Setting Zero* in this section. Set zero when the vessel contains a known quantity of material (usually none) at a later date.

## Refining the Calibration by Setting Zero

The *Zero\_Cal* Menu is used to allow the Weigh II to establish the zero live load point of the vessel. Setting zero translates the calibration line of Figure 6-3 from the dashed line to the solid line position. Entering a weight value in *Zero\_Cal* establishes point (3) in the figure. This weight value must be entered only when there is a known quantity of material in the vessel (**usually** zero material, but it can be a known, non-zero quantity) that equals the entered value. Using the *Zero\_Cal* Menu is often done at some time after the initial installation and calibration of the Weigh II, when it is practical to empty the vessel and refine the calibration.

The *Zero\_Cal* function may be used to compensate for the following circumstances:

- The estimated weight value used when performing a calibration by adding or subtracting a known quantity of material is off by a greater margin than can be tolerated.
- The vessel was not completely empty at the start of a high-accuracy calibration procedure.

#### Note

The *Zero\_Cal* function cannot “repair” a calibration in which the known quantity added or subtracted was actually incorrect, because the slope of the line is not affected by setting zero. If necessary, recalibrate.

Follow this procedure to refine the calibration by setting zero.

1. If the Weigh II is in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the system in Manual Mode. The Auto LED turns off.
2. Use the Up Arrow or Down Arrow Key to scroll to the desired vessel.
3. Press the Menu Key to display the *Main* Menu. The display shows:

```

  WII MAIN MENU
  Disp    I/O    Cal →
  F1      F2      F3
  
```

4. Press the F3 Key to access the *Cal* Menu. The display shows:

```

  CALIBRATION MENU
  Auto      Manual→
  F1      F2      F3
  
```

5. Press the F1 Key to access the *Auto* Menu. The display shows:

```

  AUTO CAL MENU
  LoSpan    HiSpan→
  F1      F2      F3
  
```

6. Press the Menu Key to access the second page of the *Auto Cal* Menu. The display shows:

```

  AUTO CAL MENU
  Zero_Cal  Disply→
  F1      F2      F3
  
```

7. Press the F1 Key to access *Zero\_Cal*. The display looks like this:

```

  ZERO CALIBRATION
  >                X lbs
  F1      F2      F3
  
```

The unit of measure you set up in the *Units* Menu shows in place of lbs.

8. Use the keypad or the Up and Down Arrow Keys to input a value that represents the known quantity of material (usually zero) in the vessel. Press the Enter Key to save the value in memory. Setting Zero weight [point (3) in Figure 6-3] is now set. The display flashes a message acknowledging your entry and returns to:

```

  AUTO CAL MENU
  Zero_Cal   Disply->
  F1      F2      F3

```

The Weigh II automatically makes all of the necessary corrections; however, the entered values of *Lo Span* and *Hi Span* weight remain in memory even though the solid line of Figure 6-3 does not pass through those two points. Those points are used only to establish the slope of the line.

9. Press the Esc Key to go up through the menu tree or press the Auto/Man Key to return the display to vessel monitoring.

## Displaying the Auto Calibration Parameters

The second page of the *Auto Cal* Menu has a display function. Accessing this menu allows you to view the following calibration values that have been entered or internally calculated for the selected vessel:

- *Cnts/mV* (digital counts per millivolt of signal)
- *0mV cnts* (number of digital counts corresponding to 0 millivolts of signal)
- *H\_SPAN\_W* (entered hi span weight)
- *L\_SPAN\_W* (entered lo span weight)
- *H\_SPAN\_C* (hi span counts = number of digital counts corresponding to the hi span weight)
- *L\_SPAN\_C* (lo span counts = number of digital counts corresponding to the lo span weight)
- *ZERO\_WGT* (entered zero calibration weight if performed *Zero\_Cal*; otherwise, zero)
- *ZERO\_CNT* (zero counts = number of digital counts corresponding to the zero calibration weight)
- *SCF\_WGT* (scale factor weight = hi span weight - lo span weight)
- *SCF\_CNT* (scale factor counts = hi span counts - lo span counts)

Follow this procedure to display the auto

calibration parameters.

1. While in the *Auto Cal* Menu, access the second page by pressing the Menu Key until the display shows:

```

  AUTO CAL MENU
  Zero_Cal   Disply->
  F1      F2      F3

```

2. Press the F3 Key to access *Disply*. The display looks like this:

```

  Cnts/mV:   XXXX
  0mV cnts   YYYYYY
  F1      F2      F3

```

3. Press any key other than the Esc or Auto/Man Key to cycle through the display parameters.
4. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return the display to vessel monitoring.

## Resetting the Auto Calibration Parameters

The third page of the *Auto Cal* Menu has a reset function. Accessing this menu allows you to reset the calibration values to the factory-set default values, which are listed below:

- *Cnts/mV* — dependent on *Gain* value (see Chapter 7, Service). Value is 699.05 for the default *Gain* of 2.
- *0mV cnts* — 1,048,576
- *H\_SPAN\_W* ---
- *L\_SPAN\_W* ---
- *H\_SPAN\_C* ---
- *L\_SPAN\_C* ---
- *ZERO\_WGT* — 0
- *ZERO\_CNT* — 1,048,576
- *SCF\_WGT* — 9,999
- *SCF\_CNT* — 250,000

## Manual

For manual calibration, you calculate and input directly the slope and setting zero points of the calibration line. There are three reasons for doing a manual calibration instead of an automatic calibration:

- You cannot move any material now, and want to get started using your system with a rough pre-calibration.
- You calibrated the system. Later, you moved material into an empty vessel and kept an accurate record of the actual material weight (based on a truck weight or some other accurate information) and the indicated material weight (from the Weigh II). However, you did not perform a calibration procedure at the time. You want to use this information now to refine the calibration.
- You want to re-enter data from a previous calibration.

The calculation of the manual calibration parameters for both a pre-calibration and for calibration refining is covered in Appendix G, Calculation of Manual Calibration Parameters. Once you have calculated the parameters, follow the procedure below to perform a manual calibration.

1. If the Weigh II is in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the system in Manual Mode. The Auto LED turns off.
2. Use the Up Arrow and Down Arrow Keys to scroll to the desired vessel.
3. Press the Menu Key to display the *Main* Menu. The display shows:

```

WII MAIN MENU
Disp  I/O  Cal →
F1    F2    F3
  
```

4. Press the F3 Key to access the *Cal* Menu. The display shows:

```

CALIBRATION MENU
Auto    Manual →
F1    F2    F3
  
```

5. Press the F3 Key to access the *Manual* Menu. The display shows:

```

MANUAL CAL MENU
ScfCnt  ScfWgt →
F1    F2    F3
  
```

6. Press the F1 Key to access *ScfCnt*. The display looks like this:

```

SCALE FACTOR
>      X counts
F1    F2    F3
  
```

7. Use the keypad or the Up and Down Arrow Keys to input a value for the scale factor counts. Press the Enter Key to save the value in memory. The display flashes a message acknowledging your entry and returns to:

```

MANUAL CAL MENU
ScfCnt  ScfWgt →
F1    F2    F3
  
```

8. Press the F3 Key to access *ScfWgt*. The display looks like this:

```

SCALE FACTOR
>      X lbs
F1    F2    F3
  
```

The unit of measure you set up in the *Units* Menu shows in place of lbs.

9. Use the keypad or the Up and Down Arrow Keys to input a value for the scale factor weight. Press the Enter Key to save the value in memory. The display flashes a message acknowledging your entry and returns to:

```

MANUAL CAL MENU
ScfCnt  ScfWgt →
F1    F2    F3
  
```

10. Press the Menu Key to go to the second page of the *Manual Cal* Menu. The display shows:

```

MANUAL CAL MENU
Zero_Cnt  Disply →
F1    F2    F3
  
```

11. Press the F1 Key to access *Zero\_Cnt*. The display looks like this:

```

ZERO CALIBRATE
>      X counts
F1    F2    F3
  
```

- Use the keypad or the Up and Down Arrow Keys to input a value for zero counts (the number of counts associated with zero live load). Press the Enter Key to save the value in memory. The display flashes a message acknowledging your entry and returns to:

```

MANUAL CAL MENU
Zero_Cnt   Disply→
F1      F2      F3

```

- Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return the display to vessel monitoring.

## Displaying the Manual Calibration Parameters

The second page of the *Manual Cal* Menu has a display function. Accessing this menu allows you to view the following calibration values that have been entered or internally calculated for the selected vessel:

- Cnts/mV* (digital counts per millivolt of signal)
- 0mV cnts* (number of digital counts corresponding to 0 millivolts of signal)
- H\_SPAN\_W* (hi span weight) — blanked out with “---” after a manual calibration
- L\_SPAN\_W* (lo span weight) — blanked out with “---” after a manual calibration
- H\_SPAN\_C* (hi span counts) — blanked out with “---” after a manual calibration
- L\_SPAN\_C* (lo span counts) — blanked out with “---” after a manual calibration
- ZERO\_WGT* (zero calibration weight, which is zero for manual calibrations)
- ZERO\_CNT* (entered counts corresponding to zero live load)
- SCF\_WGT* (entered scale factor weight)
- SCF\_CNT* (entered scale factor counts)

Follow this procedure to display the auto calibration parameters.

- While in the *Manual Cal* Menu, access the second page by pressing the Menu Key until the display shows:

```

MANUAL CAL MENU
Zero_Cal   Disply→
F1      F2      F3

```

- Press the F3 Key to access *Disply*. The display looks like this:

```

Cnts/mV:   X
0mV cnts   Y
F1      F2      F3

```

- Press any key other than the Esc or Auto/Man Key to cycle through the parameters.
- Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return the display to vessel monitoring.

## Resetting the Manual Calibration Parameters

The third page of the *Manual Cal* Menu has a reset function. Accessing this menu allows you to reset the calibration values to the factory-set default values, which are listed below:

- Cnts/mV* — dependent on *Gain* value (see Chapter 7, Service). Value is 699.05 for the default *Gain* of 2.
- 0mV cnts* — 1,048,576
- H\_SPAN\_W* ---
- L\_SPAN\_W* ---
- H\_SPAN\_C* ---
- L\_SPAN\_C* ---
- ZERO\_WGT* — 0
- ZERO\_CNT* — 1,048,576
- SCF\_WGT* — 9,999
- SCF\_CNT* — 250,000

---

## Linear

---

The linearization function can be used to correct nonlinearities from a vessel’s sensor/transducer output. Use of this function may be required if you notice one of the following after you have correctly calibrated the system (using either Automatic or Manual Calibration):

- The Weigh II gives accurate results when the live load is close to 0 and close to the full scale (maximum live load) value, but is **consistently** inaccurate between those values.
- The Weigh II gives accurate results over some or most of the live load range, but is **consistently** inaccurate in one area.

The word “consistent” refers not only to an error occurring, but that the error is approximately the same each time. This type of error may be caused by a non-linear response of the vessel’s structure to changes in load. This type of error can also result from layering of multiple types of material in the vessel, with differing densities, in distinct, consistently defined layers.

**Note**

Changing the values in the linearization table incorrectly can cause the Weigh II to display incorrect sensor data. Do not change the values in the linearization table unless one of the above problems has been noted.

An example is provided below of a situation where use of the linearization table may be required:

**Example:** When your vessel is empty, the Weigh II correctly shows approximately 0 lbs. You start putting truckloads of material into the vessel, and notice the following pattern:

Truck	Total Actual Load	Total Indicated Load
	0	0
1	5,000	6,000
2	10,000	11,500
3	15,000	16,000
4	20,000	20,000

After the fourth truckload, your indicated load from the Weigh II is reasonably accurate. You notice this same pattern and magnitude of errors every time you start with an empty vessel.

The Weigh II's linearization algorithm uses a five-point piece-wise linearization method with linear interpolation between points. Figure 6-4 illustrates the linearization operation. Table 6-1 is the default linearization table, consisting of five raw digital count values as inputs and five corrected digital count values as outputs. Note that for the default condition, the raw and corrected values are identical, so the linearization table will have no effect on the Weigh II, even if linearization is *On*.

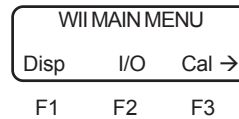
Raw Value	Corrected Value
1048576	1048576
1112576	1112576
1176576	1176576
1240576	1240576
1304576	1304576

Table 6-1. Default Linearization Table

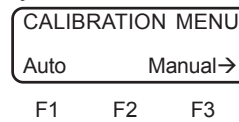
Consult with Kistler-Morse to determine the values to input for linearization.

Follow this procedure to enable, disable, and set up the linearization table.

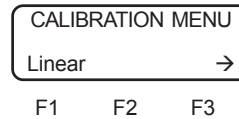
1. If the Weigh II is in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the system in Manual Mode. The Auto LED will turn off.
2. Use the Up Arrow or Down Arrow Key to scroll to the desired vessel.
3. Press the Menu Key to display the *Main* Menu. The display shows:



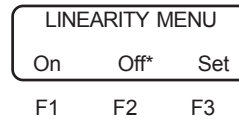
4. Press the F3 Key to access the *Cal* Menu. The display shows:



5. Press the Menu Key again to display the second page of the menu. The display shows:

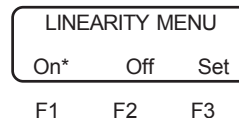


6. Press the F1 Key to access the *Linear* Menu. The display shows:



An asterisk indicates the current selection for *On* or *Off*.

7. Press the F1 Key to turn the linearization table on or the F2 Key to turn the table off. The display flashes a message acknowledging your selection and returns to:



An asterisk indicates the new selection for *On* or *Off*.

If you want to change the linearization table, continue with Step 8. If not, press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return the display to vessel monitoring.



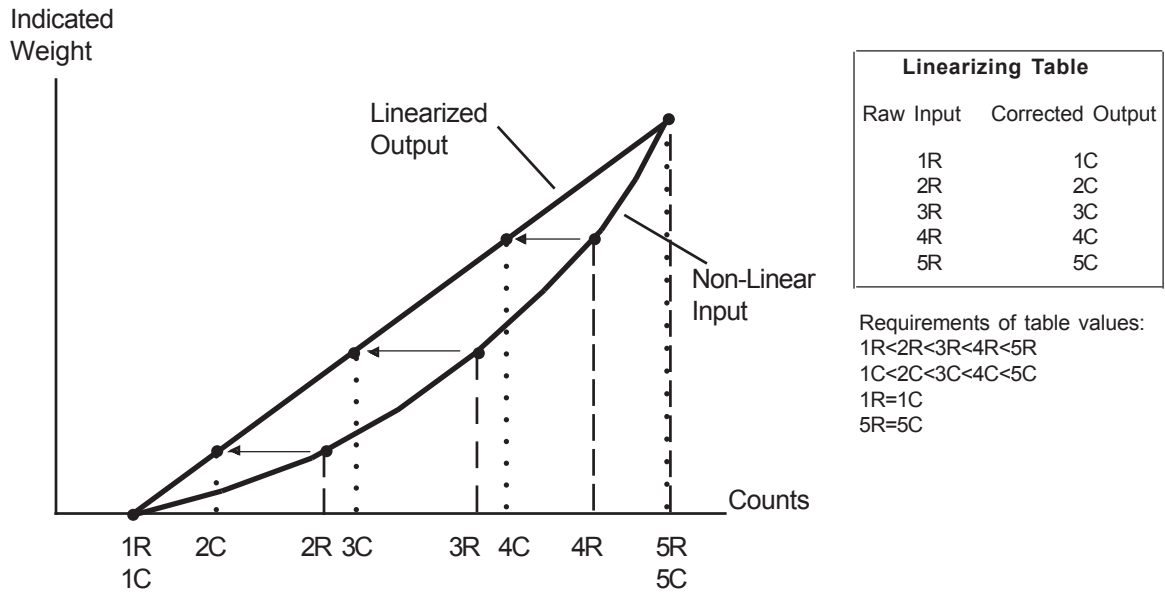


Figure 6-4. Linearization Curve

8. Press the F3 Key to access the *Set* Menu. The display looks like this:

```

Pt  RAW INPUT
01> 1048576 Cnts
F1  F2  F3

```

9. Use the keypad or the Up and Down Arrow Keys to enter a new value for the *Raw Input*. Press the Enter Key to save the new value in memory. The display then switches to a display that looks like this:

```

Pt  CORRECTED OUT
01> 1048576 Cnts
F1  F2  F3

```

10. Use the keypad or the Up and Down Arrow Keys to enter a new value for the *Corrected Output*. Press the Enter Key to save the new value in memory. The display then switches to a display that looks like this:

```

Pt  RAW INPUT
02> 1112576 Cnts
F1  F2  F3

```

11. Repeat Steps 9 and 10 as desired until you have completed your setup of the linearization table.
12. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return the display to vessel monitoring.



# Chapter 7. Service

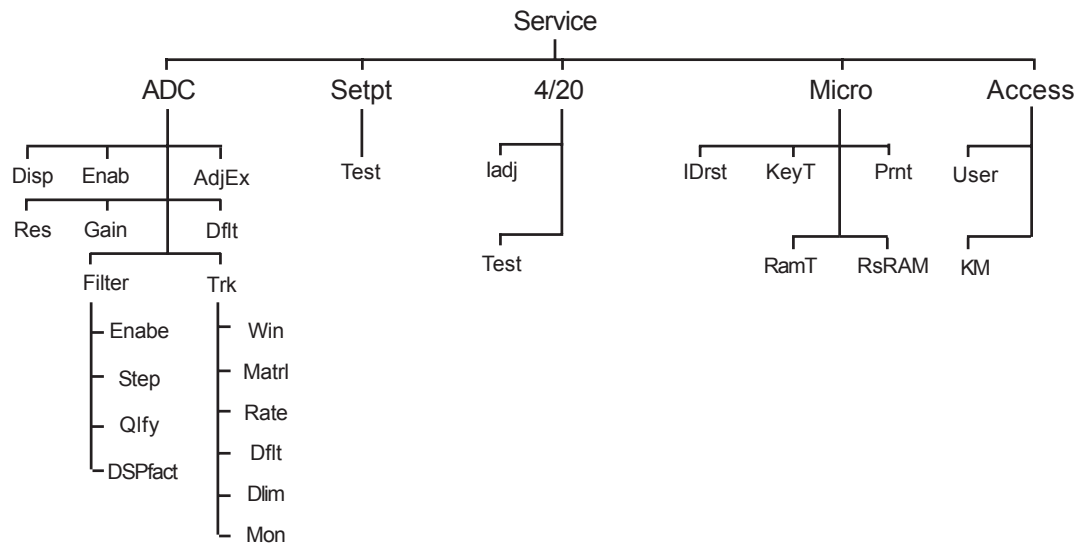


Figure 7-1. The Service Menu Tree

## Introduction

The *Service* Menu is used to set up a user-defined access code and to perform troubleshooting functions. This chapter covers the functions in the *Service* Menu. Explanations of each of the functions are provided. Additionally, navigation procedures through the menu tree are provided for some of the functions.

As shown in Figure 7-1, the *Service* Menu has five submenus:

1. *ADC* — allows you to display material weight and the equivalent A/D counts; enable or disable monitoring for a channel; adjust the excitation, effective resolution, and gain; set (or reset) default parameters for a specific channel; and set up and enable filtering and tracking parameters that reduce the effects of ‘noise’ and drift.
2. *Setpt* — allows you to turn the setpoint relays on and off for test purposes.
3. *4/20* — allows you to calibrate the 0/4 and 20 mA outputs and set the current transmitter output to specific values for test purposes.
4. *Micro* — allows you to clear the 16-character customer-defined ID, test the keyboard, print setup information for each vessel, reset the non-volatile RAM to default parameters, and test the non-volatile RAM.
5. *Access* — allows you to set up a user-

defined access code; also allows you to enter the KM Mfg Code, which is needed when performing certain troubleshooting functions.

### Note

You should not attempt to perform troubleshooting in the *Service* Menu without guidance from Kistler-Morse. Contact Kistler-Morse for telephone assistance before entering the *Service* Menu to modify system parameters.

To set up a user-defined access code, proceed directly to *Access* in this chapter.

## KM Service Code

The KM Service Code is required to change any parameters within the *Service* Menu unless you entered the KM Mfg Code. The KM Service Code number is:

9010

You can view parameters in the *Service* Menu without entering the Service Code, but will be prompted to enter the Code if you try to change any parameters. Once the Service Code is entered, you have access to all functions that require the Code, while you remain within the Manual Mode (i.e., you only need to enter the Code once per Manual Mode session, regardless of the number of functions and channels you access).

## ADC

This menu is used to:

- display material weight of each vessel and the equivalent A/D counts
- enable or disable monitoring for a channel
- adjust the excitation, effective resolution, and gain
- set (or reset) default parameters for a specific channel
- set up and enable filtering and tracking parameters that reduce the effects of 'noise' and drift

Descriptions of each of the submenus follow.

### Disp

This function allows you to display the current material weight, equivalent A/D counts, and stability. Both 'corrected' and 'raw' A/D counts are displayed. 'Corrected' counts are the counts after all system corrections, such as averaging, linearization, filtering, and tracking, are applied. 'Raw' counts are the counts before any corrections are applied.

The first page of the display looks like this:

```

04:      1043962 Cts
AdCB:    25733 lbs
  F1      F2      F3

```

- *04* is the factory-set channel ID
- *1043962 Cts* is the current "corrected" A/D counts
- *CB* is the hexadecimal serial address for the current channel
- *25733 lbs* is the current material weight

The remaining pages are displayed by pressing the F3 Key. The second page of the display looks like this:

```

04:      1043962 Cts
AdCB:21Bit  d=5
  F1      F2      F3

```

- *04* is the factory-set channel ID
- *1043962 Cts* is the current 'corrected' A/D counts
- *CB* is the hexadecimal serial address for the current channel
- *21Bit* is the effective resolution
- *d=5* is the change in counts, which is a measure of channel stability. Kistler-Morse may be interested in this number if, while vessel monitoring, the display jumps or drifts excessively. The value for d is zeroed by pressing the Enter Key while viewing

this display. The maximum value is 255. When d exceeds 255, the number is replaced by \*\*\* on the display.

The third page of the display looks like this:

```

04:      1043962 Cts
AdCB    1043990 Raw
  F1      F2      F3

```

- *04* is the factory-set channel ID
- *1043962 Cts* is the current 'corrected' A/D counts
- *CB* is the hexadecimal serial address for the current channel
- *1043990 Raw* is the current 'raw' A/D counts

Pressing the Up and Down Arrow Keys cycles the display through the other channels.

### Enab

This function is used to enable or disable the channel. This function differs from the *Hide* Menu in the *Display* Menu (see Chapter 4, Display) in that disabling a channel using *Enab* actually causes the Weigh II to stop monitoring the channel. The display shows:

```

CHANNEL 1
On*      Off
  F1      F2      F3

```

An asterisk indicates the current selection for the channel. Pressing the F1 Key enables the channel. Pressing the F3 Key turns the channel off. If you have setpoint or current output set up for the channel that you are disabling, the Weigh II will ask whether to Release I/O. Releasing I/O will free up those channels currently used for setpoint and current output for this vessel. If you want to retain the previously entered setpoint and current output information, do not Release I/O.

Pressing the Up and Down Arrow Keys cycles the display through the other channels.

#### Note

There are a total of 8 channels in *Enab*. For a single-point system, channels 2 through 8 are math channels. For a multi-point system, channels 5 through 8 are math channels. Refer to Chapter 8, Math Channels, for detailed information.

## AdjEx

This function is used to adjust the excitation voltage output from the Weigh II, which is used to excite the sensors. The default excitation is 223, which corresponds to the 12 Volts required by Kistler-Morse silicon sensors. The excitation can range from 0 to 255, corresponding to approximately 5 Volts to approximately 12.9 Volts. Foil gage sensors from other manufacturers typically require 10 Volts of excitation.

### Note

If using intrinsically safe barriers, it may be necessary to adjust the excitation voltage down.

Pressing the F2 and F3 Keys provides coarse adjustment in changing the *AdjEx* value. Pressing the Up and Down Arrow Keys provides fine adjustment in changing the value. Pressing the Enter Key saves the new value in memory.

The value for excitation voltage output is modified while in the menu tree for *any* channel, and applies to *all* of the channels in the system.

## Res

This function controls effective resolution by changing the conversion rate of the 21-bit A/D converter. In general, the higher the resolution, the slower the Weigh II conversion time (and time to switch monitoring channels), but the greater the stability. Table 7-1 shows the effective resolution and associated conversion times.

You can select from *16 bt*, *17 bt*, *18 bt*, *19 bt*, *20 bt*, and *21 bt*. The default is *16 bt*.

The value for resolution is modified while in the menu tree for *any* channel and applies to *all* of the channels in the system.

Effective Resolution (bits)	Conversion Time (mS)
16	25
17	50
18	83
19	125
20	250
21	512

Table 7-1. Effective Resolution

## Gain

Adjusting the gain increases or decreases sensor sensitivity. The type of sensors connected to the Weigh II determines the required gain. For example, for a nominal excitation output of 12 volts, the reference voltage is one quarter of the excitation voltage, or 3 volts. At a gain of 1, the A/D converter spreads 2,097,152 counts over a range of  $\pm 3$  volts. A gain of 2 spreads the counts over a range of  $\pm 1.5$  volts, doubling the sensitivity. A gain of 4 spreads the counts over a range of  $\pm 0.75$  volts, doubling the sensitivity again, etc.

The factory default setting is 2 because Kistler-Morse sensors operate within the  $\pm 1.5$  volt range. For other sensors, you can select from *1*, *2*, *4*, *8*, *16*, *32*, *64*, and *128* for the *Gain*.

The value for Gain is modified while in the menu tree for *any* channel and applies to *all* of the channels in the system.

## Dflt

This function is used to:

- reset all parameters to default values for a specific channel (does not reset parameters that apply to all channels such as resolution, gain, etc.), or
- set default parameters for a specific channel if you add a multi-point PCB to a Weigh II which you originally purchased as a single-point system.

To default a channel, it must first be enabled (see the *Enab* Menu).

The *Dflt* display shows:

```

  _____
 | DEFAULT CHANNEL 1 |
 | Yes                | No
 |_____             |_____
  F1   F2   F3
  
```

Pressing the F1 Key defaults the channel. Pressing the F3 Key exits the menu without defaulting the channel. Pressing the Up and Down Arrow Keys cycles the display through the other channels.

## Filter

Vibrations in a vessel can cause changes in the Weigh II's weight display, even though no material is moved, because the vibrations affect the vessel's structural response.

The *Filter* function, which is trademarked as Kistler-Morse's **Sentry™**, helps to reduce the display changes that can result from vibration. The principle behind the filtering follows.

The ADC converter digitizes the signal coming from a sensor. The Weigh II picks the first signal as a reference median; this is the value that is used in calculating the displayed weight for vessel monitoring. As shown in Figure 7-2, the Weigh II then compares following signals to the reference median, and recalculates the reference median when either of the following happen:

- the number of successive signals above or below the median exceeds a triggering number
- a signal falls outside of a user-defined window around the reference median

When the Weigh II recalculates the reference median, the displayed weight changes to correspond to the new reference median. Note that the *Filter* function affects setpoints, current output, and serial output as well as the vessel monitoring display.

*Filter* has four submenus:

### Enable

Enable turns the filter function on and off. The default is *Off*.

### Step

*Step* is a window of equal counts above and below the reference median. As shown in Figure 7-2, example 1, if a large signal change is detected that falls outside of the window, the Weigh II immediately moves the location of the reference median to that point. This allows the Weigh II to adjust quickly to rapid material movement in the vessel.

### Qlfy

*Qlfy* is the triggering number of successive signals above or below the median signal value, but within the *Step* window. In example 2 shown in Figure 7-2, *Qlfy* is 3. When the third successive signal above the median value (but within the *Step* window) is detected, the Weigh II moves the location of the median value to that point (or a percentage of the distance from the old median as determined by *DSPfact*). This allows the Weigh II to respond to definite trends in weight changes.

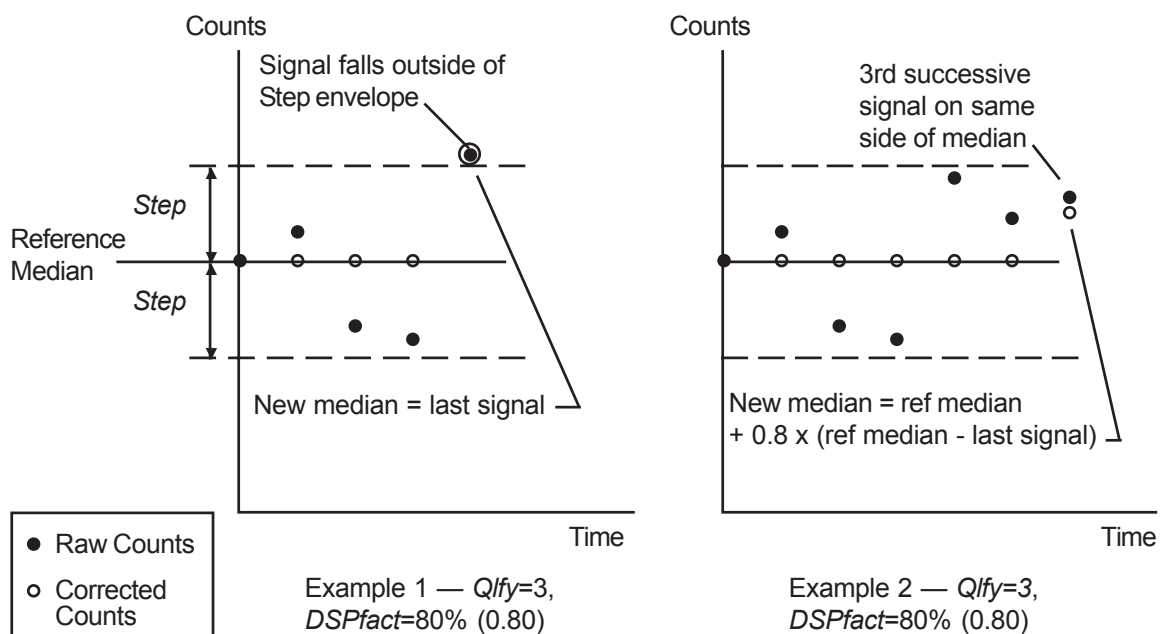


Figure 7-2. Filter Function Examples

## DSPfact

*DSPfact* determines the magnitude of change from the old reference median to the new reference median, for change triggered by the *Qlfy* parameter. In example 2 in Figure 7-2, the Weigh II moves the reference median 80% of the distance from the old median to the last signal (which triggered the change), based on a *DSPfact* of 80%. A value of 100% sets the new median to the last signal value; a value of 50% sets the new median halfway between the old median and the last signal value. Note that *DSPfact* does not affect the change caused by a signal falling outside of the *Step* window, as shown in example 1 in Figure 7-2.

## Trk

Tracking provides the ability to reject sensor drift and other related long-term errors while preserving the displayed weight's stability and accuracy. Discrimination between material movement and sensor drift is accomplished by calculating the rate of change of the sensor input signal every ten seconds, and comparing this rate to a user-defined threshold rate. The Weigh II stops tracking when the rate of change exceeds the threshold rate, indicating that material is actually moving. Additionally, discrimination between slow material loss (such as from a leak in the vessel) or gain and sensor drift is accomplished by comparing the total drift to a

user-defined limit. The Weigh II limits the maximum correction to this user-defined limit, so that the tracking function does not mask real material losses or gains. There are two aspects to the Weigh II's tracking function: zero tracking and material tracking.

Zero tracking establishes a user-defined window around the voltage associated with zero live load, as shown in Figure 7-3. When the raw voltage falls inside of the window (usually indicating a negligible amount of material in the vessel) and the rate of change is below the threshold rate, the corrected voltage and counts remain constant as those associated with zero live load, and the displayed weight remains at zero. The correction is done by the algebraic addition of a correction offset value to the output of the A/D converter. If the raw voltage falls outside the window on the negative side, the Weigh II resets the zero calibration point to that raw voltage, and sets the window around the new zero calibration point. Unlike the *Zclmp* function (see Chapter 4, Display), zero tracking affects setpoints, current output, and serial output as well as the vessel monitoring display.

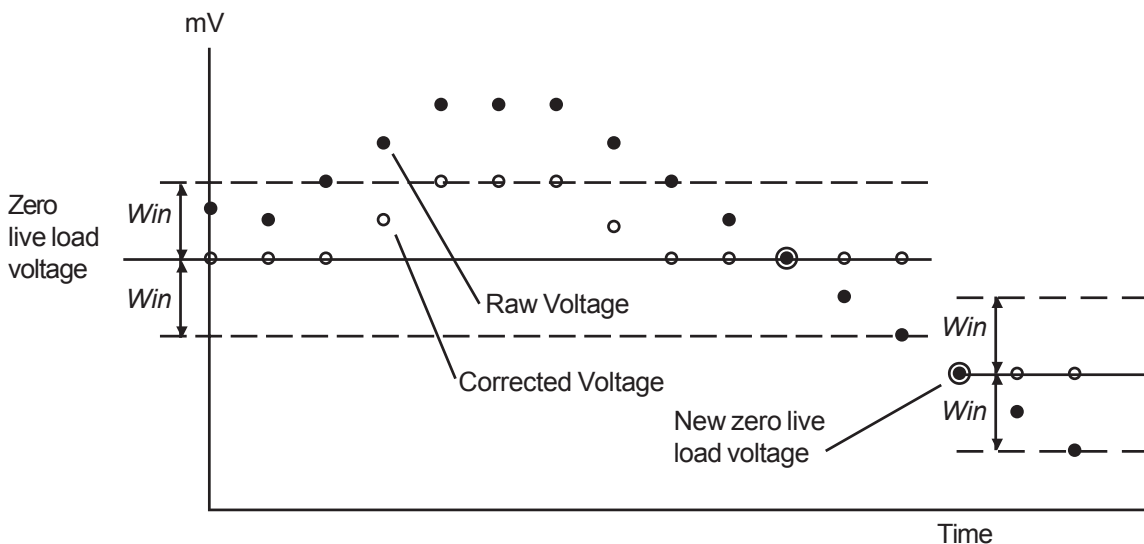


Figure 7-3. Zero Tracking Function Example — Rate of Change Less than Rate Threshold, and Material Tracking Off

Material tracking establishes a reference when material movement within a vessel has become stable (rate of change is below the threshold) during filling and batching processes, as shown in Figure 7-4. This reference is then used to maintain and hold steady the outputs. When the raw voltage falls within the Drift Limit (*DLim*), the corrected voltage and counts remain those associated with the reference weight. The correction is done by the algebraic addition of a correction offset value to the output of the A/D converter. The maximum correction offset is limited to the *DLim* value (plus or minus). Material tracking affects setpoints, current output, and serial output as well as the vessel monitoring display.

The user can utilize tracking in any of the following combinations:

- No zero or material tracking
- Zero tracking only
- Material tracking only
- Zero tracking and material tracking

*Trk* has six submenus:

### Win

This function sets the maximum plus or minus offset value for zero tracking. If the minus offset value is exceeded, the Weigh II resets the zero calibration point. The default value is .00 mV — at this default value, zero tracking is turned off.

### Matrl

This function turns material tracking on and off. The default is *Off*.

### Rate

This function sets the threshold rate in  $\mu\text{V}/\text{sec}$  for both zero and material tracking. When the rate of change in the voltage exceeds this value, indicating that material is actually moving, the Weigh II stops tracking until the rate of change again falls below this value. The default rate is  $\pm 5.0 \mu\text{V}/\text{sec}$ .

### Dflt

This function resets the zero and material tracking parameters to the factory-set default values.

### DLim

This function sets the maximum plus or minus offset value for material tracking. The default value is  $\pm 5.00 \text{ mV}$ .

### Mon

This function is a monitor only function. It displays the current rate of change in the voltage.

---



---

## Setpt

---



---

This menu allows you to turn the setpoint relays on and off for test purposes. The Weigh II displays a warning that the automatic control of the setpoints assigned to the currently selected channel is transferred to manual control, and requests verification that that is what you want to do.

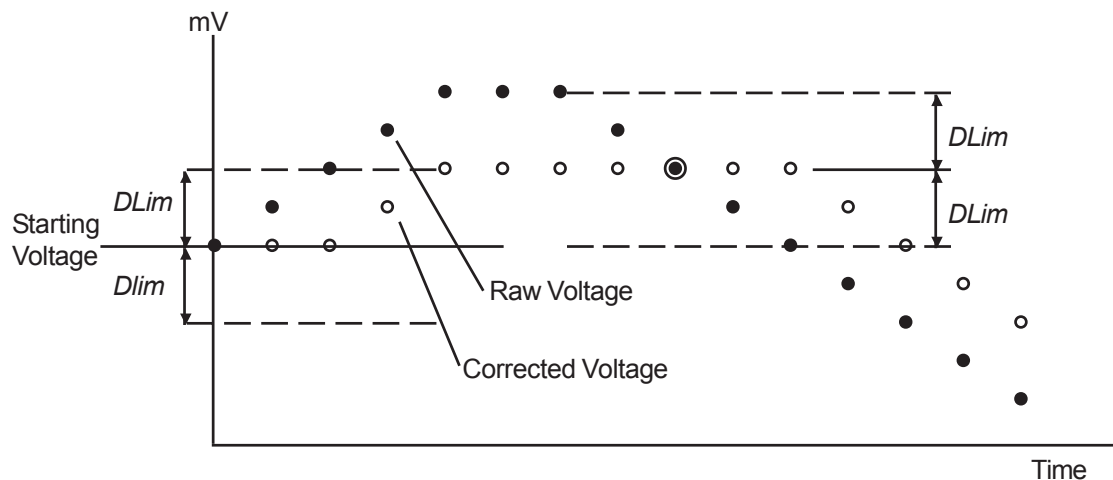


Figure 7-4. Material Tracking Function Example — Rate of Change Less than Rate Threshold



**CAUTION**

Manually activating setpoint relays may cause damage if control equipment is connected. Disconnect control equipment before proceeding.

A typical setpoint test display looks like this:

```

SP 02 :SL 02:Ch2
TOGGLE STATE>ON
F1   F2   F3

```

- *SP 02* is the current setpoint reference number (referred to as SP2 when you added it in the *I/O* Menu).
- *SL 02* is the slot number of the setpoint PCB.
- *Ch2* is the channel number of the setpoint on the setpoint PCB. Each setpoint PCB has eight individual channels.
- *On* indicates the current On/Off status of the setpoint. Pressing the F1, F2, or F3 Key toggles the setpoint between *On* and *Off*.

Pressing the Up and Down Arrow Keys or the Enter Key toggles the display between the setpoints for the current vessel.

Pressing the Esc Key or Auto/Man Key terminates the test. Once the test is terminated, the setpoints return to automatic control.

---

## 4/20

---

This menu allows you to calibrate the 0/4 and 20 mA outputs to the device that is receiving the current output. It also allows you to set the current output to specific values for test purposes. The *4/20* Menu has two submenus:

### *ladj*

This menu is used to manually assign counts-to-milliamps outputs for 0 mA, 4 mA, and 20 mA outputs to calibrate to another device. Follow this procedure:

1. Put the Weigh II in the Manual Mode, go to the *Main* Menu, the *Service* Menu, the *4/20* Menu, and then the *ladj* Menu. The display shows:

```

CURRENT CHAN#: 1
Next  Back  Select
F1   F2   F3

```

2. *Next* (F1) scrolls the display forward through all the current channels. *Back* (F2) scrolls the display backward through all the current channels. Scroll to the desired current channel using the F1 or F2 Key.
3. Press the F3 Key to access *Select*. The display shows:

```

SELECT CAL POINT
0mA  4mA  20mA
F1   F2   F3

```

### Note

If you have set up 4-20 mA output, the Weigh II ignores anything you enter for 0 mA. Similarly, if you have set up 0-20 mA output, the Weigh II ignores anything you enter for 4 mA.

4. Press a Function Key (F1, F2, or F3) to assign counts to the associated current output. If you select F1 (0 mA), the display looks like this:

```

0mA CAL POINT
>          X cnt
F1   F2   F3

```

5. Use the keypad or the Up and Down Arrow Keys to change the counts if desired. Press the Enter Key to save the value in memory. The display flashes a message acknowledging your selection and returns to:

```

SELECT CAL POINT
0mA  4mA  20mA
F1   F2   F3

```

6. If desired, repeat Steps 4 and 5 for the other current output, and repeat Steps 2 through 5 for other current channels.

## Test

This function allows manual activation of current output channels outside of normal control. The system issues a warning that the automatic control of current outputs assigned to the currently selected channel is transferred to manual control, and requests verification that that is what you want to do.

**CAUTION**

Manually activating current output can cause damage if control equipment is connected. Disconnect control equipment before proceeding.

After the warning message, if more than one 0/4-20 has been assigned for this vessel, a selection of the two 0/4-20 channels is offered. After you select a 0/4-20 channel, a typical 0/4-20 Test function display looks like this:

```

  |-----|
  |  lout02: SL 03: Ch2  |
  |-----|
  | >04mA : More  Less  |
  |-----|
  | F1   F2   F3       |
  |-----|
  
```

- *lout02* is the current 0/4-20 channel reference number. All actions performed are with respect to this number.
- *SL 03* is the slot number of the 0/4-20 PCB.
- *Ch2* is the channel number on the 0/4-20 PCB. Each 4-20 PCB has eight multiplexed current output channels.
- *04mA* is the current that is being sent to the 0/4-20 channel being tested. If the current mode is 0-20mA, the test current output ranges from 0 mA to 20 mA in 2 mA steps. If in the 4-20mA mode, the test current output ranges from 4 mA to 20 mA in 2 mA steps.
- *More* or *Less* refers to the increase (*More*) or decrease (*Less*) of the output. Pressing the F2 Key increases the output in 2 mA steps. Pressing the F3 Key decreases the output in 2 mA steps.

Pressing the Esc Key or Auto/Man Key terminates the function. Once the test is terminated, the current outputs return to automatic control.

---

## Micro

---

This menu allows you to clear the user-defined 16-character channel ID, test the keyboard, print setup information for each vessel, test the nonvolatile RAM, and reset the nonvolatile RAM to default parameters. It has the following submenus:

### *IDrst*

This function resets the user-defined ID for **all** channels. After this function is used, the top line of the display while in vessel monitoring will show only the factory-set channel ID number.

## KeyT

This function displays the number of the last key that was pressed. Table 7-2 lists all the keys on the Weigh II keypad and their corresponding reference numbers.

## Prnt

This function prints setup information for every enabled vessel. Included are calibration parameters, linearization parameters, setpoint parameters, and current output parameters.

## RamT

This function performs an internal, nondestructive test on the non-volatile RAM (NVRAM) on the Microprocessor PCB. This test does not reset any parameters. Upon completion of the test, the display should say *Micro NVRAM Test Passed!* If it does not, contact Kistler-Morse. When the test is complete, press the Esc Key to return to the *Micro* Menu.

Key	Ref#	Key	Ref#
1(STU)	01	Menu	13
2(VWX)	02	F1	14
3(YZ)	03	F2	15
4(JKL)	04	F3	16
5(MNO)	05	*Esc	17
6(PQR)	06	*Auto/Man	18
7(ABC)	07	(Up Arrow)	19
8(DEF)	08	(Down Arrow)	20
9(GHI)	09	Tare/Net/Gross	21
0(Space)	10	↵	22
. (Period)	11	Shift	23
- (Minus)	12	Enter	24
*Note: Pressing these keys will exit the <i>KeyT</i> function.			

Table 7-2. List of Keys and Corresponding Reference Numbers

## RsRAM

This function resets the non-volatile RAM (NVRAM) on the Microprocessor PCB. This resets **all** parameters to the factory-set default values (i.e., calibration parameters, setpoint parameters, display parameters, etc.). The Weigh II requires you to enter the KM Service Code (9010) to access this function (unless you have already entered it during this Manual Mode session), and requests verification before it resets the NVRAM, to prevent accidental reset of the NVRAM.

---

## Access

---

This menu allows you to:

- set a user-defined access code
- input the KM Mfg Code, which is needed when performing certain troubleshooting functions.

Access has two submenus:

### User

The Weigh II arrives from the factory without a user-defined access code in place, allowing the user to access any function (other than those requiring KM Mfg Code or KM Service Code) in the system at will. The *User* function allows you to set up a code to limit access to changing **any** system parameter (i.e., display parameters, setpoint parameters, calibration parameters, etc.). Once a User Code is in place and activated, your operator(s) will be able to go into the menu tree to view parameters, but will not be able to change parameters without entering the code.

#### Note

Record the access code and store it in a safe place. If misplaced, call Kistler-Morse for instructions on how to bypass the code.

Follow this procedure to set up an access code.

1. If the Weigh II is in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the system in Manual Mode. The Auto LED turns off.

2. Press the Menu Key to display the *Main* Menu. The display shows:

```

WII MAIN MENU
Disp  I/O  Cal→
F1    F2    F3
  
```

3. Press the Menu Key again to access the second page of the *Main* Menu. The display shows:

```

WII MAIN MENU
Service→
F1    F2    F3
  
```

4. Press the F1 Key to access the *Service* Menu. The display shows:

```

SERVICEROUTINES
ADC  SetPt  4/20→
F1    F2    F3
  
```

5. Press the Menu Key to access the second page of the *Service* Menu. The display shows:

```

SERVICEROUTINES
Micro      Access→
F1    F2    F3
  
```

6. Press the F3 Key to go to *Access*. The display shows:

```

ACCESS FUNCTIONS
User      KM
F1    F2    F3
  
```

7. Press the F1 Key to go to the *User* display. The display looks like this:

```

ACCESS NUMBER
>          0000
F1    F2    F3
  
```

8. Use the keypad to enter a one-, two-, three-, or four-digit number. Press the Enter Key when done entering the number. The display flashes a message acknowledging the entry and returns to:

```

ACCESS FUNCTIONS
User      KM
F1    F2    F3
  
```

9. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return the display to vessel monitoring.

The Access Code is 'activated' when you leave the Manual Mode. Upon returning to the Manual Mode and reentering the menu tree, you will be prompted to enter the code if you attempt to change a system parameter. But, you will be prompted to enter the code only

the *first* time you attempt to change a system parameter within one Manual Mode session (i.e., you will only need to enter the code once per Manual Mode session, regardless of the number of parameters you change and channels you access).

## ***KM***

The Weigh II has two factory code numbers. Certain troubleshooting functions require one of these code numbers be entered before access to the function is permitted. The Service Code was described earlier in this chapter, and is entered when prompted by the display. The Mfg Code is entered when in the Access Menu, as described below:

### **KM Mfg Code**

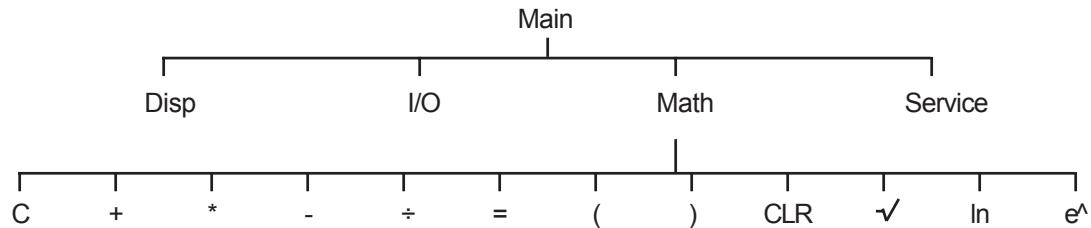
The KM Mfg Code is required to access hidden menus, which are typically only used by Kistler-Morse personnel for troubleshooting and testing the equipment. The KM Mfg Code also allows the user to change values in the Service Menu. The KM Mfg Code number is:

9111

This number is entered when in the *KM* function under the Access Menu. Once the number is entered, you have access to all functions and hidden menus that require the code, while you remain within the Manual Mode (i.e., you will only need to enter the code once per Manual Mode session, regardless of the number of functions and channels you access).

The KM Mfg Code has precedence over the KM Service Code. If you enter the KM Mfg Code in the *KM* function under the Access Menu, the Weigh II will not require you to enter the KM Service Code when you change values in the Service Menu.

# Chapter 8. Math Channels



*Note:* *Math* comes up in the *Main* Menu if you scrolled to a math channel while vessel monitoring. If the channel is a vessel monitoring channel, the menu tree shows *Cal* in place of *Math*.

Figure 8-1. The Math Channel Menu Tree

## Introduction

The *Math* Menu is used to perform math calculations on the weight results from the channels associated with vessel monitoring. The calculated value can be displayed on the Weigh II while monitoring a math channel, in both Auto and Manual Modes. And, just like for a vessel monitoring channel, the calculated value from a math channel can have setpoint and current outputs associated with it.

As shown in Figure 8-1, the *Math* Menu includes 12 math functions. These functions can be used to process the vessel monitoring results in many ways. A few typical uses of the math channels follow:

- Add together or calculate the average for the weight from multiple vessels to provide information on the total inventory of a product stored in several vessels
- Convert the data from a vessel into another set of units, such as converting a weight in pounds into a level in feet, to provide additional information on the vessel contents

When in the *Math* Menu, the display shows the math equation on the top line and the available functions on the bottom line.

For a single-point Weigh II (equipped to monitor only one vessel), there are seven channels available for math calculations. For a multi-point Weigh II (equipped to monitor up to four vessels), there are four channels available for math calculations.

This chapter covers the use of the *Math* Menu. The chapter includes:

- Explanation of each of the math functions and the keyboard functions
- Rules for inputting equations
- Detailed navigation procedures for enabling a math channel
- Detailed navigation procedures for setting up a math channel, using an example average weight calculation
- Explanation of compile error and run time error codes

## Math Channel Functions

### Menu Functions

- C** Identifies a specific channel in the equation. C must be immediately followed by a channel number (for example, C5 indicates the channel with factory-set ID# 5). The channel numbers can range from 1 to 8. All equations must start with the current channel designation and an equal sign (for example, C5= must be the start of the equation when you are in channel 5). When a channel number appears to the right of the equal sign, it tells the Weigh II to put the value from that channel (the weight from a vessel monitoring channel or the calculated value from a math channel) in the equation.
- +** Addition function. Adds the value to the right of the sign to the value to the left of the sign.
- \*** Multiplication function. Multiplies the value to the right of the sign by the value to the left of the sign.
- Subtraction function. Subtracts the value to the right of the sign from the value to the left of the sign.
- ÷** Division function. Divides the value to the left of the sign by the value to the right of the sign.
- =** Equals function. Places the value from the entire equation to the right of the sign in the channel designated to the left of the sign. All equations must start with the current channel designation and an equal sign (for example, C5= must be the start of the equation when you are in channel 5).
- (** Left parenthesis function. Used with right parenthesis to group math functions together.
- )** Right parenthesis function. Used with left parenthesis to group math functions together.
- CLR** Clear function. Clears the entire displayed formula from memory.
- √** Square root function. Takes the square root of the value to the right of the sign.

**ln** Natural log function. Takes the natural log of the value to the right of the function.

**e<sup>^</sup>** Inverse natural log. Takes the inverse natural log of the value to the right of the function.

### Keyboard Functions

- Up Arrow** Scrolls to the left through the equation (Weigh II can only display 16 characters in the equation at a time, and the scroll function allows you to view equations that have more than 16 characters).
- Down Arrow** Scrolls to the right through the equation.
- ←** Deletes the character to the left of the cursor.
- Enter** Stores the current formula in memory.

## Equation Limitations

Following are the limitations on the equations put into the math channels:

- A single equation can be up to 40 characters in length. A character is a number, a decimal point, or a function from the *Math* Menu. The example equation below contains 9 characters:  
C5=C1+10.
- A single equation can contain a maximum of 3 constants (a constant is a numerical value, such as 1000).
- A constant can have a maximum of 11 characters.
- Equations cannot contain any spaces between characters. The example below shows an incorrect and a correct equation:  
*Incorrect* (contains spaces)  
C5 = C3 + C4 + C6  
*Correct* (no spaces)  
C5=C3+C4+C6
- The Weigh II interprets equations using

standard math rules regarding order of operations. If you are unsure of how to apply these rules, use parentheses to ensure that the Weigh II is calculating what you want it to calculate.

- The maximum value that a math channel can display is limited to six active digits; if the calculated value exceeds this maximum, an error message will appear when monitoring the channel. To prevent this error, scale down the value from the equation using the divide function. Note that the magnitude of the maximum value is dependent on the *Form* selected for the channel (see Chapter 4, Display, for selecting the *Form*).

Equations containing more than 40 characters or more than three constants can be created by putting additional math channels on-line. These additional channels can be used to calculate intermediate results used by the math channel. The channels used to calculate the intermediate results can be hidden from the display by using the *Hide* function in the *Disp* Menu. The example below shows an incorrect equation with more than three constants and the use of multiple math channels to create a correct equation.

*Incorrect* (contains more than 3 constants)

$$C5=10*C3+100*C2+1000*C4+10000*C1$$

*Correct*

$$C6=10*C3 \text{ (hide this channel)}$$

$$C5=C6+100*C2+1000*C4+10000*C1$$

## Enabling a Math Channel

1. If the Weigh II is in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the system in Manual Mode. The Auto LED turns off.

### Note

It does not matter what channel the Manual Mode is in when you go into the menu tree to enable channels.

2. Press the Menu Key to display the *Main* Menu. The display shows:

```

WII MAIN MENU
Disp  I/O  Cal →
F1    F2    F3
  
```

3. Press the Menu Key again to show the second page of the *Main* Menu. The display shows:

```

WII MAIN MENU
Service →
F1    F2    F3
  
```

4. Press the F1 Key to access *Service*. The display shows:

```

SERVICE ROUTINES
ADC  SetPt  4/20→
F1    F2    F3
  
```

5. Press the F1 Key to access *ADC*. The display shows:

```

ADC FUNCTIONS
Disp  Enab  AdjEx→
F1    F2    F3
  
```

6. Press the F2 Key to access *Enab*. The display looks like this:

```

CHANNEL X
On*           Off
F1    F2    F3
  
```

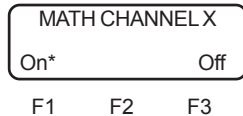
7. Use the Up and Down Arrow Keys to scroll to the math channel you want to enable. When you get to a math channel, the display looks like this:

```

MATH CHANNEL X
On           *Off
F1    F2    F3
  
```

An asterisk indicates the current selection.

8. Press the F1 Key to turn the selected math channel *On*. The display shows:



An asterisk indicates the current selection.

9. Press the Esc Key to scroll up the menu tree (repeating Steps 6, 7, and 8 as desired to enable additional math channels) or press the Auto/Man Key to return the display to vessel monitoring.

**Note**

The math channel(s) is now enabled, but you are still in the menu tree for another channel. You need to switch channels while vessel monitoring in Manual Mode to access the math channel to set it up or to view a previously entered equation.

## Setting up a Math Channel

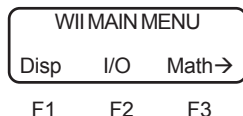
**Note**

You must enable the math channel, as described above, before you set it up.

The example below shows how to set up the math channel to calculate the average of the weights from four vessels. The equation used in the example is:

$$C5=(C1+C2+C3+C4)\div 4.0$$

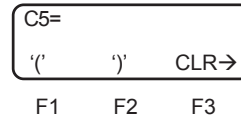
1. If the Weigh II is in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the system in Manual Mode. The Auto LED turns off.
2. Use the Up Arrow or Down Arrow Key to scroll to the desired math channel. Note that for a single-point system, channels 2 through 8 are available for math channels. For a multi-point system, channels 5 through 8 are available for math channels.
3. Press the Menu Key to display the *Main* Menu. The display shows:



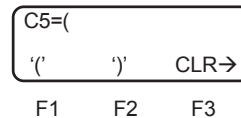
4. Press the F3 Key to access the *Math* Menu. The display shows:



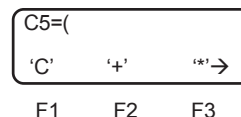
5. Press the Menu Key two times to access the third page of the Math Menu. The display shows:



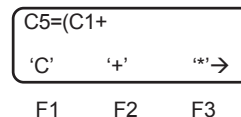
6. Press the F1 Key to select (. The display shows:



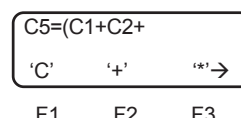
7. Press the Menu Key two times to access the first page of the Math Menu again. The display shows:



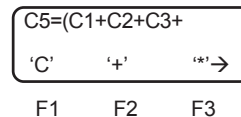
8. Press the F1 Key to select C. Press 1 on the keypad. Press the F2 Key to select +. The display shows:



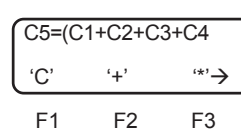
9. Press the F1 Key to select C. Press 2 on the keypad. Press the F2 Key to select +. The display shows:



10. Press the F1 Key to select C. Press 3 on the keypad. Press the F2 Key to select +. The display shows:



11. Press the F1 Key to select C. Press 4 on the keypad. The display shows:





12. Press the Menu Key two times to access the third page of the Math Menu. The display shows:

C5=(C1+C2+C3+C4		
'(	)'	CLR→
F1	F2	F3

13. Press the F2 Key to select ). The display shows:

5=(C1+C2+C3+C4)		
'(	)'	CLR→
F1	F2	F3

Notice that the display has started to scroll — the C on the far left is not visible because of space limitations.

14. Press the Menu Key three times to access the second page of the Math Menu. The display shows:

5=(C1+C2+C3+C4)		
'.'	'÷'	'=→
F1	F2	F3

15. Press the F2 Key to select ÷. Press 4.0 on the keypad. The display shows:

1+C2+C3+C4)÷4.0		
'(	)'	CLR→
F1	F2	F3

16. The entire equation is now input. Use the Up and Down Arrow Keys to scroll through the equation to ensure that you entered it correctly. Use the ⇐ Key to back up the cursor to correct any entries. After you have checked the equation, press the Enter Key to save the equation in memory. If the equation does not have any compile errors, the display flashes a message acknowledging *Script Compile Successful* and returns to:

WII MAIN MENU		
Disp	I/O	Math→
F1	F2	F3

17. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return the display to vessel monitoring.

Channel 5 will now display the average of the weights in vessel 1 through 4. You can assign setpoints and current outputs for Channel 5 in the same manner as for a vessel monitoring channel.

## Error Messages

If you make an error inputting an equation in a math channel, the Weigh II will respond in one of two ways:

- After you input the equation and press the Enter Key, the Weigh II will not be able to compile the equation, and will respond with a compile error code.
- After you input the equation and press the Enter Key, the Weigh II will respond with *Script Compile Successful*. However, when you switch to vessel monitoring for the math channel, the Weigh II will not be able to perform the calculation and will respond with a run time error code.

### Compile Error Codes

A brief explanation is provided of the possible cause for each error code. Suggestions for correcting the error are included where applicable.

1 — Equal sign not found after math channel number.

2 — Equation exceeds maximum number of characters allowed (40).

*Solution:* Simplify equation or break it up into multiple equations, using multiple math channels.

3 — Equation exceeds maximum number of constants allowed (3) **OR** a constant includes more than the maximum number of characters allowed (11).

*Solution:* Simplify equation or break it up into multiple equations, using multiple math channels.

4 — Incorrect channel ID assigned to this channel (for example, the equation says C5=, but you are in channel 6).

5 — Object buffer pointer exceeds maximum limit.

*Solution:* Simplify equation or break it up into multiple equations, using multiple math channels.

6 — Parenthesis mismatch (i.e., the number of left and right parentheses are not equal).

7 — All data registers are used up, insufficient memory is available for this channel.

*Solution:* Simplify equation or break it up into multiple equations, using multiple math channels.

8 — Equation includes spaces between characters.

9 — Equation tries to take a square root of a negative number (i.e., square root of -4).

## **Run Time Error Codes**

A brief explanation is provided of the possible cause for each error code; suggestions for correcting the error are included where applicable.

1 — Equation tries to divide by zero.

2 — Equation tries to take a square root of a negative number that is calculated as part of the equation (i.e., square root of (8-12)).

3 — Equation tries to take a natural log (ln) of a negative number or of 0.

4 — Result from intermediate channel being input into this channel is too large.

*Solution:* Correct and/or scale the equation for the intermediate channel.

5 — Result is too large to display.

*Solution:* Modify the *Form* for the math channel (see Chapter 4, Display) and/or scale the result by using the divide function.

# Appendix A. Product Specifications

## Integral Display and Operator Interface

<b>Display:</b>	Large, alphanumeric liquid crystal; two lines of 16 characters, each line independent; user programmable IDs; selectable bar graph or engineering units format. Optional backlight available
<b>Data Entry:</b>	Integral 24-key alphanumeric sealed membrane tactile keypad
<b>Setup:</b>	Menu-driven prompts
<b>Memory:</b>	NVRAM (non-volatile RAM)
<b>Serial Communications:</b>	RS-422 or RS-485 (optical isolation standard) Baud Rate: 1200, 2400, 4800, 9600, or 19,200
<b>Input:</b>	

**Transducers/Sensors:** All Kistler-Morse half-bridge, full-bridge foil gage

**Excitation:** Programmable between 5 and 12.5 volts @ 114 mA per channel

**Resolution:** Selectable 16 bit (1 part in 65,536) to 21 bit (1 part in 2,097,152)

**Conversion Speed:** Single Vessel System: 16 bit—25 mSec, 19 bit—125 mSec, 21 bit—512mSec; Multi-Vessel Scanner Card (per channel): 16 bit—76 mSec, 19 bit—376 mSec, 21 bit—1.535 Sec

**Span:** Programmable between  $\pm 3.0V$  @ 12 V excitation, Gain = 1;  $\pm 19.5$  mV @ 10V Excitation, Gain = 128

**Temperature Stability:** Zero 1 ppm/°C; Span 5 ppm/°C

**Common Mode Rejection:** 92 db min @ DC; 150 db min at 60 Hz

**Normal Mode Rejection:** 100 db min @ 60 Hz

## Option Cards

**Input card:** 4 vessel input card

**PLC Interface Option:** Allen-Bradley RIO - 32 channel block transfer, 6 channel discreet transfers; Profibus-DP Slave

**Relay Output option:** Form "C" SPDT, programmable, 10 A 110 VAC, 8 A 230 VAC non-inductive, 10 A 30 VDC; available as plug in modules of 2, 4, 5, and 8 relays each (2&4 are Combi-cards)

**4-20mA Output Option:** Isolated 600 ohms maximum or externally powered to 1000 ohms, 12 bit resolution; available as plug in modules of 1, 2, 4, and 8 outputs with common isolation; must be installed in third option slot

**Combi-Card option:** On combi-card per unit; combinations are 2 relays, 1 current; 4 relays, 1 current; 2 relays, 2 currents; or 4 relays, 2 currents

\*A maximum of three plug-in option cards can be added

## Electrical

**DC Power:** 24 V  $\pm$  10% 2A

**AC Power:** 100 VAC  $\pm$ 10% 50/60 Hz; 115 VAC  $\pm$ 10% 50/60 Hz; 230 VAC  $\pm$ 10% 50/60 Hz 35 VA

## Environmental

**Operating Temperature.** 32° to 122° F (0° to 50° C)

**Enclosure:** NEMA 4X fiberglass reinforced polyester (FRP), NEMA 4X stainless steel

**Humidity:** 1% to 95% (non-condensing)

**Storage:** -4° to 140° F (-20° to 60° C)

## Physical

**Dimensions:** Polycarbonate: 12.0 in. (305 mm) x 10.75 in. (273 mm) x 5.62 in. (143 mm)

**Weight:** 20 lbs (9 kg)



# Appendix B. Summary of Commands Used When Vessel Monitoring — Hot Keys

This Appendix contains a summary of the keyboard functions (hot keys) you can use when vessel monitoring.

- **Switch from Auto Mode to Manual Mode or vice versa —**  
Press the Auto/Man Key (Auto LED illuminates when the Weigh II is in Auto Mode).
- **Scroll through the Channels when in Manual Mode —**  
Press the Up Arrow or Down Arrow Key.
- **Tare the Vessel —**  
Press the Shift Key (Shift LED illuminates when the Shift Key is on). Then, press the Tare/Net/Gross Key.
- **Switch from Gross Weight to Net Weight or vice versa —**  
Make sure the Shift Key is off (Shift LED is not illuminated). Then, press the Tare/Net/Gross Key.
- **Switch from Numerical display to Bar Graph display or vice versa for a particular channel —**  
If you set up the bargraph (see Chapter 4, Display), press the Enter Key while in the Manual Mode to toggle between numerical display and bar graph display.
- **Enable or Disable the *Hide* function —**  
Press the Shift Key (Shift LED illuminates). Then, press the “9” Key.
- **View Factory-Set ID —**  
If you input a customer-defined ID but want to see the factory-set ID for a channel, press the Esc Key while in the Manual Mode.
- **View Serial Address for a channel —**  
Press the Esc Key while in the Manual Mode.
- **Display Current Weigh II Software Revision letter and Date of Release —**  
Press the “.” Key briefly while in the Manual Mode.



# Appendix C. Serial Commands

## Introduction

This appendix contains the serial commands and protocol syntax used for serial communications between the host or Master (PC, MVS, etc.) and the Weigh II. Detailed explanations and examples of the commands are included.

## Command Table

Command		Function	Transmitted by Master to Weigh II	Received by Master from Weigh II
Hex	ASCII			
23	#	KM product identification number	>aa#ssr	Addssr (A8068r for Weigh II)
57	W	Request engineering units (gross)	>aaWssr	A±dddddddssr
42	B	Request engineering units (net)	>aaBssr	A±dddddddssr
54	T	Tare addressed vessel	>aaTssr	Ar
75,31	u1	Request raw counts	>aa1sssr	Addddddssr

*Note:* See Table C-2 for definitions of the characters in the command strings.

Table C-1. Weigh II Serial Commands

---

Character	Definition
>	Start of message character
aa	Two-digit ASCII HEX character address of channel
d	One-digit ASCII decimal number data
dd	Two-digit ASCII decimal number data
dd..	Two-digit or more ASCII decimal number data
dd..dd	Multiple ASCII decimal numbers
hh	Two-digit ASCII HEX number, upper nibble, lower nibble
hh..hh	Multiple two-digit ASCII HEX numbers
ss	Two-digit ASCII HEX checksum of characters added between '>' or 'A' and checksum characters. See <i>Checksum Calculation</i> in this chapter for an explanation of how checksum is calculated. Note that the '?' character in place of the checksum characters is a wildcard and therefore ignores the checksum.
r	Carriage return (0x0D)
A	Acknowledge character (0x41)
N	Not acknowledge character (0x4E)
±	Normally indicates polarity. If an error is present, an 'X' displays with an error code (ASCII character) immediately following. Possible error codes and definitions are listed below: 1 — Unit disabled 6 — ADC overrange error 7 — Net or gross engineering unit overflow

*Table C-2. Definitions of Characters in Command Strings*



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## Checksum Calculation

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The one-byte checksum is calculated by adding the Hex values of all ASCII characters between the start of message character '>' or acknowledge character 'A' and the checksum character 'ss.' Overflows from the addition are ignored.

### Example:

#### **Request**

To request gross engineering units (such as weight) from a Weigh II, the command is:

```
>aaWssr
```

If the Weigh II's address is '3', the command is:

```
>03Wssr
```

Calculating the checksum 'ss' as the sum of the Hex values of all characters between '>' and 'ss':

```
03W ASCII = 30 Hex + 33 Hex + 57 hex = BA Hex
              '0'   '3'   'W'
```

Therefore, the ASCII string transmitted to the Weigh II is:

```
> 0 3 W B A CR
3E 30 33 57 42 41 0D Hex
```

#### **Response**

The response to a request for gross engineering units is:

```
A±ddddddssr
```

If the weight is +6384, the response is:

```
A+0006384ssr
```

Calculating the checksum 'ss' as the sum of the Hex values of all characters between 'A' and 'ss':

```
+0006384 ASCII = 2B Hex+30 Hex+30 Hex+30 Hex+36 Hex+33 Hex+38 Hex+34 Hex = 190 Hex
                '+'   '0'   '0'   '0'   '6'   '3'   '8'   '4'
```

Ignoring the overflow, the checksum is 90 Hex. Therefore, the ASCII string transmitted back to the master is:

```
A + 0 0 0 6 3 8 4 9 0 CR
41 2B 30 30 30 36 33 38 34 39 30 0D Hex
```

---



---

## Examples

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For each command below, the general format of the command is shown above the example.

### **‘#’ Command — KM Product Identification Number**

This command is sent by the master to request the Weigh II to send its KM product identification code (code is 80 for the Weigh II). For this example, the master requests the code from a Weigh II channel at address 01, which returns a code of 80 and a checksum of 68.

Request from Master	Response from Weigh II	
>aa#ssr	Addssr	<i>Format</i>
>01#84r	A8068r	<i>Example</i>

### **‘W’ Command — Engineering Units (gross)**

This command is sent by the master to request the Weigh II to send the gross engineering units (weight, level, etc.). For this example, the master requests the gross weight from a Weigh II channel at address 01, which returns a gross weight of +7103 and a checksum of 86.

Request from Master	Response from Weigh II	
>aaWssr	A±dddddddssr	<i>Format</i>
>01WB8r	A+000710386r	<i>Example</i>

### **‘B’ Command — Engineering Units (net)**

This command is sent by the master to request the Weigh II to send the net engineering units (weight, level, etc.). For this example, the master requests the net weight from a Weigh II channel at address 01, which returns a net weight of -4466 and a checksum of 91.

Request from Master	Response from Weigh II	
>aaBssr	A±dddddddssr	<i>Format</i>
>01BA3r	A-000446691r	<i>Example</i>

### **‘T’ Command — Tare Addressed Vessel**

This command is sent by the master to request the Weigh II to tare the indicated vessel. For this example, the master requests the tare for a Weigh II channel at address 01.

Request from Master	Response from Weigh II	
>aaTssr	Ar	<i>Format</i>
>01TB5r	Ar	<i>Example</i>

### **‘u1’ Command — Request Raw Counts**

This command is sent by the master to request the Weigh II to send the raw counts. For this example, the master requests the raw counts from a Weigh II channel at address 01, which returns a raw count of 1147226 and a checksum of 67.

Request from Master	Response from Weigh II	
>aau1ssr	Addddddssr	<i>Format</i>
>01u107r	A114722667r	<i>Example</i>

# Appendix D. Kistler-Morse Service and Warranty

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## Product Warranty

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A complete, unabridged copy of our product warranty is available upon request from Kistler-Morse. A summary of the warranty, *subject to the terms and conditions listed fully in the warranty*, follows:

Kistler-Morse warrants equipment of its own manufacture to be free from defects in material and workmanship for one year from date of shipment to original user. Kistler-Morse will replace or repair, at our option, any part found to be defective. Buyer must return any part claimed defective to Kistler-Morse, transportation prepaid.

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## Service

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Kistler-Morse maintains a fully trained staff of field service personnel who are capable of providing you with complete product assistance.

### Phone Consultation

Our Field Service staff provides the following services by telephone, via our regular and toll free number (toll free in USA and Canada only), *at no charge*:

- Technical, application, and troubleshooting assistance
- Spare parts assistance
- Warranty (replacement) assistance

### On-Site Consultation

Kistler-Morse's Field Service staff can provide additional services at your request. Contact Kistler-Morse for rate and scheduling information for the following services:

- Technical, application, startup, and troubleshooting assistance on-site
- Training on-site or at our corporate office
- Service calls
- Equipment updates to our latest configuration

General descriptions of some of these standard services follow. Of course, if your service needs vary from those described, we are available to discuss them with you.

### Installation, Startup Assistance, and On-Site Training

#### Notes

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1. For vessels to be instrumented with Microcells or L-Cells, the customer may contract to have Kistler-Morse install the sensors. For all other sensors and transducers, installation must be performed by the customer.
  2. Field wiring, conduit installation, junction box mounting, and signal processor mounting must be performed by the customer. The AC power must be connected to the signal processor, but not energized, prior to Kistler-Morse beginning work.
- 

All field wiring will be checked for errors. The system will be powered up and checked out for proper electrical operation. Calibration will be performed if actual material or weight devices can be moved. If it is not possible to move material, a pre-calibration will be performed. Recommendations for the optimal performance of the system will be provided.

On-site training will include simulation of the

calibration process (if calibration could not be performed while Kistler-Morse is on site) and instruction covering operation and maintenance of the system.

**Note**

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The sensor and junction box installation, wiring of the sensors to the junction boxes, startup assistance, and on-site training described above is included in the price for Kistler-Morse's *Silo Solution*, instrumenting skirt-supported vessels with L-Cells or Microcells.

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## Troubleshooting

Kistler-Morse will troubleshoot systems for mechanical, electrical, calibration, and wiring errors. Normal component repair and wiring errors will be corrected, including replacement of non-repairable printed circuit boards.

## Service Calls

Kistler-Morse will perform on-site repair/replacement services.

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## Return Material Authorization

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If a part needs to be sent to the factory for repair, contact Kistler-Morse and request a Return Material Authorization (RMA) number. The RMA number identifies the part and the owner and must be included with the part when it is shipped to the factory.

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## Address and Telephone Numbers

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**Kistler-Morse**

150 Venture Boulevard  
Spartanburg, SC 29306 USA

Phone: 864-574-2763

Toll Free (U.S.A. and Canada): 800-426-9010

Fax: 864-574-8063

This appendix not used at this time.



## ***Appendix F. Technical Drawings***

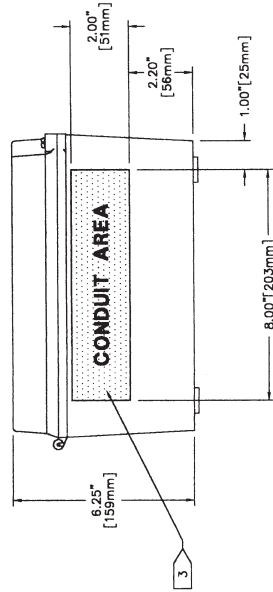
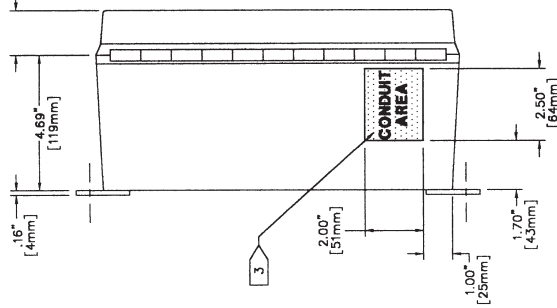
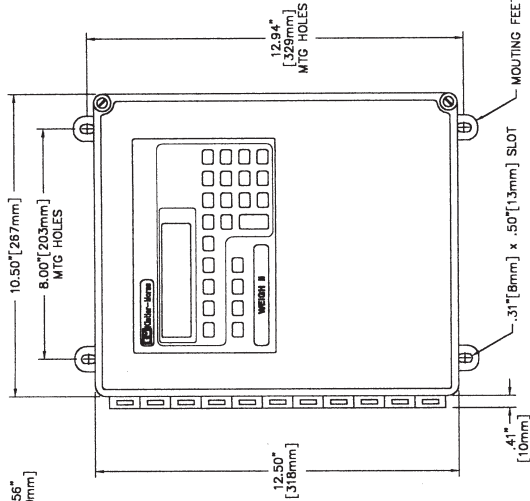
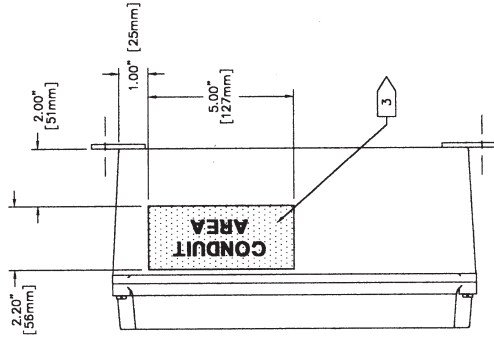
This appendix contains the following technical drawings for the Weigh II signal processor:

<b>Drawing No.</b>	<b>Drawing Title</b>
TI-SP.W2-01Rev A	Weigh II Enclosure Dimension and Installation Specifications
TI-SP.W2-02	Interconnect Diagram, Single Point, Weigh II
TI-SP.W2-03	Interconnect Diagram, Multi-Point, Weigh II
TI-SP.W2.CMB-01 Rev A	Wiring Diagram, Relay Setpt./4-20mA Output, Weigh II (AC)
TI-SP.W2.CMB-02 Rev A	Wiring Diagram, Relay Setpt./4-20mA Output, Weigh II (DC)
TI-SP.W2.XMIT-01	Wiring Diagram, 4-20mA Output Card, Weigh II (AC)
TI-SP.W2.RLY-01 Rev A	Wiring Diagram, Relay Output Card, Weigh II
TI-SP.W2.RTI-01	Wiring Diagram, Remote Tare, Weigh II





REVISIONS				
LTR	DESCRIPTION	CHECKED	APPROVED	DATE
New	Initial Release	--	S.A.S.	1/25/97
A	Per ECO #13294	W.Kornel	Exp. A	1/16/97



**NOTES: (UNLESS OTHERWISE SPECIFIED)**

- ENCLOSURE DOOR MUST BE CLOSED AT ALL TIMES AND UNUSED OPENINGS MUST BE SEALED TO MAINTAIN THE ENCLOSURE RATING.
- FOR MAXIMUM NOISE IMMUNITY, GROUNDED METAL CONDUIT AND FITTINGS (OR EQUIVALENT) ARE REQUIRED. SEAL ENCLOSURE CONDUIT ENTRIES WITH CONDUIT SEALS, OR PLUG CONDUIT ENTRY WITH APPROPRIATE SEALING COMPOUND. **CAUTION!** ALL SEALING COMPOUNDS MUST BE ELECTRICAL GRADE. SEALERS CONTAINING ACETIC ACID WILL DAMAGE THE ELECTRONICS. INSTALL ENCLOSURE ABOVE LOW POINT IN CONDUIT RUN.
- CONDUIT/CABLE PENETRATIONS AREAS ON BOTTOM/SIDE OF ENCLOSURES AS SHOWN. VERIFY FITTING CLEARANCES BEFORE DRILLING OPENINGS. USE THOMAS & BETTS CAT. NO. 370, 371, 372 (1/2", 3/4", 1") OR EQUIVALENT. WATERTIGHT CONDUIT HUBS. INSTALL HUBS ON CONDUIT AND TIGHTEN PROPERLY. THEN INSERT HUB IN ENCLOSURE OPENING AND INSTALL THE PROVIDED LOCKNUT INSIDE THE ENCLOSURE.
- THE CONDUIT CABLE ENTRY AREAS ARE PROVIDED AS A GUIDE TO ASSIST IN LOCATING ELECTRICAL FITTINGS ON THE ENCLOSURE. VERIFY THAT FITTING LOCKNUTS, WRENCH FLATS, BOSSES, etc... WILL NOT INTERFERE WITH THE ENCLOSURE LID, LATCHES, CLAMPS OR OPTION CARDS PRIOR TO DRILLING OPENINGS.
- MOUNT ENCLOSURE TO A STRUCTURE WHICH IS FREE FROM VIBRATION.

ECO ACCUMULATION:		APPROVALS		DATE		UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES	
ECO No. 1:		DRAWN:	Rev. M. Collins	1/30/97	DECIMAL	ANGULAR	
ECO No. 2:		CHECKED:			XXX	XXX	XXX
ECO No. 3:		PROJ. ENGR.:	Steve A. Smith	1/25/97	DO NOT SCALE DRAWING	SCALE	1:1
ECO No. 4:		PRODUCTION:			FINISH		
ECO No. 5:		PURCHASING:			USED ON: (REF ONLY)		
INAPPROPRIATE ABOVE ECOS							

**Kluter-Morse Corp.**  
 Bothell, WA 98011

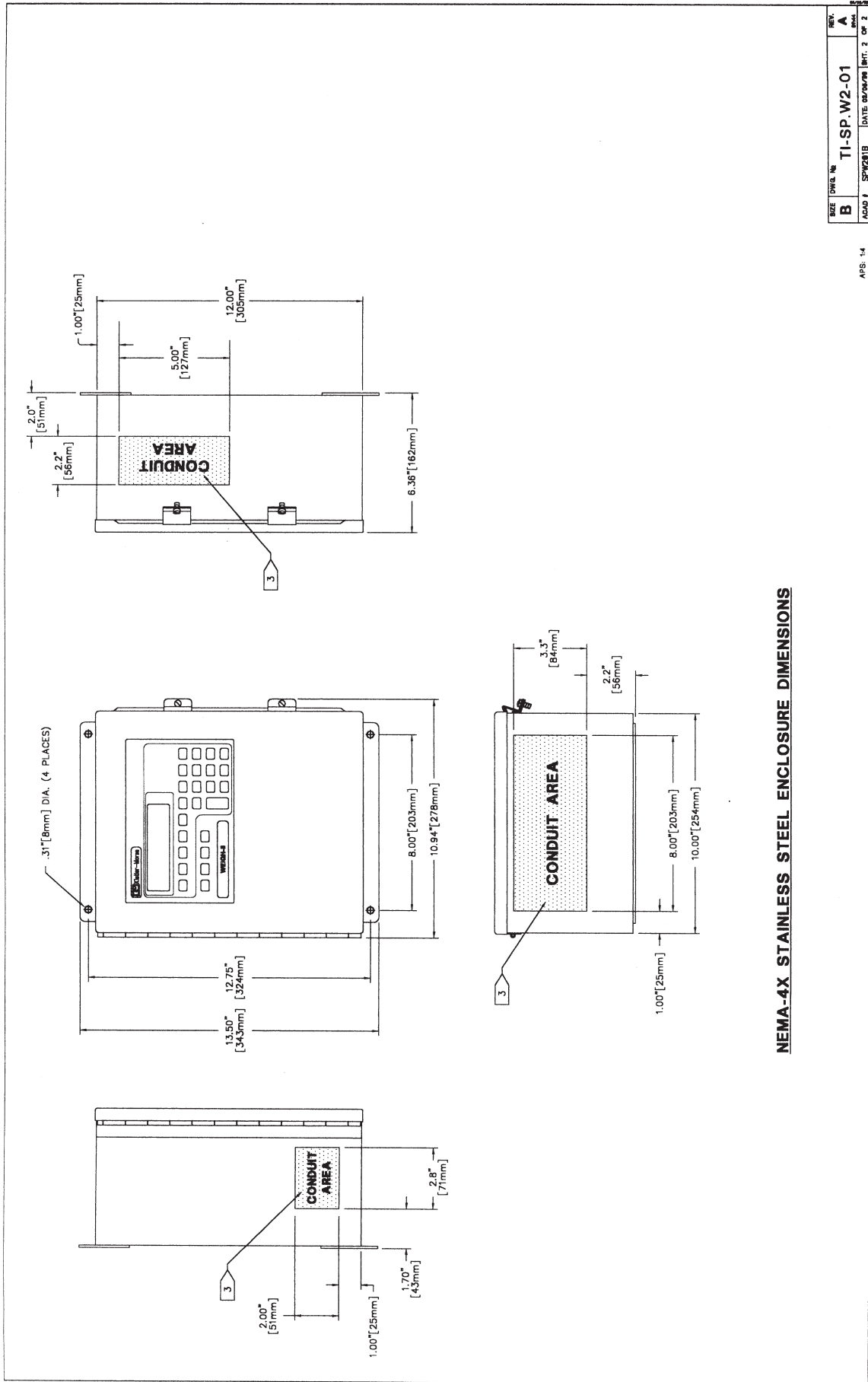
**WEIGH-IN ENCLOSURE**  
**DIMENSION AND INSTALLATION**  
**SPECIFICATIONS**

SIZE: DWG. No. **B**  
 REV. **A**

ACAD: T.SP.W2B1A | DATE: 1/25/97 | SHEET: 1 OF 2

**NEMA-4X FIBERGLASS ENCLOSURE DIMENSIONS**



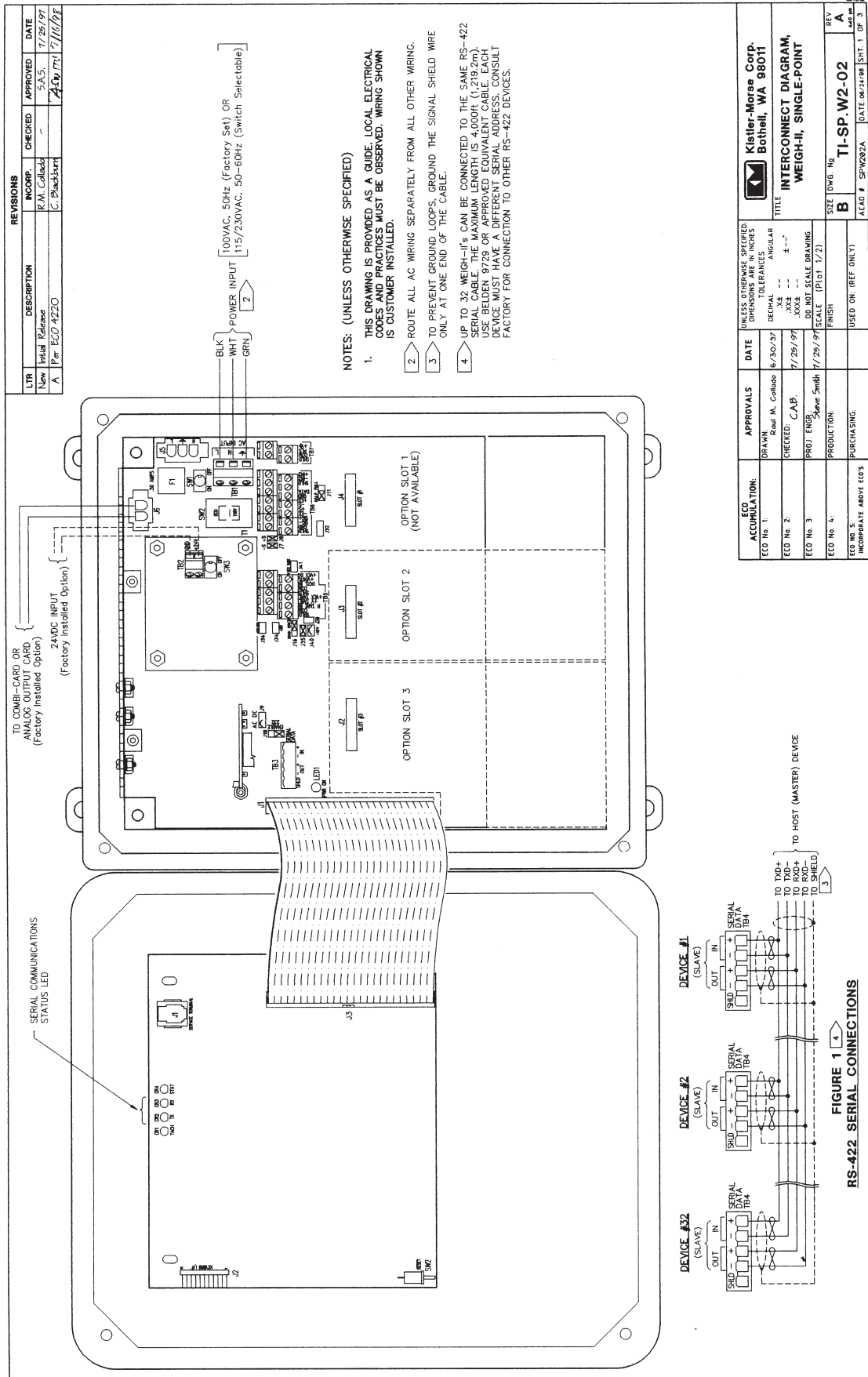


**NEMA-4X STAINLESS STEEL ENCLOSURE DIMENSIONS**

SIZE	DRAW. NO.	REV.
B	T1-SP-W2-01	A
ACAD /	SPW201B	DATE 08/04/08
		REV. 2 OF 2

APP. 14



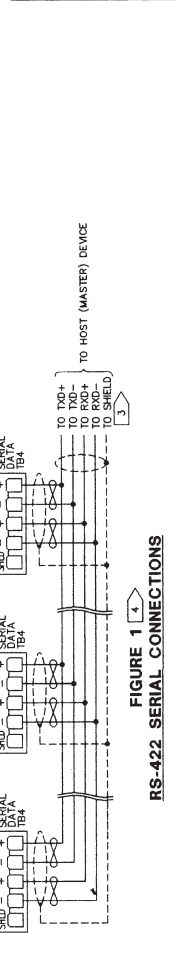


**NOTES: (UNLESS OTHERWISE SPECIFIED)**

- THIS DRAWING IS PROVIDED AS A GUIDE. LOCAL ELECTRICAL CODES AND REGULATIONS MUST BE OBSERVED. WIRING SHOWN IS CUSTOMER INSTALLED.
- ROUTE ALL AC WIRING SEPARATELY FROM ALL OTHER WIRING.
- TO PREVENT GROUND LOOPS, GROUND THE SIGNAL SHIELD WIRE ONLY AT ONE END OF THE CABLE.
- UP TO 32 WEIGH-IT'S CAN BE CONNECTED TO THE SAME RS-422 SERIAL CABLE. THE MAXIMUM LENGTH IS 4,000ft (1,219.2m). USE BELDEN 9729 OR APPROVED EQUIVALENT CABLE. EACH DEVICE MUST HAVE A DIFFERENT SERIAL ADDRESS. CONSULT FACTORY FOR CONNECTION TO OTHER RS-422 DEVICES.

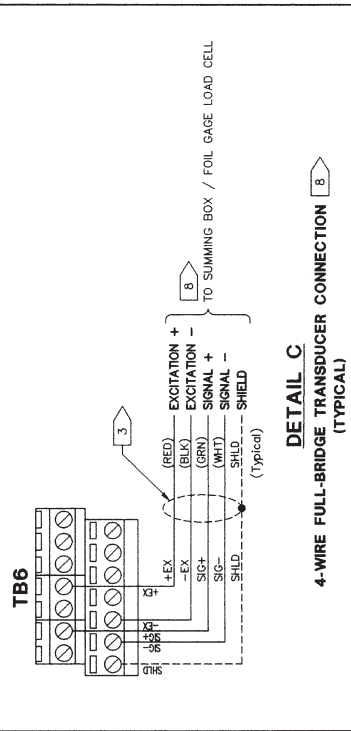
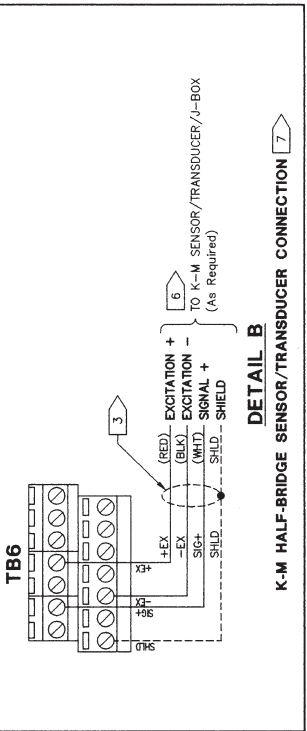
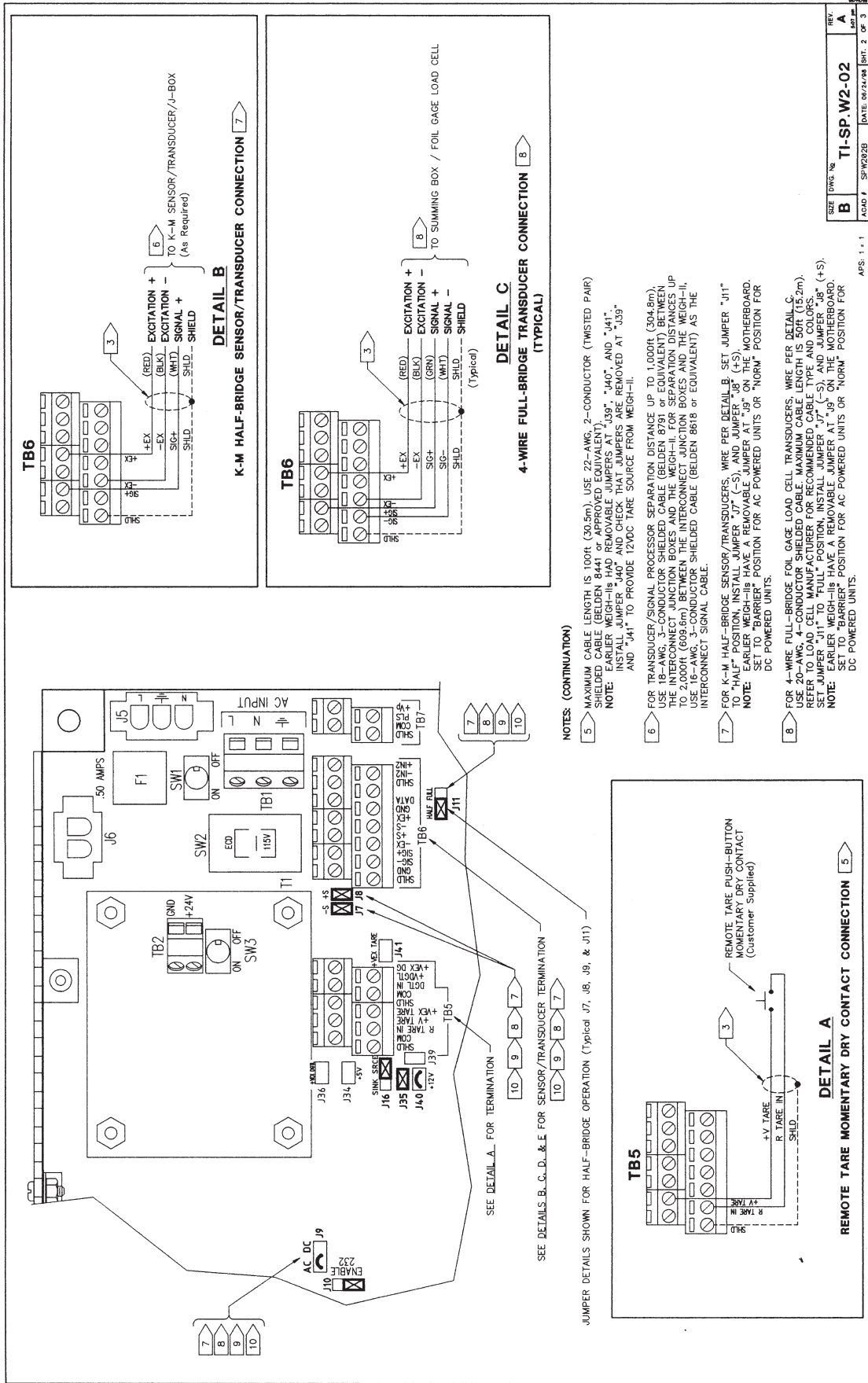
REVISIONS					
LTR	DESCRIPTION	IN CORP.	CHECKED	APPROVED	DATE
New	Initial Release	R.M. Callahan	-	S.A.S.	7/29/97
A	Per ECO 4220	C. Blackbart	-	A. By Tm	7/16/98

ECO ACCUMULATION:		APPROVALS		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	
ECO No. 1:		DRAWN	6/30/97	TOLERANCES	DECIMAL
ECO No. 2:		CHECKED	7/29/97	ANGULAR	XXX -- ± --°
ECO No. 3:		PROJ. ENG.	7/29/97	DD. NOT SCALE DRAWING	XXX -- ± --°
ECO No. 4:		PRODUCTION	7/29/97	SCALE (PLOT 1/2)	XXX -- ± --°
ECO No. 5:		PURCHASING		FINISH	
INCORPORATE ABOVE ECOS		USED ON: (REF ONLY)		TITLE	

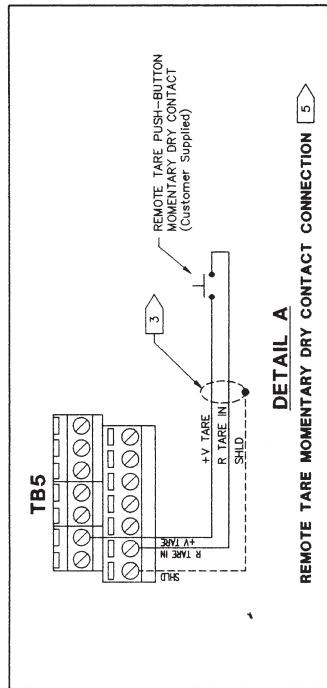


**FIGURE 1**  
**RS-422 SERIAL CONNECTIONS**





- NOTES: (CONTINUATION)
- 5 MAXIMUM CABLE LENGTH IS 100FT (30.5m). USE 22-AWG, 2-CONDUCTOR (TWISTED PAIR) SHIELDED CABLE (BELDEN 8441 or APPROVED EQUIVALENT). EXCITATION CABLE LENGTH IS 500FT (152.4m). SIGNAL CABLE LENGTH IS 500FT (152.4m). EXCITATION AND SIGNAL CABLES MUST BE KEPT SEPARATE. EXCITATION AND SIGNAL CABLES MUST BE KEPT SEPARATE. EXCITATION AND SIGNAL CABLES MUST BE KEPT SEPARATE. EXCITATION AND SIGNAL CABLES MUST BE KEPT SEPARATE.
  - 6 FOR TRANSDUCER/SIGNAL PROCESSOR SEPARATION DISTANCE UP TO 1,000FT (304.8m), USE 18-AWG, 3-CONDUCTOR SHIELDED CABLE (BELDEN 8791 or EQUIVALENT) BETWEEN THE INTERCONNECT JUMPER AND THE INTERCONNECT JUMPER. USE 18-AWG, 3-CONDUCTOR SHIELDED CABLE (BELDEN 8618 or EQUIVALENT) AS THE INTERCONNECT SIGNAL CABLE.
  - 7 FOR K-M HALF-BRIDGE SENSOR/TRANSDUCERS, WIRE PER DETAIL B. SET JUMPER "J11" TO "HALF" POSITION, INSTALL JUMPER J7/J8/J9/J10/J11 ON THE MOTHERBOARD. SET TO "BARRIER" POSITION FOR AC POWERED UNITS OR "NORM" POSITION FOR DC POWERED UNITS.
  - 8 FOR 4-WIRE FULL-BRIDGE FOIL GAGE LOAD CELL TRANSDUCERS, WIRE PER DETAIL C. USE 20-AWG, 4-CONDUCTOR SHIELDED CABLE. MAXIMUM CABLE LENGTH IS 500FT (152.4m). EXCITATION AND SIGNAL CABLES MUST BE KEPT SEPARATE. EXCITATION AND SIGNAL CABLES MUST BE KEPT SEPARATE. EXCITATION AND SIGNAL CABLES MUST BE KEPT SEPARATE.



REV	DATE	BY	CHKD
1	09/21/08		
2	09/21/08		
3			

SIZE	DWG. No.	REV.
B	TI-SP-W2-02	A
ADD'L	SPW202B	

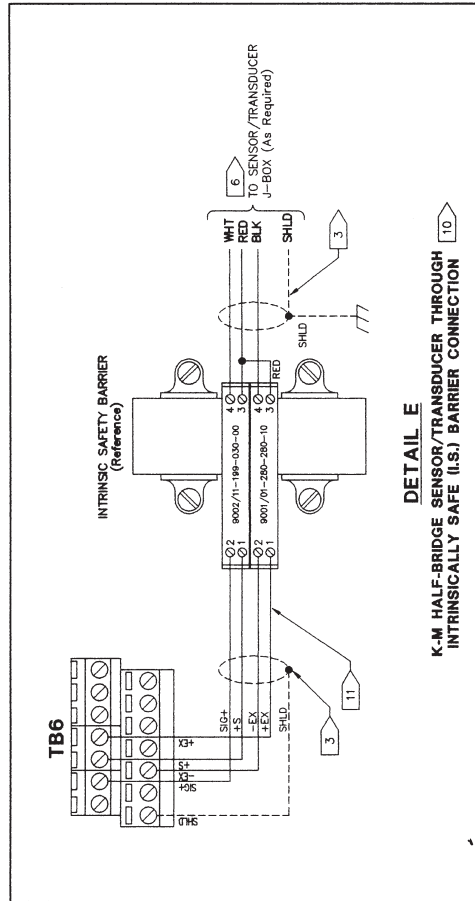
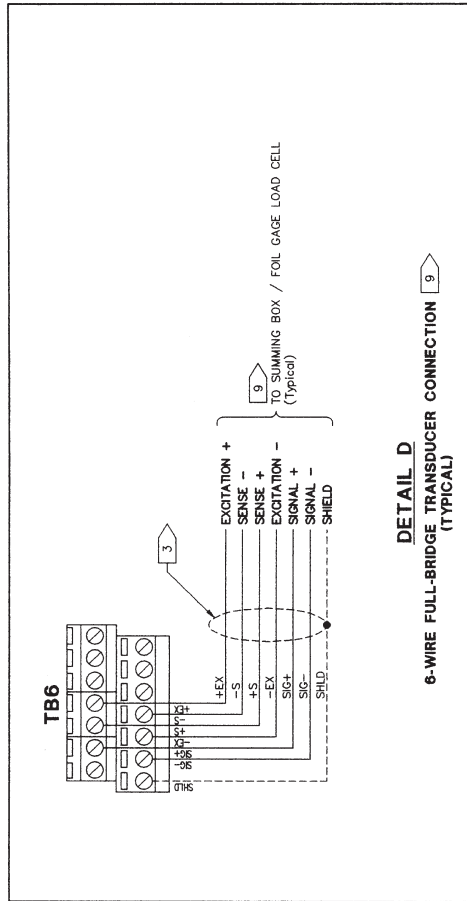
APP. F. 1.1





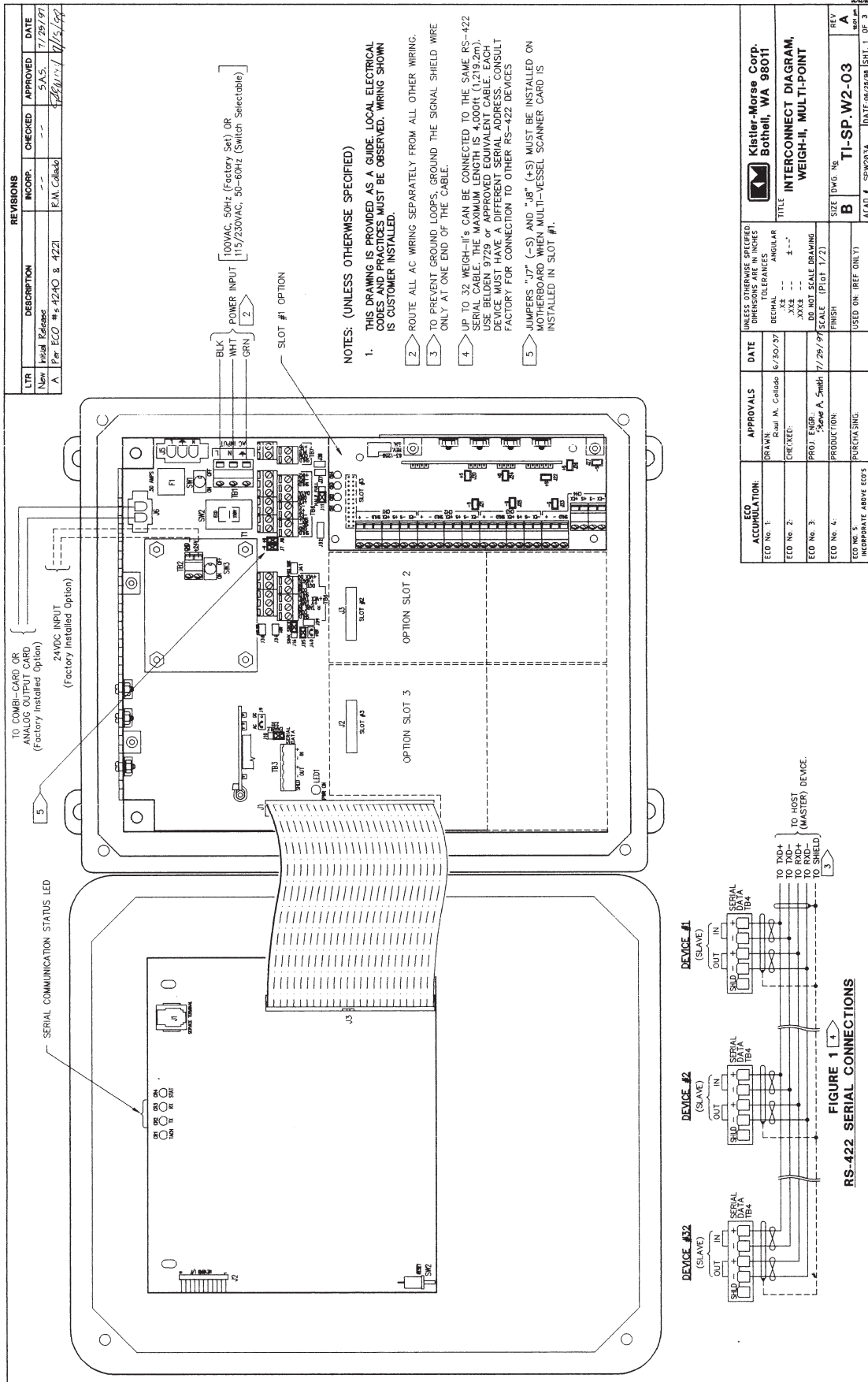
NOTES: (CONTINUATION)

- 9 FOR 6-WIRE FULL-BRIDGE FOIL GAGE LOAD CELL TRANSDUCERS, WIRE CONNECTIONS TO THE LOAD CELL SHOULD BE MADE AT THE MAXIMUM CABLE LENGTH IS 100 FT (30.5M). REFER TO LOAD CELL MANUFACTURER FOR RECOMMENDED CABLE TYPE, COLORS, AND SEPARATION DISTANCE. SET JUMPER "J11" TO "FULL" POSITION, AND REMOVE JUMPERS "J7" (-S), AND "J8" (+S).
- NOTE: EARLIER WEIGH-INS HAVE A REMOVABLE JUMPER AT "J9" ON THE MOTHERBOARD. SET TO "BARRIER" POSITION FOR AC POWERED UNITS OR "NORM" POSITION FOR DC POWERED UNITS.
- 10 FOR K-M HALF-BRIDGE SENSORS/TRANSDUCER THROUGH INTRINSICALLY SAFE (I.S.) BARRIERS, WIRE PER DETAIL E. SET JUMPER "J11" TO "HALF". INSTALL JUMPER "J7" (-S), AND REMOVE JUMPER "J8" (+S). SEE TI-SBI-FM-01 FOR INSTALLATION DETAILS REGARDING INTRINSICALLY SAFE BARRIERS.
- NOTE: EARLIER WEIGH-INS HAVE A REMOVABLE JUMPER AT "J9" ON THE MOTHERBOARD. SET TO "BARRIER" POSITION FOR AC POWERED UNITS OR "NORM" POSITION FOR DC POWERED UNITS.
- 11 MAXIMUM SEPARATION BETWEEN WEIGH-11 AND I.S. BARRIERS IS 100FT (30.5m). USE BELDEN CABLE #9566 OR EQUIVALENT.



SIZE	DWG. NO.	REV.
B	TI-SP-W2-02	A
ACID 1	SPW202C	DATE: 04/24/08
		REV. 3 OF 3





REVISIONS			
LTR	DESCRIPTION	INCRP.	CHECKED / APPROVED / DATE
New	Initial Release	--	SA.S. 7/29/97
A	Per ECO #s 4240 B 4221	R.M. Colabelli	4/26/11 11/5/97

**NOTES: (UNLESS OTHERWISE SPECIFIED)**

- THIS DRAWING IS PROVIDED AS A GUIDE. LOCAL ELECTRICAL CODES AND REGULATIONS MUST BE OBSERVED. WIRING SHOWN IS CUSTOMER INSTALLED.
- ROUTE ALL AC WIRING SEPARATELY FROM ALL OTHER WIRING.
- TO PREVENT GROUND LOOPS, GROUND THE SIGNAL SHIELD WIRE ONLY AT ONE END OF THE CABLE.
- UP TO 32 WEIGH-ii's CAN BE CONNECTED TO THE SAME RS-422 SERIAL CABLE. THE MAXIMUM LENGTH IS 4,000ft (1,219.2m). USE BELDEN 9729 or APPROVED EQUIVALENT CABLE. EACH DEVICE MUST HAVE A DIFFERENT SERIAL ADDRESS. CONSULT FACTORY FOR CONNECTION TO OTHER RS-422 DEVICES.
- JUMPERS "J7" (-S) AND "J8" (+S) MUST BE INSTALLED ON MOTHERBOARD WHEN MULTI-VESSEL SCANNER CARD IS INSTALLED IN SLOT #1.

EEO ACCUMULATION:		APPROVALS		UNLESS OTHERWISE SPECIFIED:	
EEO No. 1:		DRAWN:	Rail M. Colabelli	DATE:	6/30/97
EEO No. 2:		CHECKED:		TOLERANCES:	DECIMAL --
EEO No. 3:		PROJ. ENGR.:	A. Smith	ANGULAR	.XX4 -- ± --
EEO No. 4:		PRODUCTION:		DO NOT SCALE DRAWING	.XX4 -- ± --
EEO No. 5:	INCORPORATE ABOVE EEO'S	PURCHASING:		SCALE: (PLT) 1/21	FINISH

Kistler-Morse Corp.		TITLE	
Bothell, WA 98011		INTERCONNECT DIAGRAM, WEIGH-II, MULTI-POINT	
SIZE DWG. No.	B	DATE	04/26/11
ACAD #	TI-SP-W2-03	REV	A
		SHT.	1 OF 3

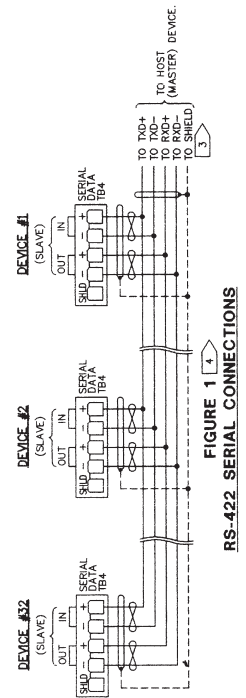
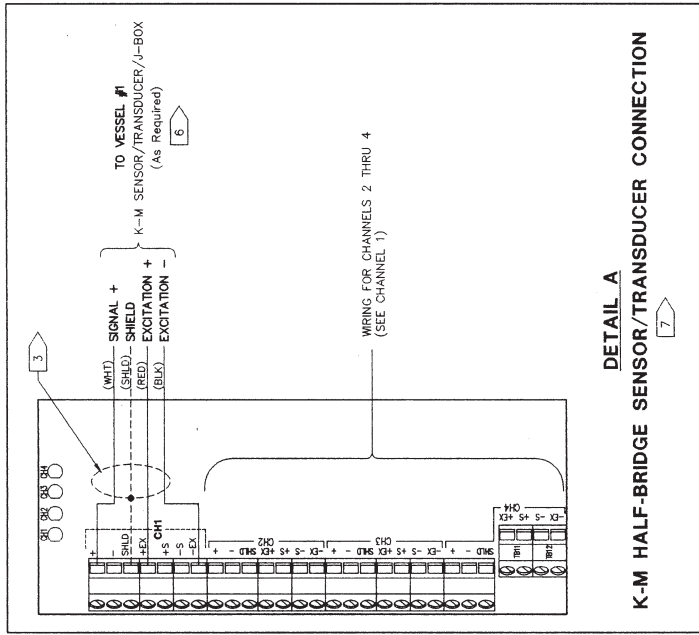
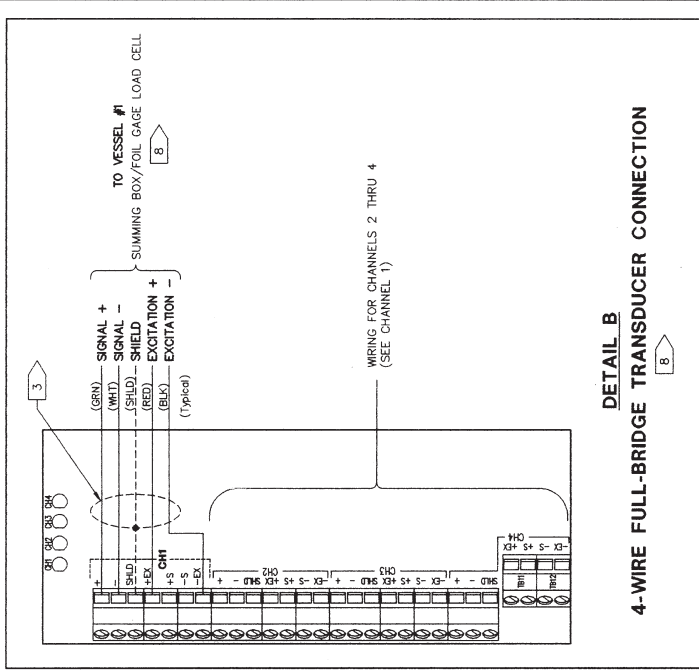
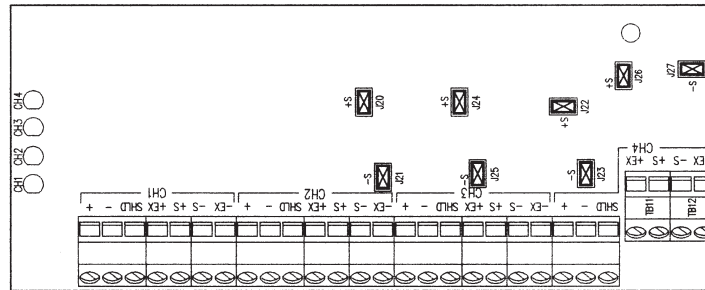




TABLE 1: [ 7 ]

CHANNEL	JUMPER POSITIONS	
	-S	+S
Channel 1	J21	J20
Channel 2	J25	J24
Channel 3	J23	J22
Channel 4	J27	J26



NOTES: (CONTINUATION)

- [ 6 ] FOR TRANSDUCER/SIGNAL PROCESSOR SEPARATION DISTANCES OF UP TO 1,000ft. (304.8m). USE 18-AWG, 3-CONDUCTOR SHIELDED CABLE (BELDEN 8791 OR EQUIVALENT). FOR SEPARATION DISTANCES OF UP TO 2,000ft. (609.6m), USE 16-AWG, 3-CONDUCTOR SHIELDED CABLE (BELDEN 8618 OR EQUIVALENT) BETWEEN THE INTERCONNECT JUNCTION BOXES AND WEIGH-II.
- [ 7 ] FOR K-M HALF-BRIDGE SENSOR/TRANSDUCER, WIRE PER DETAIL A. INSTALL "-"S" AND "+S" JUMPERS ON SCANNER CARD PER TABLE 1. SET JUMPER "J11" TO "HALF" POSITION ON WEIGH-II MOTHERBOARD.
- [ 8 ] NOTE: EARLIER WEIGH-IIs HAVE A REMOVABLE JUMPER AT "J8" ON THE MOTHERBOARD. SET TO "BARRIER" POSITION FOR AC POWERED UNITS OR "NORM" POSITION FOR DC POWERED UNITS.
- [ 8 ] FOR 4-WIRE FULL-BRIDGE FOIL GAGE LOAD CELL TRANSDUCER, WIRE PER DETAIL B. USE 20-AWG, 4-CONDUCTOR SHIELDED CABLE. MAXIMUM CABLE LENGTH IS 50ft (15.2m). REFER TO LOAD CELL MANUFACTURER FOR RECOMMENDED CABLE TYPE AND COLORS. INSTALL "-"S" AND "+S" JUMPERS ON SCANNER CARD PER TABLE 1. SET JUMPER "J11" TO "FULL" POSITION ON WEIGH-II MOTHERBOARD.
- [ 8 ] NOTE: EARLIER WEIGH-IIs HAVE A REMOVABLE JUMPER AT "J8" ON THE MOTHERBOARD. SET TO "BARRIER" POSITION FOR AC POWERED UNITS OR "NORM" POSITION FOR DC POWERED UNITS.

**WEIGH-II SCANNER BOARD TERMINATION**  
(P.N. 63-1259-XX)

SIZE DWG. No. **B** TI-SP.W2-03  
ACAD F. SPW203B DATE: 06/25/88 BRG. 2 OF 3  
REV. No. **1**

APP:











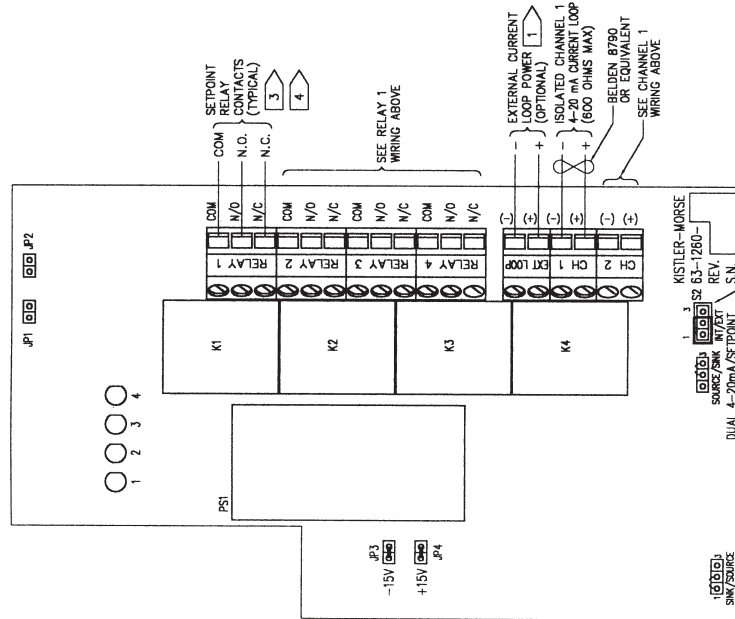




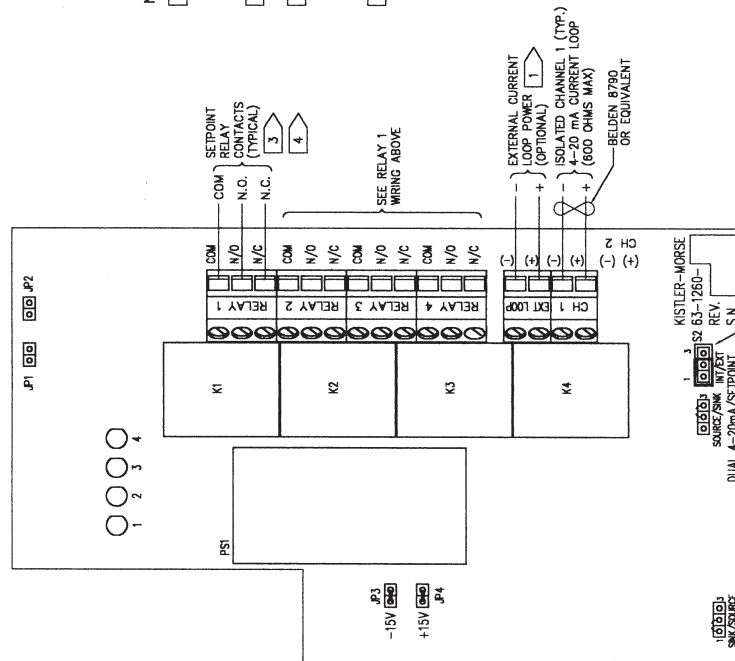


**RELAY SETPOINT and ANALOG OUTPUT BOARDS (DC WEIGH-II ONLY)**  
(ISLOT 3 ONLY)

REVISIONS				
LTR	DESCRIPTION	CHECKED	APPROVED	DATE
New	Initial Release	---	S.A.S.	7/25/97
A	Per ECO # 4298	W.Kennel	S.A.S.	11/10/98



**FOUR RELAY SETPOINT and TWO 4-20mA ANALOG OUTPUT BOARD (DC)**  
(63-1260-11)



**FOUR RELAY SETPOINT and ONE 4-20mA ANALOG OUTPUT BOARD (DC)**  
(63-1260-14)

- NOTES: (UNLESS OTHERWISE SPECIFIED)
- MAXIMUM EXTERNAL LOOP VOLTAGE IS 24VDC. THE MAXIMUM LOOP RESISTANCE WHICH CAN BE DRIVEN PER FORMULA BELOW:  

$$R_{max}(MAXIMUM RESISTANCE) = \frac{20mA}{V_{ext}(EXT. VOLTAGE) - 4V}$$
  - INSTALL JUMPER S2 ON PINS 2 & 3 (EXT) WHEN EXTERNAL CURRENT LOOP IS USED.
  - MAXIMUM RELAY RATING:  
 - 30VDC, 10AMP (RESISTIVE LOAD)  
 - 240VAC, 10AMP (RESISTIVE LOAD)
  - NOMINAL CONNECTOR SCREW TORQUE: 5 POUND-INCHES.

ECO ACCUMULATION	APPROVALS	DATE	UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES
ECO No. 1:	DRAWN: M. Colado	7/1/97	DECIMAL ANGULAR
ECO No. 2:	CHECKED:		SIZE: 2-...
ECO No. 3:	PROJ. ENGR: Steve A. Smith	7/25/97	DO NOT SCALE DRAWING
ECO No. 4:	PRODUCTION:		SCALE: 1 = 1
ECO No. 5:	PURCHASING:		FINISH
INCORPORATE ABOVE ECO'S			USED ON (REF ONLY)

**Kistler-Morse Corp.**  
 Botolph, WA 98011

**WIRING DIAGRAM**  
 RELAY SETPT. / 4-20mA OUTPUT,  
 WEIGH-II (DC)

SIZE DWG. No. **B**  
 TI-SP-W2-CMB-02

DATE: 7/25/97  
 DRAWN BY: M. Colado  
 CHECKED BY: [Blank]  
 PROJ. ENGR: Steve A. Smith  
 PRODUCTION: [Blank]

DATE: 7/25/97  
 DRAWN BY: M. Colado  
 CHECKED BY: [Blank]  
 PROJ. ENGR: Steve A. Smith  
 PRODUCTION: [Blank]

DATE: 7/25/97  
 DRAWN BY: M. Colado  
 CHECKED BY: [Blank]  
 PROJ. ENGR: Steve A. Smith  
 PRODUCTION: [Blank]





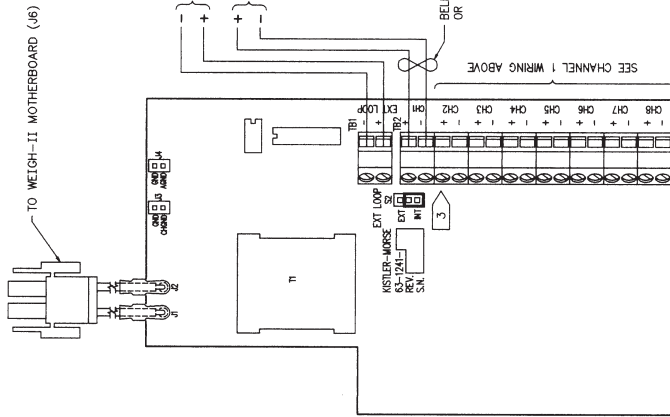




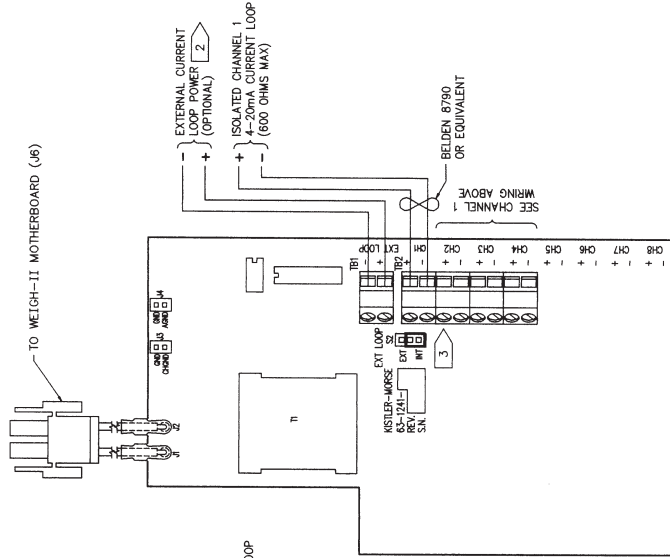
4-20mA OUTPUT CARDS (AC WEIGH-II ONLY)

(SLOT 3 ONLY)

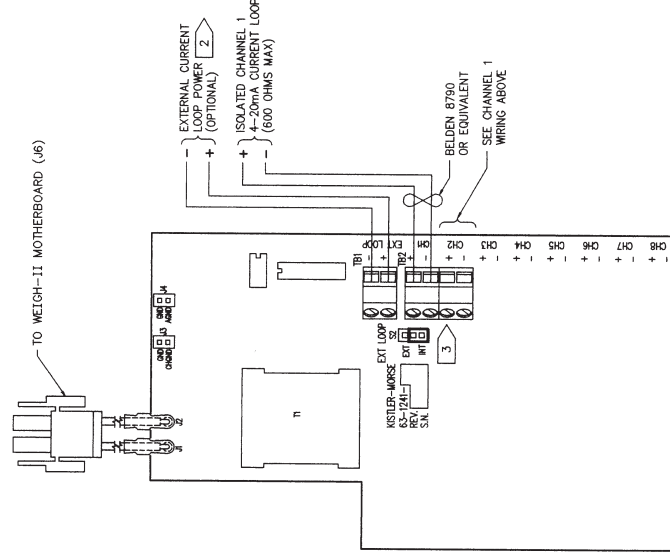
REVISIONS				
LTR	DESCRIPTION	CHECKED	APPROVED	DATE



EIGHT 4-20mA OUTPUT CARD  
(63-1241-01)



FOUR 4-20mA OUTPUT CARD  
(63-1241-02)



TWO 4-20mA OUTPUT CARD  
(63-1241-03)

NOTES: (UNLESS OTHERWISE SPECIFIED)

- MAXIMUM OF 2 ANALOG OUTPUTS PER CHANNEL.
- MAXIMUM EXTERNAL LOOP VOLTAGE IS 24VDC. THE MAXIMUM LOOP RESISTANCE WHICH CAN BE DRIVEN PER FORMULA BELOW:  
 $R_{max}(\text{MAXIMUM RESISTANCE}) = \frac{V_{ext}(\text{EXT. VOLTAGE}) - 4V}{20\text{mA}}$

3 INSTALL JUMPER S2 ON PINS 2 & 3 (EXT) WHEN EXTERNAL CURRENT LOOP IS USED.

ECO ACCUMULATION	APPROVALS	DATE	UNLESS OTHERWISE SPECIFIED
ECO No. 1:	DRAWN: Real M. Calado	7/1/97	LINEAR
ECO No. 2:	CHECKED:		DECIMAL
ECO No. 3:	PROJ. ENGR. 3-5-2000	7/1/97	ANGULAR
ECO No. 4:	PRODUCTION:		SCALE
ECO No. & INCORPORATE ABOVE ECOS	PURCHASING:		DO NOT SCALE DRAWING
			FINISH
			USED ON: (REF ONLY)

**Kistler-Morse Corp.**  
Bethell, WA 98011

**WIRING DIAGRAM.**  
4-20mA OUTPUT CARD,  
WEIGH-II (AC)

SIZE DWG No. **B**  
TI-SP. W2.XMIT-01

DATE: 02/24/97

REV. **New**  
Sht. 1 of 1



### RELAY OUTPUT CARDS (SLOTS 2 and 3 ONLY)

REVISIONS			
LTR	DESCRIPTION	CHECKED	APPROVED DATE
5A5	Initial Release	W. Kennedy	7/28/97
A	Per ECO # 4399	K. V. K.	11.1.97

#### 8-POINT RELAY CARD (63-1240-01)

#### 5-POINT RELAY CARD (63-1240-02)

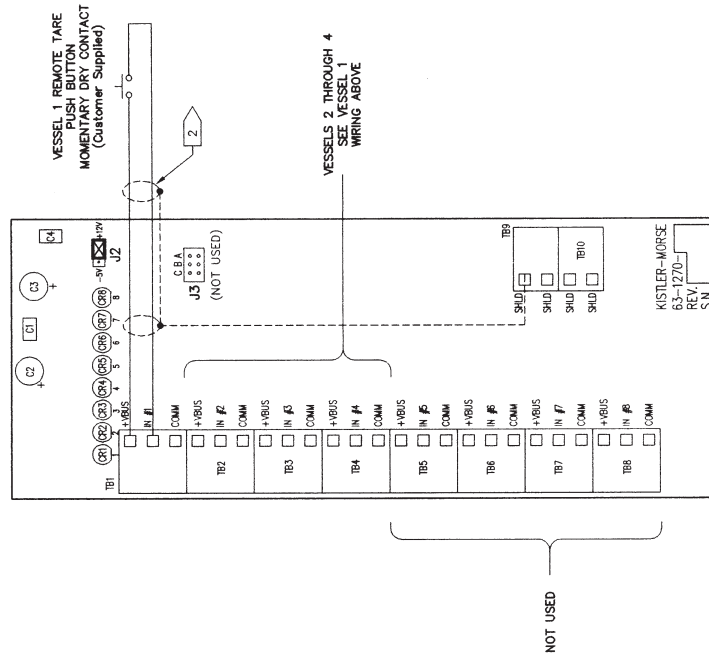
**NOTES: (UNLESS OTHERWISE SPECIFIED)**

- MAXIMUM OF 8-RELAYS PER CHANNEL.
- INSTALL THE HIGHER CAPACITY CARD IN THE FIRST AVAILABLE SLOT WHEN USING MORE THAN ONE RELAY OUTPUT CARD.
- RELAY MAXIMUM RATING:  
 - 30VDC, 10A (RESISTIVE LOAD)  
 - 120VAC, 5A (RESISTIVE LOAD)  
 - 240VAC, 5A (RESISTIVE LOAD)
- NOMINAL CONNECTOR SCREW TORQUE: 5 POUND-INCHES.

ECO ACCUMULATION:	APPROVALS	DATE	TITLE
ECO No. 1:	DRAWN: Raul M. Celisde	7/1/97	<b>Kistler-Morse Corp.</b> <b>Bothell, WA 98011</b> <b>WIRING DIAGRAM,</b> <b>RELAY OUTPUT CARD,</b> <b>WEIGH-II</b>
ECO No. 2:	CHECKED: Steve A. Smith		
ECO No. 3:	PROJ. ENGR: Steve A. Smith	1/28/97	
ECO No. 4:	PRODUCTION:		
ECO No. 5:	PURCHASING:		SIZE DWG. No. <b>B</b> TI-SP.W2.RLY-01 ACAD # SPW2RL01 DATE: 6/26/98 [SHT. 1 OF 1]



### REMOTE TARE INPUT MODULE (SLOTS 2 or 3)



**NOTES: (UNLESS OTHERWISE SPECIFIED)**

1. RECOMMENDED FOR USE WITH MULTI-POINT WEIGH-II ONLY.
2. MAXIMUM CABLE LENGTH IS 100M (328ft). USE 22-AWG, 2-CONDUCTOR, SHIELDED CABLE (BELDEN 8441 OR APPROVED EQUIVALENT).

REVISIONS					
LTR	DESCRIPTION	NGORP	CHECKED	APPROVED	DATE
A	Per ECO #4219	R.M. Colado			7/1/97

<b>ECO ACCUMULATION:</b>	<b>APPROVALS</b>	<b>DATE</b>	<b>UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES</b>
ECO No. 1:	DRAWN: Raul M. Colado	7/8/97	DECIMAL: .XX
ECO No. 2:	CHECKED:		ANGULAR: ± --
ECO No. 3:	PROD. ENG: Steve A. Smith	7/25/97	WELDING: ± --
ECO No. 4:	PRODUCTION:		SCALE: 1" = 1"
ECO No. 5:	PURCHASING:		FINISH: USED ON: (REF ONLY)
INCORPORATE ABOVE ECOS			

	Kistler-Morse Corp. Bothell, WA 98011	
TITLE		WIRING DIAGRAM, REMOTE TARE, WEIGH-II
SIZE	DWG. NO.	REV.
B	TI-SP-W2.RTI-01	A
ACAD # SPW2RTI1		DATE: 08/25/98
		SHEET 1 OF 1



# Appendix G. Calculation of Manual Calibration Parameters

## Introduction

This Appendix covers the calculation of manual calibration parameters. For manual calibration, you calculate and directly input the scale factor weight and counts. There are two reasons for doing a manual calibration instead of an automatic calibration:

- You just installed your system, cannot move any material now, and want to get started using your system with a rough pre-calibration.
- After calibration or pre-calibration, you kept an accurate record of actual material weight and indicated material weight (from the Weigh II). You want to use this information now to refine the calibration.

The sections below explain and provide examples on how to calculate the parameters for each type of calibration. After you calculate the parameters, follow the procedures in Chapter 6, Calibration, to input the values.

## Pre-Calibration

You have just installed your system, cannot move any material now, and want to get started using your system with a rough pre-calibration. Pre-calibration values are based on system parameters, including sensor sensitivity and A/D converter sensitivity. These values are known or can be obtained from the Weigh II display without moving any material. For bolt-on sensors, you must also calculate the vessel structural area and make an estimate of the weight of the material currently in the vessel.

What makes a pre-calibration not as accurate as a calibration procedure performed when you actually move material? A pre-calibration does not take into account the *actual* structural response to changes in load. We theoretically expect a change in load to result in a proportional change in digital counts, but the structure's actual response to load and interaction with piping, catwalks, a roof,

discharge chutes, etc. prevent the system from achieving the theoretically expected values. Additionally, for bolt-on sensors, the pre-calibration could be inaccurate if your estimate of the current material weight is off. A pre-calibration is a good start, but plan on performing a more accurate calibration at a later date.

Go through the following procedure to obtain the A/D converter sensitivity from the Weigh II. You will need this value to calculate the manual calibration parameters.

1. If the Weigh II is in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the system in Manual Mode. The Auto LED turns off.
2. Use the Up Arrow and Down Arrow Keys to scroll to the desired vessel.
3. Press the Menu Key to display the *Main* Menu. The display shows:

```

WII MAIN MENU
Disp   I/O   Cal →
F1     F2   F3
  
```

4. Press the F3 Key to access the *Cal* Menu. The display shows:

```

CALIBRATION MENU
Auto           Manual →
F1     F2   F3
  
```

5. Press the F3 Key to access the *Manual* Menu. The display shows:

```

MANUAL CAL MENU
ScfCnt       ScfWgt →
F1     F2   F3
  
```

6. Press the Menu Key to access the second page of the *Manual* Menu. The display shows:

```

MANUAL CAL MENU
Zero_Cnt     Disply →
F1     F2   F3
  
```

7. Press the F3 Key to access *Disply*. The display looks like this:

```

Cnts/mV:      X
0mV cnts      Y
F1     F2   F3
  
```

Write down the *Cnts/mV*.

You will use the value you just obtained from the Weigh II in the calculation of the pre-calibration parameters. Calculation of the parameters is dependent on the type of sensor(s) on the vessel. Procedures for calculation of the manual calibration values are given below for the following sensor types:

- Bolt-on sensors (L-Cells and Microcells)
- Direct Support Sensors (Load Stands, Load Discs, and Load Links)

### Bolt-On Sensors

**Note**

In this procedure, you will need to use the value for *Cnts/mV* that you obtained from the Weigh II above.

The calculation of the parameters for performing a pre-calibration follows:

1. From your sensor manual/data sheet, write down the sensor sensitivity (S) applicable to your sensor. The sensor sensitivity has units of mV/psi.
2. Summarized in Table G-1 are the stress equations for skirt-supported, leg-supported, and beam-supported vessels. See your sensor manual for a thorough explanation of the terms in the equations.

3. Write down an estimate of the current live load in the vessel, and call it 'EstLL.'
4. Write down the maximum live load for the vessel, and call it 'MaxLL.'
5. Calculate the values for the pre-calibration:

$$\text{Scale Factor Weight} = \text{MaxLL}$$

$$\text{Scale Factor Counts} = S \times \text{Cnts/mV} \times \text{MaxLL} \div A(\text{in}^2)$$

$$\text{Setting Zero} = \text{EstLL}$$

**Note**

The Scale Factor Weight and Scale Factor Counts are input in the *Manual* Menu, while the Setting Zero value is input in the *Auto* Menu.

**Example:** You are using L-Cells to monitor a 15' diameter skirt-supported vessel with 0.187" wall thickness. You estimate that the vessel currently has 50,000 lbs of material in it. The vessel can hold a maximum of 200,000 lbs. You go to the *Disply* submenu in the *Manual* calibration menu and write down the *Cnts/mV* — 699.05. Following the procedure for pre-calibration:

1. S = 35 mV/1000 psi (from L-Cell manual)

<p><b>Skirt-Supported Vessel (without spars or columns):</b></p> $\text{Stress (psi)} = \frac{\text{Live Load (lbs)}}{3.14 \times \text{diameter (ft)} \times 12 \text{ in./ft} \times \text{skirt thickness (in.)}} = \frac{\text{MaxLL (lbs)}}{A (\text{in}^2)}$ <p><b>Leg-Supported Vessel:</b></p> $\text{Stress (psi)} = \frac{\text{Live Load (lbs)}}{\text{Compression Area (in}^2\text{)} \times \# \text{ of legs}} = \frac{\text{MaxLL (lbs)}}{A (\text{in}^2)}$ <p><b>Beam-Supported Vessel:</b></p> $\text{Stress (psi)} = \frac{\text{Live Load (lbs)}}{2 \times \text{shear area (in}^2\text{)} \times \# \text{ of supports}} = \frac{\text{MaxLL (lbs)}}{A (\text{in}^2)}$
--

Table G-1. Bolt-On Sensor Stress Calculations



2. Calculate 'PSI,'
 
$$A = 3.14 \times \text{diameter (ft)} \times 12 \text{ in./ft} \\ \times \text{skirt thickness (in.)} \\ = 3.14 \times 12 \text{ ft} \times 12 \text{ in./ft} \times 0.187 \text{ in.} \\ = 84.55 \text{ in.}^2 \\ \text{PSI} = \frac{200,000}{84.55} = 2365$$
3. EstLL = 50,000 lbs
4. MaxLL = 200,000 lbs
5. Calculate the values for the calibration:
 
$$\text{Scale Factor Weight} = \text{MaxLL} \\ = 200,000 \text{ lbs} \\ \text{Scale Factor Counts} \\ = S \times \text{Cnts/mV} \times \text{PSI} \div 1000 \\ = 35 \text{ mV} \times 699.05 \text{ Cnts/mV} \\ \times 2365 \text{ lbs} \div 1000 \\ = 57,864 \text{ Counts} \\ \text{Setting Zero} = \text{EstLL} \\ = 50000 \text{ lbs}$$

### Direct Support Sensors

#### Note

In this procedure, you will need to use the value for *Cnts/mV* that you obtained from the Weigh II above.

Perform this pre-calibration after you have placed the vessel on the supports, but while the vessel is still empty. The calculation of the parameters for performing a pre-calibration follows:

1. From your direct support sensor, write down the sensor sensitivity (S) applicable to your sensor. The sensor sensitivity has units of mV/Rated Load (lb). Also, write down the Rated Load for your sensor.
2. Calculate the values for the pre-calibration:
 
$$\text{Scale Factor Weight} = \text{Load Cell Rated Load} \times \text{the number of legs} \\ \text{Scale Factor Counts} \\ = S \times \text{Cnts/mV} \times \text{Rated Load} \\ \text{Setting Zero} = \text{current live load} = \text{empty vessel} = 0$$

#### Note

The Scale Factor Weight and Scale Factor Counts are input in the *Manual* Menu, while the Setting Zero value is input in the *Auto* Menu.

**Example:** You are using direct support to monitor a vessel with four legs. The direct support Load Stand II's have a sensitivity of 320 mV/100,000 lbs. You have placed the vessel on the supports, and it is empty. You want to perform a pre-calibration. You go to the *Disply* submenu in the *Manual* calibration menu and write down the *Cnts/mV* — 699.05. Following the procedure for pre-calibration:

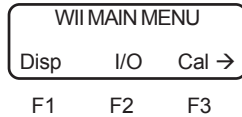
1.  $S = 320 \text{ mV/Rated Load}$   
Rated Load = 100,000 lbs  
(both from sensor manual)
2. Calculate the values for the calibration:
 
$$\text{Scale Factor Weight} = \text{Rated Load} \times \text{the number of legs} \\ = 400,000 \text{ lbs} \\ \text{Scale Factor Counts} \\ = S \times \text{Cnts/mV} \\ = 320 \text{ mV} \\ \times 699.05 \text{ Cnts/mV} \\ = 279,620 \text{ Cnts} \\ \text{Setting Zero} = \text{Current Live Load} \\ = 0$$

# Refining the Calibration

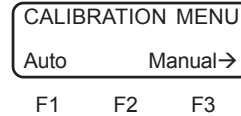
While moving material into the vessel, you kept an accurate record of the actual material weight and the indicated material weight (from the Weigh II). Now you want to use this information to refine the calibration.

Refer to Figure G-1. The calculation of the parameters for refining the calibration follows:

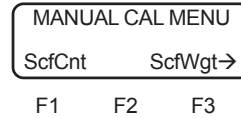
1. Define the material weights you recorded as Indicated High Load, Indicated Low Load, Actual High Load, and Actual Low Load (Actual Low Load is 0, because you started with an empty vessel).
2. If the Weigh II is in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the system in Manual Mode. The Auto LED turns off.
3. Use the Up Arrow and Down Arrow Keys to scroll to the desired vessel.
4. Press the Menu Key to display the *Main* Menu. The display shows:



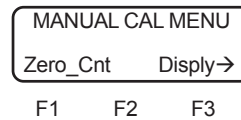
5. Press the F3 Key to access the *Cal* Menu. The display shows:



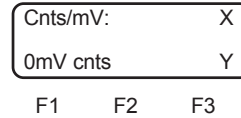
6. Press the F3 Key to access the *Manual* Menu. The display shows:



7. Press the Menu Key to access the second page of the *Manual* Menu. The display shows:



8. Press the F3 Key to access *Display*. The display looks like this:



9. Press any key other than the Esc or Auto/Man Key to cycle through the display parameters. Write down the current *ZERO\_WGT*, *ZERO\_CNT*, *SCF\_WGT*, and *SCF\_CNT* values.

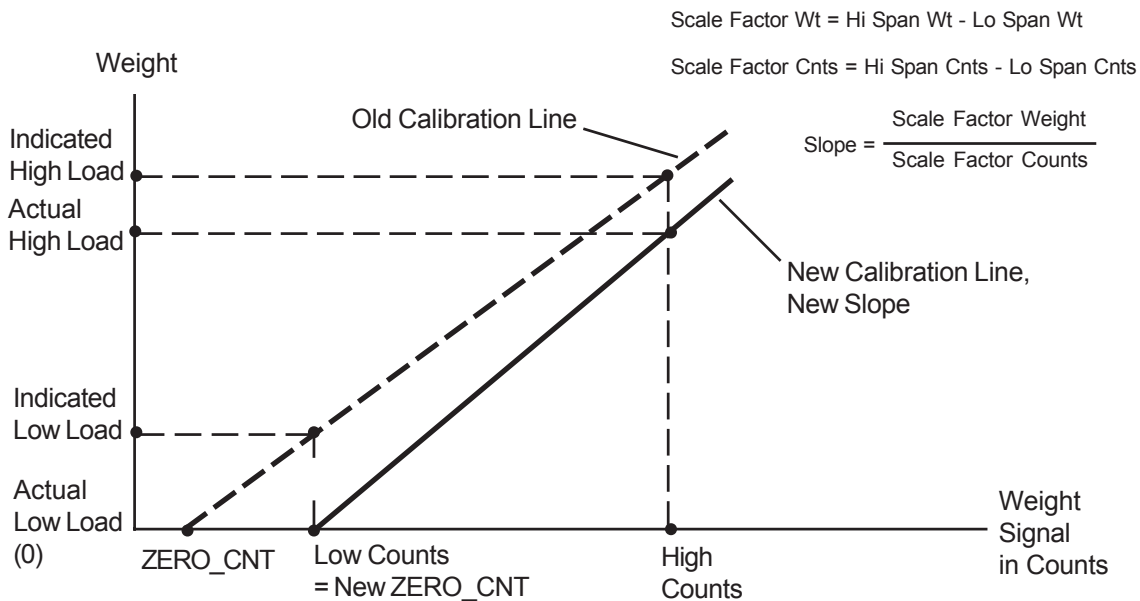


Figure G-1. Calculating Manual Calibration Parameters to Refine Calibration

10. The formula to correct the slope of the line or the current calibration is simple.

$$\frac{\text{Displayed weight change}_x}{\text{Actual weigh change}} \text{ scf\_cnt} = \text{corrected scf\_cnt}$$

During the record keeping you find that when you fill the vessel with 50,000 lbs of material, the actual weight change is 47,600 lbs.

$$47,600 \text{ lbs}/50,000\text{lbs}$$

$$\text{*current scf\_cnt} = \text{corrected scf\_cnt}$$

$$47,600/50,000 = .952$$

$$.952 \text{ * current scf\_cnt} = \text{corrected scf\_ent}$$

This procedure will change the slope of the line. As seen in figure G-1, the zero point will change because of this. A new zero point will be needed. If the amount of material in the vessel is known, a zero-cal can be done. Refer to page 6-6 for instructions on this procedure.



# Appendix H. Error Messages

This Appendix contains descriptions of the error messages displayed by the Weigh II:

1. Warning: Ambiguous Error .. Lo Span Will Be Entered .. Need New Hi Span
2. Warning: Ambiguous Error .. Hi Span Will Be Entered .. Need New Lo Span
3. Warning: Add Or Subtract More Material
4. All Channels Are Hidden
5. All Channels Are Disabled
6. ADC Overrange
7. Gross Units Over
8. Net Units Over
9. Overrange ChXX
10. Math Channel Units Over ChXX
11. Math Error # or Script Compile Error #

For each error message, one or more possible explanations and suggested solutions are provided.

## 1. Warning: Ambiguous Error .. Lo Span Will Be Entered .. Need New Hi Span

### Explanation

While performing an Auto Calibration, you entered a Lo Span weight that is higher than the Hi Span weight **OR** the Weigh II is calculating that the counts for the Lo Span are greater than the counts for the Hi Span.

### Note

You may get this message if:

1. You are doing an initial calibration, because the Weigh II is comparing the new Lo Span to the factory-default Hi Span, **OR**
2. You are recalibrating the Weigh II, because the Weigh II is comparing the new Lo Span to the old Hi Span.

### Solutions

1. Verify that you entered the correct weight for the Lo Span. Reenter the Lo Span if necessary.
2. Verify that the correct amount of material

was actually moved.

3. If the Lo Span you entered is correct, follow the path *Main/Cal/Auto/Disply* to check the Auto calibration values. You may have made an error in entering the Hi Span. If you made an error in entering the Hi Span, you must move material again to recalibrate or perform a manual calibration.

## 2. Warning: Ambiguous Error .. Hi Span Will Be Entered .. Need New Lo Span

### Explanation

While performing an Auto Calibration, you entered a Hi Span weight that is lower than the Lo Span weight **OR** the Weigh II is calculating that the counts for the Hi Span are less than the counts for the Lo Span.

### Note

You may get this message if you are recalibrating the Weigh II, because it is comparing the new Hi Span to the old Lo Span.

### Solutions

1. Verify that you entered the correct weight for the Hi Span. Reenter the Hi Span if necessary.
2. Verify that the correct amount of material was actually moved.
3. If the Hi Span weight you entered is correct, follow the path *Main/Cal/Auto/Disply* to check the Auto calibration values. You may have made an error in entering the Lo Span weight. If you made an error in entering the Lo Span, you must move material again to recalibrate or perform a manual calibration.

### 3. Warning: Add Or Subtract More Material . .

#### Explanation

While performing an Auto Calibration, you added or removed material from the vessel. The amount of material you moved produced a change of less than 9000 counts. The Weigh II will go ahead and calibrate the system with the entered values. However, for good calibration accuracy, a larger change in counts/larger movement of material is recommended.

#### Solution

Verify that the correct amount of material was actually moved. Recalibrate when possible with a larger movement of material.

### 4. All Channels are Hidden

#### Explanation

Vessel monitoring results are not shown on the display because all channels are hidden.

#### Solution

Display all hidden channels again by disabling *Hide*.

1. Put the Weigh II in Manual Mode.
2. Press the Shift Key (Shift LED illuminated) and then press the '9' Key.
3. The display acknowledges that *Hide* is disabled. You can now scroll through all of the channels in Manual Mode or switch to Auto Mode.

### 5. All Channels are Disabled

#### Explanation

The Weigh II is not monitoring any channels because all channels are disabled.

#### Solution

Display selected disabled channels again by turning *Enab* off.

1. Put the Weigh II in Manual Mode.
2. Follow the path *Main/Service/ADC/Enab*.
3. Use the Up and Down Arrow Keys to scroll to the channel that you want to enable. Press the F1 Key to turn the channel on.
4. Repeat Step 3 as desired for other channels.

### 6. ADC Overrange (+/-)

#### Explanation

The sensor input is causing the counts to go above 2,097,151 (if +) or to 0 (if -) because one of the legs of the excitation voltage is not functioning.

#### Solutions

1. Check the wiring of the sensor to the junction box and junction box to the Weigh II. Correct loose, damaged (shorted), or incorrect wiring.
2. If there is no problem with the wiring, one or more sensors may be damaged. Follow troubleshooting procedures detailed in the sensor manual to locate the damaged sensor(s). Replace if required.
3. If there is no problem with the sensors or the wiring, check the power supply by measuring across the +Ex and -Ex on the Weigh II.
  - If the Weigh II is wired to Kistler-Morse sensors/transducers, verify that the voltage is approximately 12 volts.
  - If the Weigh II is wired to foil-gage transducers, verify that the voltage meets the transducer manufacturer's requirements.

If the voltage is incorrect, adjust *AdjEx (Main/Service/ADC/AdjEx)* until the correct voltage is measured. If you cannot obtain the correct voltage, replace the power supply.

4. If Steps 1 through 3 indicated no problem, measure the millivolts across the In+ and In- terminals on the motherboard. This reading is the actual signal coming back from the sensor/transducer. For Kistler-Morse sensors/transducers, the reading should be less than 1 volt.
  - If the reading is less than 1 volt, check *Gain (Main/Service/ADC/Gain)*. If *Gain* is set correctly, the A/D converter is probably damaged. Consult with Kistler-Morse.
  - If the voltage is greater than 1 volt, recheck wiring, sensors, and power supply as described in Steps 1 through 3.

## 7. Gross Units Over

### **Explanation**

The calculated gross weight (or selected engineering unit) exceeds six active digits (999999).

### **Solutions**

#### **Note**

---

Write down all existing system parameters before you change the *Form* or *Units*. If you change the *Form* or *Units* you must adjust system parameters to correspond to the new *Form* or *Units*.

---

1. Check the *Form* you selected for the channel. A form of xxxx.xx yields a maximum value of 9999.99, while a form of xxxxx00 yields a maximum value of 99999900. Make sure that the form is consistent with the maximum expected value.
2. Check the *Units* you selected for the channel. For example, a value in tons is 2000 times greater than a value in pounds; a value in barrels is 42 times greater than a value in gallons. Make sure that the units are consistent with the maximum expected value.
3. Check the calibration for the channel. Recalibrate if required.

## 8. Net Units Over

### **Explanation**

The calculated net weight (or selected engineering unit) exceeds six active digits (999999).

### **Solutions**

#### **Note**

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Write down all existing system parameters before you change the *Form* or *Units*. If you change the *Form* or *Units* you must adjust the system parameters to correspond to the new *Form* or *Units*.

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1. Check the *Form* you selected for the channel. A form of xxxx.xx yields a maximum value of 9999.99, while a form of xxxxx00 yields a maximum value of 99999900. Make sure that the form is consistent with the maximum expected value.

2. Check the *Units* you selected for the channel. For example, a value in tons is 2000 times greater than a value in pounds; a value in barrels is 42 times greater than a value in gallons. Make sure that the units are consistent with the maximum expected value.
3. Check the calibration for the channel. Recalibrate if required.

## 9. Math Channel Overage ChXX

### **Explanation**

This error message applies to math channels only. It indicates that one of the sensor input channels used in the math formula is above 2,097,151 counts (if +) or 0 (if -). There will be a corresponding ADC Overage error message on the sensor channel.

### **Solution**

Determine which of the sensor input channels has the overrange problem by scrolling to each input channel to see if the ADC Overage message is displayed. Then, see ADC Overage above for correcting the problem.

## 10. Math Channel Units Over ChXX

### **Explanation**

This error message applies to math channels only. It indicates that the calculated net or gross weight (or whatever engineering unit you selected for the display) from one or more of the sensor input channels used in the math formula exceeds six active digits (999999). There will be a corresponding Gross or Net Units Over error message on the sensor channel.

### **Solution**

Determine which of the input channels has the problem by scrolling to each input channel to see which has the Gross Units Over or Net Units Over message displayed. Then, see Gross Units Over above for correcting the problem.

## **11. Math Error # or Script Compile Error #**

### ***Explanation***

These error messages apply to math channels only. They indicate a problem with the input equation.

### ***Solution***

See Chapter 8, Math Channels, for a detailed list of the math error messages and solutions.