SonoTracker™ Ultrasonic System Reference Manual

CAUTION

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

SON280020
Rev A
July 2007

NOTICE

Table of Contents

Introduction

This chapter describes the organization, manual conventions, and provides contact and technical service information .

Welcome

This manual describes the installation and operational parameters of the SonoTracker™ Ultrasonic Level System. Begin with Chapter 2, Installation and upon power-up, complete the quick configuration for your application and you are ready to go!

Contact Bindicator Technical Support at 1-800-778-9242 if you have any questions regarding the installation. From outside the USA and from Canada, call 864-574-8060.

About this manual

The chapters are organized in the following way:

Chapter 1:	Description of the SonoTracker™
Chapter 2:	SonoTracker™ Installation
Chapter 3:	Methods of Operation
Chapter 4:	Level Application Start-Up
Chapter 5:	DLD Application Start-Up
Chapter 6:	Flow Application Start-Up
Chapter 7:	Menu Descriptions

Appendix A through G include specifications, serial commands, troubleshooting charts, error messages, technical drawings (TI's), Error Codes, and Menu Tree & Hot Keys.

Manual Conventions

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

WARNING

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

CAUTION

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

Note

Contains additional information about a step or feature critical to the installation or operation of the SonoTracker™.

Contact Information

You may reach Bindicator corporate headquarters at the following:

Mail:	Bindicator 150 Venture Blvd. Spartanburg, SC 29306
Telephone:	1-800-778-9242 (864) 574-8060
Fax:	(864) 574-8063
E-mail:	sales@bindicator.com
Website:	http://www.bindicator.com

Technical Service

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

Bindicator warrants the equipment to be free from defects in material and workmanship for one year from date of shipment to original user or two years if purchased with STARTUP program. Bindicator will replace or repair, at our option, any part found to be defective. Buyer must return any part claimed defective to Bindicator, transportation prepaid.

Bindicator maintains a fully trained staff of field service personnel who are capable of providing you with complete product assistance. Our field service staff is Spartanburg, SC.

Phone Consultation

Our Customer Service staff provides the following services by telephone, via our regular and toll free number (toll free in U.S.A. and Canada only):

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

On-Site Consultation

Bindicator's Field Service staff can provide additional services at your request. Contact Bindicator 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.

Troubleshooting

Bindicator will troubleshoot systems for mechanical, electrical, calibration, and wiring errors. Normal component repairs will be made and wiring errors will be corrected, including replacement of non-repairable printed circuit boards. (To troubleshoot your own equipment, see Appendix C for Equipment Troubleshooting charts)

Service Calls

Bindicator will perform on-site repair/replacement services.

Return Material Authorization

If a part needs to be sent to the factory for repair, contact Bindicator's corporate office 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.

Chapter 1: Description of the SonoTracker™ System

This chapter describes the Ultrasonic system and its applications. It also includes 'Getting Started' information and a system block diagram.

Introduction

Figure 1-1. Sonotracker™ *system*

The SonoTracker™ Ultrasonic System (Fig 1-1) can monitor up to a total of 16 transducers of various frequencies, accommodating multiple vessels of different heights and shapes as well as flow and DLD (Differential Level Detection) applications.

The high scan rates of the SonoTracker™ provide fast information updates on material level. The SonoTracker™ has an integral keyboard and a display that provide easy access for programming and allow the user to input their own vessel identifications. The enclosure is designed for rugged, outdoor applications and is wall-mounted. The SonoTracker™ is available in both AC- and DC- powered versions.

What is Ultrasonics?

The operating principle of ultrasonics is based on the reflection of sound, which is used in many applications to determine distance. The transducer sends out a sound pulse through the air and then receives an echo a short time later. The time is carefully measured, allowing the distance to the reflecting object to be determined.

System Applications

The SonoTracker™ can be used in three ways:

1. Level —
   - Monitors level from up to 16 transducers.
   - Can display volume or weight converted from level.

2. Differential Level —
   - Monitors level and difference in level between two points.
   - Can display volume or weight of vessel contents, converted from level.
   - Each differential level system requires two transducers. Therefore, the SonoTracker™ can accommodate a maximum of eight differential level applications.

3. Flow —
   - Monitors flow for flumes, weirs, and nozzles, using the transducer.
   - Can accommodate a maximum of four flow applications per SonoTracker™.

4. Demo- ***An option used for demo purposes only. Configures the SonoTracker™ to respond to quick movements such as the moving of the transducer to and from the vessel wall to show response time.***

Note:

The SonoTracker™ can monitor combinations of level, differential level, and flow applications, with a maximum of 16 transducer and no more than 4 flow applications.

For example, the following combinations of applications are all possible:

- *16 level applications*
- *8 differential level applications*
- *4 flow and 12 level applications*
- *4 flow and 6 differential level applications*
- *4 flow, 3 differential level, and 6 level applications*

Modular Printed Circuit Boards (PCBs)

The SonoTracker™ modular design allows easy system configuration to the specific needs of your application and expansion to meet future requirements (Figure 1-2).

This flexible system allows simple interconnection to a variety of Programmable Logic SonoTrackers™ (PLCs). The SonoTracker™ is Allen-Bradley Enabled™· It can be connected to the Allen-Bradley network through an optional printed circuit board (PCB) installed in the SonoTracker™ .

The motherboard inside the SonoTracker™ enclosure has three optional PCB card positions. Optional PCBs plug onto the motherboard and are accessed through the front of the enclosure for wiring.

The PCBs available to make up an SonoTracker™ 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 —

- 2-, 4-, or 8-channel Scanner PCB; Two cards combined can monitor up to 16 vessels
- 5- or 8-channel Relay Output PCB
- 2-, 4-, or 8-channel Current Output PCB
- Combi-Card PCBs for Relay and Current Output functions, in the following combinations:
  - 2 Relay and 1 Current Output
  - 4 Relay and 2 Current Outputs
- 16-channel Point Level Input PCB
- Allen-Bradley RIO PCB
- Profibus PCB

Getting Started

To quickly get started using your SonoTracker™ and transducer(s), do the following:

1. Read Chapter 2, System Installation, and install the transducer(s), junction box(es), temperature probe(s), and the SonoTracker™.
2. Read Chapter 3, Methods of Operation, to get a basic understanding of how to use the keyboard and menus.
3. Read and follow the *Start-Up* Procedure for your application:
   - **Chapter 4 — Level**
   - **Chapter 5 — Differential level (DLD)**
   - **Chapter 6 — Flow**
4. Read Chapter 7: Menu Descriptions: See the related menus, and follow the procedures to set up setpoint relays, current outputs, and serial communications.

That's it — you can begin to use your SonoTracker™ to monitor the contents of your vessel. It is recommended that you read the entire manual for a thorough understanding of the operation of the SonoTracker™ and the available options.

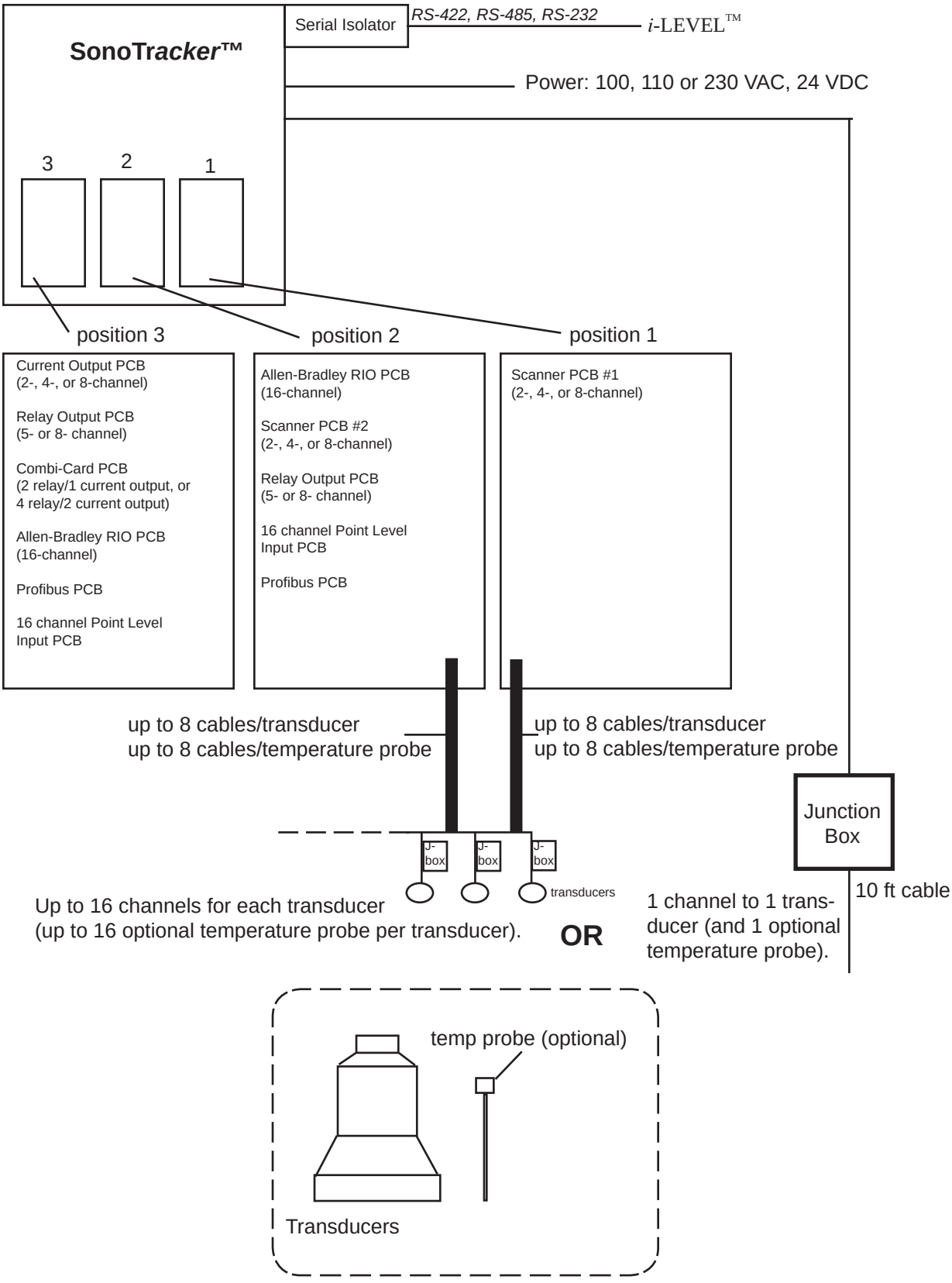


Fig 1-2. Sonotracker™ Ultrasonic System Configuration Diagram

Chapter 2: SonoTracker™ Ultrasonic System Installation

This chapter provides instructions on how to install the transducers, optional temperature probes, junction boxes, and SonoTracker™ signal processor. Procedures to wire external power to the SonoTracker™ power supply and to connect the transducers and temperature probes, 4-20 mA outputs, setpoint relays, and communications to the SonoTracker™ are included in this chapter. Refer to the drawings in Appendix E for wiring and installation details. Review all instructions before beginning installation. It is important that all instructions are followed carefully to ensure that the equipment is properly mounted and wired.

Application Verification

Prior to ordering your system, you should have completed an Application Data Form. If you need the form, go to our website at http://www.bindicator.com or contact Bindicator (See page ii) to get another copy before you proceed. Review the information on the form to verify the application details.

Order Verification

Carefully remove the SonoTracker™, junction box(es), transducer(s), and optional temperature probe(s) 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 Bindicator immediately. Store the shipping container and packing material for later use in the event the equipment must be returned to the factory.

Prior to beginning installation, verify that your order is complete and assemble additional equipment needed for the installation. If any items are missing from the order, contact Bindicator before proceeding. Substituting parts without Bindicator approval may cause system problems and will void the warranty.

Mounting transducer

Mounting Location Guidelines

See Figures 2-1 and 2-2. For optimum results, a clear sound beam path between the transducer and the lowest level of material is required. When selecting a mounting location for the transducer, follow these guidelines:

- Minimum distance from the transducer to any sidewall is **the greater of the following**:
  - — 1’ (0.30m) horizontal distance for each 10’ (3.0m) in vertical distance from the face of the transducer to the zero level (no material in the vessel)
  - — 2’ (0.60m) horizontal distance

  Note that for a very deep vessel with a small cross-section, it may be impossible to meet the above requirements.
- Transducer beam path is outside the path of the fill stream.
- Transducer beam path is away from any turbulent air currents which might be produced by dust collectors, pneumatic conveyor discharge, etc.
- Transducer beam path is away from splashing or agitating liquid or bouncing materials.
- Ladders, seams, rebar, etc. in the transducer beam path are avoided or eliminated.
- Transducer location is away from equipment which create vibration and noise that can interfere with the operation of the system: dryers, motors, compressors, fans and blowers, air conditioning units, etc.
- Face of the transducer is above the maximum expected material level by a minimum of:
  - — 12” (305mm) for BT-26 transducers
  - — 24” (610mm) for BT-61 transducers
  - — 36” (914mm) for BT-101 transducers
  - — 24” (610mm) for BT-55 transducers

  This is required to avoid having material within the transducer’s blind space (amount of time required for transducer vibration to decay to a level where ultrasonic measurement is possible).

Example: If the vertical distance from the face of the transducer to the bottom of the tank is 50’, the minimum horizontal distance to any sidewall is the greater of:
- (50’÷10’) x 1’ = 5’
- 2’

So, the minimum horizontal distance to any sidewall is 5’.

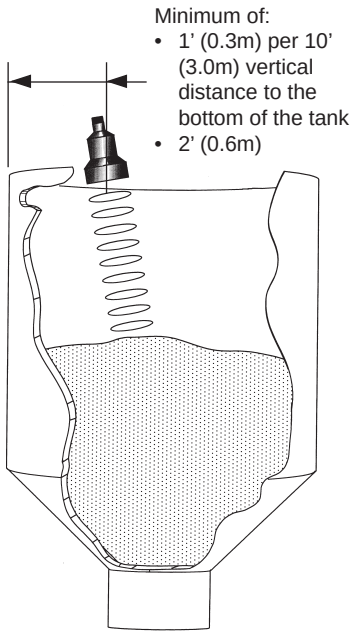


Figure 2-1. Mounting Distance from Sidewalls

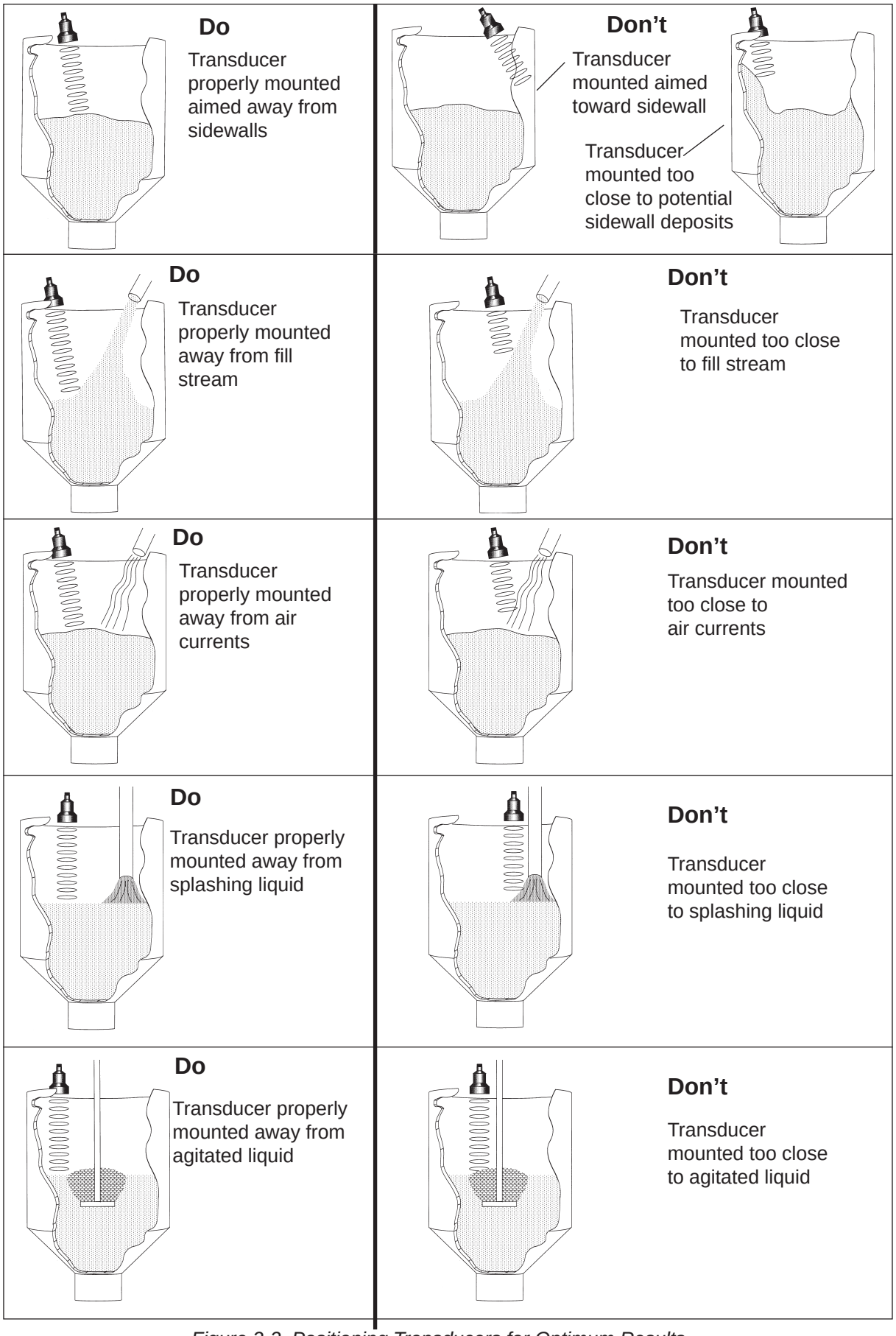


Figure 2-2. Positioning Transducers for Optimum Results

General Installation Guidelines

- Use transducer aiming mounts on solids applications.
- Aim the transducer toward the low level draw point on solids and perpendicular to the surface on liquids.
- Provide sufficient flexible conduit at the transducer location to facilitate transducer aiming movement and removal.
- Run transducer cable from the transducer to the junction box, and from the junction box to the signal processor in dedicated grounded metal conduit or in cable tray. All cables connected to the same signal processor may be routed in the same conduit. Do not run transducer cable with any other AC power wiring.

Mounting Instructions

Mounting dimensions, electrical and mechanical specifications for all the transducers, and mounting methods are found in the drawings in Appendix E.

The mounting dimensions as well as the location and positioning information provided in this chapter should be taken into consideration before selecting a mounting method, as some methods depend on the type of vessel and application.

Mounting Temperature Probe

If you are installing a temperature probe, refer to Appendix E, Technical Drawings. Follow these guidelines:

- Ensure that the temperature probe does not come in contact with the measured material during normal fill **and** during overfill conditions. The probe may be damaged if it comes in contact with the material.
- Temperature probe may be mounted pointing in any direction.
- Mount the temperature probe so that an average or representative air temperature in the vessel is read.
- Temperature probe has a 1/4" NPT mount. It can be mounted on the same flange with the transducer or through use of a small bracket that will allow for a hanger type mounting within the vessel.
- Many users find it convenient to mount the temperature probe near the transducer. If mounted in this way, the temperature probe cable can be run through the same conduit as the transducer cable.

Mounting Junction Box

Mount the junction box close enough to the transducer to use the supplied 10' (3.0m) transducer cable without splicing. Mount the junction box so that water cannot reach the terminal block.

Note:
Mounting hardware for the junction box is not supplied by Bindicator.

1. See Figure 2-3. Hold the junction box at the desired location and mark the positions of the mounting holes. Place the junction box in a safe place.
2. Drill the mounting holes.
3. Attach the junction box using hardware that will secure it firmly in place.

Note:
Mounting hardware for the SonoTracker™ is not supplied by Bindicator.

Mounting SonoTracker™

When mounting the SonoTracker™, be sure there is enough clearance to open the front door completely. Removal and insertion of the modular PCBs and wiring of the ultra-cells™ and the PCBs are done through the front of the unit.

Do not mount the SonoTracker™ near high power equipment, contactors, SCR drives, 440 V lines, etc.

The SonoTracker™ enclosure dimensions are shown in Appendix E, Technical Drawings. Refer to Appendix A for environmental specifications before mounting the unit.

Follow this procedure to mount the SonoTracker™:

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

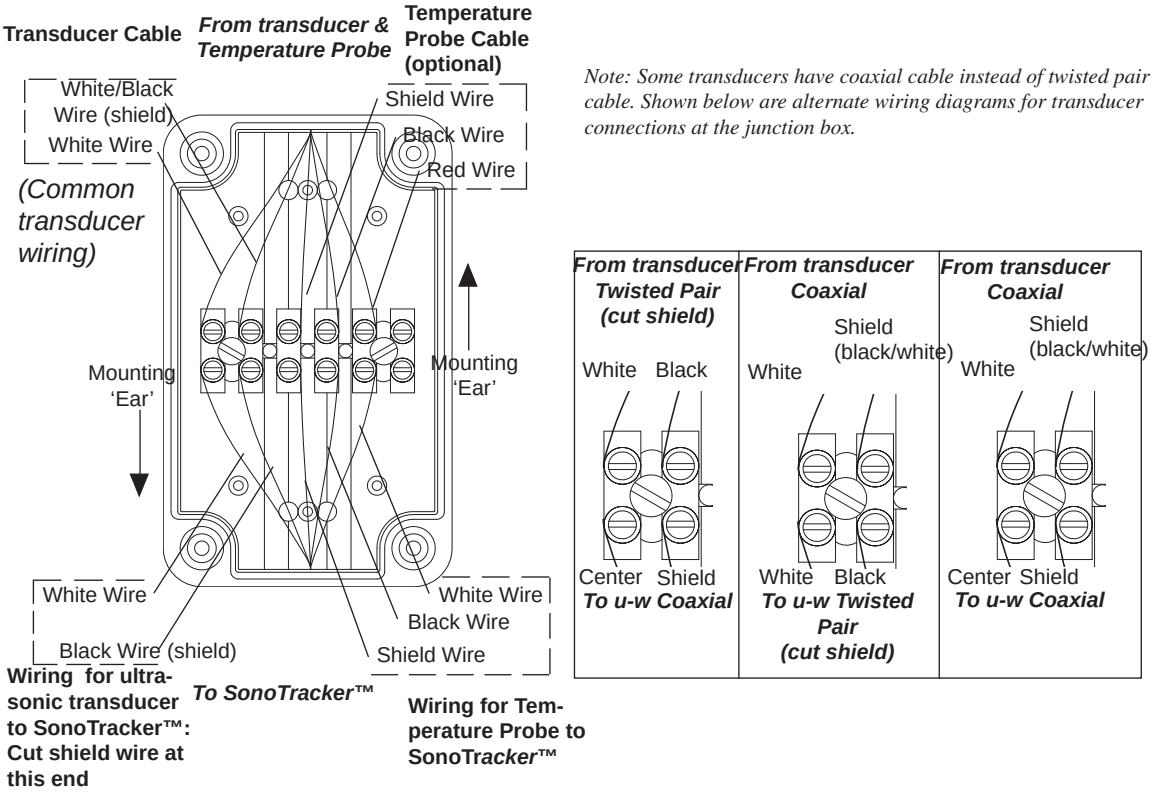


Figure 2-3. Junction Box Mounting and Wiring

System Wiring

This section describes how to wire the transducer to the junction box, junction box to the SonoTracker™, power to the SonoTracker™, and auxiliary equipment to the optional PCBs.

WARNING:
All wiring must comply with government or local codes.

Wiring Transducer and Temperature Probe to Junction Box

See Figure 2-4. Avoid cutting the transducer cable if possible.

1. Transducer cable — Connect the cable to the junction box terminals.
2. Optional temperature probe — Connect the cable to the junction box terminals.

CAUTIONS:

Do not run other cables or wires through the same conduit with the transducer and temperature probe cables.

Do not route the transducer/junction box cables in the same conduit with the serial data bus cables.

Drilling Holes in SonoTracker™ Enclosure

Remove the electronics before drilling holes in the enclosure. Drill the holes through the bottom or side of the enclosure. (See Appendix E, TI Drawings) DO NOT drill holes through the top as this may allow moisture seepage, which can damage the electronics and void the warranty.

The SonoTracker™ enclosure has no openings through which to route cables or install conduit. Before you begin wiring, remove the PCB panel (4 screws) and 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 mother-board, option cards, or enclosure door. Refer to Appendix E, Technical Drawings.

Notes:

1. *Seal all conduit fittings against water entry. Install drain holes at conduit's lowest elevation(s) to allow condensation to drain.*
2. *Wiring for transducer, from junction box to SonoTracker™: Use Belden 8760 two-conductor twisted shielded pair cable. Maximum lengths are:*
   - *BT-55 — 500' (152m)*
   - *BT-26 — 750' (228m)*
   - *BT-61 — 1000' (304m)*
   - *BT-101 — 1200' (365m)*
3. *For runs up to 1200 ft (365m) for all transducers, RG62U coaxial cable can be substituted.*
4. *Wiring for temperature probe (optional) from junction box to SonoTracker™: Use Belden 8760 two-conductor twisted shielded pair cable.*
5. *All wiring routed between junction boxes and SonoTracker™ must be continuous (no splices).*

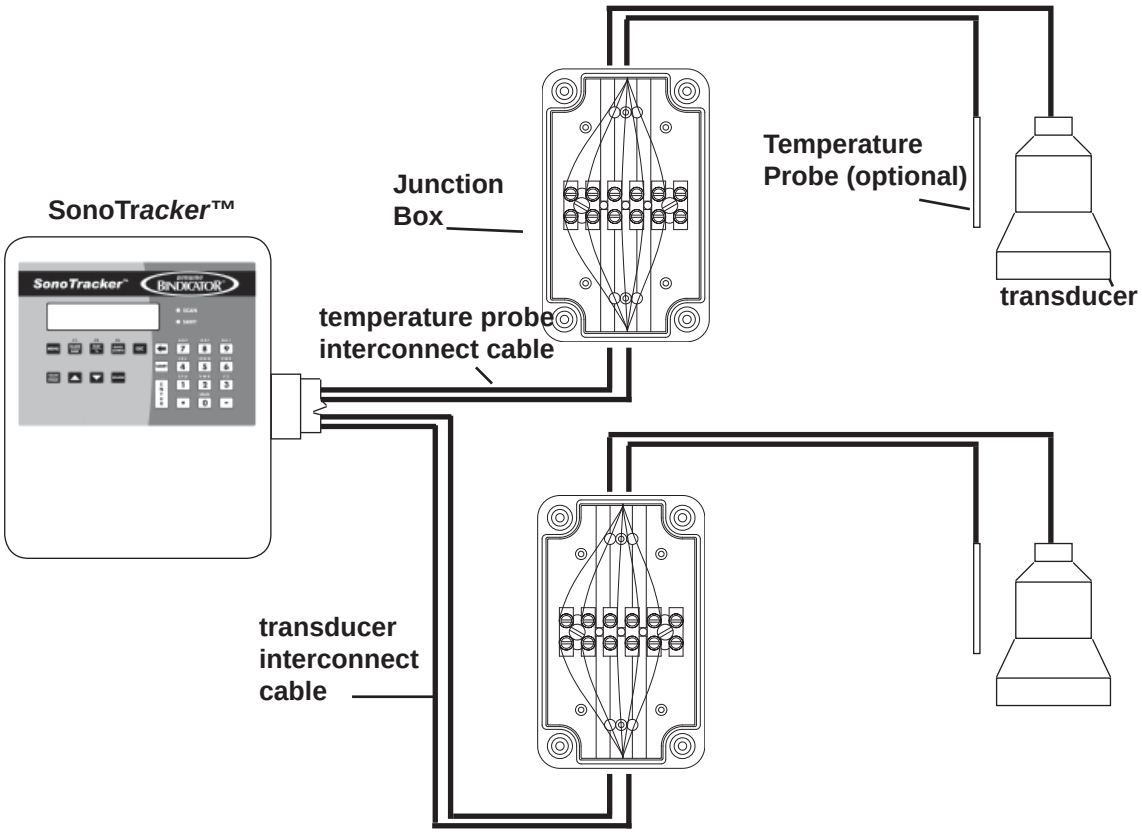


Figure 2-4. WiringTransducers to SonoTracker™

Wiring Junction Box to SonoTracker™

1. See Figure 2-4 for wiring at the junction box.
   A. Transducer Interconnect — Cut the shield wire at the J-Box end of the cable only. Connect this end of the cable to the junction box terminals.
   B. Temperature probe Interconnect — Connect one end of the cable to the junction box terminals.
2. If wiring a single transducer to the SonoTracker™, see Appendix E:
   A. Connect the transducer wiring to TB7 on the motherboard (on right side).
   B. Connect the temperature probe wiring (optional) to TB6 on the motherboard (to left of TB7).
3. If wiring multiple transducers to the SonoTracker™, see Appendix E:
   A. Connect the transducer wiring to the designated terminals on the Scanner PCB.
   B. Connect the temperature probe wiring (optional) to the designated terminals on the Scanner PCB.

The Scanner PCB can be temporarily removed from the SonoTracker™ to make wiring easier.

WARNING:

When connecting power to this unit, 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.

Notes:

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

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

The current output transmitter drives a maximum load of 600 ohms. If an external current loop power supply is provided, the transmitter drives a maximum load of 1,000 ohms.

Multiple current outputs share a common lowside.

CAUTION

Only use Sikaflex™ 1A polyurethane sealant or Dow Corning RTV 739 or RTV 738. Other sealants may contain acetic acid, which is harmful to electronics.

Wiring Power

Refer to Appendix E, Technical Drawings and to instructions below for AC and DC systems.

AC SonoTracker™

Route the AC power cable and the relay output cables separate from the low-level signal cables. Doing so will avoid electrical interference in the transducer signal and the communication signals.

DC SonoTracker™

Route the DC power cable separate from any AC power cable and transducer cable. Route the relay output cables separate from the DC power cables 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.

Wiring Optional Control Devices for Relay Outputs

Relay Output PCB — Refer to Appendix E to wire each control device.

Combi-Card PCB — Refer to Appendix E to wire each control device.

Wiring Auxiliary Equipment for Current Outputs

Current Output PCB — Refer to Appendix E to wire auxiliary equipment.

Combi-Card PCB — Refer to Appendix E to wire auxiliary equipment.

Point Level PCB— Refer to Appendix E to wire auxiliary equipment.

Wiring Optional Input Devices for Point Level Input

Point Level Input PCB — Refer to Appendix E to wire auxiliary equipment.

Wiring Serial Communications

Refer to Appendix E to wire serial communications.

Wiring PLC Interface Module

Refer to A-B RIO Interface Manual for SonoTracker™ for wiring and setup information, Profibus User's Manual, or associated device manual for wiring information.

Sealing Openings in Enclosure

After you have completed installation of the conduit and cables, seal around the openings in the SonoTracker™ enclosure to prevent moisture entry.

Synchronization (SYNC)

If you use the same conduit to run transducer cables from more than one SonoTracker™ controller, the units **must** be synchronized. To do this, wire the synchronize terminal blocks (TB3) on the main boards of the SonoTrackers™ to each other. TB3 is on the left side of the motherboard, to the right of the ribbon cable. Refer to Appendix E. The synchronize cable can be run in the same conduit as the transducer cable.

Serial Addresses

Note:
Setting the addressing dipswitch is not required unless you are using the serial port.

The SonoTracker™ will monitor up to 16 channels, with each channel having its own address. The SW2 switch, located on the Display PCB inside the door of the SonoTracker™ (Figure 2-5), sets the base address for channel 1. The addresses for the remaining channels (if there is more than one) will automatically be set in sequential order. For example, if the SonoTracker™ is monitoring 16 transducers and SW2 is set for address 8, channel 1 will be address 8, channel 2 will be address 9, channel 3 will be address 10, etc.

The SonoTracker™ supports a total of 256 addresses (range of 0-255). Setting the starting address is done by positioning the rocker-arm switches (S1 - S8) on SW2 to the binary equivalent of the address number. Table 2-1 shows how the switches are set in binary sequence for the first 16 (0 - 15) and last two (254 and 255) addresses.

The SonoTracker™ counts a block of eight serial addresses for each Scanner PCB in the SonoTracker™, even if you do not enable all channels on the Scanner PCB. If any math channels are enabled (see Chapter 7: Service Menu/Enable), the math channel serial addresses begin after the block of monitoring channel addresses.

Example:
The SonoTracker™ has two Scanner PCBs, with a total capacity of 16 monitoring channels, but you enable only 12 monitoring channels. You enable channel 17, the first available math channel. You set the base serial address to 0. The serial addresses are:

- Addresses 0 through 11 for the monitoring channels
- Address 16 for the math channel

Note that addresses 12 through 15 are not being used for the SonoTracker™.

Binary								Decimal
S8	S7	S6	S5	S4	S3	S2	S1	ADDR
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	1	1
0	0	0	0	0	0	1	0	2
0	0	0	0	0	0	1	1	3
0	0	0	0	0	1	0	0	4
0	0	0	0	0	1	0	1	5
0	0	0	0	0	1	1	0	6
0	0	0	0	0	1	1	1	7
0	0	0	0	1	0	0	0	8
0	0	0	0	1	0	0	1	9
0	0	0	0	1	0	1	0	10
0	0	0	0	1	0	1	1	11
0	0	0	0	1	1	0	0	12
0	0	0	0	1	1	0	1	13
0	0	0	0	1	1	1	0	14
0	0	0	0	1	1	1	1	15
.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
1	1	1	1	1	1	1	0	254
1	1	1	1	1	1	1	1	255

Table 2-1. Address Selections — 0=OFF, 1=ON

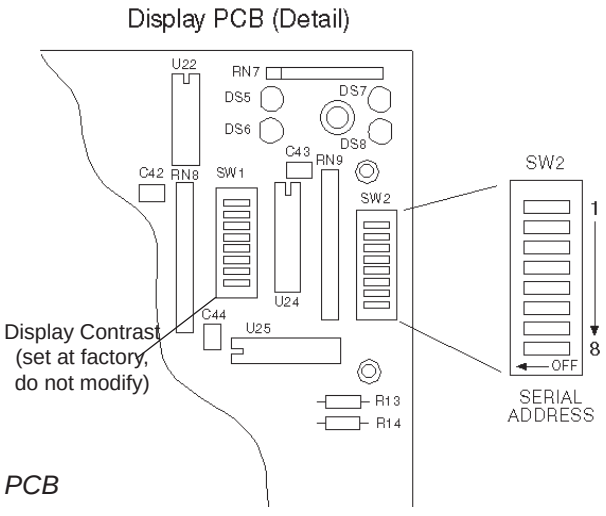


Figure 2-5. SW2 on the Display PCB

Installing PCB's

The SonoTracker™ arrives from Bindicator 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 SonoTracker™ that accept optional PCBs. Note the following restrictions on PCB positions in the SonoTracker™:

- **Position 1**
  2-, 4-, or 8-channel Scanner PCB (1st scanner PCB)
- **Position 2**
  2-, 4-, or 8-channel Scanner PCB (2nd scanner PCB)
  5-channel or 8-channel Relay Output PCB
  16-channel Allen-Bradley RIO PCB
  16 channel Point Level Input PCB
  Profibus card

- **Position 3**
  5-channel or 8-channel Relay Output PCB
  2-, 4-, or 8-channel Current Output PCB
  16 channel Point Level Input PCB
  Combi-Card PCBs
  (2 relays and 1 current output;
  or 4 relays and 2 current outputs)
  16-channel Allen-Bradley RIO PCB
  Profibus card

Refer to Appendix E and follow this procedure to install an optional PCB into the SonoTracker™:

1. Open the door of the SonoTracker™.
2. Turn off the SonoTracker™ — the AC switch is in the upper right corner of the PCB.
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 three screws supplied with the PCB.
5. Connect the field wiring to the PCB.
6. Restore power to the SonoTracker™. Close the door. Installation is complete.

If you add a 2-, 4-, or 8-channel Scanner PCB to the SonoTracker™, you must use the *Enable* and *Default* functions in the *Service* Menu to bring the new channels on-line. Refer to Chapter 7, Menu Descriptions, for the use of those functions.

Note:
Before you use the *Default* function to bring the new channels on-line, **record all calibration and setup parameters**. The *Default* function will erase all existing calibration and setup parameters. Re-enter the parameters after the new channels are on-line.

Chapter 3: Methods of Operation

This chapter describes how to use the keyboard and provides the quick configuration parameters and menu structure. To gain access to the menus, you need to be in the Manual Mode.

Introduction

The SonoTracker™ has two modes of operation:

- Channel Monitoring — level (or other indication of vessel contents) is displayed. Channel monitoring has two submodes:
  — Auto Mode displays information on each channel sequentially.
  — Manual Mode displays information on one channel. The Up and Down Arrow Keys are used to manually scroll to other channels.
  Pressing the Auto/Man Key switches between Auto and Manual Modes.

- Menu Operation — system parameters for display, input/output, calibration, and troubleshooting can be viewed and modified. Pressing the Menu Key while in Manual Mode accesses Menu Operation.
  Pressing the Auto/Man Key switches between Auto and Manual Modes.

Display and Keyboard

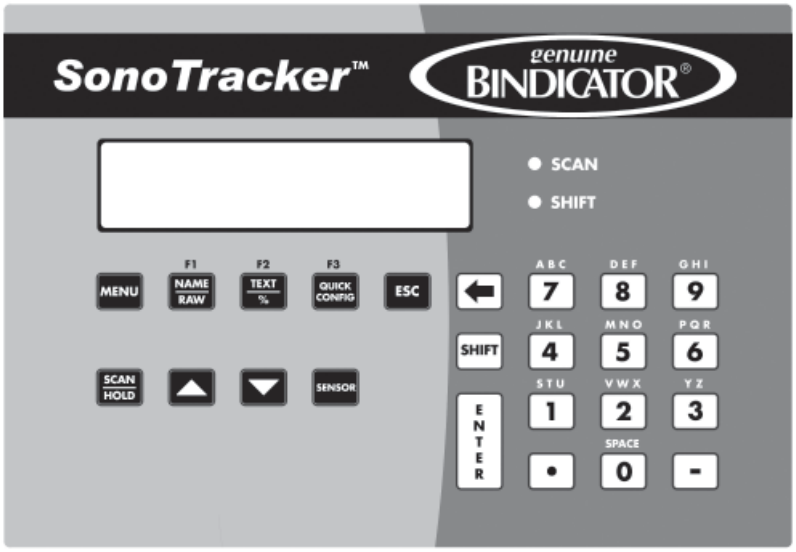


Fig 3-1. Display and Keyboard

Refer to Figure 3-1. The SonoTracker™ display/keyboard panel has a liquid crystal display (LCD) made up of two 16-character lines and an integral, weather-sealed membrane keyboard. The LCD displays the vessel ID, material level (or other indication of vessel contents), menu selections, and error messages.

The SonoTracker™ keyboard is used to access the different menus, scroll through the vessel monitoring display screens, and enter setup and calibration parameters. The function of each key on the keyboard is described in the sections to follow.

Auto/Man Key

When in RUN Mode, the SonoTracker™ displays the factory-set ID number (or the customer-defined ID, if input) and Material Level or Range. The SonoTracker™ display can be set up to scroll automatically through the display screens for each channel (Auto Mode) or remain fixed on a selected channel (Manual Mode). The Auto/Man Key toggles between Auto and Manual Modes:

- When the SonoTracker™ is in the Auto Mode, the display remains on a channel for a preset period of time before scrolling to the next channel. The preset display time can be changed to suit the operator needs, using the *Display Scan Time* function (see Chapter 7, Display Menu).
  The Auto LED to the right of the LCD is illuminated when the SonoTracker™ is in the Auto Mode.
- When the SonoTracker™ is in the Manual Mode, the display remains fixed on a selected channel and must be scrolled manually with the Up Arrow and Down Arrow Keys to display information on another channel. The Auto LED is off when the SonoTracker™ 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 the RUN Mode.

Up Arrow and Down Arrow Keys

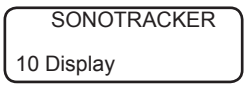
The Up Arrow and Down Arrow Keys are used to manually scroll the display through the channels when the SonoTracker™ is in the Manual Mode.

These keys are also used to scroll to desired values when in the menu tree, entering setup and calibration parameters.

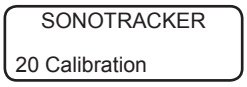
Menu Key

Note:
The SonoTracker™ must be in the Manual Mode (Auto LED off) to access the menus.

Pressing the Menu Key accesses the *Main* Menu. To scroll through the menus, use the up and down arrow keys. For example, the first page shows:



Pressing the up arrow key displays the other options, like below:



Pressing the Esc Key backs through the submenus one level at a time.

Note:
For F3 function see page 7-34.

F1, F2, and F3 Keys

The Function Keys — F1, F2, and F3 — are used for lower case characters and special symbols when editing the display. From Auto mode, pressing MANUAL then F1 displays raw target (in inches or centimeters) from transducer face to processed echo. Pressing F2 changes the display to read in bar graph mode. Pressing F3 will initiate a default of a channel..

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 the RUN Mode.
- The Esc Key also has another function. The SonoTracker™ arrives from Bindicator with a factory-set ID number assigned to each channel. If you replaced the number with a customer-defined ID during the *Startup* Procedure or in the *Display* Menu, pressing the Esc Key while the display is in the Manual Mode (Auto LED off) briefly displays the factory-set ID.

(Backspace Arrow) Key

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

"." *(Period)* Key

When the SonoTracker™ is in the Manual Mode, pressing the "." Key briefly displays the current SonoTracker™ 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 and Shift Key

The Alphanumeric Keys (also referred to as the keypad) are used to input numeric parameters during setup and calibration and customer-defined IDs.

The Shift LED is located below the Auto LED on the faceplate. Pressing the Shift Key toggles the Shift LED on and off. The effect is described below:

- Shift LED not illuminated — Pressing an Alphanumeric Key types the number shown on the key.
- Shift LED illuminated — Pressing an Alphanumeric Key types a letter labeled above the key. Pressing the key repeatedly toggles the display through the three letters labeled 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. Figure 3-2 shows the characters available for a customer-defined ID.

Key	Character Shift LED On	Character Shift LED Off
1	S T U s t u	1
2	V W X v w x	2
3	Y Z y z	3
4	J K L j k l	4
5	M N O m n o	5
6	P Q R p q r	6
7	A B C a b c	7
8	D E F d e f	8
9	G H I 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	yz , “ ‘ ! : ;
Auto/ Man	- o ° Ö Ü è ∞	

Figure 3-2. List of Characters Available for Customer-Defined ID

Note:
The Sensor Key only works if you are at the “end” of a menu; i.e., you are at the point where you are meant to enter a value or select from a list of choices on the display.

Enter Key

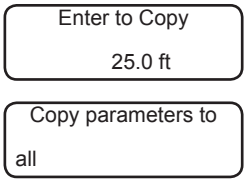
The Enter Key has several functions:

- The Enter Key is used to save in memory any parameter set up in the menus. For example, if you enter an operating span value in the *Main/Calibration/Span* Menu, pressing the Enter Key saves it to memory. The value remains in memory until a new value is entered.
- When entering a vessel ID, the Enter Key advances the cursor one space to the right.
- When the SonoTracker™ is vessel monitoring in 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 when the SonoTracker™ is turned off and back on again) until the Enter Key is pressed to toggle back to the numerical format.

Sensor Key

The Sensor Key allows you to copy parameters to a different channel while remaining in a particular menu function. For example, assume the display is showing this screen for channel 2 under the *Main/Calibration/Span* Menu:

If you press the Sensor Key, the display changes to:



Press the up/down arrow keys to switch to the previous channel (ID#01). When the display shows the desired channel, press the Enter Key. For *Next* and *Back*, the SonoTracker™ display actually switches to the menu tree for the selected channel.

If you do not want to switch channels but simply want to copy the *Span* you entered for channel 2 for use in another channel(s), press enter for *Copy*. The SonoTracker™ then asks whether you want to copy the value to all other channels or to a selected channel.

Quick Configuration Parameters

Upon power up in ***Level*** applications (See Chapter 5 for DLD and Chapter 6 for Flow), the following parameters will be shown:

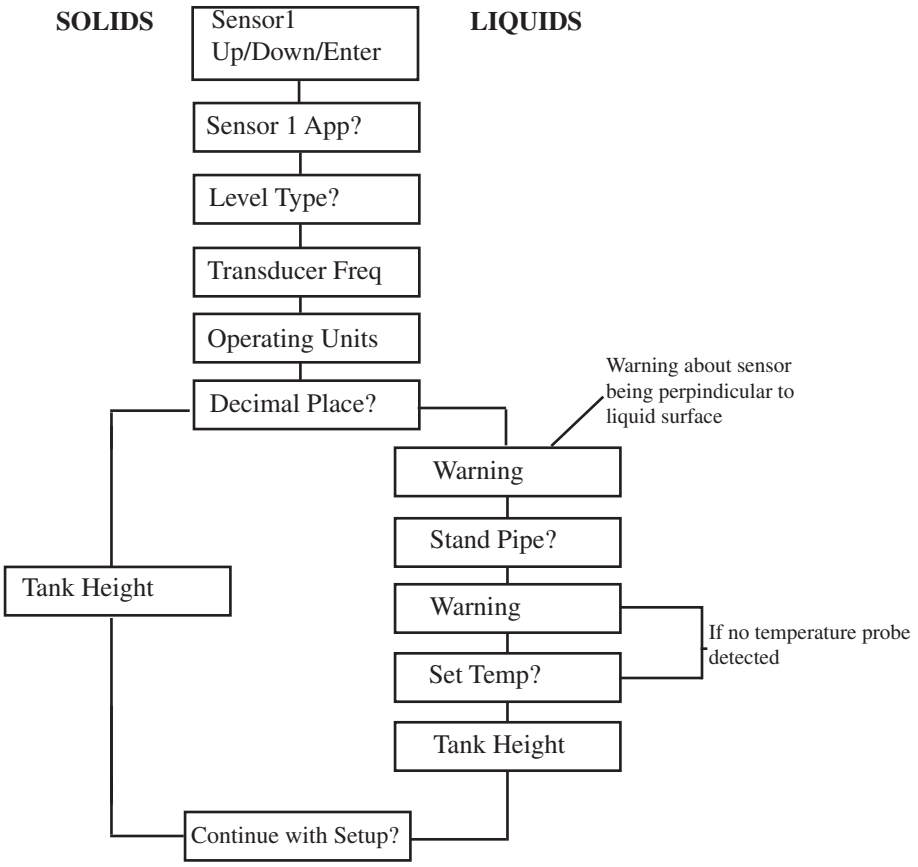


Figure 3-3. Quick Config parameters

Selecting *Yes* allows the entering of other transducer parameters or continues to auto assign; selecting *No* completes the configuration of transducers and continues to auto assign. Once the Auto Assign mode is initiated, select Yes or No to *Auto 4-20*?

In Auto Assign Mode, you are assigning the following per enabled level channel,if the PCB's are installed:

4-20mA:	**1**

All are assigned sequentially. Press Enter to save.

Quick Config is now completed!

Menu Tree

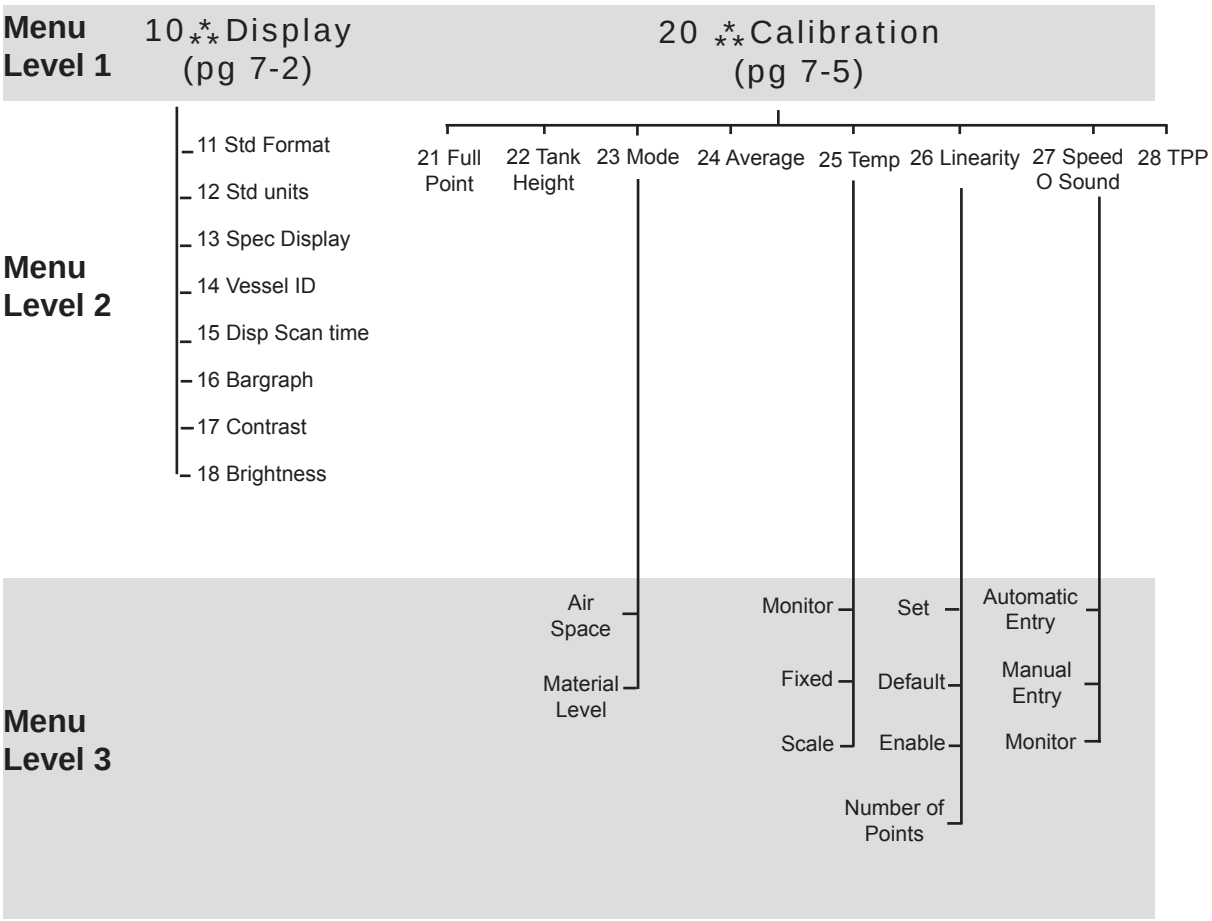
The menu tree of the ultra-*wave*™ is used to enter and view settings, set up, calibrate, and troubleshoot for the system. There are nine submenus listed in the *Main* Menu:

- *10 Display:* enter and view display settings
- *20 Calibration or Math Menu*: calibrate the system
- *30 Relay Set Point:* enter and view setpoint parameters
- *40 I-Output:* enter and view current output parameters
- *50 Serial /PLC:* enter and view serial port configurations, and PLC
- *60 Transducer:* configure tranducer specific parameters (power, gain, etc.)
- *70 Range/Filters:* configure min/max range and filters i.e. noise, Sentry™ DSP
- *80 Point Level:* enter and view Point Level parameters
- *90 Service Menu:* turn channels on and off
  reset parameters to default values
  test the keyboard and non-volatile RAM
  set up a user access code

Note:
Some of the sub-menus are not shown in the menu tree in Figure 3-4 due to space constraints and will vary depending on application.

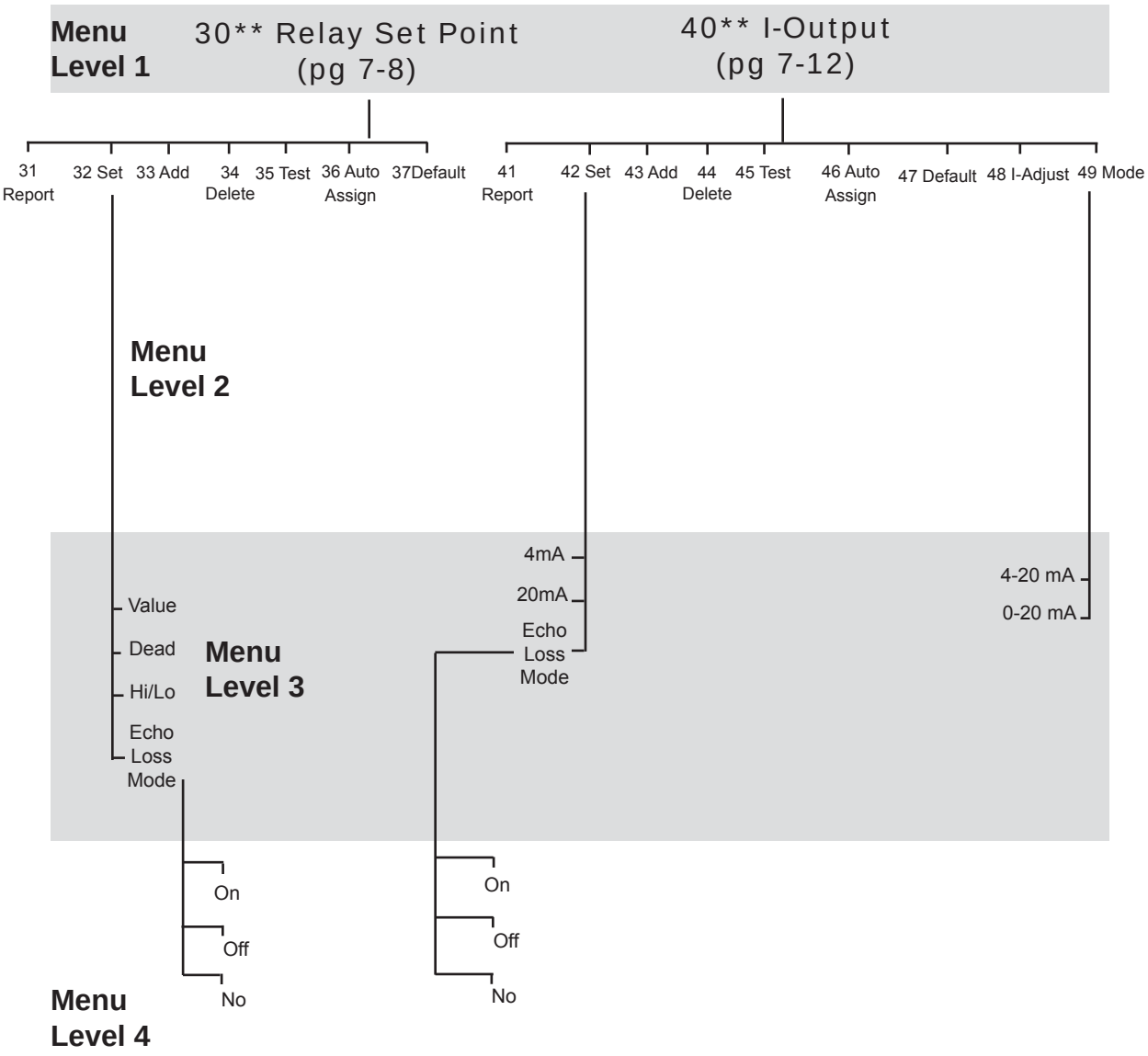
The menu tree in Figure 3-4 shows the *Main* Menu in Menu Level 1 and the submenus in Menu Levels 2 through 4. The menu tree is a quick reference guide to help you find the functions you want to perform. For example, if you want to change setpoint parameters, the menu tree shows you that setpoints are set up in the *Relay Set Point* Menu. Level 2 shows the submenus that are displayed when *Relay Set Point* is selected. Level 3 shows the submenus that are displayed when a selection is made from Level 2, etc.

Chapter 7 provides detailed information on the function and use of all of the menu parameters.



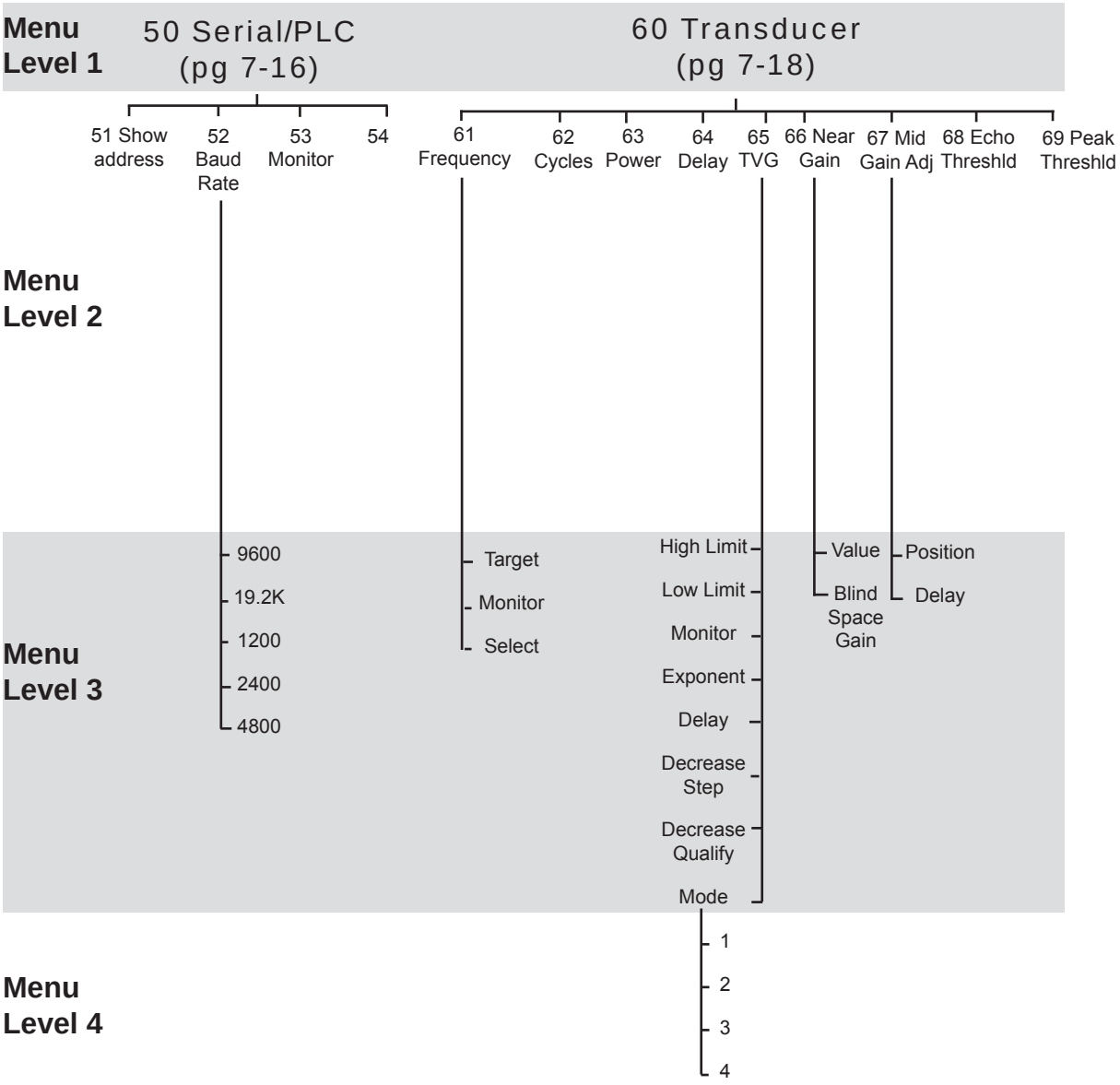
*Parameters change for Math Channels.
**Parameters change for Flow Channels.

Figure 3-4a.SonoTracker™ Menu Tree (continued)



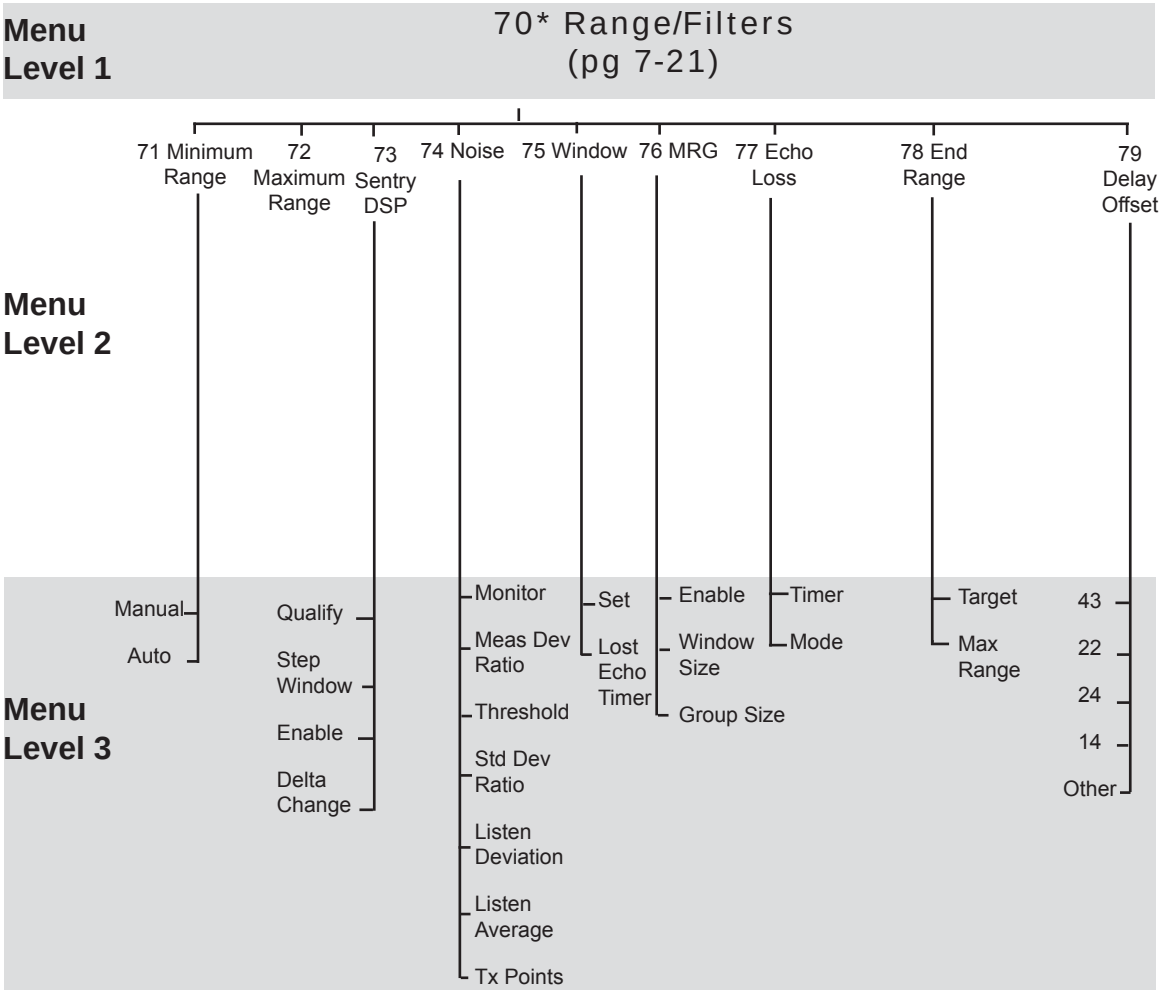
*Parameters change for Math Channels.
**Parameters change for Flow Channels.

Figure 3-4b. SonoTracker™ Menu Tree (continued)



* Submenus are available for PLC only if your SonoTracker™ includes an Allen-Bradley RIO PCB or Profibus. See *A-B RIO Interface Manual for Profibus Interface Manual* for detailed information.

Figure 3-4c. SonoTracker™ Menu Tree (continued)



*Parameters change for Math Channels.
**Parameters change for Flow Channels.

Figure 3-4d. SonoTracker™ Menu Tree (continued)

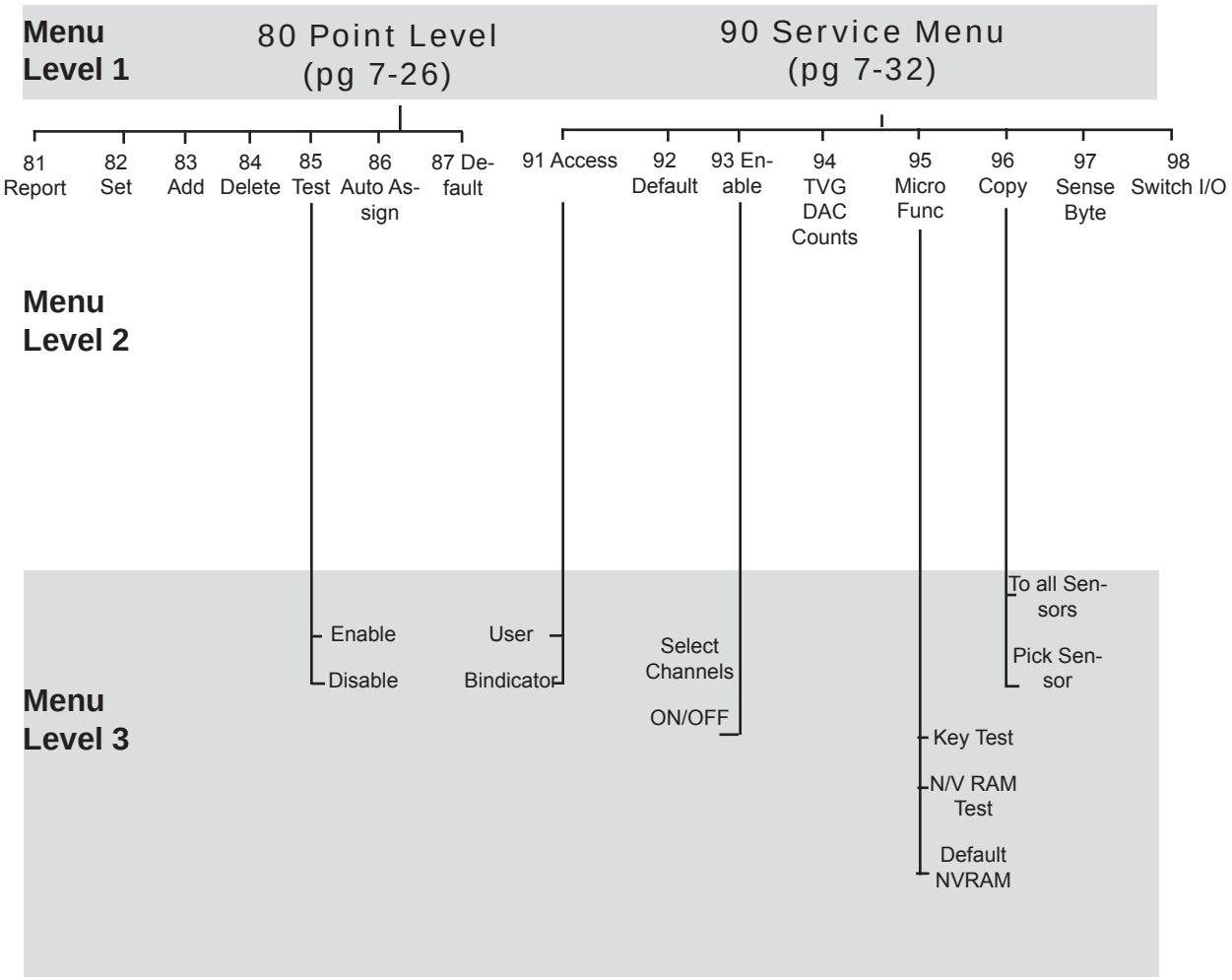


Figure 3-4e. SonoTracker™ Menu Tree

Chapter 4: Operating the SonoTracker™ in Level Applications

This chapter describes how to use your SonoTracker™ System for level applications and includes detailed examples of the Startup Procedure.

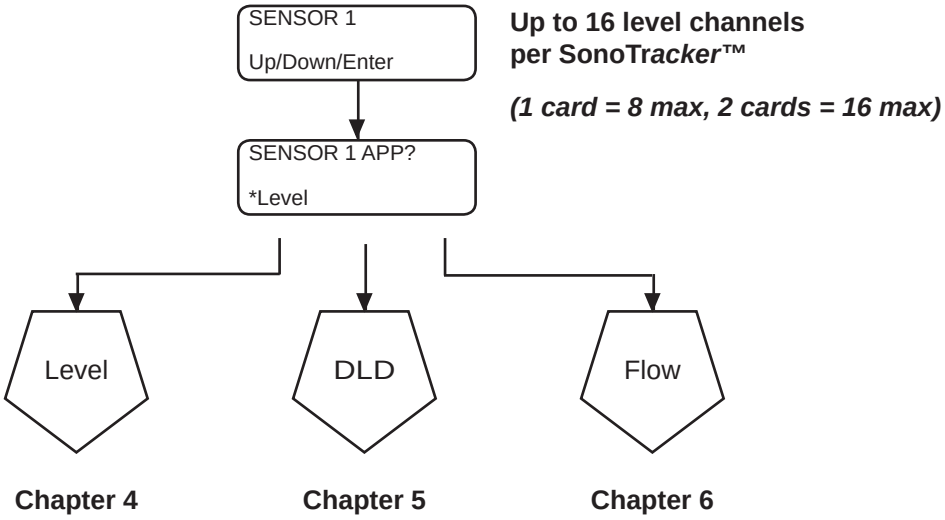


Figure 4-1. Block Diagram of the SonoTracker™ *Startup Procedure*

Introduction

Refer to Figure 4-1 for a block diagram of the initial part of the *Startup* Procedure. The SonoTracker™ is designed to get you up and running quickly once the system is installed. The SonoTracker™ guides you through the *Startup* Procedure. During the *Startup* Procedure, you will be asked to input a number of parameters, including:

- *Tank Height* — Refer to Figures 4-2 and 4-3. *Operating Span* is the distance from the full point to the point where the vessel is considered empty. Material level changes within this range are displayed by the SonoTracker™.

Note:
The maximum distance a transducer can measure depends on its frequency and the type of material in the vessel and the design of the transducer. Entering a value for Operating Span greater than the transducer's capability may cause erratic reading at these extended ranges.

Note:
See Calibration Menu (Chapter 7) for a description of the full point.

Start-Up

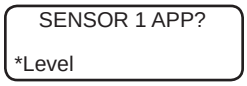
(typical for multi-point solids applcia-tion)

When performing the *Startup* Procedure, use backspace if you make an error. The parameters can also be corrected in the *Calibration* Menu (page 7-5) after you complete the *Startup*, or the entire *Startup* Procedure can be repeated by defaulting the channel in the *Service* Menu (page 7-30). Perform the *Startup* Procedure, as follows:

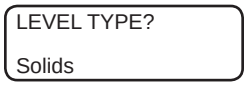
1. Apply power to the unit. If there are Scanner PCB(s) installed, the display is shown below. If not, go to step 2. Use the keypad to input the number of transducers you want to set up. Press ENTER to save the value in memory.

Note:
An asterisk indicates the current selection.

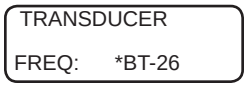
2. Press ENTER to select *Level*.



3. Press the up/down arrow keys to select Liquid or Solids. Press ENTER to save.

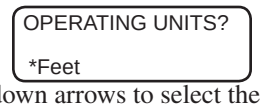


4. The display then shows:

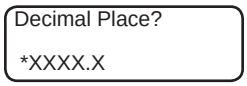


The model number of the transducer is displayed: BT-26, BT-61, BT-101, BT-55, other. Refer to the model number of the transducer for the proper selection. Use the up /down arrow keys to select the desired frequency and press ENTER.

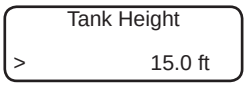
5. Press the up/down arrows to select the desired units. Press ENTER to save.



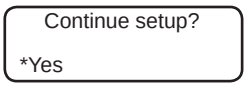
6. Press the up/down arrows to select the decimal place format. Press ENTER to save.



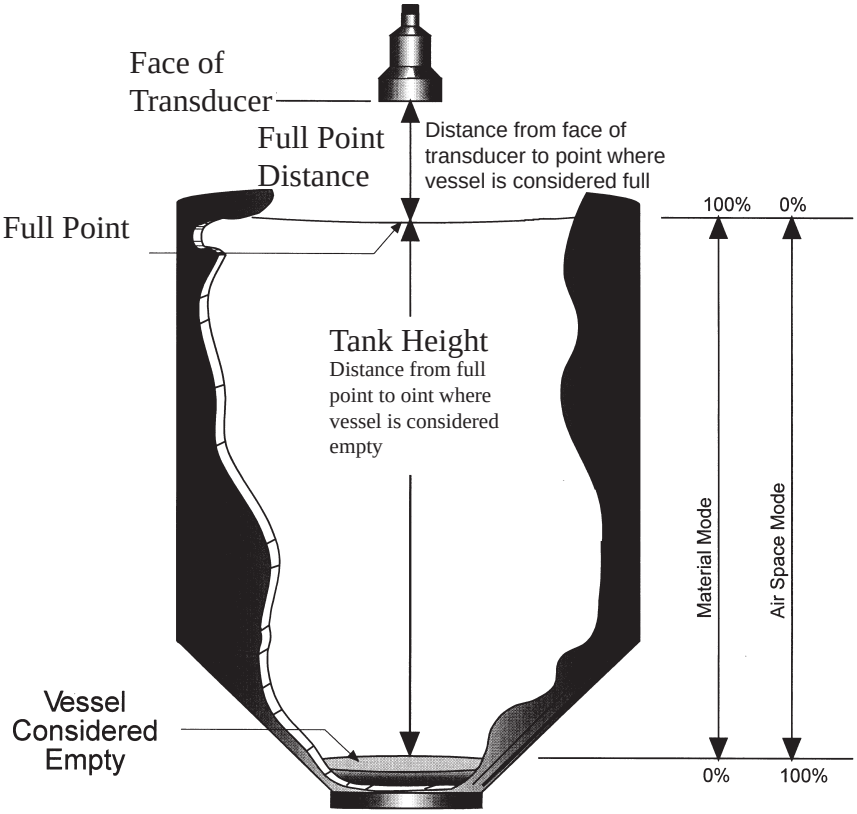
7. Use the keypad or arrow keys to enter the *Operating Span*. (See Figures 4-2 and 4-3) Press ENTER to save. The display flashes a message *PRESS ENTER TO EDIT DISPLAY* . Press ENTER.



If there are additional unconfigured channels then the following screen will appear.



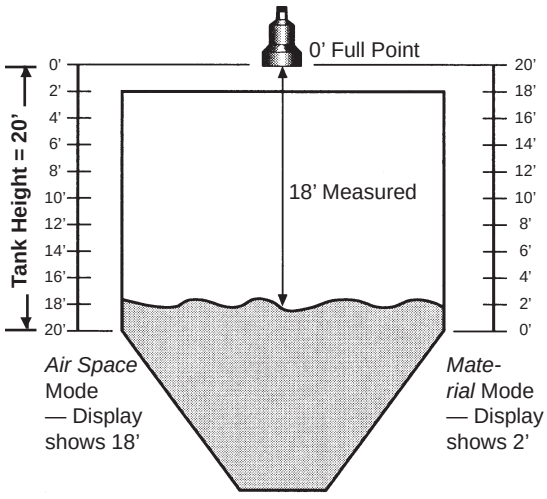
Select YES to continue through the menus as done above for the second sensor, selecting vessel parameters. Select NO to discontinue the setup of the remaining channels. See the Service Menu to copy all parameters to the remaining channels or cycle power to start again. Once complete, you will be given a chance to *auto assign* outputs. Refer to page 3-5.



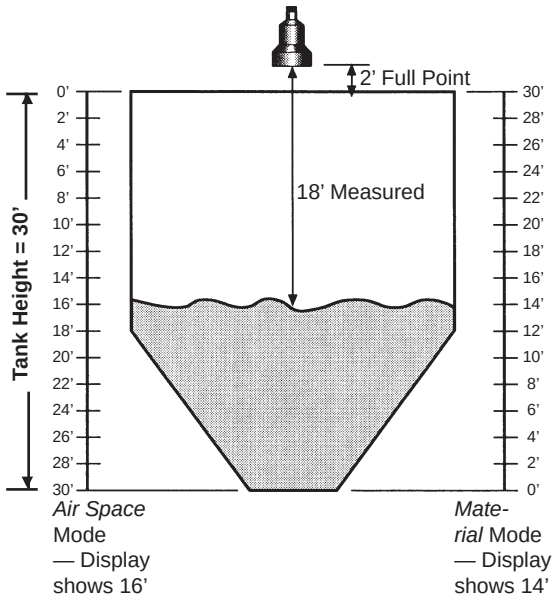
Notes:

1. Full Point + Tank Height must be less than the Maximum Range for the transducer, or the SonoTracker™ will not be able to detect material levels near the bottom of the vessel.
2. If Full Point is less than the Minimum Range for the transducer, be aware that the SonoTracker™ will not detect or report material levels near the top of the *Span*. Full Point is normally 0.0.

Figure 4-2. Full Point, Tank Height, and Mode



Example 1: *Tank Height*= 20' (not interested in material level in cone), *Full Point* = 0' (note that SonoTracker™ will not be able to detect material levels close to the transducerl)



Example 2: *Tank Height* = 30' (interested in material level in cone), *Full Point* = 2'

Figure 4-3. Examples of Effect of Full Point, Tank Height, and Mode on Display

Chapter 5: Operating the SonoTracker™ in Differential Level Detection Applications (DLD)

This chapter describes how to begin operation of your SonoTracker™ System for differential level applications and includes detailed examples of the Startup Procedure.

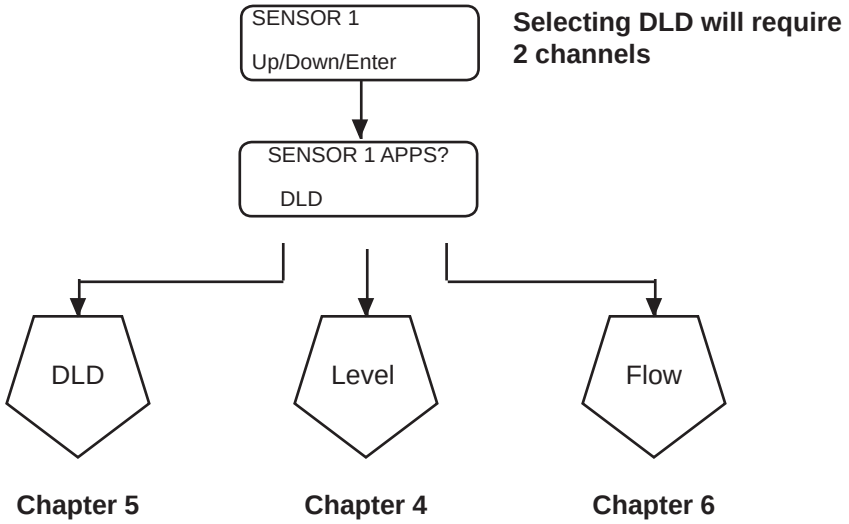


Figure 5-1. Block Diagram of the SonoTracker™ *Startup Procedure*

Introduction

Refer to Figure 5-1 for a block diagram of the initial part of the *Startup* Procedure. The SonoTracker™ is designed to get you up and running quickly once the system is installed. The SonoTracker™ guides you through the *Startup* Procedure. During the *Startup* Procedure, you will be asked to input a number of parameters, including:

- *Tank Height* — Refer to Figure 5-2. *Tank Height* is the distance from the full point to the point where the vessel is considered empty. Material level changes within this range are displayed by the SonoTracker™. Note that the tank heights and full points for the two transducers in a differential level application do not have to be the same.

Note:
The maximum distance a transducer can measure depends on its frequency and the type of material in the vessel. Do not enter a value for *Tank Height* greater than the transducer's capability.

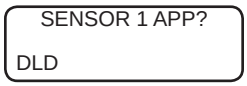
Note:
See *Calibration Menu* in Chapter 7 for a description of the full point.

Start-Up

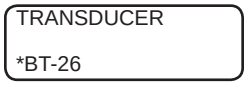
When performing the *Startup* Procedure, do not worry if you make an error. The parameters can be corrected in the *Calibration* Menu after you complete the *Startup*, or the entire *Startup* can be repeated by defaulting the channel in the *Service* Menu (page 7-34). Perform the *Startup* Procedure as follows:

1. Apply power to the unit. If there are Scanner PCB(s) installed, the display shows: (If not, go to Step 2) Use the keypad to input the number of transducers you want to set up. (You must enter a number equal or greater than 2.) Press ENTER to save the value in memory.

2. Press the up arrow key to select *DLD*. Press ENTER.

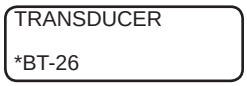


3. The display will flash *UPSTREAM SENSOR* and then shows:



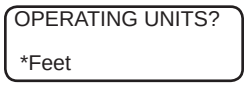
An asterisk indicates the current selection for the first transducer. The model number of the transducer indicates the nominal frequency of operation: BT-26, BT-61, BT-101, BT-55, etc. Refer to the model number of the transducer for the proper frequency selection.
Once selected for the upstream sensor, press ENTER.

4. The display flashes DOWNSTREAM SENSOR and then shows:

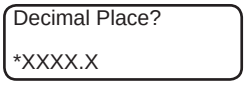


An asterisk indicates the current selection for the second or downstream transducer.
Press the arrow keys to select the desired frequency for the second or downstream transducer. Press ENTER.

5. Press the arrow keys to select the units desired. Display units are based on which Operating Units you selected. Once selected, press ENTER.

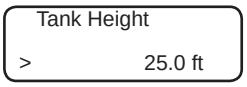


6. Press the arrow keys to select the desired display units. Press ENTER and the display flashes *UPSTREAM SENSOR*.



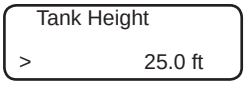
The units on the display are based on the selection you made for the Standard Display units.

7. Use the keypad or arrow keys to enter the *Tank Height* for the first transducer or upstream sensor. Press the Enter key. The display flashes *DOWNSTREAM SENSOR*.



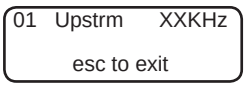
The units on the display are based on the selection you made for the Standard Display units.

8. Use the keypad or arrow keys to enter the *Tank Height* for the second transducer or downstream sensor. Press the Enter key.



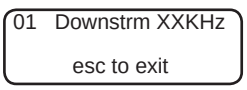
The display flashes *Press Enter to Edit Display*. Press ENTER.

9. Note that the Shift LED automatically came on, indicating that the letters above the Alphanumeric Keys are accessible. The SonoTracker™ is ready for you to input a customer-defined ID. The customer-defined ID allows you to identify the channel in a meaningful manner, with a 16-character alphanumeric title.



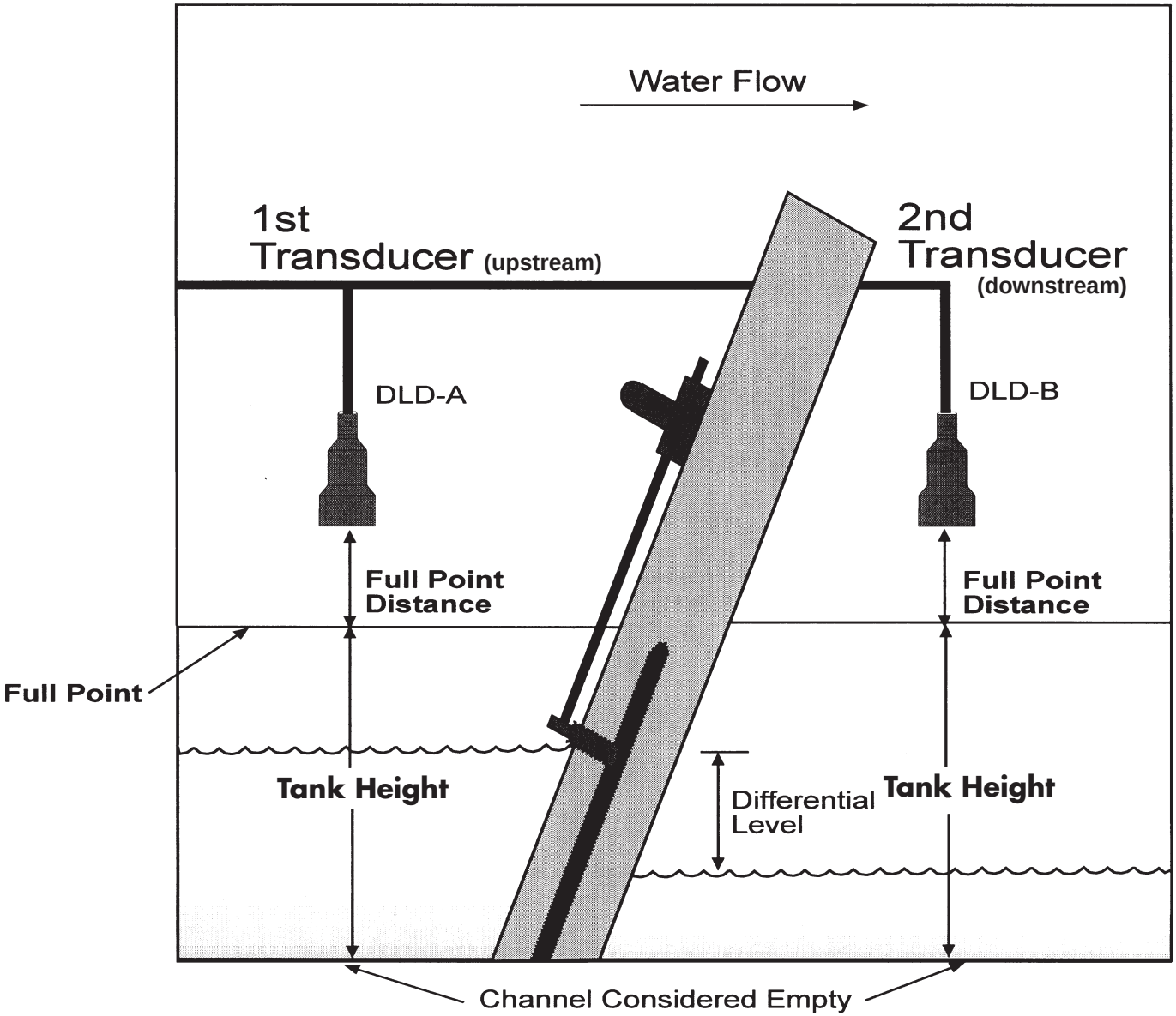
Type in the first alphanumeric of the desired ID. Press the Enter Key *or* press the next alphanumeric in the ID (if it is on a different key than the previous one) to accept the displayed alphanumeric. The cursor advances one space to the right.

Repeat until the display shows the entire customer-defined ID for the first transducer. Press the Esc Key to enter the entire ID in memory. The display flashes *DOWNSTREAM SENSOR*.
The display then shows:



Notes:

1. Type in a 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 backspace key to back up the cursor to correct an entry.



Notes:

1. Tank Height = Distance from full point to point where channel is considered empty.
2. Full Point = Distance from face of transducer to point where channel is considered full.
3. Full Point + Tank Height must be less than the Maximum Range for the transducer, or the SonoTracker™ will not be able to detect material levels near the bottom of the channel.
4. If Full Point is less than the Minimum Range for the transducer, be aware that the SonoTracker™ will not detect or report material levels near the top of the *Tank Height*.

Figure 5-2. Differential Level

10. Follow the procedure for inputting the customer-defined ID (described in Step 10) for the second transducer. When the display shows the entire customer-defined ID for the second transducer, press the Esc Key to enter the entire ID in memory.

The display might flash *SENSOR 3 APP?* and begins the *Startup* Procedure over again for the next transducer in your system, if applicable.

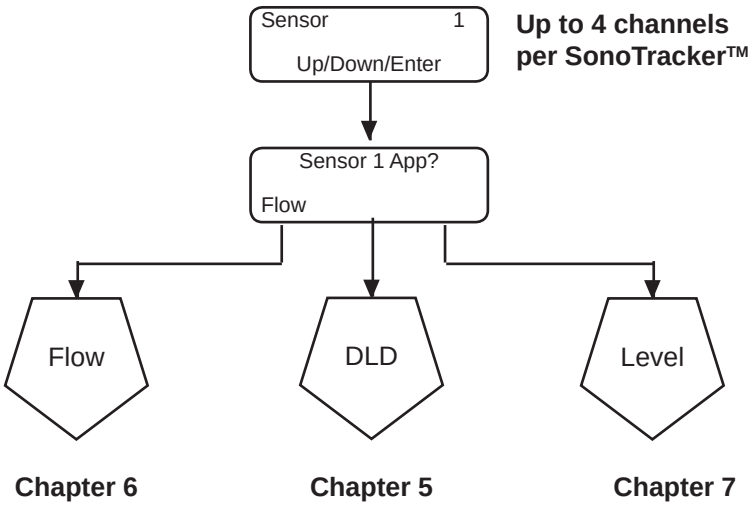
11. Repeat Steps 3 through 11 as required to set up all differential level applications.

Notes:

1. If you are setting up transducers for applications other than DLD, refer to the *Startup* Procedure in the proper chapter (Chapter 4 for level, Chapter 6 for flow).
2. If a transducer has a non-zero full point, you must enter the full point to get correct results, even though entering the full point is not part of the *Startup* Procedure. See *Calibration Menu* for a description of the full point and procedure for inputting the value.

Chapter 6: Operating the SonoTracker™ in Flow Applications

This chapter describes how to begin operation of your SonoTracker™ *System for flow applications. The chapter includes detailed examples of the Startup Procedure.*



Introduction

Note:
The maximum distance a transducer can measure depends on the type of material being measured. Do not enter a value for *Zero Distance* greater than the transducer's capability. *Zero Distance minus Max head* must be greater than 12".

Refer to Figure 6-1 for a block diagram of the initial part of the *Startup* Procedure, and Figure 6-2 for the remainder of the *Startup* Procedure. The SonoTracker™ is designed to get you up and running quickly once the system is installed. The SonoTracker™ guides you through the initial *Startup* Procedure. During the *Startup* Procedure, you will be asked to input a number of parameters, including the following (refer to Figure 6-3):

- *Maximum Head* — The maximum head for your primary element is available from the flow chart supplied by the primary element manufacturer.
- *Zero Distance* — If doing a Manual Calibration during *Startup*, measure the zero distance, the distance from the face of the transducer to the bottom of the channel.
- *Current Head* — If doing an Auto Calibration during *Startup*, measure the current head **just before** you input the value to perform an accurate calibration.

Flow

Operating Units Inches Centimeters

Primary Element

Flume

Parshall	P-B	L-L	Trap	Othr
1”	4”	4”	L60ºV	
2”	6”	6”	XL60ºV	
3”	8”	8”	2”45ºV	
6”	10”	10”	12”45ºV	
9”	12”	12”		
1’	15”	15”		
1.5’	18”	18”		
2’	21”	21”		
3’	24”	24”		
4’	27”	30”		
5’	30”			
6’	36”			
8’	42”			
10’	48”			
12’	60”			
	72”			

Weir

Rect		V notch	Cip	Other
Cont	W/O Cont	22.5º	1’	
1’	1’	30º	1.5’	
1.5’	1.5’	45º	2’	
2’	2’	60º	2.5’	
2.5’	2.5’	90º	3’	
3’	3’	120º	4’	
4’	4’		5’	
5’	5’		6’	
6’	6’		8’	
8’	8’		10’	
10’	10’			
Othr				

Nozzle

Ken*
6”
8”
10”
12”
16”
20”
24”
30”
36”

Flow Type CFS GPS GPM GPD MGD (CMS CMH LPS LPM LPD MLD)

Flow Format X.XXXX XXXXX XXXX.X XXX.XX XX.XXX

Total Type CF GL MG (CM LT ML)

Totalizer Format XXXXX0 XXXXXX XXXX.X XXX.XX XX.XXX X.XXXX XXX000 XXXX00

Zero Calibration

Auto: Max Head, Current Head

Zero Distance

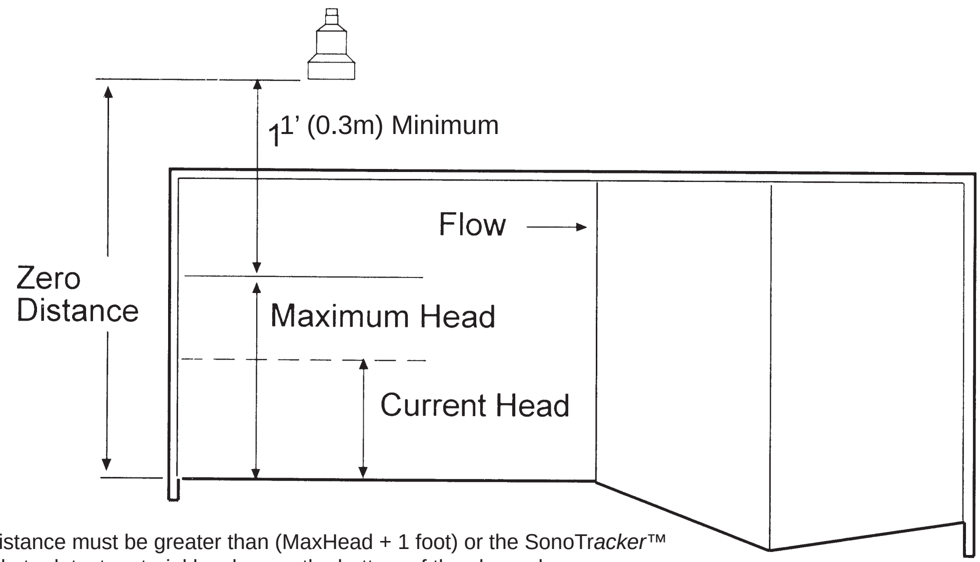
Manual: Max Head

Zero Distance

Low Head Cutoff

ID

Figure 6-2. SonoTracker™ Flow Startup Procedure



Note: Zero Distance must be greater than (MaxHead + 1 foot) or the SonoTr*acker*™ will not be able to detect material levels near the bottom of the channel.

Figure 6-3. SonoTracker™ *Definitions for Flow Applications*

Start-Up

When performing the *Startup* Procedure, do not worry if you make an error. The entire *Startup* can be repeated by defaulting the channel in the *Service* Menu (page 7-34) or by pressing the F3 key. Perform the *Startup* Procedure, as follows:

1. Apply power to the unit. If there are Scanner PCB(s) installed, the display shows: (If not, go to Step 2) Use the keypad to input the number of transducers you want to set up. Press ENTER to save the value in memory.

Sensor 1
Up/Down/Enter

2. Press the arrow keys to select *Flow* and press ENTER. If a temperature compensation sensor is not connected, a warning displays stating that one was not detected. Press any key to continue.

SENSOR 1 APP?
*Flow

3. A warning will appear if no temperature probe is deleted. Pressing enter will clear the warning allowing a temperature to be entered.

4. Press the Enter Key to select *Inches* or scroll with the arrow keys to select *Centimeters*.

OPERATING UNITS?
*Inches

5. Press the Enter Key to select *Flume*, or the arrow keys to select *Weir* or *Nozzle* as the primary element.

Primary Element
Flume

If you select *Flume*, continue to Step 6. If you select *Weir*, go to Step 8. If you select *Nozzle*, go to Step 9.

Weir Note

If you selected *Other* in the Menu, the SonoTracker™ asks you to enter a custom value for *Crest Length*. Use the keypad to enter the *Crest Length*. Press the Enter Key. The display flashes a message acknowledging your selection.
Go to Step 10.

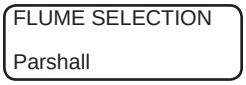
Kennison Note

The 20" Kennison Nozzle is the only nozzle size currently available. If you select another Kennison nozzle size, the display shows *function not available*.

Note:

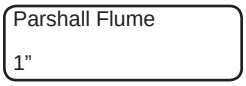
CFS is cubic feet per second, *GPS* is gallons per second, *GPM* is gallons per minute, *GPD* is gallons per day, and *MGD* is million gallons per day.

6. **Flume** — The five flume selections are:
Parshall, Palmer-Bowlus, Leopold-Lagco, Trapezoid, and *Other*.
If you selected *Flume* in Step 5, the display shows:

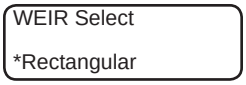


Press the arrow keys to access the remaining options of the *Flume* Menu. Press the Enter Key for your desired option.

7. For each option, there are sub-menus. Scroll through the options and make your selection. *Once selected, press ENTER and go to step 10: Select Flow Type.*

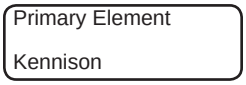


8. **Weir**— The four Weir selections are:
Rectangular, V-Notch, Cipolletti, and *Other.*



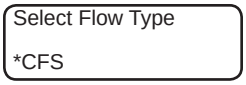
Press the arrow keys to access the options of the Weir Menu. Press Enter for your desired options. *Once completed, you will go to Step 10, Select Flow Type.*

9. **Nozzle**—The only option here is *Ken*. Press ENTER.

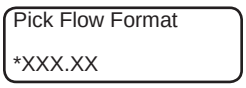


Scroll through the Kennison Nozzle options with the arrow keys and press ENTER.

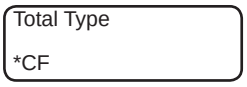
10. *Flow Type* determines the units to use for measuring the flow rate. Select the Flow Type by scrolling through the options with the arrow keys. Press ENTER.



11. The *Flow Format* allows you to choose how many digits you want to the left and right of the decimal point for displaying the flow rate. Scroll through the format options and press ENTER.

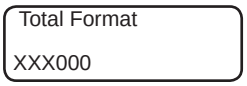


12. After selecting *Flow Format*, the display prompts you to select the *Total Type*, the units to use for measuring total flow. The display shows:

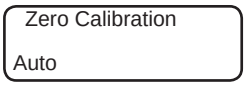


An asterisk indicates the default units. *CF* is cubic feet, *GL* is gallons, and *MG* is million gallons.

13. After selecting the *Total Type*, the display prompts you to select the *Total Format* or *Totalizer Format* . This allows you to select how many digits you want to the left and right of the decimal point or how many fixed zeros you want for displaying the total flow. The display shows:

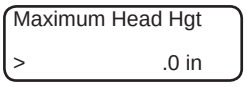


14. Use the arrow keys to scroll through the options available. Press ENTER. The display shows:



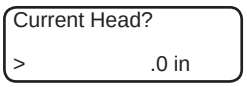
The SonoTracker™ has two methods for calibration, *Auto* and *Manual*, for a flow application. Refer to Fig. 6-3 for an illustration of the calibration parameters. For *Auto* calibration, you enter the maximum head and the current head. For *Manual* calibration, you enter the maximum head and the zero distance. Press ENTER to select *Auto* or the arrow key to select *Manual,* then ENTER. If you select *Auto*, continue with Step 15. If you select *Manual*, go to Step 15 then skip to Step 17.

15. For *Auto and Manual* calibration, the display shows:



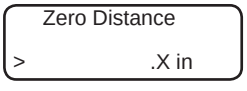
Use the keypad or the up/down arrow keys to enter the *Maximum Head Height*, obtained from the flow chart supplied by the primary element manufacturer. Press ENTER.

16. Physically measure the *Current Head*. Use the keypad or the up/down arrow keys to enter the *Current Head*. Press ENTER.



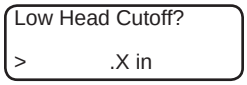
17. The *Zero Distance* shown on the display is a calculated value. It is shown for information only, and cannot be modified while in the *Auto* calibration:

Zero Distance = *Current Head* + Distance measured by transducer from face of transducer to liquid surface

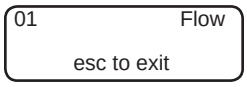


Press Enter.

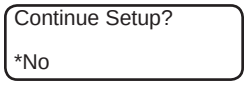
17. Using the keypad, enter Low Head Cutoff and press ENTER.



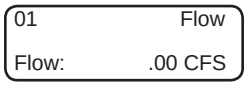
18. Press ESC to enter the values to memory.



19. The display then shows:

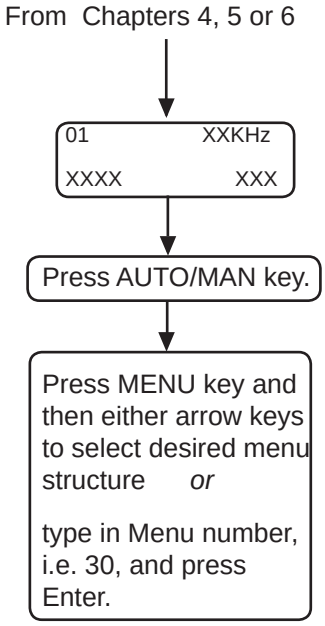


20. Select NO to exit out of the quick configuration, skipping the setup of any remaining channels; select YES to continue the configuration process on the remaining sensors. Once complete, the display will show:



Chapter 7: SonoTracker™ Level Menu Descriptions

This chapter describes the Main Menu options and their parameters. After the initial Start-Up procedures, use the Main Menu to configure the system to desired parameters.



Block Diagram of the SonoTracker™ *Menu access*

Menu Options

The following options are available from the MENU key in MANUAL mode:

10	Display:	Select desired display formats, input vessel ID, and adjust brightness and contrast.
20	Calibration:	System configurations including full point, tank height and mode of operation; Math Menu for Math Channel configuration.
30	Relay Set Point:	Configure relay set point.
40	I-Output:	Configure Current (mA) output.
50	Serial/PLC:	Set up serial out and PLC.
60	Transducer:	Configure the transducer including frequency, delay and threshold values.
70	Range/Filters:	Set up range and filter windows.
80	Point Level:	Configure point level devices.
90	Service Menu:	Includes access configuration as well as system default and copy function.

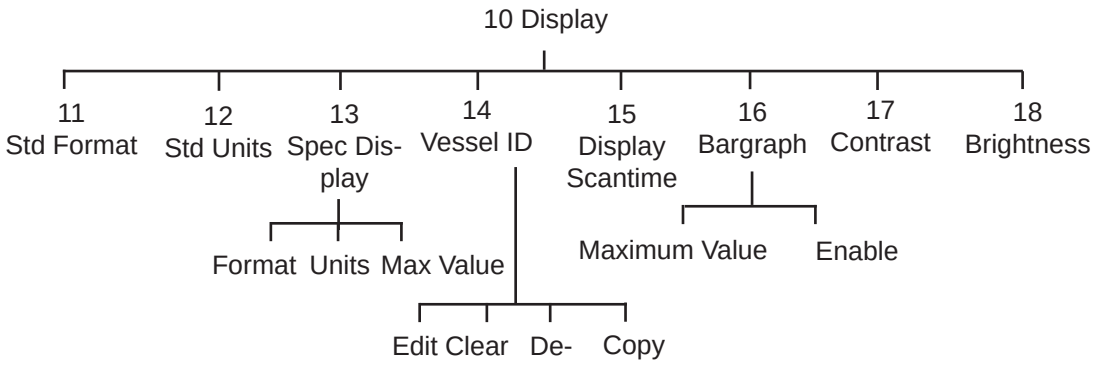


Figure 7-1. Display Menu Tree

10 Display

The Display Menu is used to set up the parameters that govern the display functions when channel monitoring. This section covers the functions in the *Display* Menu. Explanations of each of the functions are provided.

Unless otherwise noted, the display function for each channel (such as ID) 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 7-1, the *Display* Menu has eight submenus.

11 Std Format

Select a format from the menu options:

XXXX.X
XXX.XX
XXXXX

12 Std Units

Select the desired units:

Feet, Inches, Meters, or Centimeters

13 Spec Display

Enter *Format, Units,* and *Max Value. (Format and Units must not be zero for Max Value to be active.)*

14 Vessel ID

During the Startup Procedure for the SonoTracker™ (Chapters 5, 6, and 7), you input a customer-defined ID for each channel. This menu allows you to later change the customer-defined ID.

The SonoTracker™ arrives from Bindicator with a factory-set ID number assigned for each channel in the system. Note that 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.

15 Display Scan Time

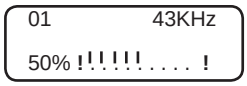
This menu allows you to choose the amount of time the SonoTracker™ displays vessel monitoring information before scrolling to the next channel, when the SonoTracker™ is in the Auto Mode. *(It is not the internal scantime.)* Scan time can be set to 1 second, 2 seconds, or 5 seconds. The current selection is indicated by an asterisk.

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

16 Bar Graph (F2 Key)

You can choose to view a numerical display or a bar graph of a vessel's contents while vessel monitoring. The maximum span for the bar graph (*Span*) is set and the bar graph option for the display is turned on and off (*Enable*) in this menu.

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



The 0% point of the bar graph is always 0. The 100% point of the bar graph is set by direct entry in the *Span* menu 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 level of 100' as the BarS value results in a bar graph with 0% corresponding to 0 feet and 100% corresponding to 100'.

If the level reading goes above the *Span* value, the graph remains at 100% and the numerical percentage reflects the actual level. For example, if the *Span* value is 100' and the actual level is 120', the numerical percentage displayed is 120% 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 for *Enable* is indicated by an asterisk.

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

17 Contrast

The contrast of the display is adjusted in this menu. The Up and Down Arrow Keys are used to make 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 *Contrast* is selected while in the menu tree for any channel, and applies to all of the channels in the system.

18 Brightness

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 adjustments. The display brightness changes immediately as you make the adjustments. When the desired results are attained, pressing the Enter Key saves the new value.

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

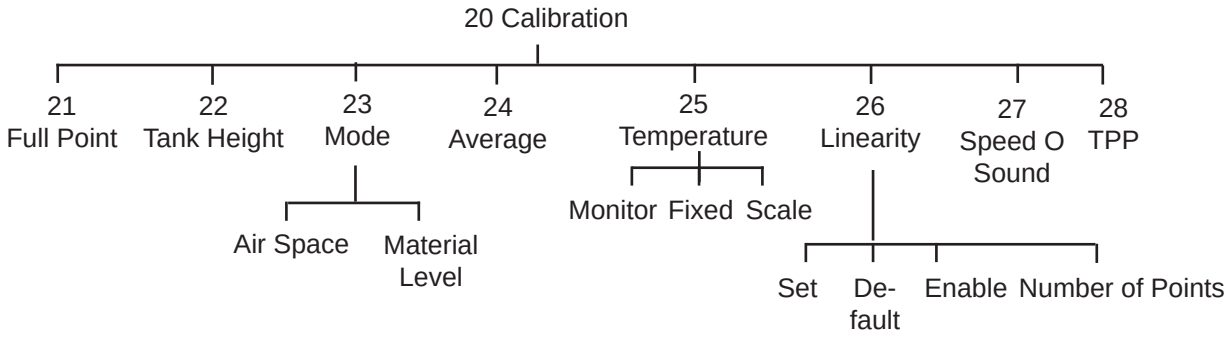


Figure 7-2. Calibration Menu Tree

20 Calibration

21 Full Point

Refer to Figure 4-2. *Full Point* is the distance from the face of the transducer to the top of the *Span*. Modifying *Full Point* allows you to change the point of reference for measurement. If you add 1' to *Full Point* you are essentially moving the *tank height* down 1'. If you take 1' away from *Full Point*, you are essentially pulling the tank height up 1'. The default value for *Full Point* is 0 (i.e., the *Tank Height* begins at the face of the transducer).

The number shown upon entry into this menu shows the current full point for the displayed channel. Modification of *Full Point* is performed by direct entry using the Alphanumeric Keys or by using the Arrow Keys to scroll to a number. When the desired number is shown, pressing the Enter Key registers the new *Full Point* in memory.

Note:

The transducer has a blind space near its face where there are mechanical limitations that prevent detecting a target. The SonoTracker™ comes defaulted with a minimum range (see page 7-21, Range/ Filters Menu) equal to the blind space for the transducer. If you leave *Fullpoint* at its default of 0 to enter a *Full point* less than *Minimum Range*, be aware that the SonoTracker™ will not detect or report levels at the top of the *Tank Height*.

Most users leave Full Point at zero.

22 Tank Height

Refer to Figure 4-2. The *Tank Height* was entered during the *Startup* Procedure. The *Tank Height* is displayed and modified in this menu. *Tank Height* is the distance from the full point to the point where the vessel is considered empty. Material level changes within this range are displayed by the transducer.

The number shown upon entry into this menu shows the current *Tank Height* for the displayed channel. Modification of *Tank Height* is performed by direct entry using the Alphanumeric Keys or by using the Arrow Keys to scroll to a number. When the desired number is shown, pressing the Enter Key registers the new *Tank Height* in memory.

The system also performs a test to insure that the tank height and full point do not exceed the maximum range.

Note:

The SonoTracker™ calculated a default value for maximum range as 120% of the *Tank Height* input in the *Startup* Procedure. If you enter a *Full Point* or change *Tank Height*, the SonoTracker™ checks (*Span* + *Full Point*) is less than (*Maximum Range*). If this requirement is not met, the SonoTracker™ rejects the new *Full Point or Tank Height* and displays an error message. To enter the desired *Full Point or Tank Height*, first increase *Maximum Range* and then enter *Full Point or Tank Height*. See page 7-21, Range/Filters Menu.

23 Mode

Note:
The *Mode* affects setpoints, current output, etc. as well as the display. In other words, the SonoTr*acker*™ interprets inputs for all parameters with respect to the display mode you select.

Refer to Figures 4-2 and 4-3. The *Mode* was entered during the *Startup* Procedure. This menu is where *Air Space* or *Material Level* mode is modified:

- In *Material Level* mode, the SonoTracker™ calculates and displays the height of material in the vessel. For example, a reading of 0 indicates the material level is at the bottom of the *Tank Height*.
- In *Air Space* mode, the SonoTracker™ calculates and displays the distance (air space) from the full point to the top of the material. For example, a reading of 0 indicates that the material level is at the full point.

An asterisk on the display indicates the current display mode. Modification of the *Mode* is performed by selecting *Main Menu, Calibration Menu, Mode.*

24 Average

This menu is used to set the number of individual readings (from 1 to 255) that the SonoTracker™ averages for each display reading while vessel monitoring. The SonoTracker™ 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. *Average* affects the value seen on the display as well as setpoints, current outputs, and serial outputs. The default value for *Average* is 5 for level application and 10 for flow.

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.

25 Temperature

This menu sets up the temperature compensation parameters. *Temperature* has three submenus: *Fixed*, *Monitor*, and *Scale*.

Fixed (fixed temperature)

- *Fixed* allows you to enter a fixed temperature, usually to match the temperature inside the vessel where the transducer is operating. The SonoTr*acker*™ then adjusts the speed of sound in the calculations to correspond to that temperature. *Fixed* has two submenus:
  - If you select *Yes*, the SonoTracker™ asks for the fixed temperature.
  - If you select *No*, the SonoTracker™ disables the fixed temperature function. If you have a temperature compensation probe, the SonoTracker™ uses the probe's temperature data to adjust the speed of sound in the calculations. If there is no probe, the SonoTracker™ uses the at the default temperature.

26 Linearity

Linearization tables allow us to compensate for vessels that do not have a linear relationship between level and weight (or level and volume). For example, the vessel has a cone bottom, and we are interested in weight or volume information instead of level information. An increase in the level does not produce a proportionate increase in weight or volume, because of the shape of the vessel.

The SonoTracker™ has the capability to linearize up to 32 points. The more points of linearization you provide, the more accurate the system will be. *Linearity* has four submenus:

- *Set* — allows you to set the values for the linearization. For each point, you enter a input and an output value.
- *Default* — changes the values in the linearization table back to the default values. Note that for the default condition the input and output values are identical. Therefore, for the default condition the linearization table has no effect on the SonoTracker™, even if linearization is enabled.
- *Enable* — turns linearization on and off.
- *Number of points* — allows you to select the number of points to input for the linearization (32 maximum points).

Contact Bindicator for technical assistance in calculating linearization parameters.

27 Speed O Sound

The *Speed O Sound* Menu allows you to monitor and adjust the value for the speed of sound, which is used by the SonoTracker™ in the calculation of range. The default value for speed of sound is based on the sound pulse traveling through air. At 68° F [20° C], the speed of sound is approximately 1127 ft/sec [344 m/sec]. Note that the SonoTracker™ automatically adjusts the speed of sound for temperature based on the information from the temperature probe (if installed) or the fixed temperature input (see Chapter 7, Calibration Menu). In the *Speed O Sound* Menu, an adjustment is made based on the medium of sound travel — the material that the pulse is traveling through ***above*** the material actually being measured. *Speed O Sound* has three submenus:

- *Automatic Entry* — This menu allows you to input a correction distance for the speed of sound. For example, if you know there is 3 feet of material in the vessel but the SonoTracker™ is displaying 4.2 feet because the medium is not standard air, input 3.0 ft for *Auto*. The SonoTracker™ takes that distance and uses it to automatically calculate a correction factor, in percent, for the speed of sound.
- *Manual Entry* — This menu allows you to input a correction factor, in percent, for the speed of sound. For example, if the speed of sound through the medium is only 95% of the speed of sound in air, enter 95% for *Manual Entry*.
- *Monitor* — This menu allows you to view the current value for speed of sound.

28 TPP (Transmissions Per Point)

In a multipoint system for solids, TPP sets the number of tranmissions on each point prior to advancing to the next channel. For a vessel with rapidly changing conditions, it can be helpful to send out several transmissions in a row to get an accurate reading before the SonoTracker™ moves on to the next channel. TPP can range from 1 to 20. The default is 5 for Solids and 1 for Liquids. Increasing the TPP to high, will cause delay in other channel update rates.

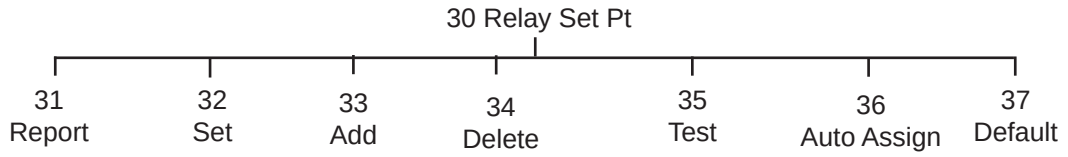


Figure 7-3. Relay Set Pt Menu Tree

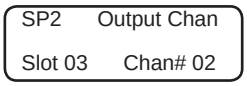
30 Relay Set Pt

The setpoint value is the measured value where you wish a device (for example, a pump) to activate or deactivate. The setpoint setup functions for each channel are accessed in this menu. They include adding and deleting setpoints and selecting activation values, high or low activation, deadband values, and fail-safe parameters. In addition, for flow applications, setpoint setup includes selecting what parameter triggers activation (flow, head, total, time, or temperature) and the amount of time for pulse activation.

The *Relay Set Pt* section defines each of the parameters.

31 Report

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



- SP2 is the setpoint label.
- Slot 03 is the slot number where the Relay Output PCB resides.
- Chan# 02 is the relay channel of the setpoint on the Relay Output PCB.

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

32 Set

This menu is used to select the setpoint to be set up for the displayed channel. Setpoints can be established for monitoring channels and also for math channels, including math channels set up automatically by the SonoTracker™ as part of a differential level system (for example, for a differential level math channel, you can set up a setpoint to energize a relay when the difference in level exceeds a certain value). Depending on the options you selected for your SonoTracker™, up to eight setpoints can be assigned per channel, labeled SP1 for setpoint 1 through SP8 for setpoint 8. *Set* has four submenus for level and differential level applications and six submenus for flow applications:

- *Value* — Once you have selected a setpoint to set up, the activation value, the point where the setpoint relay changes state, can be entered. This value is entered directly with the Alphanumeric Keys or scrolled to with the Arrow Keys. The "-" Key is used to toggle between the positive and negative value of the number entered.
- *Dead* — 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 change in the measured parameter before the setpoint relay returns to its normal state. Bindicator 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. Pressing the Enter Key saves the new value.
- *Hi/Lo* - Setpoint relays can be configured to change state either above (*Hi*) or below (*Lo*) the setpoint value (*Value*).
- *Mode* (***flow applications only***) — This menu sets up how the setpoint relays are going to be activated and used. There are five choices for *Mode*:
  1. *Flow* relay activation is based on the flow rate — for example, CFS, GPS, etc. With this selection, the relay can be programmed to control a dosing pump for a chlorine system or pace a wastewater sampler.
  2. *Head* relay activation allows the relay to be activated based on the head (level) — for example, ft, in, m, etc.
  3. *Rate* relay activation is based on total flow — for example, CF, GL, etc. With this selection, the relay can be programmed to pulse a remote totalizer or telemetry system.

     OnTm (***flow applications only***) —

     If you want the relay to pulse once it is activated, this menu sets up how long the relay pulses. Setting *OnTm* to 0 turns off the pulsing function.
  4. *Time* relay activation is based on time. For example, every 90 minutes a relay will change status to pace a wastewater sampler based on time.
  5. If a temperature compensation probe is used with the transducer, *Tmp* relay activation sets up the relay or setpoint to activate on temperature changes.
- *Echo Loss Mode:* If the SonoTracker™ detects an echo loss that lasts longer than a threshold time, one of three fail-safe conditions can be applied to a setpoint: *On*, *Off*, *No Change*. The *On* setting energizes the setpoint in an echo loss condition. The *Off* setting de-energizes the setpoint in an echo loss condition. The *No Change* setting means no change is made to the setpoint condition in an echo loss condition (i.e., whatever was energized before the echo loss was detected will continue to be energized). *No Change* is the default. A fail-safe condition remains in effect until the echo loss ends. Note that when the SonoTracker™ is in echo loss, the echo loss is indicated on the display with an asterisk (*).

Note:

See Chapter 7, Transducer Menu, for information on setting the threshold time for echo loss.

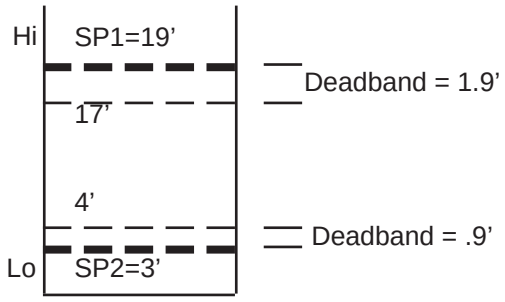


Figure 7-3a. Setpoint Example for Level Application

Example: Following is an example of the use of *Val*, *Dead*, and *Hi/Lo* for a level application. See Figure 7-3a:

- A vessel with a 20' *tank height* operating in *Material Leve* mode has *Value* for setpoint 1 (SP1) set at 1.9'. The *Hi/Lo* function is set to *Hi* and the deadband (*Dead*) is set at 1.9'. When the contents exceeds 1.9', the setpoint energizes, activating a pump to remove material from the vessel. The pump continues to operate until the setpoint de-energizes at a level of 17' (1.9' minus the 1.9' deadband).
- This vessel has *Value* for setpoint 2 (SP2) set at 3'. The *Hi/Lo* function is set to *Lo* and the deadband (*Dead*) is set at .9'. When the contents go below 3', the setpoint energizes, activating a pump to fill the vessel. The pump continues to operate until the setpoint de-energizes at a level of 4' (3' plus the .9' deadband).

33 Add

This menu is used to add setpoint channels (up to eight) for the current channel. Note that the setpoint must be added before the *Set* parameters (*Val*, *Dead*, etc.) can be input. The bottom line of the display shows the slot number of the Relay Output PCB and the channel number for the first available setpoint on the Relay Output PCB. Pressing the Up and Down Arrow Keys cycles through all other unassigned setpoint channels. Pressing the Enter Key adds the setpoint.

34 Delete

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

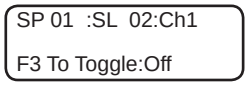
This menu allows previously added setpoint channels to be removed from the current channel. The top line of the display shows an assigned setpoint number. The bottom line shows the slot number of the Relay Output PCB and the channel number for the setpoint on the Relay Output PCB.

To delete a setpoint channel, cycle through the setpoints by pressing the Up and Down Arrow Keys 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.

35 Test

This menu allows you to turn the setpoint relays on and off for test purposes. The SonoTracker™ 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.

A typical setpoint test display looks like this:



- *SP 01* is the current setpoint reference number (referred to as SP1 when you added it in the *Set Point Relay* Menu).
- *SL 02* is the slot number of the setpoint PCB.
- *Ch1* is the channel number of the setpoint on the Relay Output PCB. Each Relay Output PCB has eight individual channels.
- *On* indicates the current On/Off status of the setpoint.

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

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

36 Auto Assign

Automatically assigns one relay per active channel.

37 Default

Unassigns all relays.

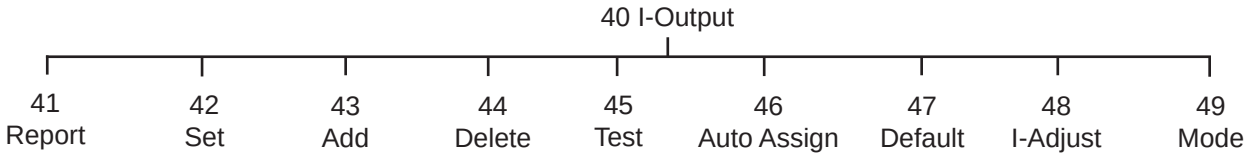


Figure 7-4. I-Output Menu Tree

40 I-Output

The *I-Output* Menu is used to enter parameters for current outputs (4-20 mA, 0-20 mA). This chapter covers the functions in the *I-Output* 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.

Current output is typically used to retransmit continuous level/flow 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 outputs, and selecting fail-safe and operating modes. Depending on the options you selected, up to two sets of current outputs can be assigned per channel.

41 Report

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

42 Set

This menu is used to select the current outputs, assign values to determine the points where the transmitter outputs the currents, and define fail-safe conditions for the current outputs. Current outputs can be established for monitoring channels and also for math channels, including math channels set up by the SonoTracker™ automatically as part of a differential level system. *Set* has three submenus for level and differential level applications and four submenus for flow applications.

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.

- *4/0mA* — The *4/0mA* Menu sets the low current (4 mA or 0 mA) operation point. The value entered determines the point where the transmitter outputs the minimum current. For example, if 10' is entered as the low current operation parameter and the *Mode* function is set to *4-20 mA* operation, when the display shows 10' of level or air space, the current output transmits 4 milliamps.
- *20mA* — The *20mA* Menu sets the high current (20 mA) operation point. The value entered determines the point where the transmitter outputs the maximum current. For example, if 50' is entered, the current output transmits 20 milliamps when the display shows 50' of level or air space.
- *Track* (***flow applications only***) — This menu sets up how the current outputs will be activated. There are two choices for *Track*. *Head* allows the current outputs to be activated based on the head (level). *Flow* allows the current outputs to be activated based on the flow rate; i.e., CFS, GPS, etc.

Note:
See Chapter 7, Transducer Menu, for information on setting the threshold time for echo loss.

- *Echo Loss Mode* — If the SonoTracker™ detects an echo loss that lasts longer than a threshold time, one of three fail-safe conditions can be applied to a current output: *Lo*, *Hi*, *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 *No Change* 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). *No Change* is the default. A fail-safe condition remains in effect until the echo loss ends. Note that when the SonoTracker™ is in echo loss, the echo loss is indicated on the display with an asterisk (*).

43 Add

This menu is used to add current output channels (up to two) to the displayed vessel. Note that the current output must be added before the *Set* parameters can be input.
The top line of the display shows the first available current output. The bottom line shows the slot number of the Current Output PCB and the channel number for the current output on the Current Output PCB. Pressing the Up and Down Arrow Keys cycles through all other unassigned current output channels. Pressing the Enter Key adds the current output channel.

44 Delete

This menu allows previously added current outputs to be removed from the displayed channel. The top line of the display shows an assigned current output number. The bottom line shows the slot number of the Current Output PCB and the channel number on the Current Output PCB.

To delete a current output, cycle through the current outputs by pressing the Up and Down Arrow Keys 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.

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

45 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 for what you want to do.

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:

```
Iout02:  SL  03:   Ch2
>04mA : More
```

- *Iout02* 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 Current Output PCB.
- *Ch2* is the channel number on the Current Output PCB. Each Current Output 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 up arrow key increases the output in 2 mA steps; pressing the down arrow 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.

46 AutoAssign

Automatically assigns one 4-20mA per active channel.

47 Default

Unassigns all 4-20mA channels.

48 I-adjust

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 SonoTr*acker*™ in the Manual Mode. Proceed to the *Main* Menu/*Service* Menu/*4/20* Menu/*Iadj* Menu. The display shows:

```
CURRENT CHAN#: X
Next
```

2. *Up arrow* scrolls the display forward through all the current channels. *Down arrow* scrolls the display backward through all the current channels. Scroll to the desired current channel.

Note:
If you have set up 4-20 mA output, the SonoTracker™ ignores anything you enter for 0 mA. Similarly, if you set up 0-20 mA output, the SonoTracker™ ignores anything you enter for 4 mA.

3. Press the Enter Key to access *Select*. The display shows:

4. Press an arrow key to assign counts to the associated current output. If you select 0 mA, the display looks like this:

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:

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

49 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 SonoTracker™ default current output mode is 4-20 mA.

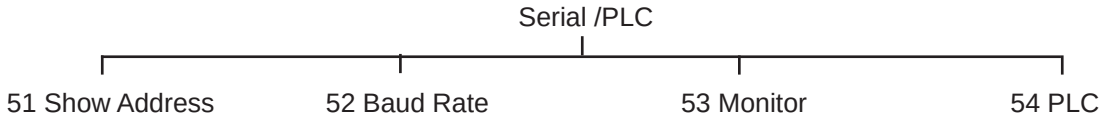


Figure 7-5. Serial /PLC Menu Tree

50 Serial/PLC

The *Serial/PLC* Menu is used to set up serial communications through the microprocessor COM port between the SonoTracker™ and external equipment, such as:

- PLC with a BASIC Module or a similar communication device

The SonoTracker™ can only be the slave to external equipment. The SonoTracker™ has one COM port for serial communications. Refer to Appendix E for information on how to serially connect the SonoTracker™ to various external equipment.

51 Show Address

This parameter shows the current serial address of the displayed channel. See page 2-9 for more details about serial addresses.

52 Baud Rate

The SonoTracker™'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 baud rate can be modified by the user. When connecting the SonoTracker™ to external equipment, all of the serial communications settings must match for the equipment to communicate. As necessary, modify the default setting for baud rate of the SonoTracker™. Modify the data bits, stop, and parity settings in the external equipment to match the SonoTracker™'s built-in settings.

There are five baud rates (bits per second) available: 1200, 2400, 4800, 9600 (default), 19.2K

53 Monitor

A diagnostic function which indicates current serial buffer contents. Consult factory for proper interpretation.

54 PLC

The SonoTracker™ can provide direct serial communications to an Allen-Bradley PLC through the A-B RIO PCB (optional) on the SonoTracker™. Refer to the *A-B Remote I/O Interface Manual for SonoTracker™* to connect, set up, and program the A-B RIO.

The SonoTracker™ can also provide serial communications to a Modbus. Additionally, the SonoTracker™ can provide direct serial communications to a Siemens PLC. Refer to theProfibus *Interface User's Manual*.

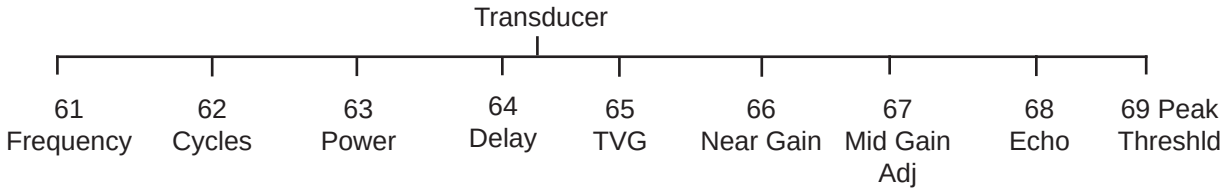


Figure 7-6. Transducer Menu Tree

60 Transducer

61 Frequency

Freq has four submenus:

- *Target* — Under *Target*, the target frequency of the transducer set up for the current channel is displayed and can be modified. For example, a BT-55 transducer has a 'nominal' frequency of 43 KHz, but the actual default frequency is 43.5 KHz.
- *Monitor* — This parameter allows you to view the frequency that the transducer for the current channel is actually transmitting and receiving. It usually does not exactly equal the *Target* value, but is very close.
- *Select* — Under *Select*, the transducer type for the current channel can be displayed and changed (you may need to change it if you made an error during the *Startup* Procedure or have changed the transducer).

62 Cycles

Cycles is used to set the number of cycles in the transmission pulse.

63 Power

Power defines the amount of output transmission power the SonoTracker™ utilizes. The range is 0 to 100%. The default value is variable depending on quick configuration settings.

64 Delay

Delay allows you to set up a transmission delay for the transducers. The amount of time between transmit signals from the SonoTracker™ will be at least *Delay*; more time will be provided if necessary because of distance to the target. Increasing *Delay* may be useful if you have a target (such as a liquid) that causes a lot of bouncing of signals. Delaying the next transmit signal allows the noise from the bouncing to dissipate before the next signal is transmitted.

Delay is typically used only for a single-channel system. A multi-channel system usually has enough time between signals for each transdcuer to allow noise from bouncing to dissipate.

65 TVG (Time Varied Gain)

TVG adjusts the SonoTracker™'s ability to pick up return echoes.

When material is close to the transducer, the sound energy in the return echo is very high and the time for the return echo to reach the transducer is very short. As the level in the vessel decreases, the sound energy decreases and the time for the return echo to reach the transducer increases. Gain can be used to amplify the return echo, to allow a low energy echo (caused by low material level) to be picked up. However, if the gain is left continuously at a high setting to provide accurate tracking of low material levels, it will also result in amplification of high energy echoes. This can cause the transducer to pick up its own transmission burst as a return echo from a full vessel, resulting in lockup of the level display at the vessel full point. TVG affects the sensitivity of the system in detecting return echoes by amplifying the return signal in relation to the time it takes the signal to reach the transducer (which is related to the distance from transducer to measured material).

TVG has eight submenus:

- *High Limit* sets the high limit for the TVG. This value is the highest the TVG will go in an effort to achieve an echo above the echo threshold (*Echo*). The range for *High Limit* is from 0 to 200.00%. The default value is a function of the *Span* entered during the *Startup* Procedure.
- *Low Limit* sets the low limit for the TVG. This value is the lowest the TVG will go to get the echo below the peak threshold (*Peak*). The range for *Low Limit* is from 0 to 200.00%.
- *Monitor* allows you to monitor the current TVG amplification.
- *Exponent* controls the shape of the TVG curve. *Exponent* can range from 0 to 2.55. Values of *Exponent* greater than 2.0 reduce the gain close to the transducer, often necessary for tall, narrow vessels. Values of *Exponent* less than 2.0 increase the gain close to the transducer.
- *Delay* shifts the portion of the TVG curve that is beyond the point where the blind space gain algorithm (*BGN*) is in effect. The default for *Delay* is 0'.
- *Decrease Step* controls the rate of TVG decrease. The value ranges in percentage from 0.00% to 100.00%.
- *Decrease Qualify* controls the number of decrease steps at one value prior to switching to the Decrease Step value. The value ranges from 0 to 255.
- *Mode* allows you to switch from the standard TVG algorithm (Mode = 1) to an algorithm designed for a specific application for a vessel filled with a very fine talcum powder (Mode = 2).

  For Mode=1, the TVG algorithm is applied to the closest target encountered.
  For Mode=2, the TVG algorithm is applied to the largest amplitude target.
  The default for Mode is 1.
  For Mode=3, same as Mode 1 yet only adjusts if return echo is outside the echo or peak thresholds.
  For Mode=4, same as Mode 2 yet only adjusts if return echo is outside the echo or peak thresholds.

Note

Setting *High Limit* equal to *Low Limit* puts the SonoTracker™ into a Fixed TVG mode, as it prevents the SonoTracker™ from raising or lowering the TVG curve in response to echoes below the *Echo* threshold or above the *Peak* threshold.

66 Near Gain

Near Gain specifies the near gain of the system and ranges from 0 to 100.00%. The near gain affects the ability to pick up targets in the first 4' (1.2m) to 6' (1.8m) from the face of the transducer and has minimal effect after that. The default for *Near Gain* is dependent on the type of transducer and application.

- *Value* is used to change the entry for this parameter.

- *Blind Space Gain (BGN)* controls the gain in the 'blind space' region of the transducer to help reduce ringing. *BGN* can be set from 0 to 100%. The default for *BGN* is dependent on the type of transducer and Quick Configuration settings.

67 Mid Gain Adj

Mid Gain Adj allows the adjustment of the TVG curve in the middle distance ranges. It is generally not used. *Mid Gain Adj* has two submenus:

- *Position* is the distance (in the selected length units) from the face of the transducer to the beginning of the midrange delay. The default for *Position* is 0.
- *Delay* sets the midrange delay. The distance (in the selected length units) over which the TVG remains constant. The TVG curve is shifted out past *Delay.* The default for *Delay* is 0.

68 Echo Threshld (Echo Threshold)

Echo Threshld sets the echo threshold from 0 to 100.0%. The default is 35%. The echo threshold is the minimum amplitude the echo must achieve to be accepted as a valid echo. If the echo has an amplitude less than *Echo*, the SonoTracker™ responds as follows:

Note:
100% *Echo* = 5 VDC
20% *Echo* = 1 VDC

- If in Auto TVG mode, the SonoTracker™ increases the amplification until it detects a valid echo or the amplification reaches *High Limit*. If the amplification reaches *High Limit* without detecting a valid echo, the SonoTracker™ assumes that the echo is not from a valid target, ignores the echo, and transmits the next signal.
- If in Fixed TVG mode, the SonoTracker™ assumes that the echo is not from a valid target, ignores the echo, and transmits the next signal.

69 Peak Threshld

Peak Threshld sets the peak threshold for return echoes. *Peak Threshld* only effects the results if the SonoTracker™ is in Auto TVG mode. If the echo has an amplitude greater than *Peak Threshld* while in Auto TVG mode, the SonoTracker™ decreases the amplification until the echo is below *Peak Threshld* or the amplification reaches *Low Limit*. Peak threshold can be set from 0 to 100.0%. The default setting is 50.0%.

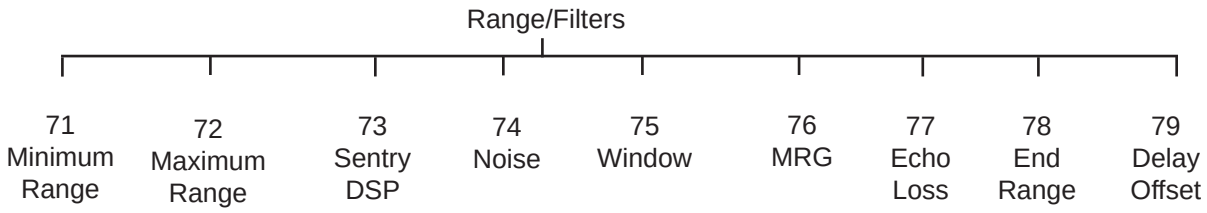


Figure 7-7. Range/Filters Menu Tree

70 Range/Filters

71 Minimum Range

Minimum Range displays and sets up the minimum range of the transducer. The minimum range is the minimum distance from the face of the transducer where the SonoTracker™ starts recognizing the return signal (echo). The default minimum range is set past the transducer's blind space to avoid interpreting the noise from the transmission signal as a return signal. However, if there are obstructions near the face of the transducer, the minimum range should be extended past the obstructions to eliminate the possibility of interference.
Minimum Range has two submenus — *Automatic* and *Manual*. Selecting *Automatic* enables the *Min Range Delay* parameter. Selecting *Manual* disables the *Min Range Delay* parameter. The default is *Manual*. For most applications, do not change this to *Auto*.

Automatic

Monitor allows you to monitor the actual minimum range the system is using, which includes the effect of *Min Range Delay (*if *Mode* is *Auto)*.

Min Range Delay is the number of counts to delay the minimum range by. If the SonoTr*acker*™ detects instability in the return echo, it compensates by adding a slight delay (*Min Range Delay*) to the minimum range, extending it out past the unstable signal. The factory default for *Min Range Delay* is 600 counts, which corresponds to 5.7" (145mm).

Manual

Min Range Set sets the distance for the minimum range. The defaults are:

— 12" (305mm) for BT-26 transducers
— 24" (610mm) for BT-61 transducers
— 36" (914mm) for BT-101 transducers
— 24" (610mm) for BT-55 transducers

Note

In Manual Mode, Max Range must be greater than Full Point + Tank Height. The system will NOT allow a Tank Height value that violates this distance. Change Max Range prior to changing Tank Height if needed..

72 Maximum Range

Maximum Range displays and sets up the maximum range of operation. The maximum range is the farthest distance from the face of the transducer where the transducer stops recognizing the return signal. Typically, *Maximum Range* should extend past the bottom of the vessel or bottom of the channel to ensure that the SonoTracker™ displays correct values when the level (or flow) is low. For level and differential level applications, the default *Maximum Range* is 120% of the *Tank Height* input in the *Startup* Procedure. For flow applications, the default *Maximum Range* is 120% of the Zero Distance input in the *Startup* Procedure.

73 Sentry DSP™ *(Consult Bindicator before modifying!)*

Note:
The *Sentry DSP* algorithm dampens the response rate of the SonoTracker™.For demonstration/test purposes set *Enable* to *Off*.

Extraneous noise caused by acoustical or electrical interference can cause changes in the SonoTracker™'s display, even though no material is moved. *Sentry DSP* helps to reduce the display changes that can result from acoustical or electrical interference. The SonoTracker™ picks the level from the first echo as a reference median; this is the value that is used in calculating the displayed level.

As shown in Figure 7-7a, the SonoTracker™ then compares following signals to the reference median, and recalculates the reference median when either of the following happen:

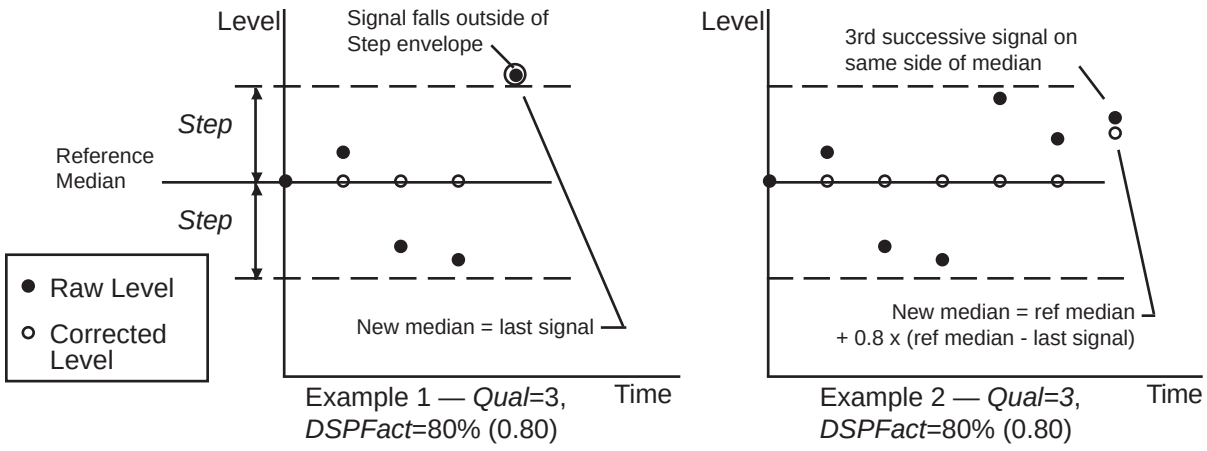
- the number of successive signals above or below the median exceeds a triggering number
- a signal falls outside of a user-defined window around the reference median

When the SonoTracker™ recalculates the reference median, the displayed level changes to correspond to the new reference median. Note that the *Sentry DSP* function affects setpoints, current output, and serial output as well as the display.

DSP has four submenus:

- *Qualify* 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 x-x, *Qualify* is 3. When the third successive signal above the median value (but within the *Step window*) is detected, the SonoTracker™ moves the location of the median value to that point or a percentage of the distance from the old median as determined by *Delta change*. This allows the SonoTracker™ to respond to definite trends in level changes. The default for *Qualify* is 4.
- *Step Window* is a window of equal height above and below the reference median. As shown in Figure 7-7a, example 1, if a large signal change is detected that falls outside of the window, the SonoTracker™ immediately moves the location of the reference median to that point. This allows the SonoTracker™ to adjust quickly to rapid material movement.
- *Enable* turns the filter function on and off. The default is *On*.
- *Delta Change* determines the magnitude of change from the old reference median to the new reference median, for change triggered by the *Qualify* parameter. In example 2 in Figure 7-7a, the SonoTracker™ moves the reference median 80% of the distance from the old median to the last signal (which triggered the change), based on a *Delta Change* 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 *Delta Change* does not affect the change caused by a signal falling outside of the *Step window*, as shown in example 1 in Figure 7-7a.

Figure 7-7a. Sentry DSP Function Examples



74 Noise (Consult Bindicator before modifying!)

The *Noise* function reduces the effect of extraneous noises that may confuse the signal processor. This menu sets up the noise routine algorithm. The algorithm is activated when the measured noise level (*Monitor*) exceeds the noise threshold level (*Threshold*). *Noise* has seven submenus:

- *Monitor* is used to monitor the current noise level. This value is calculated by capturing the voltage level at the current maximum TVG gain prior to the transmit burst. *Monitor* has a range between 0% (0 ADC counts) and 100% (2047 ADC counts). Normal ranges are 6.2% - 15%.
- *Meas Dev Ratio* is used to monitor the current deviation ratio. This number is calculated by dividing the listen deviation value (*Listen Deviation*) by the transmit deviation value.
- *Threshold* is a noise threshold. Measured noise levels (*Monitor*) that are above this threshold cause the noise algorithm to be switched on. At this point, all level measurements are frozen and are only updated when the noise algorithm qualifies a valid target or the noise level falls below *Threshold*. The default for *Threshold* is 100.0%. When *Threshold* is 100.0%, the noise algorithm is turned off.
- *Std Dev Ratio* is a deviation ratio threshold. Any measured deviation ratios (*Meas Dev Ratio*) larger than *Std Dev Ratio* indicate a high confidence level that the mean transmit target value is the actual target. When *Meas Dev Ratio* exceeds *Std Dev Ratio* the SonoTracker™ uses the mean target value to update the level measurement. The default for *Std Dev Ratio* is 3.0.
- *Listen Deviation* monitors the listen deviation value. The absolute value of each of 16 listen noise values are subtracted from the mean value. The results of each subtraction are added together to calculate *Listen Deviation*.
- *Listen Average* monitors the mean value of the listen deviation and is displayed in the current engineering units. It is calculated by averaging 16 listen noise values.
- *Tx Points* provides 16 transmits and listens. This value can be modified. Consult factory.

75 Window

Window sets the size of the window around the target. Only signals within the window are recognized as valid targets, in order to minimize interference from external noise. The window is maintained around the target as the target moves up and down (i.e., as the target moves, the center of the window moves with it). *Window* has two submenus:

- *Set* establishes the value for the window size. The default is 0. When the window is 0 the *Window* function is disabled.
- *Lost Echo Timer* sets the limit on timing if the target cannot be detected within the window.
  - — If the target reappears in the window within *Lost Echo Timer* seconds the SonoTracker™ stops timing and maintains the window around the new target.
  - — If the target does not reappear in the window within *Lost Echo Timer* seconds, the SonoTracker™ qualifies the next target (after *Lost Echo Timer* seconds) as the valid target, even if it is outside the window. The SonoTracker™ then sets the window up around the new target location.

  The default for *Lost Echo Timer* is 60 seconds.

77 Echo Loss

Echo Loss is for the echo loss timer, which allows you to set the amount of time from when an echo loss is first detected to when the SonoTracker™ responds to the echo loss. The echo loss timer allows the SonoTracker™ to ignore momentary echo losses which may occur occasionally. *Echo Loss* has two submenus:

- *Timer* allows you to set the amount of time from when the echo loss is first detected to when it is reported on the display (with an asterisk *), reported over any communications links, and causes fail-safe conditions (*Echo Loss Mode*) to apply for setpoints and current outputs. The default is 60 seconds.
- *Mode* allows you to select the echo loss indication mode — *Timed* or *Temporary*. If *Temporary* is selected, the display shows an exclamation point (!) every time an echo loss is detected, even if only momentarily. If the echo loss continues for *Timer,* the exclamation point changes to an asterisk (*) and communications links, setpoints, and current outputs are affected. If *Timed* is selected, the display gives no indication of the echo loss until the echo loss continues for *Timer*. The default for *Mode* is *Timed*.

78 End Range

End Range allows you to increase the rate at which the system transmits signals for targets that are close to the transducer. Each type of transducer has a prescribed rate at which it transmits signals, based on allowing enough time for a return of signal from a target at the transducer's maximum range. There are two choices for *End Range*:

- *MaxRange* — The transducer waits the prescribed amount of time, as defined for that transducer and based on the transducer's maximum range, before it transmits the next signal, regardless of how quickly the previous signal was returned. *MaxRange* is the default and recommended setting for *End Range*.
- *Target* — If the transducer detects a target closer than the maximum range (i.e., the total time to transmit and receive the signal is less than the prescribed time), the transducer sends out the next signal, rather than waiting until the prescribed time has elapsed.

79 Delay Offset

Delay Offset is a parameter related to the operating frequency of the transducers. It sets the propagational delay for the electronic circuitry. Note that a change made to *Delay Offset* for a particular type of transducer affects ***all*** channels that are monitoring that type of transducer. For example, if you modify *Delay Offset* for an BT-26, all channels that are using a BT-26 will use the new *Delay Offset* value.

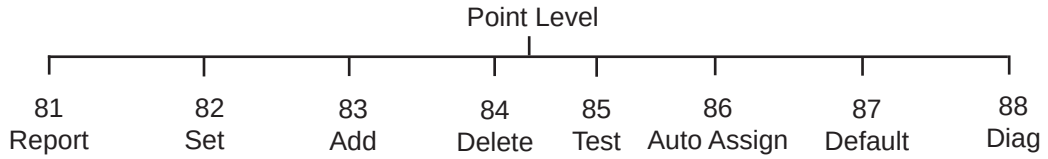


Figure 7-8. Point Level Menu Tree

80 Point Level

The addition of Point Level sensors enhances the reliability of the SonoTracker system at the extremes of range. Point level sensors such as the Roto-Bin-Dicator™ may be installed in a vessel to detect the presence or absence of material. The probes are connected to the SonoTracker™ controller using the Point Level input PCA (63-1288).

Point Level information is programmed in the mode selected under calibration, air space or material level mode. If the mode is changed later in the setup, the point level probe values are adjusted to the mode selected.

Up to (4) Point Level inputs per level channel can be assigned:

HiHi
High
Low
LoLo

When reading the description below, refer to Figure 7-9. The display examples shown below assume the SonoTracker™ controller is in material mode and set to display one decimal place in units of feet.

Normal Operation

The point level sensors are connected so that current flows through the switch wiring when the material level is within the normal operating range – between the Low and High sensors. (Figure 7-9c)

Function of Low and LoLo sensors

When material is withdrawn below the position of the Low sensor, the switch in the Low sensor opens and signals the SonoTracker™ controller that the Low point has been reached.

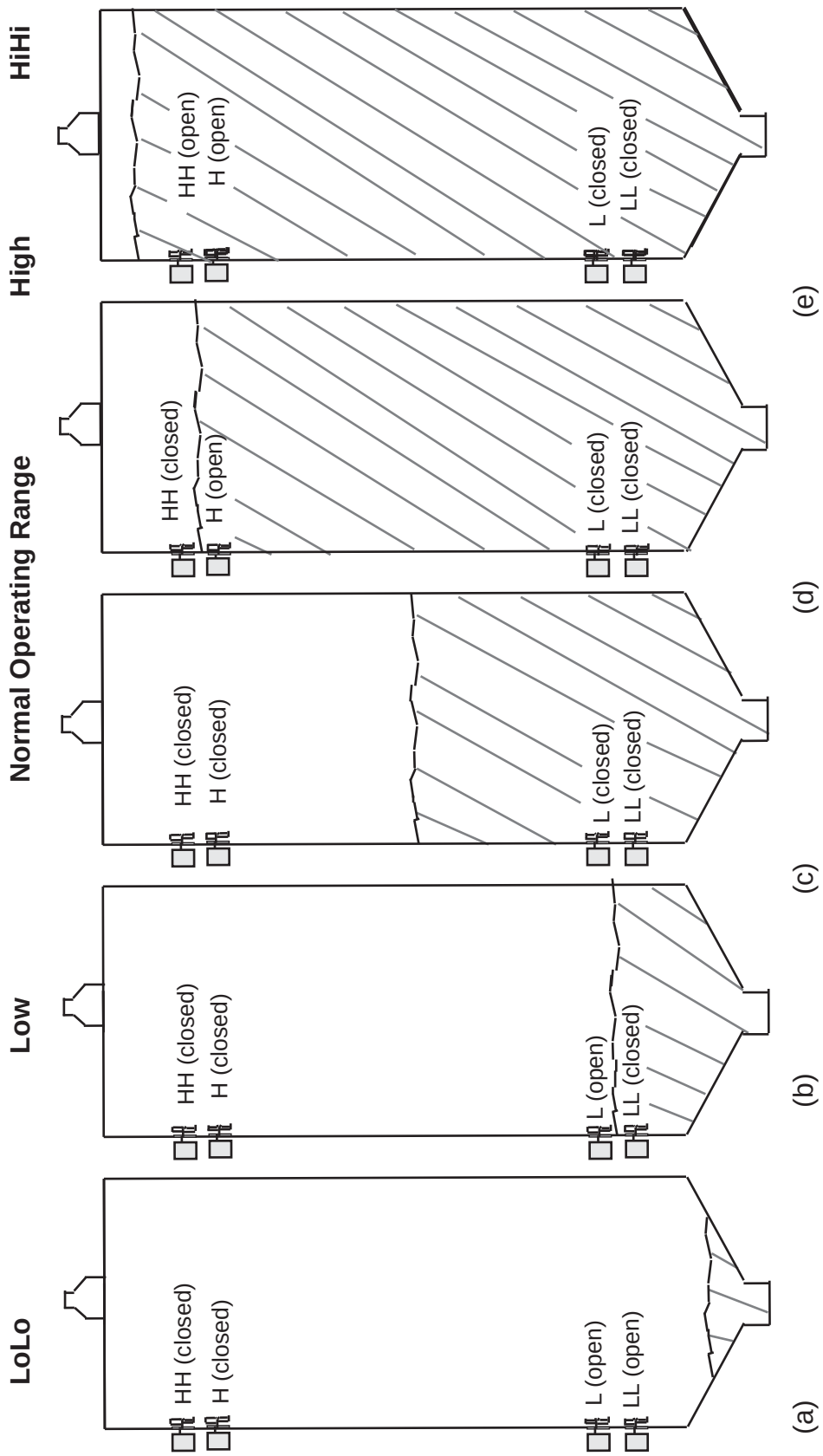
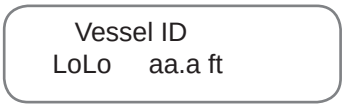


Figure 7-9. Point Level Example

The SonoTr*acker* display will show:

until the material level either rises to within the normal range or drops further and triggers the LoLo sensor. bb.b is the value entered as the Low point during system setup. (Figure 7.9b)

When the material is below the level of the LoLo sensor, the switches in both the Low and LoLo sensors will be open. The SonoTracker display will show:



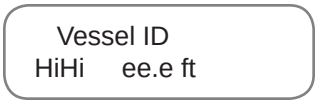
as long as the level remains below the LoLo point. aa.a is the value entered as the LoLo point during system setup. (Figure 7.9a)

Function of High and HiHi sensors

When material is added above the position of the High sensor, the switch in the High sensor opens and signals the SonoTracker controller that the High point has been reached. The SonoTracker display will show :

until the material level either drops to within the normal range or rises further and triggers the HiHi sensor. dd.d is the value entered as the High point during system setup. (Figure 7.9d)

When the material is above the level of the HiHi sensor, the switches in both the High and HiHi sensors will be open. The SonoTracker display will show:



as long as the level remains above the HiHi point. ee.e is the value entered as the HiHi point during system setup. (Figure 7.9e)

Failsafe Wiring

The point level inputs are wired in a failsafe manner: Under normal conditions, all four switches are closed when the material level is between the Low and High sensors.

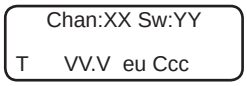
In the event that a wiring fault occurs, the current flow will be interrupted. If the error condition signals an illegal combination of sensor inputs the SonoTracker controller will alternate between the two displays below:

```
Vessel ID
P/L ERROR
```

```
Vessel ID
LEVEL   xx.x ft
```

81 Report

When the menu is accessed, the display shows the information for the first point level input that is assigned to a channel.



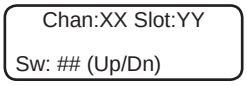
Where:

XX	= SonoTracker™ channel
YY	= Point Level Switch assigned
T	= Type of switch assignment (L, LL, H, HH)
VV.V	= Level Assignment of switch
eu	= Engineering units the channel is programmed in
Ccc	= Current switch condition (Opn, Cls)

Use the up/down arrow keys to cycle to the next assigned point level input and ESC exits up one level.

82 Set

If a point level input has been previously added, then the type and setting of the input can be modified. Only one switch of each type can be assigned to an SonoTr*acker*™ channel, so changing switch type may not be possible.



Where:

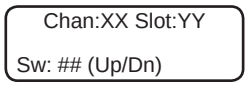
XX	= SonoTracker™ channel
YY	= Point Level Input Module Slot Number
##	= Current Switch Number

Use the up/down arrow keys to cycle to the next assigned point level input, ESC exits up one level and pressing ENTER takes you to the change setting menu.

83 Add

Up to four point level input channels can be assigned to one SonoTracker™ channel. They can be assigned as type LoLo, Low, High, HiHi with the stipulation that only one type per SonoTracker™ channel is allowed. They can be added in any sequence and programmed in either air space mode or material mode, depending on the SonoTracker™ channel mode. The SonoTracker™ monitors the setting for each type to insure that they have logical setting. The settings in air space mode are checked to insure the logic is LoLo > Low > High > HiHi and in material mode the logic is LoLo < Low < High < HiHi.

In the ADD mode, pressing ENTER takes you to the display:

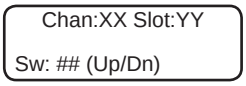


Where: XX = SonoTracker™ channel
YY = Point Level Input Module Slot Number
= Current Switch Number

Use the up/down arrow keys to cycle to the next assignable point level input, ESC exits up one level and pressing ENTER takes you to the ADD setting menu wizard.

84 Delete

This mode is used to delete an assigned point level input. When selected the display is:



Where: XX = SonoTracker™channel
YY = Point Level Input Module Slot Number
= Current Switch Number

Use the up/down arrow keys to cycle to the next assigned point level input, ESC exits up one level and pressing ENTER takes you to the DELETE point level input menu.

85 Test

In this mode, the point level switch input condition can be set regardless of actual input. The test condition, once enabled, remains until either the power is cycled or the test mode is disabled.

86 Auto Assign

In this mode, two point level inputs per active SonoTracker™ channel are assigned with the type being Hi and Lo, and the setting being one foot from full point and span.

87 Default

This mode is used to unassign all point level inputs and make them available for assignment.

88 Diag

When selected the SonoTracker display shows:

Where X = 0 or 1 (1 is switch closed and 0 is switch open)
Various messages on second line of display indicating last action taken on point level menus.

If Test Mode is active, then the display indicates the state of the switches as modified by the Test Mode. Changing the point level input switch will not be reflected in the diagnostic mode if Test is enabled. Disable Test to perform diagnostics.

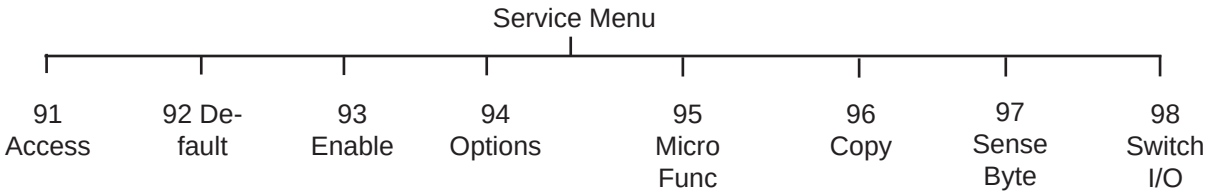


Figure 7-9. Service Menu Tree

90 Service Menu

91 Access

The Access menu allows you to:

- Set a user-defined access code
- Input the Bindicator Mfg Code, which is needed when performing certain troubleshooting functions.

Access has two submenus: *User* and *Service*

User

Note:
Record the access code and store it in a safe place. If misplaced, call Bindicator for instructions on how to bypass the code.

The SonoTracker™ arrives from the factory without a user-defined access code in place, allowing the user to access any function (other than those requiring the Service Mfg Code or 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.

Follow this procedure to set up an access code:

1. If the SonoTracker™ 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:

   SonoTracker
   10 Display

3. Scroll with the arrow keys to the 90 Service Menu option. Press Enter. The display shows:

   Service Menu
   Access

4. Press Enter. Then select User, press Enter.

   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.

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 one time per Manual Mode session, regardless of the number of functions and channels you access).

The Bindicator Mfg Code (see below) has precedence over the Bindicator Service Code (same as Mfg Code). If you enter the Bindicator Mfg Code in the *Bindicator* function under the *Access* Menu, the SonoTracker will not require you to enter the Bindicator Service Code when you change values in the *Service* Menu.

5. Press the Esc Key to scroll up the menu tree or 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 one time per Manual Mode session, regardless of the number of parameters you change and channels you access).

Service

The SonoTr*acker*™ 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, described earlier in this chapter, is entered when prompted by the display and is the same as Service Mfg Code. The Mfg Code is entered when in the *Access* Menu, as described below:

Service Mfg Code

The Service Mfg Code is required to access hidden menus, which are typically only used by Bindicator personnel for troubleshooting and testing the equipment. The Service Mfg Code number is:

9010

Note:
A default will cause a loss of data for the channel(s) defaulted..

92 Default

This function clears all SonoTracker™ setup parameters, resets them to factory default values, and automatically leads you through the *Startup* Procedure again (see Chapters 4, 5, and 6 for *Startup* Procedures). *Default* has two submenus:

- *Single* clears all parameters only for the channel whose menu tree you are in and used when bringing new channels online or reconfigured.
- *All* clears all parameters for ***all*** the channels (including math channels).
  Be careful when using this submenu.

93 Enable

This function is used to enable or disable the channel. Disabling a channel actually causes the SonoTracker™ to stop monitoring the channel.
The display shows:

Notes:
There are a total of 24 channels in *Enable*, consisting of channels that are monitoring transducers as well as math channels.

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*.

An asterisk indicates the current selection for the channel.

Pressing the up/down keys selects ON or OFF. Pressing the ENTER key saves the selection. If you have setpoint or current output set up for the channel that you are disabling, the SonoTracker™ will ask whether to Release I/O. Releasing I/O will free up those channels currently used for setpoint and current output for this channel. 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.

Math Channels

Math Channel functions can be used to process the vessel monitoring results in many ways. A few typical uses of the math channels follow:

- Add the level or calculate the average for the level 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 level in feet into a weight in pounds, to provide additional information on the vessel contents.

The number of channels available for math channels is dependent on the system you purchased:

- Single-point SonoTracker™ (equipped to monitor only one channel) — 23 channels available for math calculations (channels 2 through 24)
- One Scanner PCB SonoTracker™ (equipped to monitor up to eight channels) — 16 channels available for math calculations (channels 9 through 24)
- Two Scanner PCB SonoTracker™ (equipped to monitor up to 16 channels) — 8 channels available for math calculations (channels 17 through 24)

Enabling a Math Channel

1. If the SonoTracker™ 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.
3. Press the up/down arrow key until ***90 Service Menu*** appears. Press Enter.
4. Scroll with the up arrow key to 93 Enable. Press Enter.
5. Scroll with the arrow keys to the math channel you want to enable.
6. Press the Enter Key to enable a channel. Press Enter again to enable. Scroll to *No* to disable.
7. Press the Auto/Man Key to return the display to vessel monitoring.

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

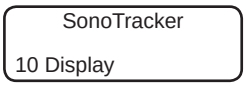
Configuring a Math Channel

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

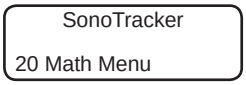
C9=(C1+C2+C3+C4)÷4.0

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

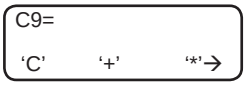
1. If the SonoTr*acker*™ is in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the system in Manual Mode. The Auto LED turns off.
2. Use the Up Arrow or Down Arrow Key to scroll to the desired math channel (channel 9 in this example).
3. Press the Menu Key to display the *Main* Menu. The display shows:



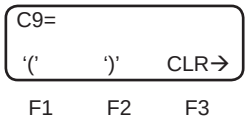
4. Select *20* and press Enter. The display shows:



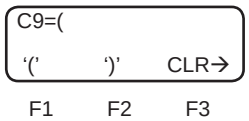
5. Press Enter and the display shows:



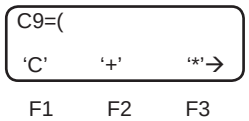
6. Press the Menu Key two times to access the third page of the Math Menu. The display shows:



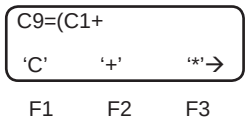
7. Press the F1 Key to select (. The display shows:



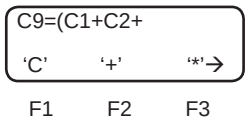
8. Press the Menu Key two times to access the first page of the Math Menu again. The display shows:



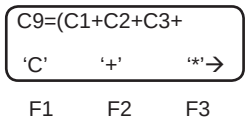
9. Press the F1 Key to select C. Press 1 on the keypad. Press the F2 Key to select +. The display shows:



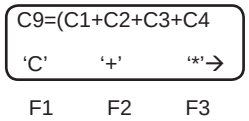
10. Press the F1 Key to select C. Press 2 on the keypad. Press the F2 Key to select +. The display shows:



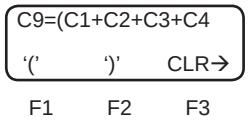
11. Press the F1 Key to select C. Press 3 on the keypad. Press the F2 Key to select +. The display shows:



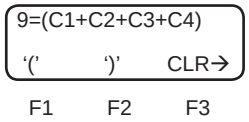
12. Press the F1 Key to select C. Press 4 on the keypad. The display shows:



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

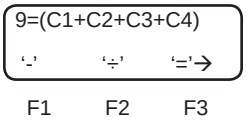


14. Press the F2 Key to select). The display shows:

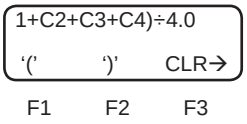


Notice that the display has started to scroll — the *C* on the far left is not visible because of space limitations.

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



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



17. After reviewing equation, press Enter to save equationto memory. A message should scroll across the screen acknowledging the entry. After entering the equation, the display should return to:

Channel 9 will now display the average of the vessels in vessel 1 through 4.

Math Channel Menu Functions

C Identifies a specific channel in the equation. C must be immediately followed by a channel number (for example, C9 indicates the channel with factory-set ID# 9). See Appendix page F-1. All equations must start with the current channel designation and an equal sign (for example, *C9=* must be the start of the equation when you are in channel 9). When a channel number appears to the right of the equal sign, it tells the SonoTracker™ to put the value from that channel (the level 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, *C9=* must be the start of the equation when you are in channel 9).

(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.

$\sqrt{\ }$ 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^ 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 (SonoTracker™ 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.
[backspace]	Deletes the character to the left of the cursor.
Enter	Stores the current formula in memory.

Math Channel 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:
  C9=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)
  C9 = C3 + C4 + C6
  Correct (no spaces)
  C9=C3+C4+C6
- The SonoTracker™ 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 SonoTracker™ is calculating what you want it to calculate.
- The maximum value that a math channel can display is limited to seven 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.

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 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) C9=10*C3+100*C2+1000*C4+10000*C1

Correct

C10=10*C3

C9=C10+100*C2+1000*C4+10000*C1

94 TVG DAC Count

TVG DAC Counts allows you to set up a transmission delay for the transducers. The amount of time between transmit signals from the SonoTracker™ will be at least *TX Delay*; more time will be provided if necessary because of distance to the target. Increasing *TX Delay* may be useful if you have a target (such as a liquid) that causes a lot of reverberation of signals. Delaying the next transmit signal allows the noise from the reverberation to dissipate before the next signal is transmitted.

95 Micro Func

This menu allows you to test the keyboard, test the nonvolatile RAM, reset the nonvolatile RAM to default parameters, and monitor the serial port. It has the following submenus:

KeyTest (keyboard test)

This function displays the number of the last key that was pressed. Table 7-9a lists all the keys on the SonoTracker™ keypad and their corresponding reference numbers.

NVRAM Test (RAM memory test)

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 *RAM TEST PASSED!* If it does not, contact Bindicator. When the test is complete, press the Esc Key to return to the *Micro Func* 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	Sensor	21
0(Space)	10	⇦	22
. (Period)	11	Shift	23
- (Minus)	12	Enter	24
*Note: Pressing these keys will exit the			

Table7-9a. List of Keys and Corresponding Reference Numbers

Default NVRAM (reset RAM memory)

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 SonoTracker™ requires you to enter the Bindicator 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.

96 Copy

The *Copy* Menu allows you to copy all parameters for the current transducer channel to one or all of the other transducer channels. This can save you a considerable amount of time if you have multiple channels with the same or similar parameters. Follow this procedure to use the *Copy* Menu.

1. If the SonoTracker™ 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 channel with the parameters you want to copy.

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

   SonoTracker
   10 Display

4. Press the up/down arrow keys to display the Service Menu. The display shows:

   SonoTracker
   90 Service Menu

5. Press the up arrow key to access the *Copy* Menu. Press Enter. The display shows:

   Copy all parameters
   to all sensors?

6. To copy the parameters to all channels, press the Enter Key and go to Step 7. To copy the parameters to one channel, press the up arrow Key, selecting Pick Sensor and go to Step 8.

7. If you selected *To All Sensors*, the display looks like this:

   COPY TO ALL?
   Yes

   Press the Enter Key to copy the parameters to all channels. The display flashes a message acknowledging your selection and returns. Go to Step 9.

8. If you selected *Pick Sensors*, the display looks like this:

   COPY PARAMTRS TO
   SENSOR:XX ID#:YY

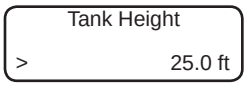
   - *SENSOR: XX* is the base address of the channel (used only for serial communications)
   - *ID#: YY* is the factory-set ID for the channel

   Press the Up or Down Arrow Keys to scroll to the ID# for the channel you want to copy the parameters into. When you have reached the desired channel, press the Enter Key. The display flashes a message acknowledging your selection and returns.

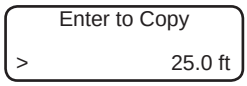
9. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return the display to channel monitoring.

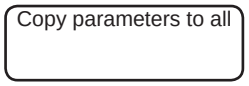
In addition to function 96, the sensor key can also perform a copy function

The sensor key allows you to copy parameters to a different channel while remaining in a particular menu function. For example, assume the disply is showing this screen for channel 2 under the Main/Calibration/Tank Height Menu:



If you prss the Sensor Key, the display changes to:





Press the up/down arrow keys to switch to the previous channel (ID#01). When the display shows the desired channel, press the Enter Key. For Next and Back, the SonoTracker display actually switches to the menu tree for the selected channel.

If you do not want to switch channels but simply want to copy the Span you entered for channel 2 for use in another channel(s), press enter fo Copy. The SonoTracker then asks whether you want to copy the value to all other channels or to a selected channel.

97 Sense Byte

Factory diagnostic only.

98 Switch I/O

Factory diagnostic only.

Appendix A: Specifications

Transducer Frequency: 10 KHz to 45 KHz

Display: Large, back-lit alphanumeric liquid crystal, two lines of 16 characters, user programmable IDs, selectable bar graph display or engineering units format

Programming and Parameter Entry: 24-key sealed membrane tactile keypad

Set-up: Menu-driven prompts

Memory: Non-volatile RAM, common isolation parameter storage

Built-in Serial Communication: RS-422, (optical isolation standard), 1200, 2400, 4800, 9600 or 19.2 K baud; designed for multi-drop connection

Option cards*

Scanner options: For multiple channel expansion; available with 2, 4, or 8 channels; first scanner card must be full 8 to use a second scanner card; maximum of two scanner cards per SonoTracker™.

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)

Point Level Input: 5V @ 5mA, voltage provided for contact inputs. This offers maximum protection for the process with fail-safe on disconnect. These point level input modules are compatible with the majority of the devices available on the market today i.e. Monitor, available as plug-in module of 16 inputs.

4-20 mA 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: One 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:

Voltages: 100 VAC 50/60 Hz, 110/230 VAC (+/- 10%) 50/60 Hz or 24 VDC

Power requirement: 20 VA

Environmental:

Operating Temperature: -5° to 122° F (-20° to 50° C)

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

Enclosures: NEMA 4X fiberglass reinforced polyester (FRP) with 24-key, sealed elastomer keypad, NEMA 4X stainless steel and optional mild steel NEMA-4 for CE version. SonoTracker™ has NEMA 4X compression molded fiberglass, reinforced polyester and a silicon door gasket.

Physical:

Dimensions:

FRP: 12.0 in. (305 mm) x 10.75 in. (273 mm) x 5.62 in (143 mm);

Stainless Steel: 12.0 in. (305 mm) x 10.0 in.(254 mm) x 6.0 (152 mm)

Weight: 12 pounds (5.45 kg)

Appendix B: Serial Commands

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

Command Table

Command		Function Master to	Transmitted by Master from SonoTr*acker*™	Received by SonoTr*acker*™
Hex	**ASCII**			
23	#	Bindicator product identification number	>aa#ssr	Addssr (A96BOr for SonoTracker™)
61	a	Request application type 0=level; 1=flow; 2=pump; 3=differential level; 99=math	>aaassr	Addssr
32	2	Request engineering units ***Note 1**. This digit is echo-loss character: 0=no echo-loss, 1=echo-loss condition, 2=momentary echo-loss condition. ****Note 2**. This is the level/head data if material mode selected or range data if air space mode selected. If a flow device, this is the head.	>aa2ssr	Addddddddssr
46,30	F0	Request flow rate (flow applications only) in selected engineering units	>aaF0ssr	A*ddddddddssr **
74	t	Request totalizer data (flow applications only) ***Note 1**. This digit indicates units: 0=CF, 1=GL, 2=MG, 3=CM, 4=LT, 5=ML ****Note 2**. This digits indicates format: 0=XXXXXX, 1=XXXX00, 2=XXXXX0, 4=XXXX.X, 5=XXX.XX, 6=XX.XXX, 9=X.XXXX, B=XXX000 *****Note 3**. 32 bit totalizer data in hexadecimal	>aatssr	Ahhhhhhhhhh*ssr *** **
52,44	RD	Request raw target Distance in .01 inches.	>aaRDssr	Addddddddssr

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

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 *Checksum Calculation* 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)
+ -	Indicates polarity.

Table B-2. Definitions of Characters in Command Strings

Checksum Calculation

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 engineering units (such as level) from a SonoTr*acker*™, the command is:

>aa2ssr

If the SonoTr*acker*™'s address is '3', the command is:

>032ssr

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

032 ASCII = 30 Hex + 33 Hex + 32 hex = 95 Hex
'0' '3' '2'

Therefore, the ASCII string transmitted to the SonoTr*acker*™ is:

> 0 3 2 9 5 CR
3E 30 33 32 39 35 0D Hex

Response

The response to a request for engineering units is:

Adddddddssr

If the level is 63.84 feet (transmitted without decimal points as 6384) and there is no echo loss, the response is:

A0006384ssr

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

0006384 ASCII = 30 Hex+30 Hex+30 Hex+36 Hex+33 Hex+38 Hex+34 Hex = 165 Hex
‘0’ ‘0’ ‘0’ ‘6’ ‘3’ ‘8’ ‘4’

Ignoring the overflow, the checksum is 65 Hex. Therefore, the ASCII string transmitted back to the master is:

A 0 0 0 6 3 8 4 6 5 CR
41 30 30 30 36 33 38 34 36 35 0D Hex

Examples

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

'#' Command — Bindicator Product Identification Number

This command is sent by the master to request the SonoTracker™ to send its Bindicator product identification code (code is 95 for the SonoTracker™). For this example, the master requests the code from a SonoTracker™ channel at address 01, which returns a code of 95 and a checksum of 6E.

Request from Master	**Response from** SonoTr*acker*™	
>aa#ssr	Addssr	*Format*
>01#84r	A96BOr	*Example*

'a' Command — Request Application Type

This command is sent by the master to request the SonoTracker™ to send the application type for the channel: 00=level, 01=flow, 02=pump, 03=differential level, and 99=math. For this example, the master requests the code from a SonoTracker™ level channel at address 01, which returns a code of 00 and a checksum of 60.

Request from Master	**Response from SonoTracker™**	
>aaassr	Addssr	*Format*
>01aC2r	A0060r	*Example*

'2' Command — Request Engineering Units (level/head or range)

This command is sent by the master to request the SonoTracker™ to send the engineering units (level/head or range). For this example, the master requests the level from a SonoTracker™ channel at address 01, which is set up with a standard display format of 0.01 ft. The SonoTracker™ returns an indication that there is no echo-loss, a level of 2500 (25.00 feet), and a checksum of 57.

Request from Master	**Response from SonoTracker™**	
>aa2ssr	Add*dddddddssr ****	*Format*
>01293r	A0*00250057r ****	*Example*

*Note 1. Echo-loss character: 0=no echo-loss, 1=echo-loss condition, 2=momentary echo-loss condition.
**Note 2. Level/head data if material mode selected or range data if air space mode selected.

'F0' Command — Request Flow Rate (flow applications only)

This command is sent by the master to request the SonoTracker™ to send the flow rate. For this example, the master requests the flow from a SonoTracker™ channel at address 01, which is set up with standard flow format of XXX.XX and standard flow units of cubic feet per second (CFS). The SonoTracker™ returns a flow rate of 989 (9.89 cubic feet per second) and a checksum of 6A.

Request from Master	**Response from SonoTracker™**	
>aaF0ssr	Adddddddssr	*Format*
>01F0D7r	A00009896Ar	*Example*

't' Command — Request Totalizer Data (flow applications only)

This command is sent by the master to request the SonoTracker™ to send the totalizer data. For this example, the master requests the totalizer data from a SonoTracker™ channel at address 01, which is set up with standard totalizer format of XXXX.X and standard totalizer units of cubic feet. The SonoTracker™ returns a total flow of 2753 (275.3 cubic feet) and a checksum of A5.

Request from Master	**Response from SonoTracker™**	
>aatssr	Ahhhhhhhhhh*ssr └──────┘** ***	*Format*
>01tD5r	A0400000AC1A*5r └──────┘** ***	*Example*

*Note 1. 0=CF, 1=GL, 2=MG
**Note 2. Format: 0=XXXXXX,1=XXXX00, 2=XXXXX0, 4=XXXX.X, 5=XXX.XX, 6=XX.XXX, 9=X.XXXX, B=XXX000
***Note 3. 32 bit totalizer data in hexadecimal; 00000AC1 is the hexadecimal equivalent of 2753.

'RD' Command — Request Raw Target

This command is sent by the master to request the SonoTracker™ to send the raw target. For this example, the master requests the raw target from a SonoTracker™ channel at address 01, which returns a raw target of 25939 (259.39 inches) and a checksum of 6C.

Request from Master	**Response from SonoTracker™**	
>aaRDssr	Adddddddssr	*Format*
>01RDF7r	A00259396Cr	*Example*

Appendix C: Troubleshooting the System

This chapter describes some common problems. For each problem, one or more possible explanations are listed. For each explanation, an indication of when the problem is likely to be noticed and suggested solutions are provided.

Problem	Solution
You applied power to the unit, but the display does not come on.	1. Check fuse F1. If it has blown, replace. 2. If the fuse is okay, check to see if the green power LED (in the middle of the motherboard inside the enclosure) is illuminated. If it is not illuminated: A. Check if the power switch (inside the enclosure in the upper right corner next to the AC connection) is on. Turn on if necessary. B. Check if there is voltage coming to the unit. Fix power supply or wiring to the unit if necessary. 3. Check the contrast setting for the display. It could be set too light for you to view the display. Follow this exact sequence to check and increase the *Contrast*: A. Press the Auto/Man Key to put the SonoTracker™ in Manual Mode. B. Press the Menu Key to access the *Main/Display* Menu. C. Press 17. D. Press Enter. E. Press the up/down arrow keys repeatedly to darken the contrast. You may need to press them 20 to 40 times to see any effect on the display. 4. Turn off the unit, then while holding the period key, turn unit back on. 5. If the display still does not illuminate, contact the Bindicator Service Department.
You applied power to the unit and want to perform the *Startup* Procedure to set up the SonoTr*acker*™, but the SonoTr*acker*™ does not display the *Startup* Procedure. Another individual may have previously powered up the unit and pressed some keys, entering inappropriate values in the *Startup* Procedure.	Follow the procedure below to repeat the *Startup* Procedure. Press the F3 key or A. Press the Auto/Man Key to put the SonoTracker™ in Manual Mode. B. Press the Menu Key to access the *Main* Menu. C. Scroll with the arrow keys to the *90 Service Menu*. Press Enter. D. Press the arrow keys to access the *92 Default* Menu. E. Enter the *Service Code*, which is 9010. Press the Enter Key. F. Press the arrow keys to select *All* in the *Default* Menu. G. Press the Enter Key to select *Yes* when the SonoTracker™ requests verification that you want to default all of the channels. The SonoTracker™ will then repeat the *Startup* Procedure, allowing you to set up the channels again. Follow the appropriate *Startup* Procedure in Chapter 4, 5, or 6.

Problem	Solution
The SonoTracker™ is displaying data while channel monitoring, but the value does not agree with the known, measured level in the vessel.	1. Check the raw target value to compare it to the known, measured level in the vessel. The raw target is the 'raw' distance from the face of the transducer to the target, before averaging, tracking, filtering, etc. are applied. The raw target has units of inches (centimeters if you are using metric units). • To obtain the raw target, press the F1 Key while in Manual Mode. The top line of the display now shows the raw target. Press F1 again to turn off. If the raw target value agrees with the measured level, the values input for averaging or filtering parameters may be causing the problem with the displayed data. Contact the Bindicator Service Department. In order to allow us to help you with troubleshooting over the phone, first write down all of the parameters you entered during the *Startup* Procedure, and in the *Calibration* and *Service* Menus. See Appendix D. 2. Disconnect the transducer and reconnect it directly to the SonoTracker™. Aim it at a target of a known distance that is greater than the minimum range of the transducer (the target must be farther than 3.5' [1.1m] away). If the level reads correctly, reconnect the transducer into the application and aim the transducer to ensure proper level. Refer to Chapter 2, System Installation, for installation and aiming information. 3. Check the cable to ensure that there are no ground points within the cable. 4. Turn the AC power off. Measure the resistance across the transducer leads: • BT-26 Sonocell — Verify resistance is between 180 and 220 K ohms • All Other Sonocells — Verify resistance is between 90 and 110 K ohms Resistance of 0 ohms indicates a short. Resistance above the specified range indicates a transducer or cable open or a bad connection to the SonoTracker™. • Check the connection of the transdcuer cable to the SonoTracker™. A common error is wires inserted in the wrong side of the screw terminal connector clamps. Also check polarity and shield wire. 5. Verify that the frequency of operation of the channel matches the transducer used for the application. The frequency selection can be viewed and modified in *Transducer Menu*. Refer to Chapter 7, Monitor. 6. Verify that the maximum range is below the bottom of the vessel. Maximum range can be viewed and modified in *Range/Filters*. Refer to Chapter 7. 7. Adjustments to the power and gain settings may be required. These adjustments should only be made by trained operators or Bindicator personnel. Contact the Bindicator Service Department. 8. If you have followed the above steps, and the displayed data still does not agree with the known, measured level in the vessel, contact the Bindicator Service Department. In order to allow us to help you with troubleshooting over the phone, first write down all of the parameters you entered during the *Startup* Procedure and calibration.

Appendix D: Error Messages

This chapter contains descriptions of the error messages displayed by the SonoTracker™:

1. An exclamation point (!) on the display
2. An asterisk (*) on the display
3. A box (■) on the display
4. All Channels Are Disabled
5. Units Overrange
6. A-B Comm Error
7. Blue Hose Error
8. Math Error # or Script Compile Error #
9. NVRAM Failure
10. Noise (^)

Error messages

For each error message, one or more possible explanations and suggested solutions are provided.

1. An exclamation point (!) on the display

Explanation

77 Echo Loss/Mode allows you to select the echo loss indication mode — *Timed* or *Temporary*. If you selected *Temporary*, the display shows an exclamation point (!) every time an echo loss is detected, even if only momentarily. The display continues to show the last valid level (or flow) until the target is 'found' again. Communications links, setpoints, and current outputs continue to operate normally, based on the last valid level.

Range/Filters Menu allows you to set the amount of time from when an echo loss is first detected to when it is reported on the display with an asterisk (*), reported over any communications links, and causes fail-safe conditions (*Echo Loss Mode*) to apply for setpoints and current outputs. If an echo loss continues for *Timer,* the exclamation point changes to an asterisk (*). Note that if *Timed* is selected, the display gives no indication of the echo loss (no exclamation point) until the echo loss continues for *Echo Loss/Timer*.

Solutions

Momentary echo loss will occur occasionally, due to noise, vibration, fill, etc. Set *Mode* to *Timed* if you do not want to be notified of momentary echo loss.

2. An asterisk (*) on the display

Explanation

Range/Filters Menu allows you to set the amount of time from when an echo loss is first detected to when it is reported on the display with an asterisk (*), reported over any communications links, and causes fail-safe conditions (*Echo Loss Mode*) to apply for setpoints and current outputs. The display continues to show the last valid level (or flow) until the target is 'found' again. The default for *Timer* is 60 seconds.

Solutions

Echo loss can occur while filling. Other situations that can cause echo loss include an extreme angle of repose in a bulk solid or foam on a liquid. If echo loss frequently occurs, you may need to adjust parameters in the *Range/Filter* Menu to improve the system performance; contact Bindicator.

3. A box (■) on the display

Explanation

A box (■) displays while vessel monitoring to indicate that the system senses a temperature greater than 300ºF (149ºC) or less than –100ºF (–73ºC) . The over- or under-temperature condition is most likely caused by a short in the temperature probe. Current outputs and setpoint relays are put in a fail-safe condition (*ELM*) and the temperature condition is reported over any communication links. When an over- or under-temperature condition occurs, the SonoTracker™ uses 68ºF (20ºC), instead of the data from the temperature probe, to calculate the level.

Solution

Verify if there is a short in the temperature probe. Replace the temperature probe if necessary.

4. All Channels are Disabled

Explanation

The SonoTracker™ is not monitoring any channels because all channels are disabled.

Solution

Display selected disabled channels again by turning *Enable* on.

1. Put the SonoTracker™ in Manual Mode.
2. Follow the path *Main/Service Menu/Enable*. Press Enter.
3. Use the Up and Down Arrow Keys to scroll to the channel that you want to enable. Press the Enter Key to turn the channel on.
4. Repeat Step 3 as desired for other channels.

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*.

5. Units Overrange

Explanation

The calculated level exceeds the maximum number for a 16-bit system (65535).

Solutions

1. Check the *Std Dev Ratio* units (in the *Range-Filter/Noise* Menu) for the channel. For example, a value in .01 inches is 1200 times greater than a value in feet; a value in .01 centimeters is 10,000 times greater than a value in meters. Make sure that the units are consistent with the maximum expected value.
2. If you selected special display units (*Spec Display* in the *Display* Menu) for the channel, check the *Format* and *Maximum Value*. A *Format* of xxx. xx yields a maximum value of 65.535, while a *Format* of xxxxx00 yields a maximum value of 6553500. Make sure that the *Format* and *MaximumValue* is consistent with the maximum expected value.
3. Check the calibration for the channel. Recalibrate if required.

6. A-B Comm Error

Explanation

(This error message can appear only if you had an A-B RIO PCB installed in the SonoTracker™.) The A-B RIO PCB was removed from the SonoTracker™ or is not functioning properly.

Solutions

1. Verify that the A-B RIO PCB is properly installed in the SonoTracker™.
2. Contact Bindicator for assistance in determining if there is a problem with the PCB.

7. Blue Hose Error

Explanation

(This error message can appear only if you have an A-B RIO PCB installed in the SonoTracker™.)The PLC parameters in the SonoTracker™ and the PLC are not consistent or there is a problem with the 'Blue Hose' that connects to the Allen-Bradley PLC.

Solutions

1. Check the setup parameters (baud, rack size, etc.) for the A-B RIO in the SonoTracker™ (refer to the *A-B RIO Interface Manual*. Verify that they match the parameters for the PLC. Modify the parameters for the SonoTracker™ or the PLC if necessary.
2. Verify if the 'Blue Hose' is cut or if there is a short. Replace the 'Blue Hose' if necessary.

8. 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 7, *90 Service Menu/Math Channels*, for a detailed list of the math error messages and solutions.

9. NVRAM Failure

Explanation

This error message will only occur at power-up. NVRAM data has been corrupted.

Solution

Contact Bindicator Technical Support at 1-800-778-9242 or 864-574-8060.

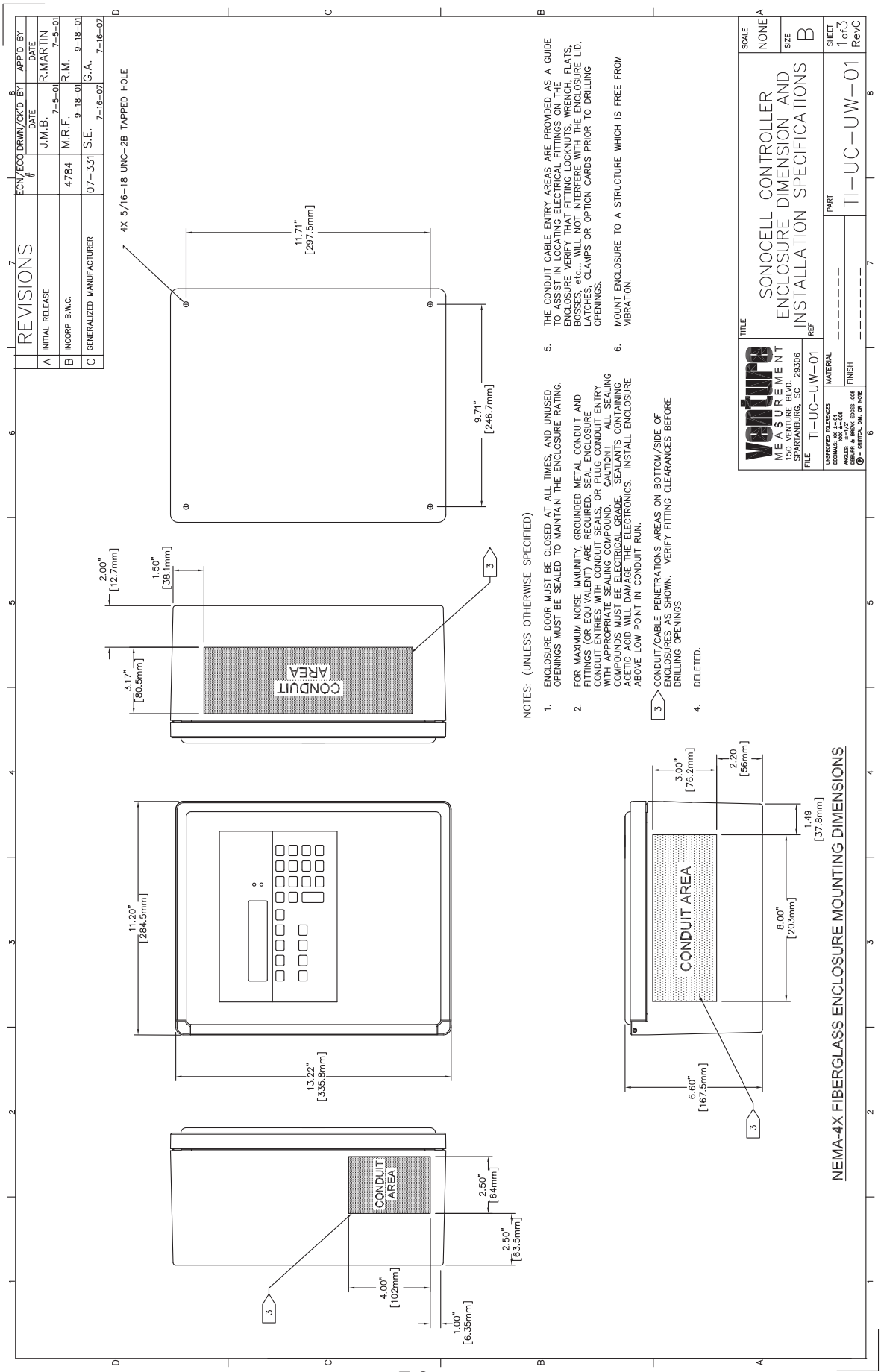
10. Noise /\

The amount of noise exceeds noise limit.

Appendix E: Technical Drawings

This appendix contains the following technical drawings for the SonoTr*acker*™ and transducers:

Drawing No.	**Drawing Title**
TI-UC-UW2-01	SonoTracker™ Assembly and Option Board Placements
TI-UC-UW 01 Sheet 1-3	SonoTracker™/BT-55 Enclosure Dimension and Installation Specifications
TI-UW-UC 02 Sheet 1-2	Interconnect Diagram, Single Point SonoTracker™
TI-UC-UW 03 Sheet 1-3	Interconnect Diagram, Multi-Point SonoTracker™
TI-Bindicator-TRPT-01	Transducer Specifications (PT) PVC/CPVC Body
TI-Bindicator-TRST-01	Transducer Specification (ST) Stainless Steel Series
TI-UC-UWSAN25-01 Sheet 1-2	BT-26 Transducer Sanitary Mounting Options
TI-SC-UW AIM-01	Transducer / SonoTracker™ Aiming mount installation
TI-UC-UW AIM-01	Transducer / SonoTracker™ Aiming mount installation
TI-UC-UWTRACC-01	Transducer Optional Accessories
TI-UC-UW XMT-01	SonoTracker™ Current Output Card
TI-UC-UW XMT-02	SonoTracker™ current output card DC
TI-UC-UW RLY-01	SonoTracker™ Relay Output Card
TI-UC-UW CMB-01 Sheet 1-2	AC powered SonoTracker™ Combination Output Card, Relay/Current Output
TI-UC-UW CMB-02 Sheet 1-2	DC powered SonoTracker™ Combination output card, relay/current output
TI-UC-UW PLPCB	Point Level Input
TI-2121 Sheet 1-2	Transducer Installation, FM Approved


REVISIONS
A INITIAL RELEASE J.M.B. 7-5-01 R.MARTIN 7-5-01
B INCORP B.W.C. 4784 M.R.F. 9-18-01 R.M. 9-18-01
C GENERALIZED MANUFACTURER 07-331 S.E. 7-16-07 G.A. 7-16-07
4X 5/16-18 UNC-2B TAPPED HOLE
11.71" [297.5mm]
9.71" [246.7mm]
2.00" [12.7mm]
1.50" [38.1mm]
3.17" [80.5mm]
CONDUIT AREA
11.20" [284.5mm]
13.22" [335.8mm]
CONDUIT AREA
2.50" [64mm]
2.50" [63.5mm]
4.00" [102mm]
1.00" [6.35mm]
3.00" [76.2mm]
2.20 [56mm]
1.49 [37.8mm]
8.00" [203mm]
6.60" [167.5mm]
NOTES: (UNLESS OTHERWISE SPECIFIED)
1. ENCLOSURE DOOR MUST BE CLOSED AT ALL TIMES, AND UNUSED OPENINGS MUST BE SEALED TO MAINTAIN THE ENCLOSURE RATING.
2. 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. SEALANTS CONTAINING ACETIC ACID WILL DAMAGE THE ELECTRONICS. INSTALL ENCLOSURE ABOVE LOW POINT IN CONDUIT RUN.
3 CONDUIT/CABLE PENETRATIONS AREAS ON BOTTOM/SIDE OF ENCLOSURES AS SHOWN. VERIFY FITTING CLEARANCES BEFORE DRILLING OPENINGS
4. DELETED.
5. 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.
6. MOUNT ENCLOSURE TO A STRUCTURE WHICH IS FREE FROM VIBRATION.
NEMA-4X FIBERGLASS ENCLOSURE MOUNTING DIMENSIONS
ECN/ECO # DRWN/CK'D BY DATE APP'D BY DATE
Ventura MEASUREMENT 150 VENTURE BLVD SPARTANBURG, SC 29306
FILE TI-UC-UW-01
TITLE SONOCELL CONTROLLER ENCLOSURE DIMENSION AND INSTALLATION SPECIFICATIONS
REF
MATERIAL
FINISH
PART TI-UC-UW-01
SCALE NONE
SIZE B
SHEET 1 of 3
REV C

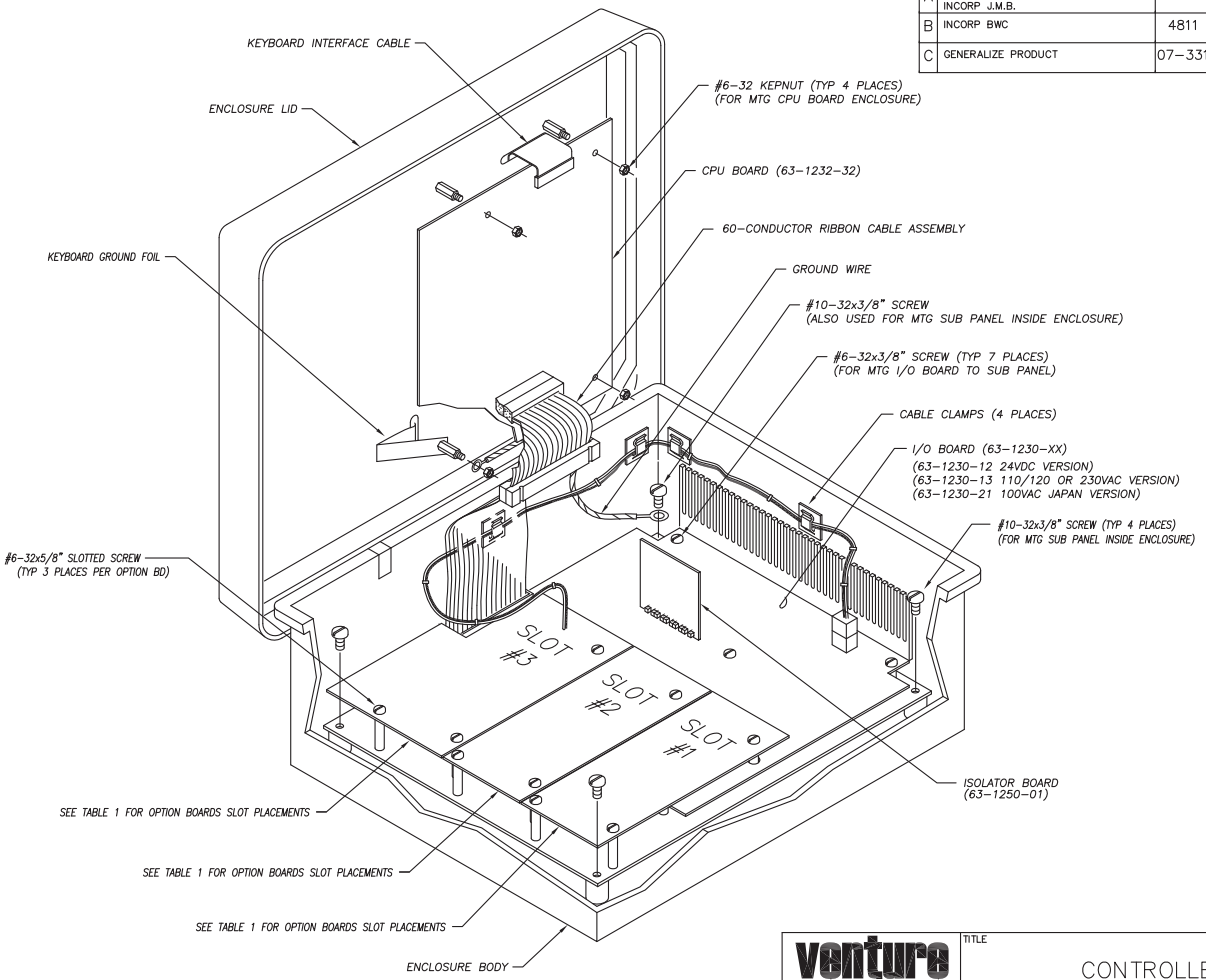
REVISIONS		ECN/ECO #	DRWN/CK'D BY DATE	APP'D BY DATE
A	INITIAL RELEASE INCORP J.M.B.		J.M.B. 7-5-01	R.M. 7-5-01
B	INCORP BWC	4811	B.W.C. 2-7-02	K.S. 2-7-02
C	GENERALIZE PRODUCT	07-331	S.E. 7-16-07	G.A. 7-16-07

OPTION BOARDS DESCRIPTION:

63-1240-01 = RELAY SETPOINT BD, 8-RELAY
63-1240-02 = RELAY SETPOINT BD, 5-RELAY
63-1241-01 = 4-20mA BOARD, 8 OUTPUTS
63-1241-02 = 4-20mA BD, 4 OUTPUTS
63-1241-03 = 4-20mA BD, 2 OUTPUTS
63-1241-04 = 4-20mA BD, 8 OUTPUTS (100V)
63-1241-05 = 4-20mA BD, 4 OUTPUTS (100V)
63-1241-06 = 4-20mA BD, 2 OUTPUTS (100V)
63-1242-01 = SCANNER BD, 8 POINTS
63-1242-02 = SCANNER BD, 4 POINTS
63-1242-03 = SCANNER BD, 2 POINTS
63-1242-04 = SCANNER BD, 6 POINTS
63-1260-01 = DUAL 4-20mA, 4 RELAY (AC)
63-1260-04 = SGL 4-20mA, 4 RELAY (AC)
63-1260-05 = SGL 4-20mA, 2 RELAY (AC)
63-1260-11 = DUAL 4-20mA, 4 RELAY (DC)
63-1260-12 = DUAL 4-20mA, 2 RELAY (DC)
63-1260-14 = SGL 4-20mA, 4 RELAY (DC)
63-1260-15 = SGL 4-20mA, 2 RELAY (DC)
63-1260-21 = DUAL 4-20mA, 4 RELAY (100V)
63-1260-22 = DUAL 4-20mA, 2 RELAY (100V)
63-1260-24 = SGL 4-20mA, 4 RELAY (100V)
63-1260-25 = SGL 4-20mA, 2 RELAY (100V)
63-1261-01 = RIO SINGLE POINT
63-1261-02 = RIO MULTI POINT
63-1288-01 = POINT LEVEL INPUT CARD

TABLE 1: OPTION BOARDS SLOT PLACEMENTS

SLOT #1		SLOT #2		SLOT #3	
PART No	PRICE BOOK CODE	PART No	PRICE BOOK CODE	PART No	PRICE BOOK CODE
NONE	(A)	NONE	(A)	NONE	(A)
63-1242-01	(B)	63-1242-01	(B)	63-1240-01	(D)
63-1242-02	(J)	63-1242-02	(J)	63-1240-02	(C)
63-1242-03	(K)	63-1242-03	(K)	63-1241-01	(G)
63-1242-04	(R)	63-1242-04	(R)	63-1241-02	(H)
		63-1240-01	(D)	63-1241-03	(I)
		63-1240-02	(C)	63-1241-04	(GJ)
		63-1261-01	(L)	63-1241-05	(HJ)
		63-1261-02	(M)	63-1241-06	(IJ)
		63-1263-01	(Q)	63-1260-01	(N)
		63-1288-01	(S)	63-1260-04	(F)
				63-1260-05	(E)
				63-1260-11	(ND)
				63-1260-12	(PD)
				63-1260-13	(I)
				63-1260-14	(FD)
				63-1260-15	(ED)
				63-1260-21	(NJ)
				63-1260-22	(PJ)
				63-1260-24	(FJ)
				63-1260-25	(EJ)
				63-1261-01	(L)
				63-1261-02	(M)
				63-1263-01	(Q)
				63-1288-01	(S)



venture MEASUREMENT
150 VENTURE BLVD.
SPARTANBURG, SC 29306

FILE TI-UC-UW2-01
REF

TITLE: CONTROLLER ASSEMBLY AND OPTION BOARD PLACEMENTS

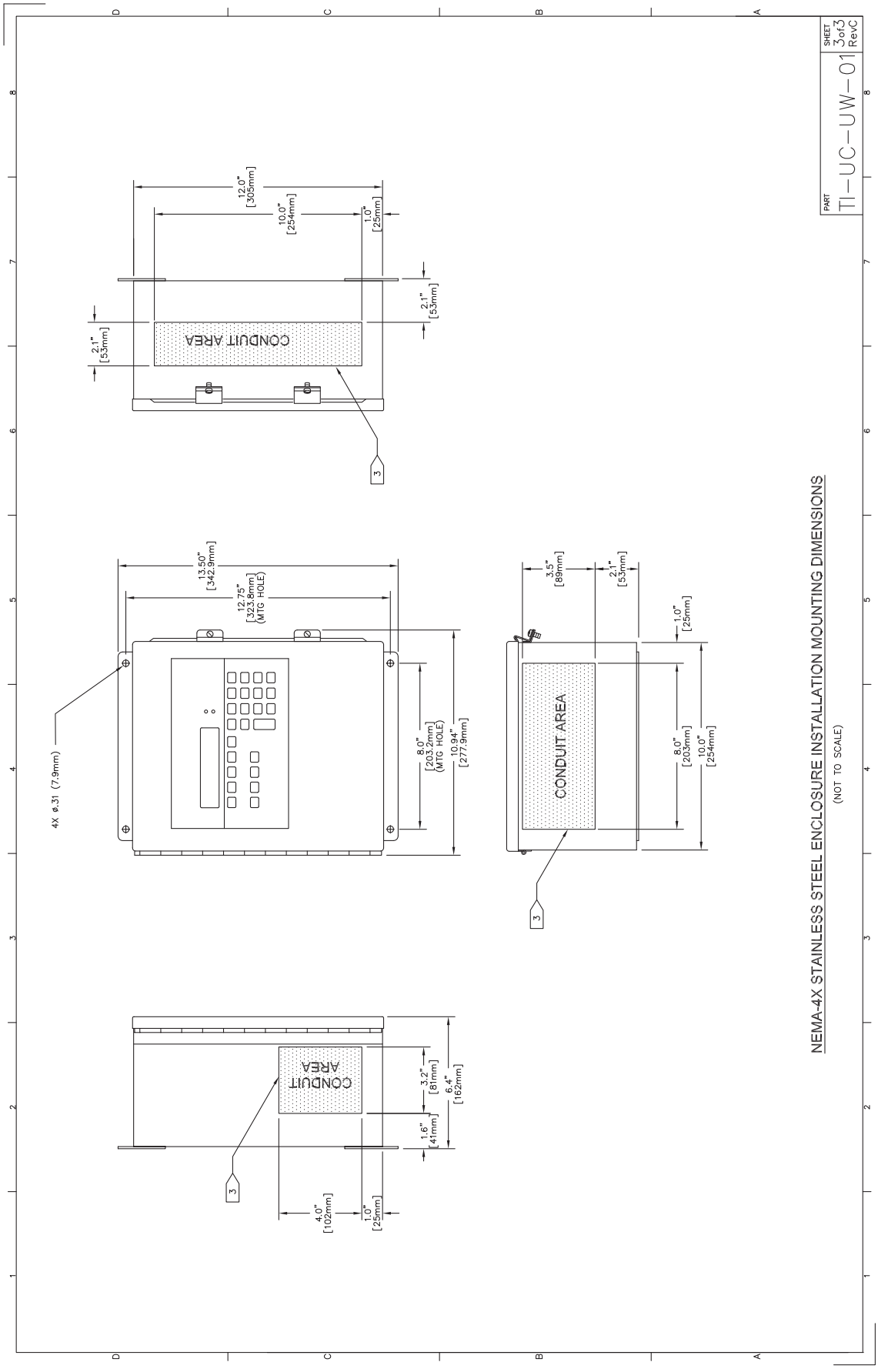
SCALE: NONE
SIZE: B

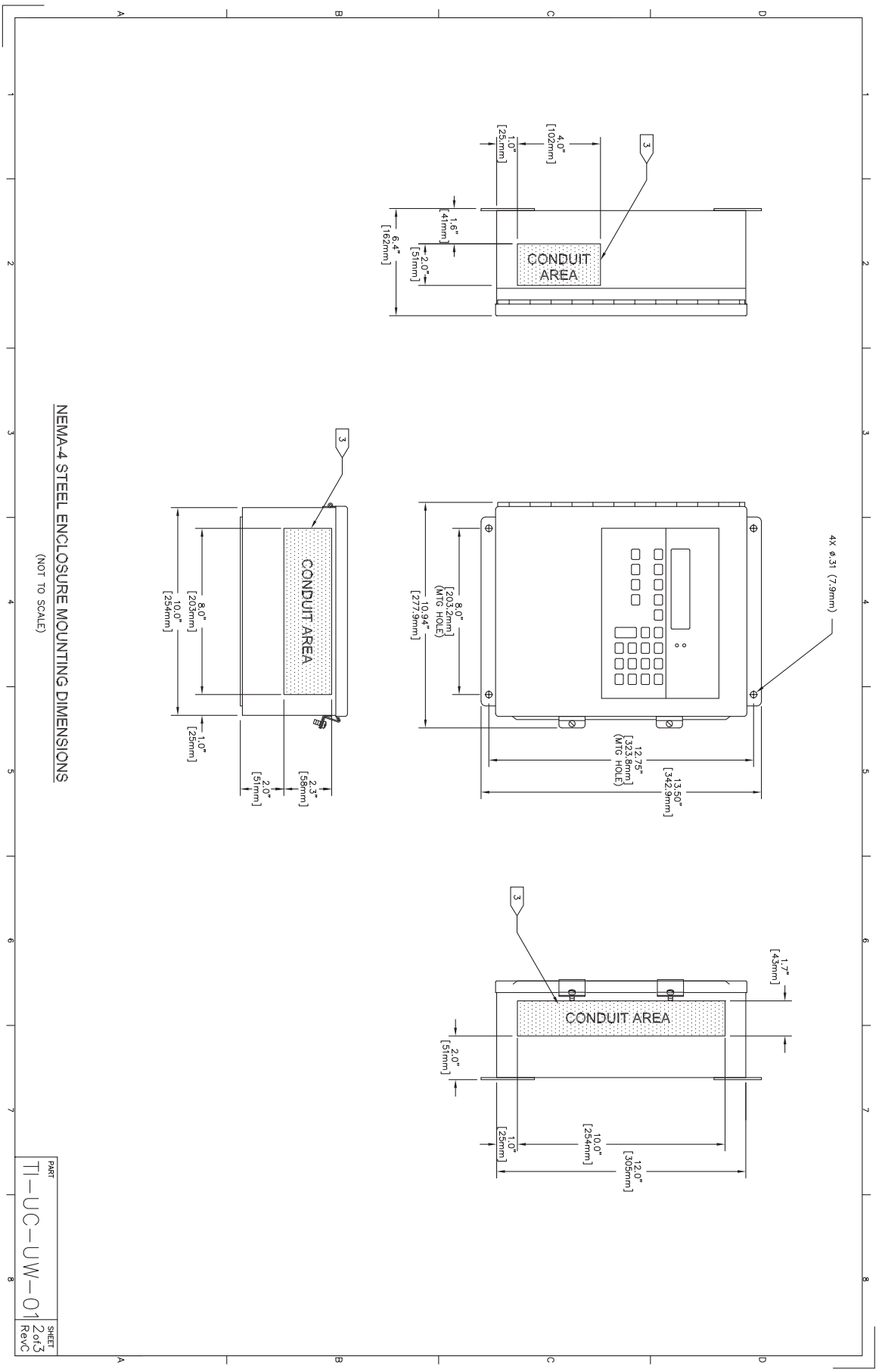
UNSPECIFIED TOLERENCES
DECIMALS: XX ±=.01
XXX ±=.005
ANGLES: ±=1/2°
DEBURR & BREAK EDGES .005
Ⓒ = CRITICAL DIM. OR NOTE

MATERIAL: _____
FINISH: _____

PART: TI-UC-UW2-01

SHEET: 1 of 1
RevC

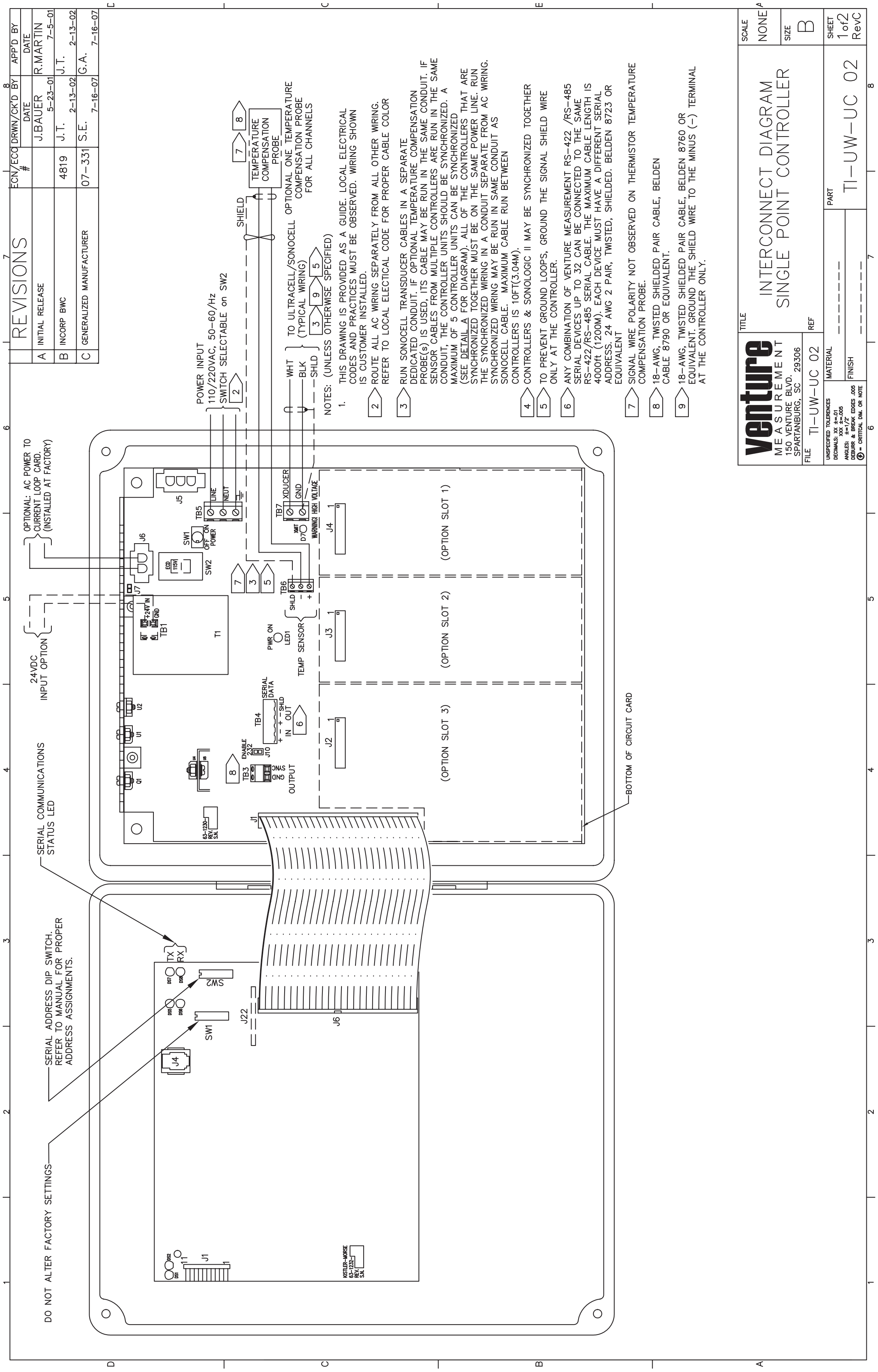

PART TI-UC-UW-01
SHEET 3 of 3 RevC
12.0" [305mm]
10.0" [254mm]
1.0" [25mm]
2.1" [53mm]
2.1" [53mm]
CONDUIT AREA
3
13.50" [342.9mm]
12.75" [323.8mm] (MTG HOLE)
4X ø.31 (7.9mm)
8.0" [203.2mm] (MTG HOLE)
10.94" [277.9mm]
3.5" [89mm]
2.1" [53mm]
1.0" [25mm]
CONDUIT AREA
8.0" [203mm]
10.0" [254mm]
3
CONDUIT AREA
3.2" [81mm]
6.4" [162mm]
1.6" [41mm]
4.0" [102mm]
1.0" [25mm]
3
NEMA-4X STAINLESS STEEL ENCLOSURE INSTALLATION MOUNTING DIMENSIONS
(NOT TO SCALE)



NEMA-4 STEEL ENCLOSURE MOUNTING DIMENSIONS

(NOT TO SCALE)

PART	
TI-UC-UW-01	SHEET 2 of 3
	Rev C


REVISIONS
ECN/ECO # | DRWN/CK'D BY DATE | APP'D BY DATE
A INITIAL RELEASE | J.BAUER 5-23-01 | R.MARTIN 7-5-01
B INCORP BWC | 4819 | J.T. 2-13-02 | J.T. 2-13-02
C GENERALIZED MANUFACTURER | 07-331 | S.E. 7-16-07 | G.A. 7-16-07
POWER INPUT
110/220VAC, 50-60/Hz
SWITCH SELECTABLE on SW2
TO ULTRACELL/SONOCELL
(TYPICAL WIRING)
OPTIONAL ONE TEMPERATURE COMPENSATION PROBE FOR ALL CHANNELS
TEMPERATURE COMPENSATION PROBE
SHIELD
WHT
BLK
SHLD
NOTES: (UNLESS OTHERWISE SPECIFIED)
1. THIS DRAWING IS PROVIDED AS A GUIDE. LOCAL ELECTRICAL CODES AND PRACTICES MUST BE OBSERVED. WIRING SHOWN IS CUSTOMER INSTALLED.
2 ROUTE ALL AC WIRING SEPARATELY FROM ALL OTHER WIRING. REFER TO LOCAL ELECTICAL CODE FOR PROPER CABLE COLOR
3 RUN SONOCELL TRANSDUCER CABLES IN A SEPARATE DEDICATED CONDUIT. IF OPTIONAL TEMPERATURE COMPENSATION PROBE(s) IS USED, ITS CABLE MAY BE RUN IN THE SAME CONDUIT. IF SENSOR CABLES FROM MULTIPLE CONTROLLERS ARE RUN IN THE SAME CONDUIT, THE CONTROLLER UNITS SHOULD BE SYNCHRONIZED. A MAXIMUM OF 5 CONTROLLER UNITS CAN BE SYNCHRONIZED (SEE DETAIL A FOR DIAGRAM). ALL OF THE CONTROLLERS THAT ARE SYNCHRONIZED TOGETHER MUST BE ON THE SAME POWER LINE. RUN THE SYNCHRONIZED WIRING IN A CONDUIT SEPARATE FROM AC WIRING. SYNCHRONIZED WIRING MAY BE RUN IN SAME CONDUIT AS SONOCELL CABLE. MAXIMUM CABLE RUN BETWEEN CONTROLLERS IS 10FT(3.04M).
4 CONTROLLERS & SONOLOGIC II MAY BE SYNCHRONIZED TOGETHER
5 TO PREVENT GROUND LOOPS, GROUND THE SIGNAL SHIELD WIRE ONLY AT THE CONTROLLER.
6 ANY COMBINATION OF VENTURE MEASUREMENT RS-422 /RS-485 SERIAL DEVICES UP TO 32 CAN BE CONNECTED TO THE SAME RS-422/RS-485 SERIAL CABLE. THE MAXIMUM CABLE LENGTH IS 4000ft (1200M). EACH DEVICE MUST HAVE A DIFFERENT SERIAL ADDRESS. 24 AWG 2 PAIR, TWISTED, SHIELDED. BELDEN 8723 OR EQUIVALENT
7 SIGNAL WIRE POLARITY NOT OBSERVED ON THERMISTOR TEMPERATURE COMPENSATION PROBE.
8 18-AWG, TWISTED SHIELDED PAIR CABLE, BELDEN CABLE 8790 OR EQUIVALENT.
9 18-AWG, TWISTED SHIELDED PAIR CABLE, BELDEN 8760 OR EQUIVALENT. GROUND THE SHIELD WIRE TO THE MINUS (-) TERMINAL AT THE CONTROLLER ONLY.
OPTIONAL: AC POWER TO CURRENT LOOP CARD. (INSTALLED AT FACTORY)
24VDC INPUT OPTION
SERIAL COMMUNICATIONS STATUS LED
SERIAL ADDRESS DIP SWITCH. REFER TO MANUAL FOR PROPER ADDRESS ASSIGNMENTS.
DO NOT ALTER FACTORY SETTINGS
BOTTOM OF CIRCUIT CARD
(OPTION SLOT 1)
(OPTION SLOT 2)
(OPTION SLOT 3)
TEMP SENSOR
SERIAL DATA
OUTPUT
XDUCER
GND
LINE
NEUT
PWR ON
TX
RX
venture
MEASUREMENT
150 VENTURE BLVD.
SPARTANBURG, SC 29306
TITLE
INTERCONNECT DIAGRAM
SINGLE POINT CONTROLLER
FILE TI-UW-UC 02
PART TI-UW-UC 02
SCALE NONE
SIZE B
SHEET 1of2 RevC

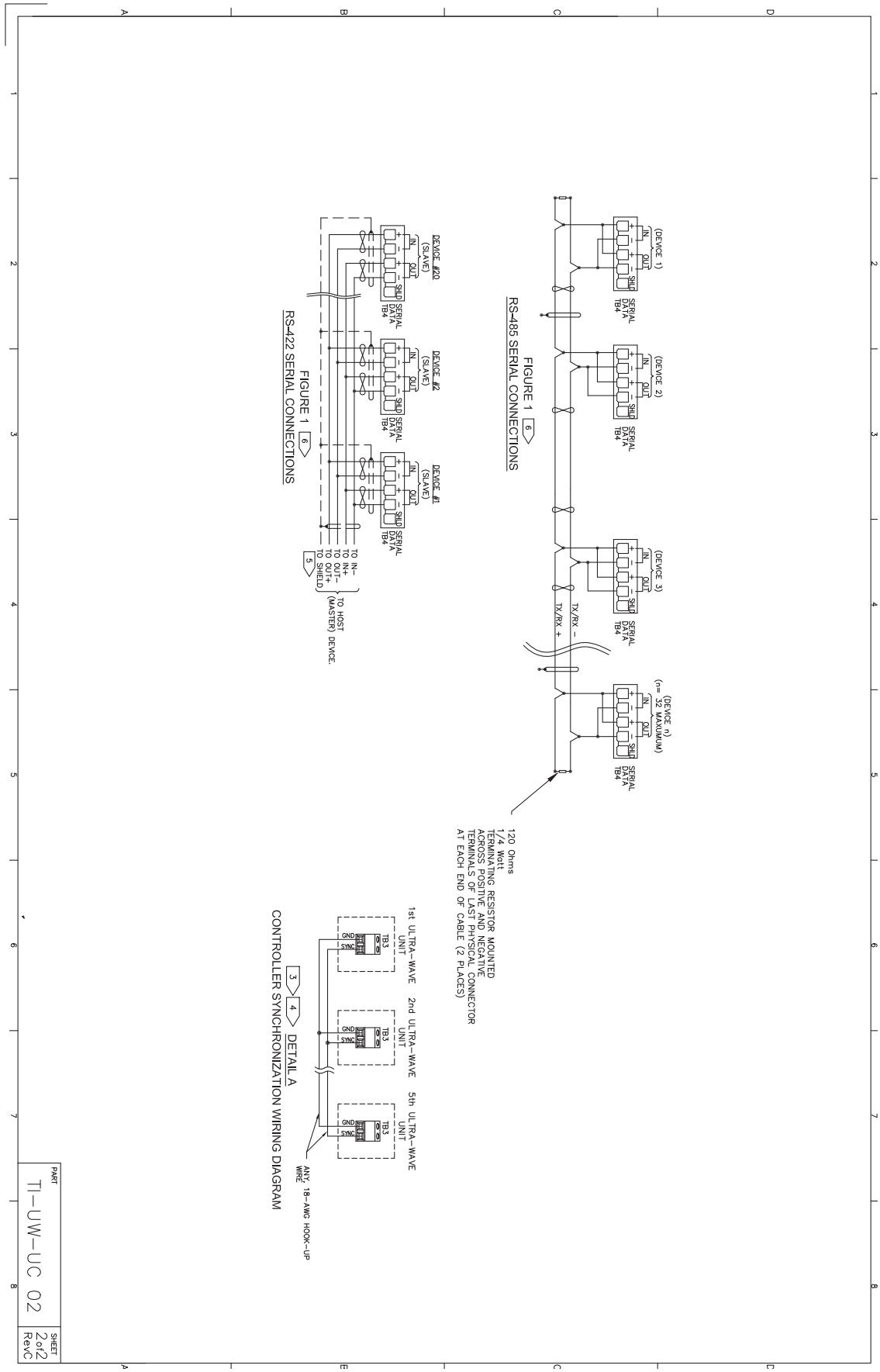
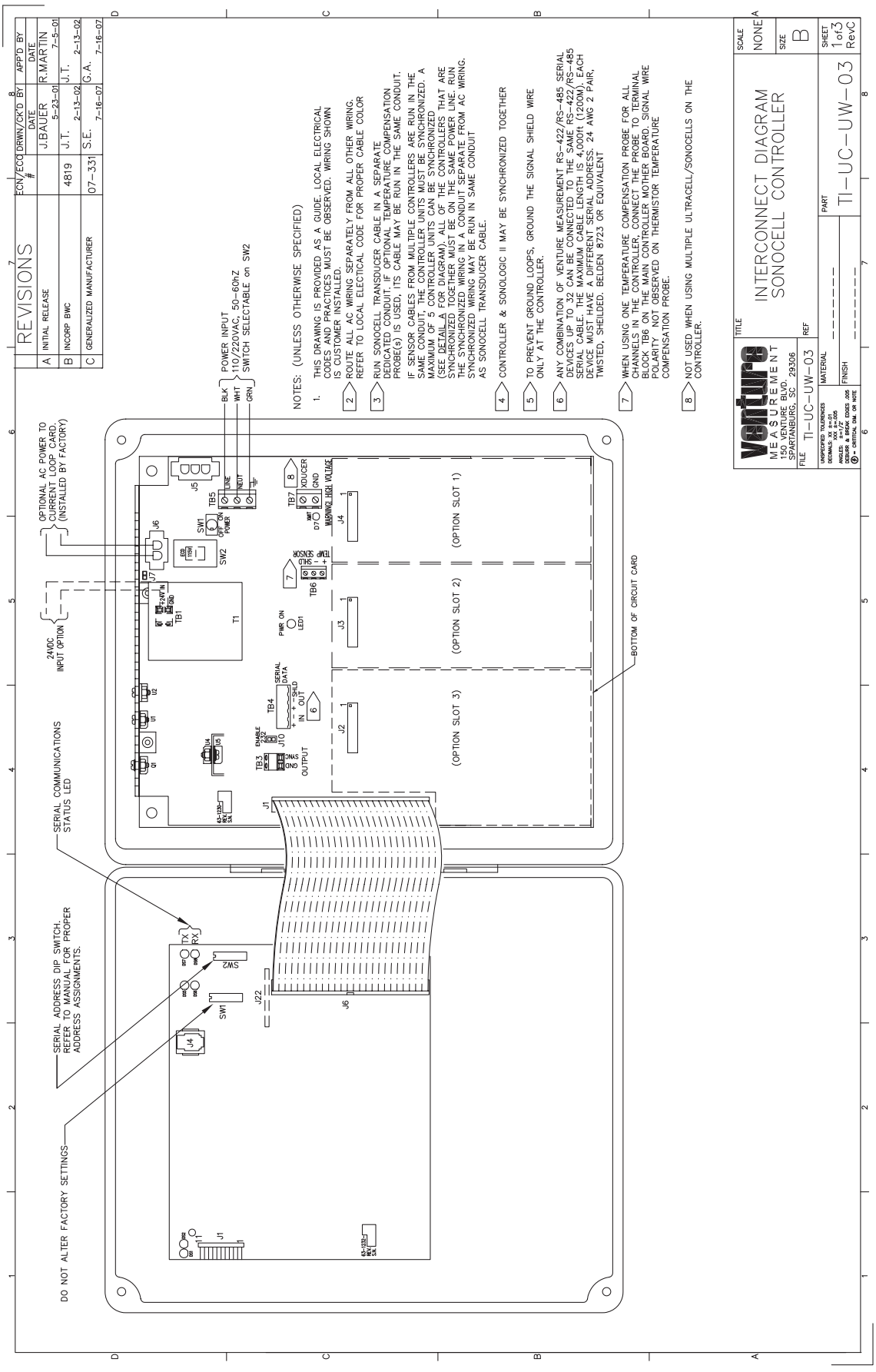


FIGURE 1 6
RS-485 SERIAL CONNECTIONS
(DEVICE 1)
(DEVICE 2)
(DEVICE 3)
(DEVICE n)
(n= 32 MAXIMUM)
IN
OUT
SHLD
SERIAL DATA TB4
TX/RX +
TX/RX -
120 Ohms 1/4 Watt TERMINATING RESISTOR MOUNTED ACROSS POSITIVE AND NEGATIVE TERMINALS OF LAST PHYSICAL CONNECTOR AT EACH END OF CABLE (2 PLACES)
FIGURE 1 6
RS-422 SERIAL CONNECTIONS
DEVICE #20 (SLAVE)
DEVICE #2 (SLAVE)
DEVICE #1 (SLAVE)
TO IN+
TO IN-
TO OUT-
TO OUT+
5 TO SHIELD
TO HOST (MASTER) DEVICE.
1st ULTRA-WAVE UNIT
2nd ULTRA-WAVE UNIT
5th ULTRA-WAVE UNIT
TB3
GND
SYNC
3 4 DETAIL A
ANY 18-AWG HOOK-UP WIRE
CONTROLLER SYNCHRONIZATION WIRING DIAGRAM
PART
TI-UW-UC 02
SHEET 2 of 2
RevC


REVISIONS
A INITIAL RELEASE
B INCORP BMC
C GENERALIZED MANUFACTURER
NOTES: (UNLESS OTHERWISE SPECIFIED)
1. THIS DRAWING IS PROVIDED AS A GUIDE. LOCAL ELECTRICAL CODES AND PRACTICES MUST BE OBSERVED. WIRING SHOWN IS CUSTOMER INSTALLED.
2 ROUTE ALL AC WIRING SEPARATELY FROM ALL OTHER WIRING. REFER TO LOCAL ELECTICAL CODE FOR PROPER CABLE COLOR
3 RUN SONOCELL TRANSDUCER CABLE IN A SEPARATE DEDICATED CONDUIT. IF OPTIONAL TEMPERATURE COMPENSATION PROBE(s) IS USED, ITS CABLE MAY BE RUN IN THE SAME CONDUIT. IF SENSOR CABLES FROM MULTIPLE CONTROLLERS ARE RUN IN THE SAME CONDUIT, THE CONTROLLER UNITS MUST BE SYNCHRONIZED. A MAXIMUM OF 5 CONTROLLER UNITS CAN BE SYNCHRONIZED (SEE DETAIL A FOR DIAGRAM). ALL OF THE CONTROLLERS THAT ARE SYNCHRONIZED TOGETHER MUST BE ON THE SAME POWER LINE. RUN THE SYNCHRONIZED WIRING IN A CONDUIT SEPARATE FROM AC WIRING. SYNCHRONIZED WIRING MAY BE RUN IN SAME CONDUIT AS SONOCELL TRANSDUCER CABLE.
4 CONTROLLER & SONOLOGIC II MAY BE SYNCHRONIZED TOGETHER
5 TO PREVENT GROUND LOOPS, GROUND THE SIGNAL SHIELD WIRE ONLY AT THE CONTROLLER.
6 ANY COMBINATION OF VENTURE MEASUREMENT RS-422/RS-485 SERIAL DEVICES UP TO 32 CAN BE CONNECTED TO THE SAME RS-422/RS-485 SERIAL CABLE. THE MAXIMUM CABLE LENGTH IS 4,000ft (1200M). EACH DEVICE MUST HAVE A DIFFERENT SERIAL ADDRESS. 24 AWG 2 PAIR, TWISTED, SHIELDED. BELDEN 8723 OR EQUIVALENT
7 WHEN USING ONE TEMPERATURE COMPENSATION PROBE FOR ALL CHANNELS IN THE CONTROLLER, CONNECT THE PROBE TO TERMINAL BLOCK TB6 ON THE MAIN CONTROLLER MOTHER BOARD. SIGNAL WIRE POLARITY NOT OBSERVED ON THERMISTOR TEMPERATURE COMPENSATION PROBE.
8 NOT USED WHEN USING MULTIPLE ULTRACELL/SONOCELLS ON THE CONTROLLER.
POWER INPUT 110/220VAC, 50-60hZ SWITCH SELECTABLE on SW2
BLK
WHT
GRN
OPTIONAL AC POWER TO CURRENT LOOP CARD. (INSTALLED BY FACTORY)
24VDC INPUT OPTION
SERIAL COMMUNICATIONS STATUS LED
SERIAL ADDRESS DIP SWITCH. REFER TO MANUAL FOR PROPER ADDRESS ASSIGNMENTS.
DO NOT ALTER FACTORY SETTINGS
BOTTOM OF CIRCUIT CARD
(OPTION SLOT 1)
(OPTION SLOT 2)
(OPTION SLOT 3)
J1
J2
J3
J4
J5
J6
J7
J10
J22
SW1
SW2
TB1
TB3
TB4
TB5
TB6
TB7
T1
LED1
TX
RX
VENTURE MEASUREMENT 150 VENTURE BLVD. SPARTANBURG, SC 29306
TITLE
INTERCONNECT DIAGRAM SONOCELL CONTROLLER
FILE TI-UC-UW-03
REF
MATERIAL
FINISH
PART
TI-UC-UW-03
SCALE NONE
SIZE B
SHEET 1 of 3
REV C
ECN/ECO # 07-331
DRWN/CK'D BY J.BAUER 5-23-01 / J.T. 2-13-02 / S.E. 7-16-07
APP'D BY R.MARTIN 7-5-01 / J.T. 2-13-02 / G.A. 7-16-07

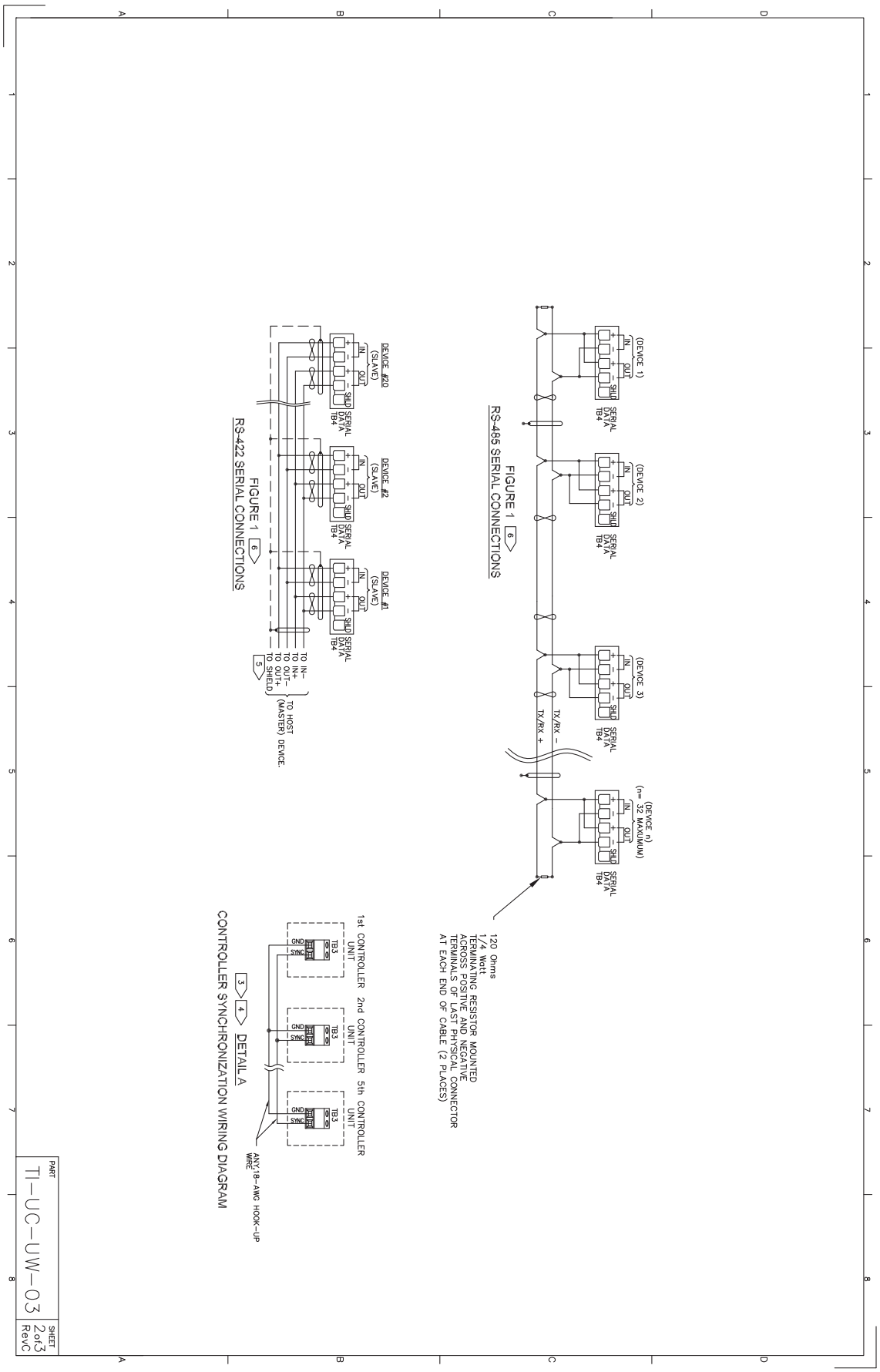
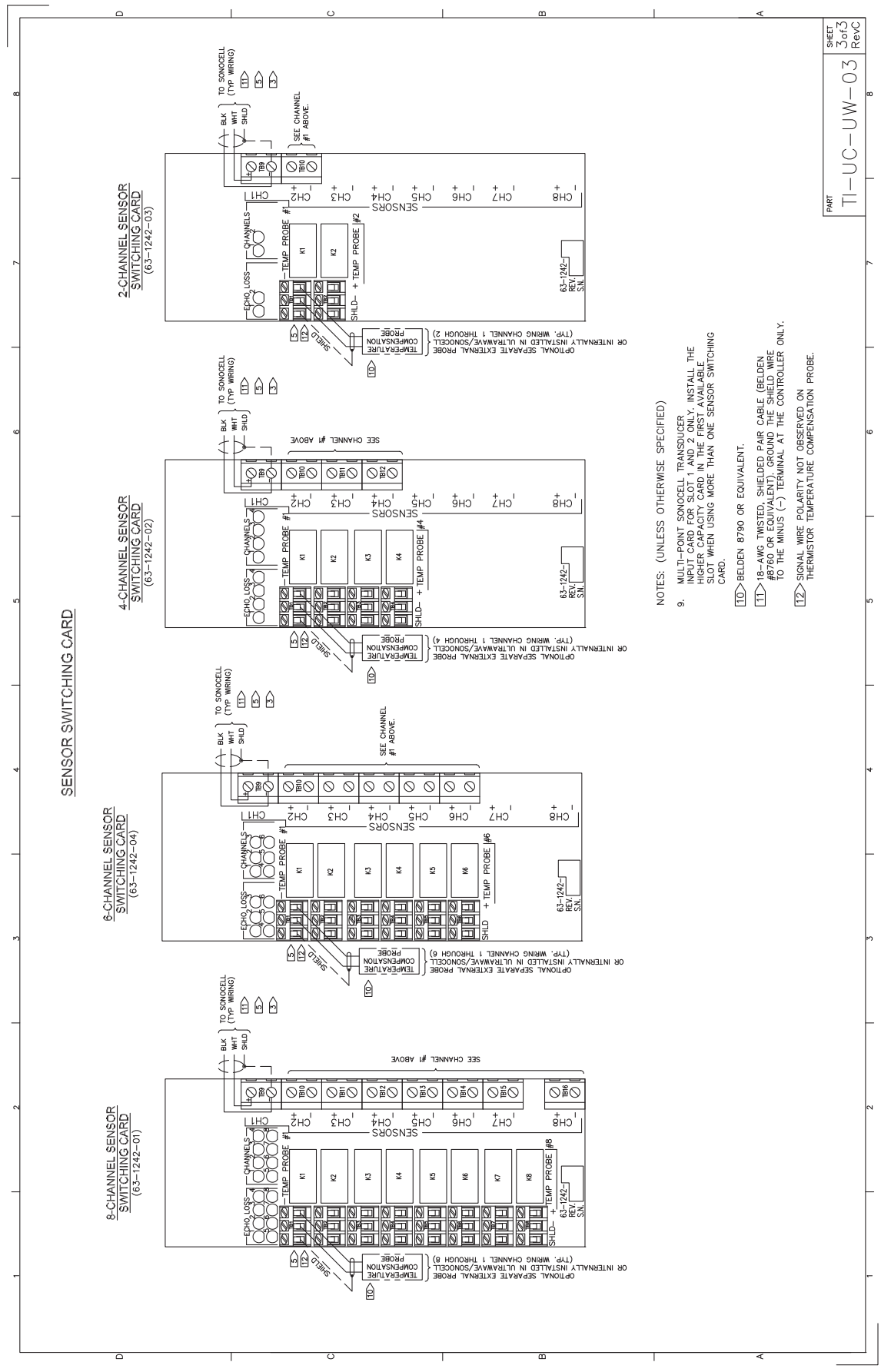
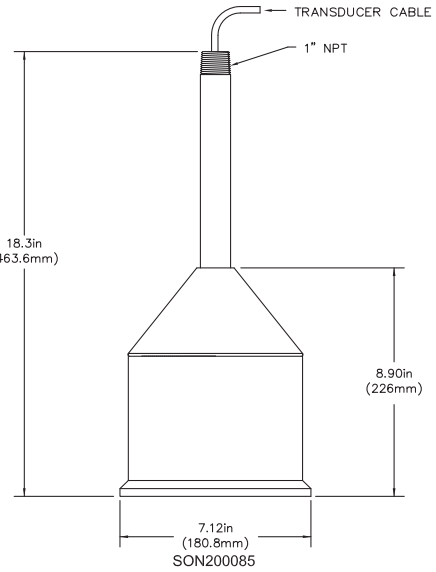


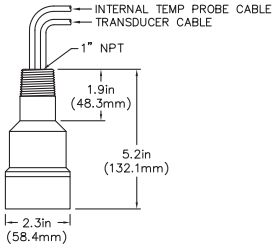
FIGURE 1 6
RS-485 SERIAL CONNECTIONS
(DEVICE 1)
(DEVICE 2)
(DEVICE 3)
(DEVICE n)
(n= 32 MAXIMUM)
IN
OUT
SHLD
SERIAL DATA TB4
TX/RX +
TX/RX -
120 Ohms 1/4 Watt TERMINATING RESISTOR MOUNTED ACROSS POSITIVE AND NEGATIVE TERMINALS OF LAST PHYSICAL CONNECTOR AT EACH END OF CABLE (2 PLACES)
FIGURE 1 6
RS-422 SERIAL CONNECTIONS
DEVICE #20 (SLAVE)
DEVICE #2 (SLAVE)
DEVICE #1 (SLAVE)
TO IN+
TO IN-
TO OUT+
TO OUT-
TO SHIELD
5
TO HOST (MASTER) DEVICE.
1st CONTROLLER UNIT
2nd CONTROLLER UNIT
5th CONTROLLER UNIT
TB3
GND
SYNC
ANY 18-AWG HOOK-UP WIRE
3 4 DETAIL A
CONTROLLER SYNCHRONIZATION WIRING DIAGRAM
PART
TI-UC-UW-03
SHEET 2 of 3
REV C


SENSOR SWITCHING CARD
2-CHANNEL SENSOR SWITCHING CARD (63-1242-03)
4-CHANNEL SENSOR SWITCHING CARD (63-1242-02)
6-CHANNEL SENSOR SWITCHING CARD (63-1242-04)
8-CHANNEL SENSOR SWITCHING CARD (63-1242-01)
TO SONOCELL (TYP. WIRING)
BLK
WHT
SHLD
SEE CHANNEL #1 ABOVE.
SEE CHANNEL #1 ABOVE
SENSORS
CH1
CH2
CH3
CH4
CH5
CH6
CH7
CH8
CHANNELS
TEMP PROBE #1
TEMP PROBE #2
TEMP PROBE #4
TEMP PROBE #6
TEMP PROBE #8
ECHO LOSS
SHLD
63-1242-
REV.
S/N.
OPTIONAL SEPARATE EXTERNAL PROBE FOR INTERNALLY INSTALLED IN ULTRAWAVE/SONOCELL TEMPERATURE COMPENSATION PROBE (TYP. WIRING CHANNEL 1 THROUGH 2)
OPTIONAL SEPARATE EXTERNAL PROBE FOR INTERNALLY INSTALLED IN ULTRAWAVE/SONOCELL TEMPERATURE COMPENSATION PROBE (TYP. WIRING CHANNEL 1 THROUGH 4)
OPTIONAL SEPARATE EXTERNAL PROBE FOR INTERNALLY INSTALLED IN ULTRAWAVE/SONOCELL TEMPERATURE COMPENSATION PROBE (TYP. WIRING CHANNEL 1 THROUGH 6)
OPTIONAL SEPARATE EXTERNAL PROBE FOR INTERNALLY INSTALLED IN ULTRAWAVE/SONOCELL TEMPERATURE COMPENSATION PROBE (TYP. WIRING CHANNEL 1 THROUGH 8)
NOTES: (UNLESS OTHERWISE SPECIFIED)
9. MULTI-POINT SONOCELL TRANSDUCER INPUT CARD FOR SLOT 1 AND 2 ONLY. INSTALL THE HIGHER CAPACITY CARD IN THE FIRST AVAILABLE SLOT WHEN USING MORE THAN ONE SENSOR SWITCHING CARD.
10 BELDEN 8790 OR EQUIVALENT.
11 18-AWG TWISTED, SHIELDED PAIR CABLE (BELDEN #8760 OR EQUIVALENT). GROUND THE SHIELD WIRE TO THE MINUS (-) TERMINAL AT THE CONTROLLER ONLY.
12 SIGNAL WIRE POLARITY NOT OBSERVED ON THERMISTOR TEMPERATURE COMPENSATION PROBE.
PART
TI-UC-UW-03
SHEET
3of3
RevC

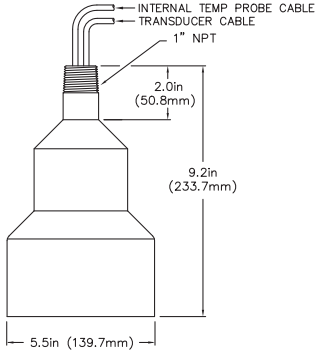
REVISIONS		ECN/ECO #	DRWN/CK'D BY DATE	APP'D BY DATE
A	PRODUCTION RELEASE	07-331	S.E. 7-16-07	G.A. 7-16-07



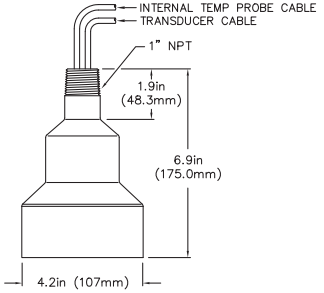
SON200085



SON200064
SON200058



SON200084
SON200057



SON200074
SON200077

SONOCELL TRANSDUCER SPECIFICATIONS:

SONOCELL MODEL	NOMINAL MEASURING RANGE LIQUIDS	NOMINAL MEASURING RANGE SOLIDS	BLIND SPACE	CONSTRUCTION	INSTALLED CABLE	OPERATING TEMPERATURE	OPERATING PRESSURE	WEIGHT	FREQUENCY	BEAM ANGLE	MAXIMUM SEPARATION TRANSDUCER TO CNTRL. 1
SON200064 SON200058	25FT (7.6m)	15FT (4.6m)	12in (305mm)	CPVC W/TFE FACE VITON SEAL	10FT (3.0m)	−40° F TO 160° F (−40° C TO 71° C)	10 PSIG (.69 BAR) MAX.	1.2 LBS (0.5 Kg)	43 KHz	12° INCLUDED	750FT (228m)
SON200074 SON200077	50FT (15.2m)	30FT (9.2m)	24in (610mm)	CPVC W/TFE FACE VITON SEAL	10FT (3.0m)	−40° F TO 160° F (−40° C TO 71° C)	10 PSIG (.69 BAR) MAX.	3.1 LBS (1.4 Kg)	22 KHz	12° INCLUDED	1,000FT (305m)
SON200084 SON200057	125FT (38.1m)	100FT (30.5m)	36in (915mm)	CPVC W/TFE FACE VITON SEAL	10FT (3.0m)	−40° F TO 160° F (−40° C TO 71° C)	10 PSIG (.69 BAR) MAX.	5.75 LBS (2.6 Kg)	14 KHz	12° INCLUDED	1,200FT (365m)
SON200085	100FT (30.5m)	50FT (15.25m)	24in (610mm)	PVC W/PVC BACKCOVER	10FT (3.0m)	−40° F TO 160° F (−40° C TO 71° C)	10 PSIG (.69 BAR) MAX.	13 LBS (6.0 Kg)	24 KHz	<5° INCLUDED	1,000FT (305m)

NOTES: (UNLESS OTHERWISE SPECIFIED)

1 USING 18-GA TWISTED SHIELDED PAIR CABLE, BELDEN #8760 OR EQUIVALENT INTERCONNECT CABLE.

venture MEASUREMENT
150 VENTURE BLVD.
SPARTANBURG, SC 29306

TITLE: SONOCELL TRANSDUCER SPECIFICATIONS (PT) PVC/CPVC BODY

FILE: TI-BINDICATOR TRPT-01
REF:
SCALE: NONE
SIZE: B
UNSPECIFIED TOLERANCES
DECIMALS: XX ±.01
XXX ±.005
ANGLES: ±1/2°
DEBURR & BREAK EDGES .005
Ⓒ = CRITICAL DIM. OR NOTE
MATERIAL: _ _ _ _ _ _ _
FINISH: _ _ _ _ _ _ _
PART: TI-BINDICATOR TRPT-01
SHEET: 1 of 1 RevA

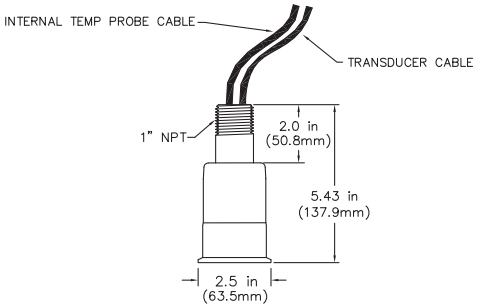
REVISIONS		ECN/ECO #	DRWN/CK'D BY DATE	APP'D BY DATE
A	PRODUCTION RELEASE	07-331	S.E. 7-16-07	G.A. 7-16-07

NOTES (UNLESS OTHER WISE SPECIFIED):

1 USE 18ga TWISTED SHIELDED PAIR CABLE, BELDEN 8760 OR EQUIVALENT.

SONOCELL TRANSDUCER SPECIFICATIONS:

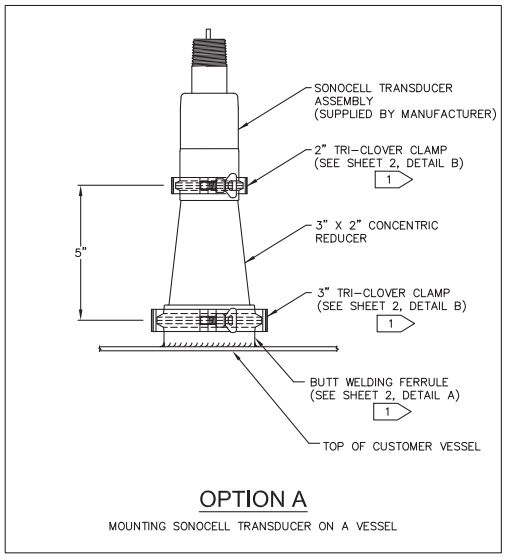
SONOCELL MODEL	NOMINAL MEASURING RANGE		BLIND SPACE	CONSTRUCTION	INSTALLED CABLE	OPERATING TEMPERATURE	OPERATING PRESSURE	WEIGHT	FREQUENCY	BEAM ANGLE	MAXIMUM SEPARATION – TRANSDUCER TO CONTROLLER 1
	LIQUIDS	SOLIDS									
SON200069 SON200058	25 FT (7.6m)	15 FT (4.6m)	12in (305mm)	STAINLESS STEEL W/TFE FACE VITON SEAL	10 FT (3.0m)	230° F (110° C) CONTINUOUS OPERATION 250° F (121° C) MAX. WASH DOWN	10 PSIG (.69 BAR) MAX.	1.8 LBS (0.9 Kg)	43 KHz	12° INCLUDED	750 FT (228m)



SON200069
SON200058

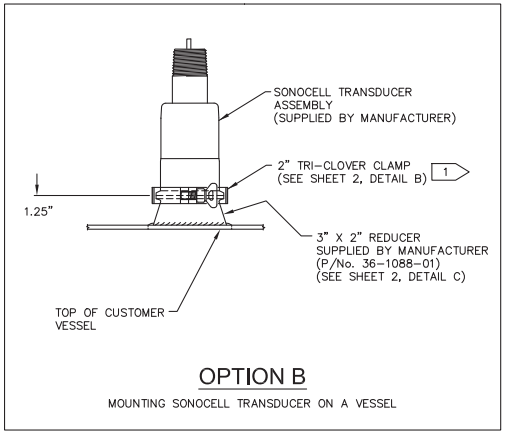
venture MEASUREMENT 150 VENTURE BLVD. SPARTANBURG, SC 29306	TITLE: SONOCELL TRANSDUCER SPECIFICATIONS STAINLESS STEEL BODY		SCALE: NONE
FILE: TI-BINDICATOR TRST-01	REF		SIZE: B
UNSPECIFIED TOLERANCES DECIMALS: XX ±.01 XXX ±.005 ANGLES: ±1/2° DEBURR & BREAK EDGES .005 (C) = CRITICAL DIM. OR NOTE	MATERIAL: --------	PART: TI-BINDICATOR TRST-01	SHEET: 1of1 RevA
	FINISH: --------		

	REVISIONS	ECN/ECO #	DRWN/CK'D BY DATE	APP'D BY DATE
A	INITIAL RELEASE		J.BAUER 5-24-01	R.MARTIN 7-2-01
B	GENERALIZED MANUFACTURER	07-331	S.E. 7-16-07	G.A. 7-16-07



OPTION A

MOUNTING SONOCELL TRANSDUCER ON A VESSEL



OPTION B

MOUNTING SONOCELL TRANSDUCER ON A VESSEL

NOTES: (UNLESS OTHERWISE SPECIFIED)

1 ALL PARTS SUPPLIED BY CUSTOMER UNLESS OTHERWISE NOTED. SUGGESTED PART MANUFACTURER AND PART NUMBER FOR CUSTOMER SUPPLIED PARTS:

PART DESCRIPTION	PART NUMBER	MANUFACTURER
2" TRI-CLOVER CLAMP	13MHHM 2"	CHERRY-BURRELL
3" TRI-CLOVER CLAMP	13MHHM 3"	CHERRY-BURRELL
4" TRI-CLOVER CLAMP	13MHHM 4"	CHERRY-BURRELL
4" BUTT WELDING FERRULE	L14AM7 4"	CHERRY-BURRELL
3" BUTT WELDING FERRULE	L14AM7 3"	CHERRY-BURRELL
2" BUNA-N GASKET	40MP-U 2"	CHERRY-BURRELL
2" TEFLON GASKET	40MP-G 2"	CHERRY-BURRELL
3" BUNA-N GASKET	40MP-U 3"	CHERRY-BURRELL
3" TEFLON GASKET	40MP-G 3"	CHERRY-BURRELL
4" BUNA-N GASKET	40MP-U 4"	CHERRY-BURRELL
4" TEFLON GASKET	40MP-G 4"	CHERRY-BURRELL

EQUIVALENT PARTS FROM OTHER MANUFACTURERS MAY ALSO BE USED.

2 BEFORE WELDING FERRULE, CHECK THAT THE VESSEL TOP WILL NOT INTERFERE WITH TIGHTENING THE TRI-CLOVER CLAMP WING NUT.

venture MEASUREMENT
150 VENTURE BLVD.
SPARTANBURG, SC 29306

TITLE: 43 KHZ STAINLESS STEEL SONOCELL TRANSDUCER SANITARY MOUNTING OPTIONS

SCALE: NONE

SIZE: B

FILE: TI-UC-UW SAN25-01

REF

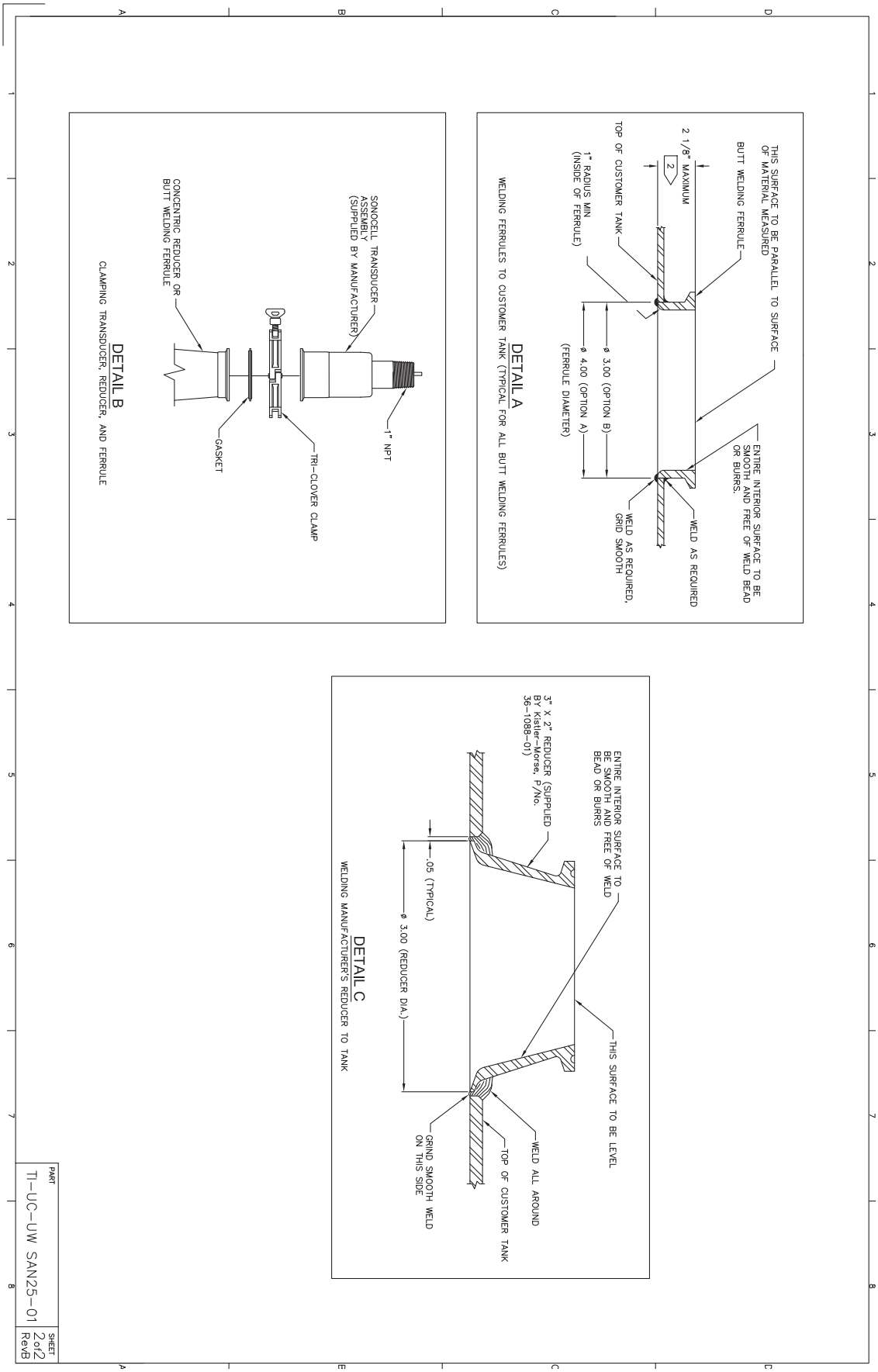
UNSPECIFIED TOLERANCES
DECIMALS: XX ±=.01
XXX ±=.005
ANGLES: ±=1/2°
DEBURR & BREAK EDGES .005
Ⓒ = CRITICAL DIM. OR NOTE

MATERIAL: _____

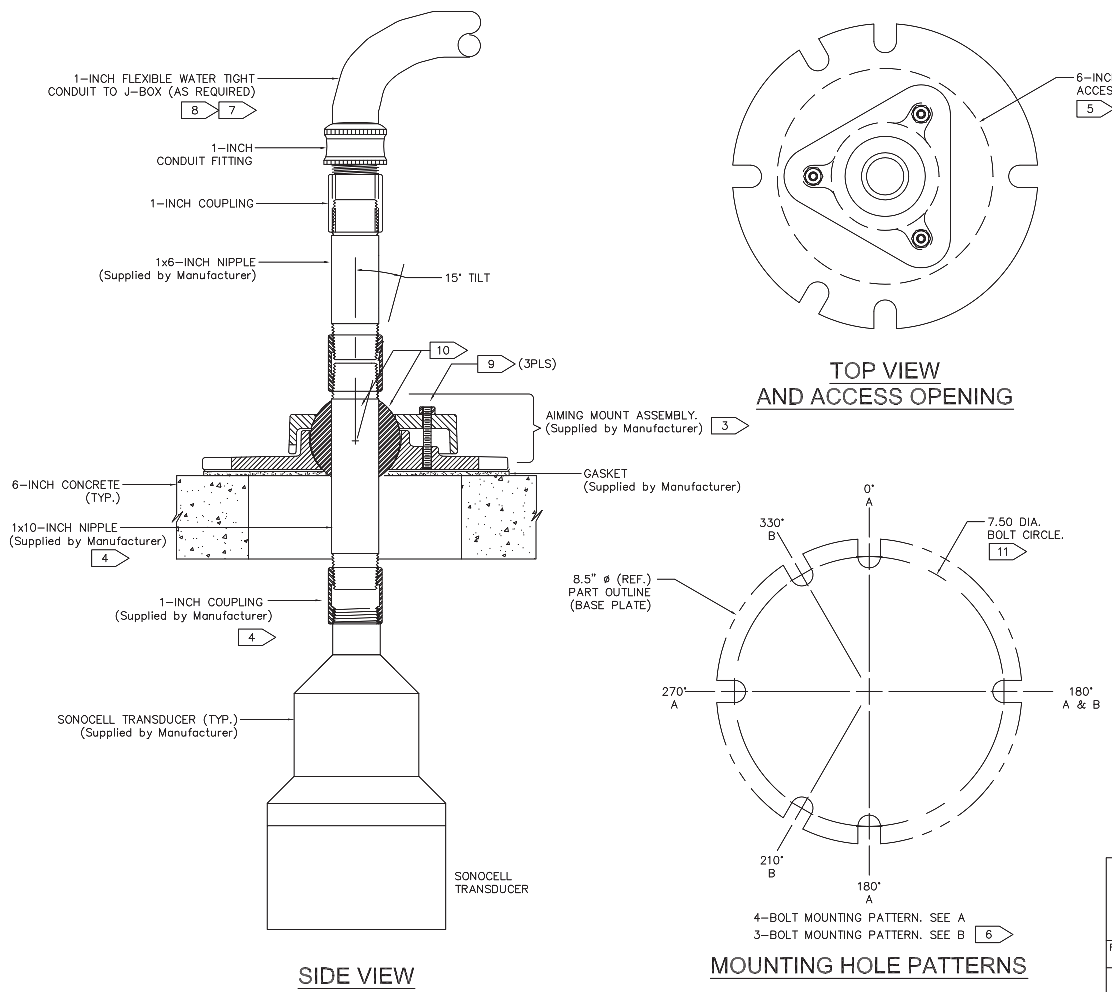
FINISH: _____

PART: TI-UC-UW SAN25-01

SHEET: 1 of 2 RevB


THIS SURFACE TO BE PARALLEL TO SURFACE OF MATERIAL MEASURED
BUTT WELDING FERRULE
2 1/8" MAXIMUM
2
TOP OF CUSTOMER TANK
1" RADIUS MIN (INSIDE OF FERRULE)
ø 3.00 (OPTION B)
ø 4.00 (OPTION A) (FERRULE DIAMETER)
ENTIRE INTERIOR SURFACE TO BE SMOOTH AND FREE OF WELD BEAD OR BURRS.
WELD AS REQUIRED
WELD AS REQUIRED, GRID SMOOTH
DETAIL A
WELDING FERRULES TO CUSTOMER TANK (TYPICAL FOR ALL BUTT WELDING FERRULES)
SONOCELL TRANSDUCER ASSEMBLY (SUPPLIED BY MANUFACTURER)
CONCENTRIC REDUCER OR BUTT WELDING FERRULE
1" NPT
TRI-CLOVER CLAMP
GASKET
DETAIL B
CLAMPING TRANSDUCER, REDUCER, AND FERRULE
3" X 2" REDUCER (SUPPLIED BY Kistler-Morse, P/No. 36-1088-01)
ENTIRE INTERIOR SURFACE TO BE SMOOTH AND FREE OF WELD BEAD OR BURRS
THIS SURFACE TO BE LEVEL
.05 (TYPICAL)
ø 3.00 (REDUCER DIA.)
WELD ALL AROUND
TOP OF CUSTOMER TANK
GRIND SMOOTH WELD ON THIS SIDE
DETAIL C
WELDING MANUFACTURER'S REDUCER TO TANK
PART
TI-UC-UW SAN25-01
SHEET
2 of 2
RevB

	REVISIONS	ECN/ECO #	DRWN/CK'D BY DATE	APP'D BY DATE
A	PRODUCTION RELEASE		J.BAUER 6-7-01	R.MARTIN 7-5-01
B	GENERALIZED MANUFACTURER	07-331	S.E. 7-16-07	G.A. 7-16-07



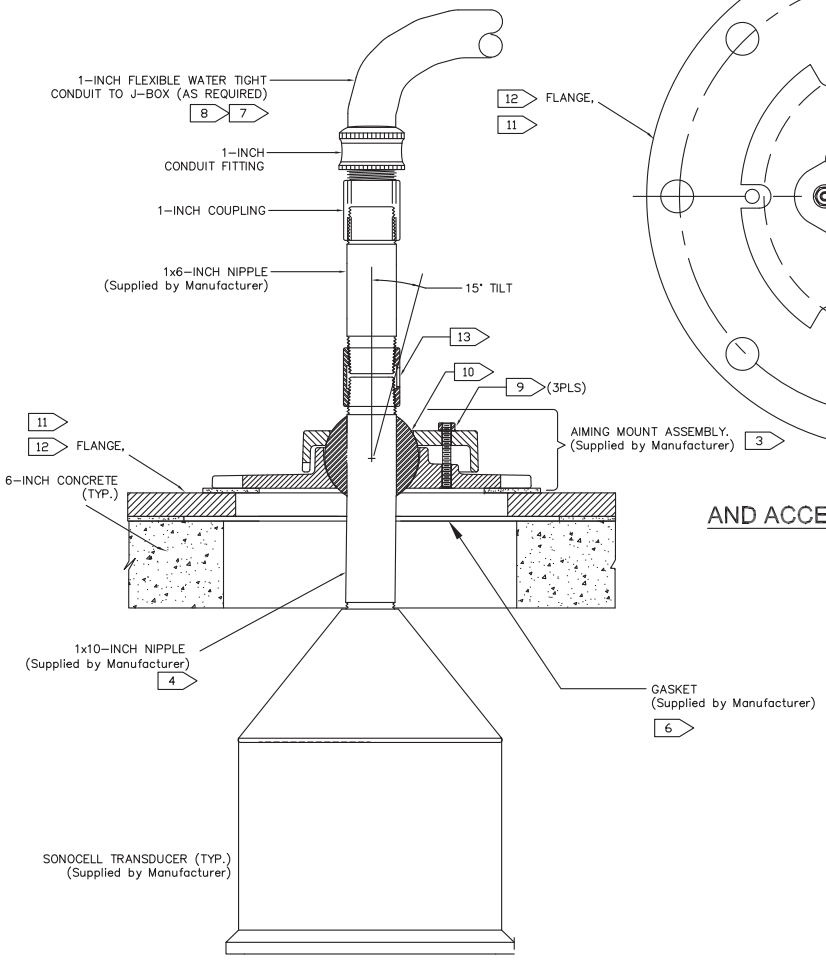
NOTES: (UNLESS OTHERWISE SPECIFIED)

1. ALL PARTS SHOWN SUPPLIED BY CUSTOMER UNLESS OTHERWISE NOTED.
2. THIS INSTALLATION IS PROVIDED ONLY AS A GUIDE. LOCAL INSTALLATION CODES MUST BE FOLLOWED.
3. THE AIMING MOUNT CAN BE POSITIONED USING THE NIPPLES AS A GUIDE BEFORE THE SONOCELL IS INSTALLED. MARK THE FLOOR AND BASE PLATE ORIENTATION AND TIGHTEN THE TOP CUP NUTS FIRMLY BEFORE REMOVING AIMING MOUNT TO INSTALL THE TRANSDUCER.
4. 1 X 10" NIPPLE SUPPLIED WITH AIMING KIT PART NUMBER 29-1029-07
5. MAXIMUM DIAMETER REQUIRED TO INSTALL/REMOVE ANY SONOCELL TRANSDUCER FROM TOP OF BIN. OPENING CAN BE SIZED AS REQUIRED TO FIT THE TRANSDUCER USED OR IF ACCESS TO INSTALL SONOCELL IS FROM THE BOTTOM. ALLOW SUFFICIENT SIDEWALL CLEARANCE FOR THE TRANSDUCER TO BE AIMED.
6. TRIM GASKET AS REQUIRED FOR 3-HOLE TRIANGULAR BOLT MOUNTING PATTERN.
7. PROVIDE SUFFICIENT FLEXIBLE CONDUIT LENGTH (OR A SERVICE LOOP) TO ALLOW FOR SWIVELLING AND REMOVAL OF THE SONOCELL TRANSDUCER ASSEMBLY WITHOUT DISASSEMBLING THE CONDUIT.
8. SMALLER CONDUIT DIAMETER IS ACCEPTABLE. USE APPROPRIATE REDUCERS AS REQUIRED.
9. TIGHTEN BOLTS ON TOP CUP UNTIL BALL SWIVEL IS SNUG. MOVE SONOCELL TRANSDUCER TO DESIRED POSITION. TIGHTEN NUTS TO PREVENT SONOCELL FROM MOVING.
10. SEAL GAP AS REQUIRED WITH RTV 738 (NON-ACETIC ACID BASED) OR EQUIVALENT.
11. BOLT CIRCLE DIAMETER MATCHES A CLASS 150 4-inch ANSI FLANGE.

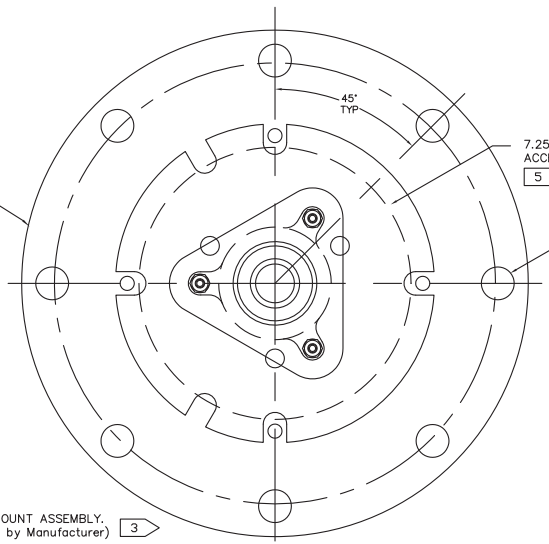
Venture MEASUREMENT
150 VENTURE BLVD.
SPARTANBURG, SC 29306

FILE: TI-SC-UW AIM-01	TITLE: SONOCELL TRANSDUCER AIMING MOUNT INSTALLATION	REF	SCALE: NONE / SIZE: B
UNSPECIFIED TOLERENCES DECIMALS: XX ±=.01 XXX ±=.005 ANGLES: ±=1/2° DEBURR & BREAK EDGES .005 ® = CRITICAL DIM. OR NOTE	MATERIAL: ------- / FINISH: -------	PART: TI-SC-UW AIM-01	SHEET: 1 of 1 RevB

	REVISIONS	ECN/ECO #	DRWN/CK'D BY DATE	APP'D BY DATE
A	PRODUCTION RELEASE		HLK 8-22-02	HLK 8-22-02
B	INCORP BY BWC	4918	HLK 8-22-02	HLK 8-22-02
C	GENERALIZED MANUFACTURER	07-331	S.E. 7-16-07	G.A. 7-16-07



SIDE VIEW



TOP VIEW
AND ACCESS OPENING W/ FLANGE

NOTES: (UNLESS OTHERWISE SPECIFIED)

1. ALL PARTS SHOWN SUPPLIED BY CUSTOMER UNLESS OTHERWISE NOTED.
2. THIS INSTALLATION IS PROVIDED ONLY AS A GUIDE. LOCAL INSTALLATION CODES MUST BE FOLLOWED.
3. THE AIMING MOUNT CAN BE POSITIONED USING THE NIPPLES AS A GUIDE BEFORE THE SONOCELL IS INSTALLED. MARK THE FLOOR AND BASE PLATE ORIENTATION AND TIGHTEN THE TOP CUP BOLTS FIRMLY BEFORE REMOVING AIMING MOUNT TO INSTALL THE TRANSDUCER.
4. 1 X 10" NIPPLE SUPPLIED WITH AIMING KIT PART NUMBER 29-1029-07
5. MAXIMUM DIAMETER REQUIRED TO INSTALL/REMOVE ANY SONOCELL TRANSDUCER FROM TOP OF BIN. OPENING CAN BE SIZED AS REQUIRED TO FIT THE TRANSDUCER USED OR IF ACCESS TO INSTALL SONOCELL IS FROM THE BOTTOM. ALLOW SUFFICIENT SIDEWALL CLEARANCE FOR THE TRANSDUCER TO BE AIMED.
6. TRIM GASKET AS REQUIRED
7. PROVIDE SUFFICIENT FLEXIBLE CONDUIT LENGTH (OR A SERVICE LOOP) TO ALLOW FOR SWIVELLING AND REMOVAL OF THE SONOCELL TRANSDUCER ASSEMBLY WITHOUT DISASSEMBLING THE CONDUIT.
8. SMALLER CONDUIT DIAMETER IS ACCEPTABLE. USE APPROPRIATE REDUCERS AS REQUIRED.
9. TIGHTEN BOLTS ON TOP CUP UNTIL BALL SWIVEL IS SNUG. MOVE SONOCELL TRANSDUCER TO DESIRED POSITION. TIGHTEN BOLTS TO PREVENT SONOCELL FROM MOVING.
10. SEAL GAP ON BALL AS REQUIRED WITH RTV 738 (NON-ACETIC ACID BASED) OR EQUIVALENT.
11. BOLT CIRCLE DIAMETER MATCHES AN 8" PVC BLIND FLANGE
12. FLANGE USED WHEN SONOCELL IS INSTALLED THRU AN ACCESS OPENING >6" (REF PN 39-1174-01).
13. FOR "SWING" IN INSTALLATIONS, USE HOLE TO FASTEN ROPE TO SONOCELL AND PIPE.

Ventura MEASUREMENT
150 VENTURE BLVD.
SPARTANBURG, SC 29306

TITLE: SONOCELL TRANSDUCER AIMING MOUNT INSTALLATION

SCALE: NONE

SIZE: B

FILE: TI-UC-UW AIM-01

REF:

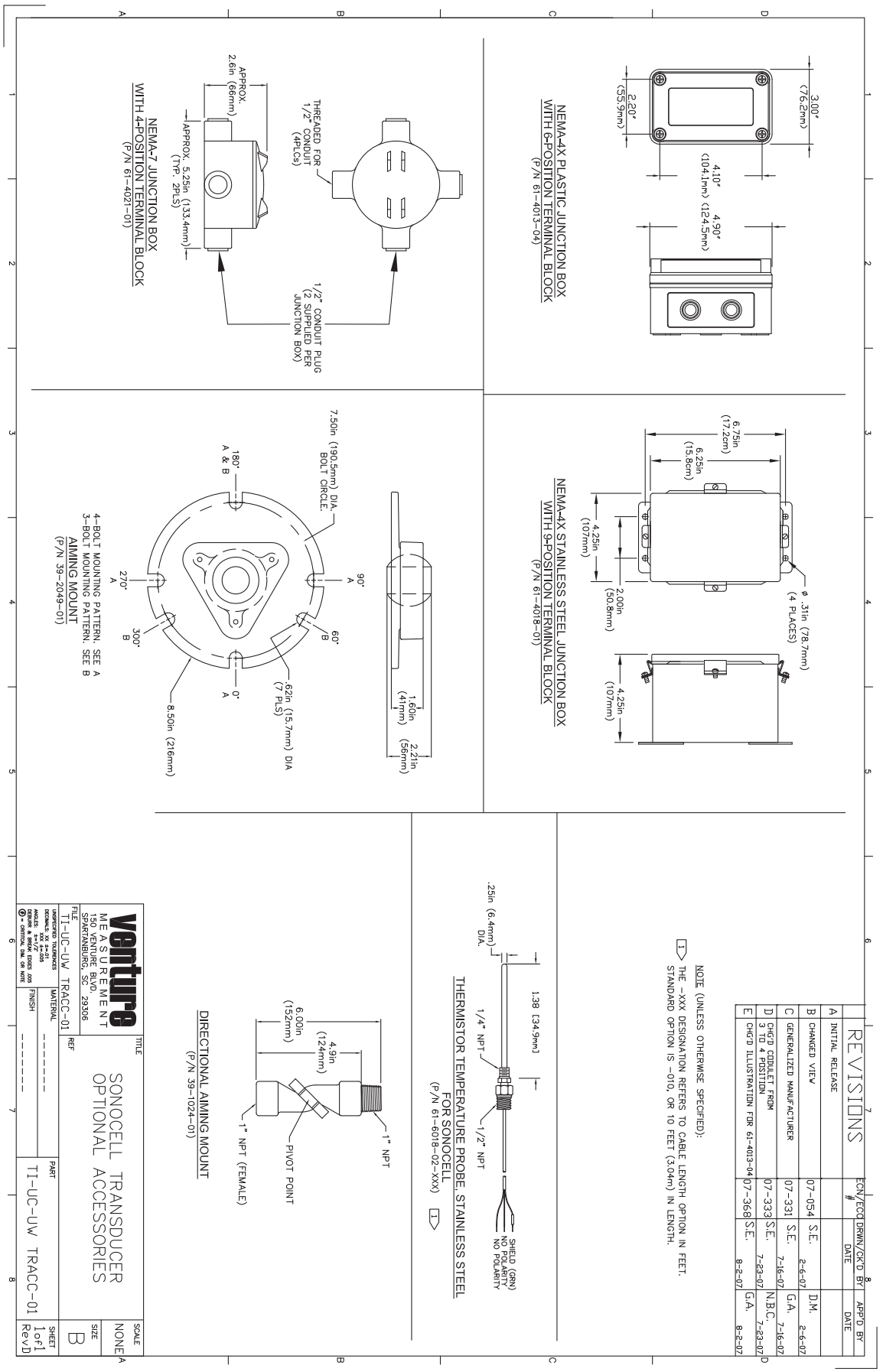
UNSPECIFIED TOLERENCES
DECIMALS: XX ±=.01
XXX ±=.005
ANGLES: ±=1/2°
DEBURR & BREAK EDGES .005
(D) = CRITITCAL DIM. OR NOTE

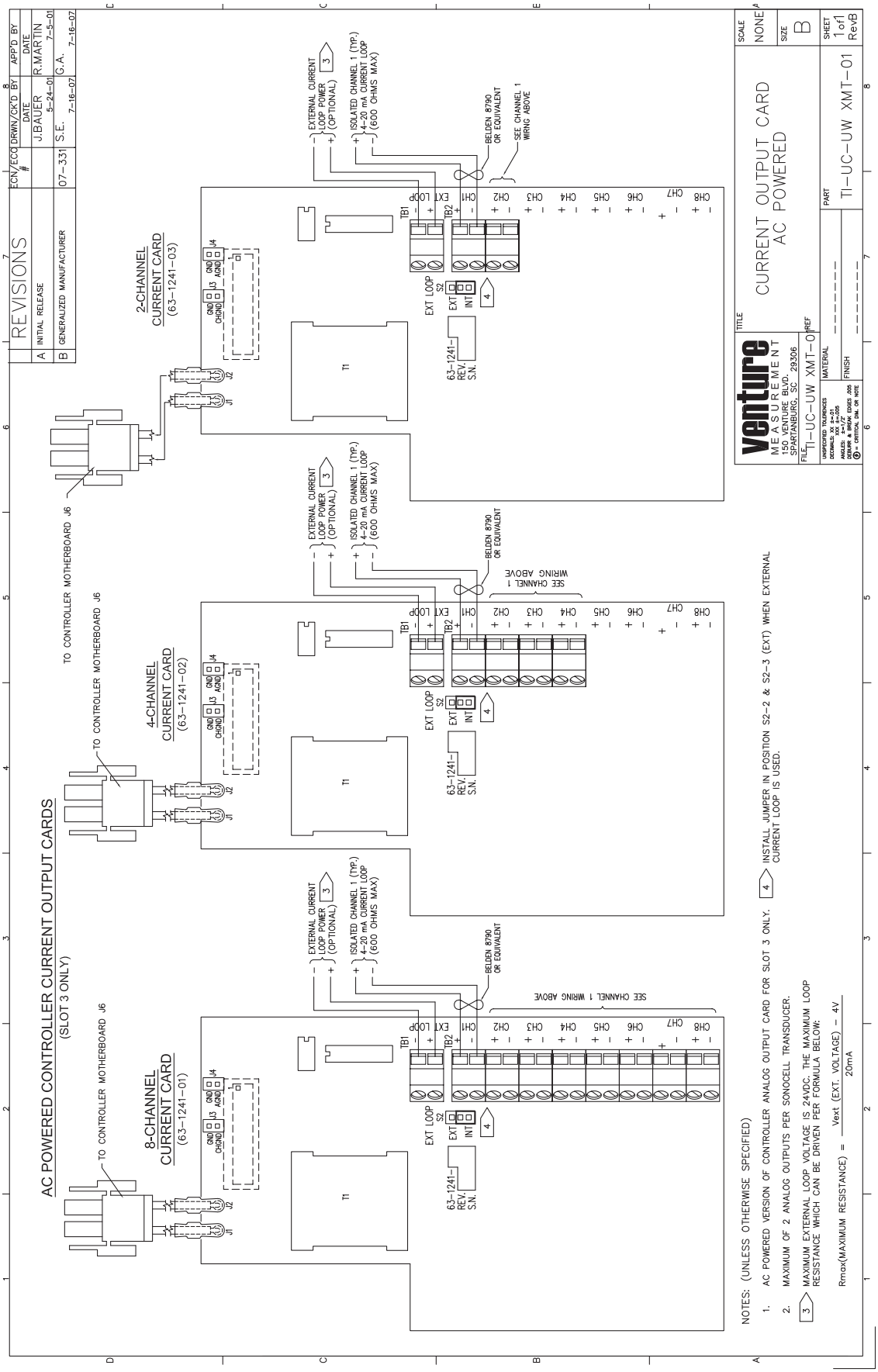
MATERIAL: _____

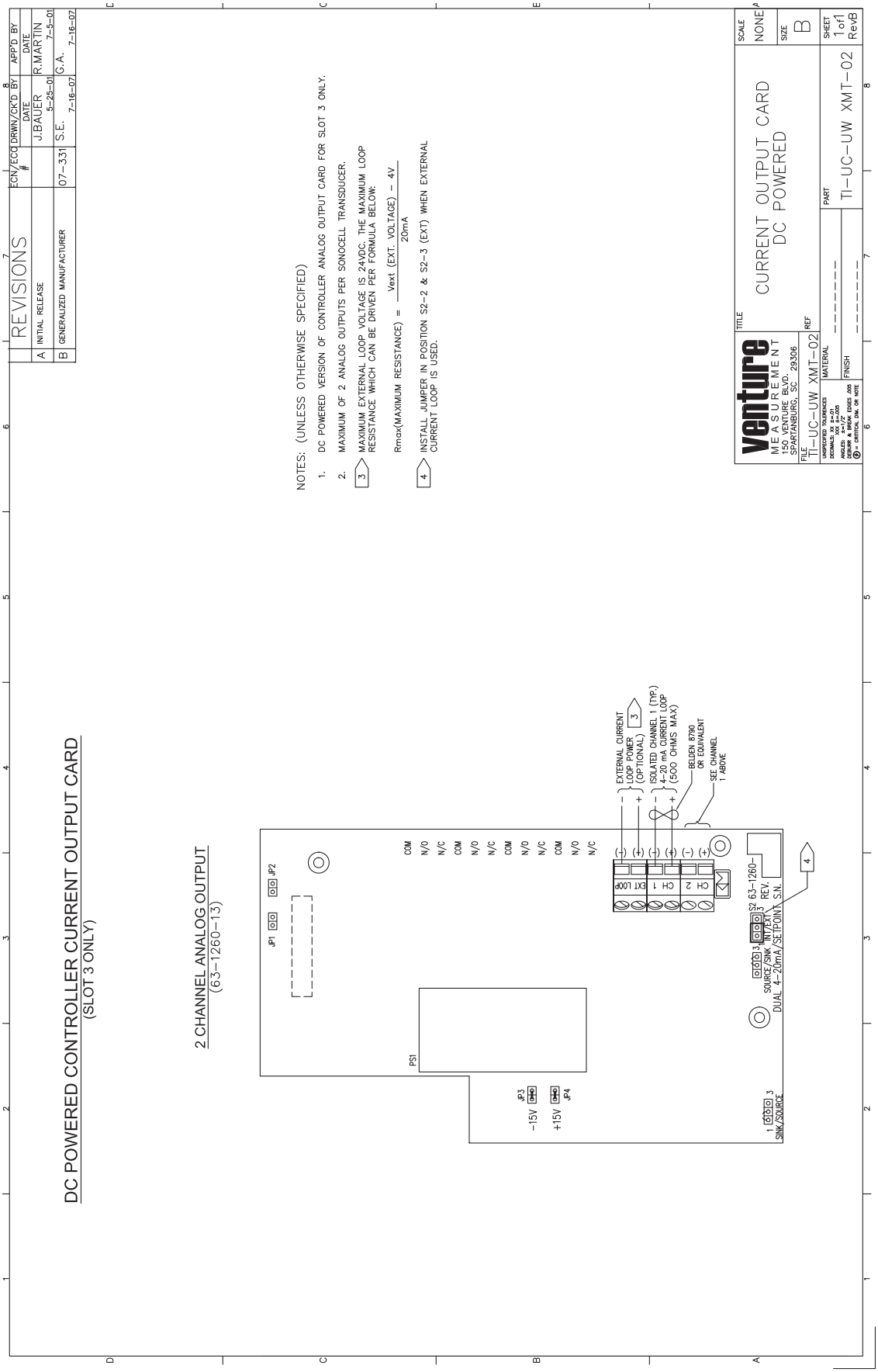
FINISH: _____

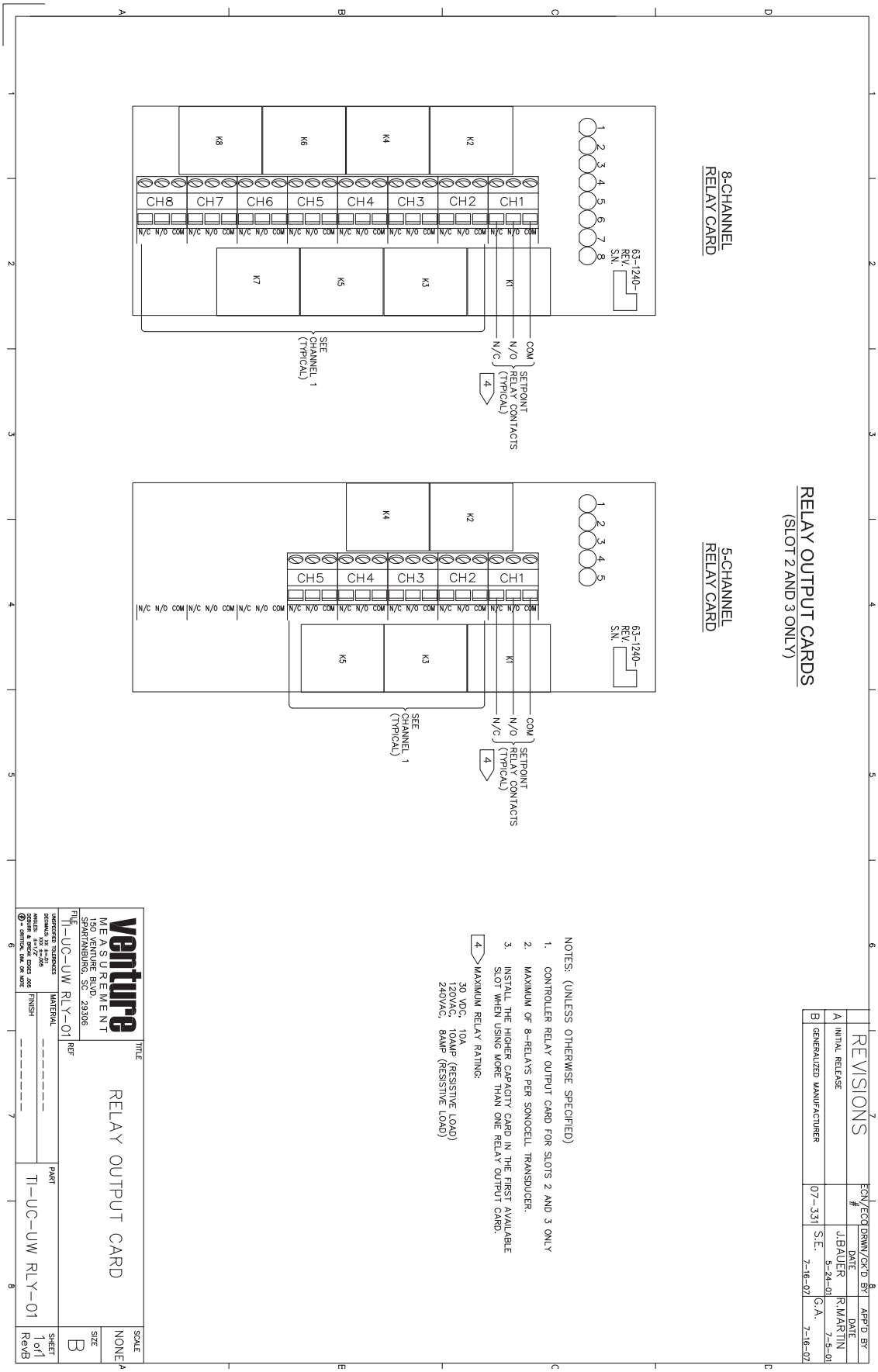
PART: TI-UC-UW AIM-01

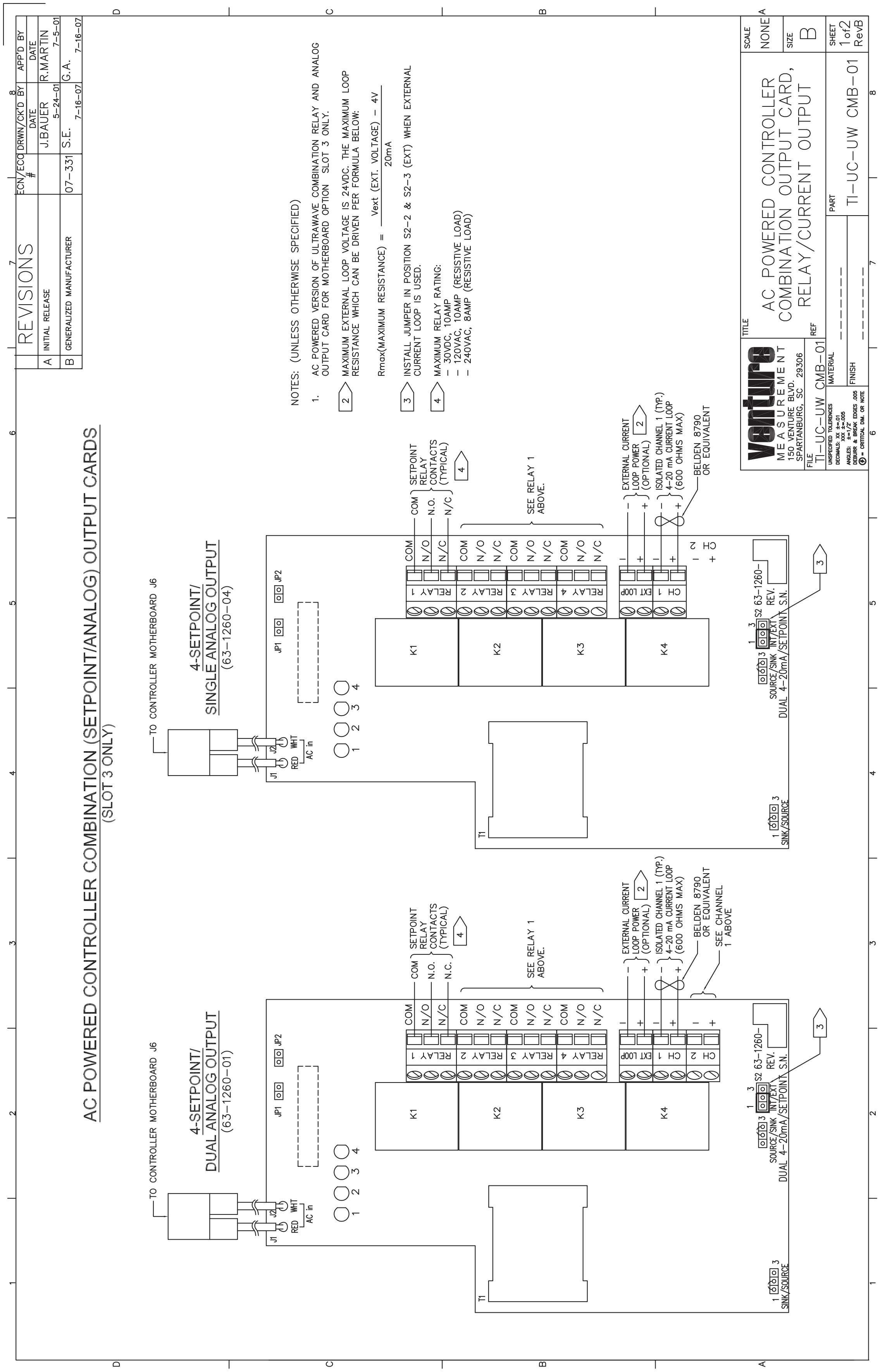
SHEET: 1of1 RevC

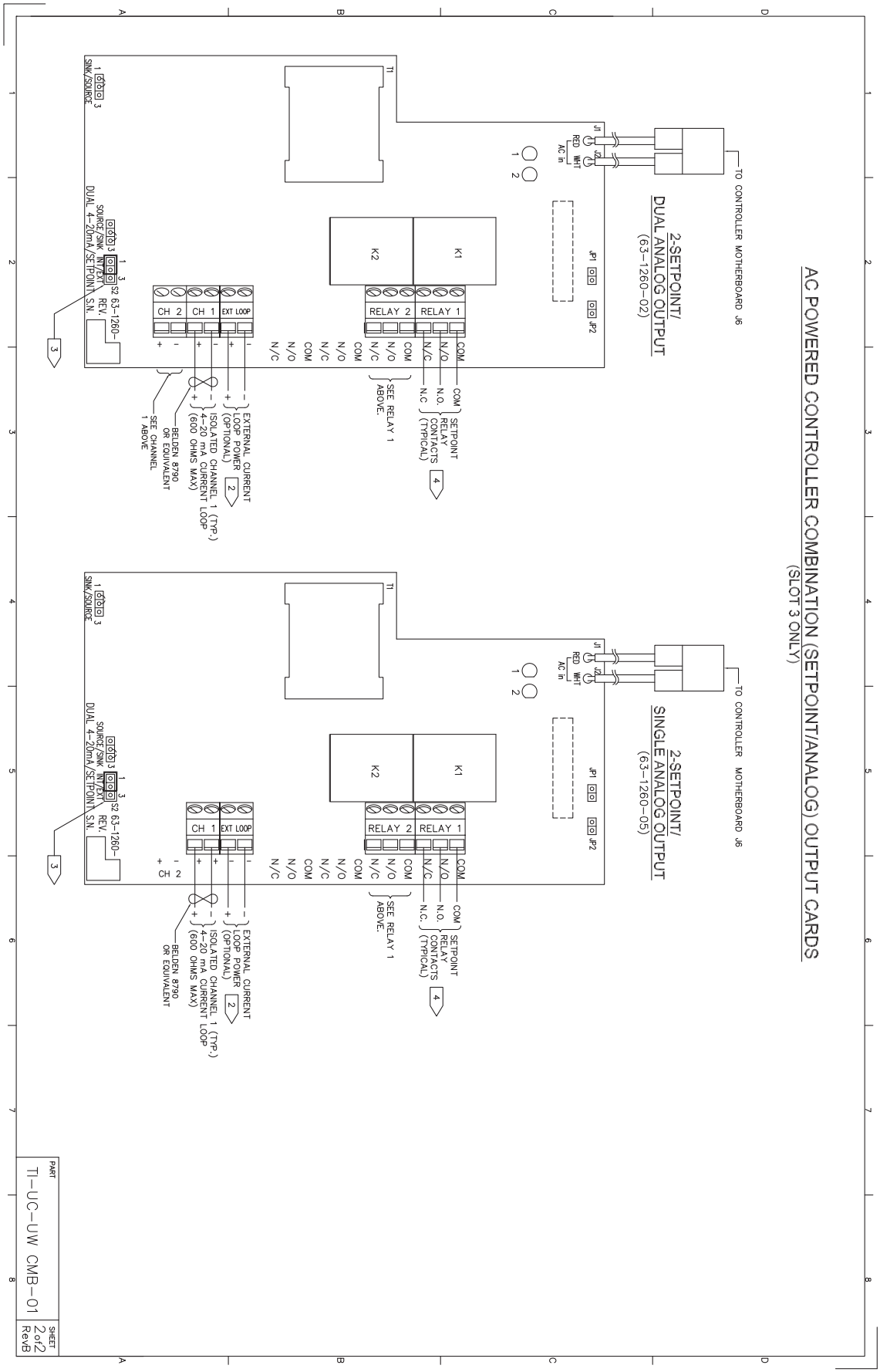

REVISIONS
NOTE (UNLESS OTHERWISE SPECIFIED):
1 THE -XXX DESIGNATION REFERS TO CABLE LENGTH OPTION IN FEET. STANDARD OPTION IS -010, OR 10 FEET (3.04m) IN LENGTH.
NEMA-4X PLASTIC JUNCTION BOX WITH 6-POSITION TERMINAL BLOCK (P/N 61-4013-04)
NEMA-7 JUNCTION BOX WITH 4-POSITION TERMINAL BLOCK (P/N 61-4021-01)
NEMA-4X STAINLESS STEEL JUNCTION BOX WITH 9-POSITION TERMINAL BLOCK (P/N 61-4018-01)
AIMING MOUNT (P/N 39-2049-01)
THERMISTOR TEMPERATURE PROBE, STAINLESS STEEL FOR SONOCELL (P/N 61-6018-02-XXX) 1
DIRECTIONAL AIMING MOUNT (P/N 39-1024-01)
Ventura MEASUREMENT 150 VENTURE BLVD. SPARTANBURG, SC 29306
SONOCELL TRANSDUCER OPTIONAL ACCESSORIES
TI-UC-UV TRACC-01
SIZE B
SHEET 1 of 1 RevD

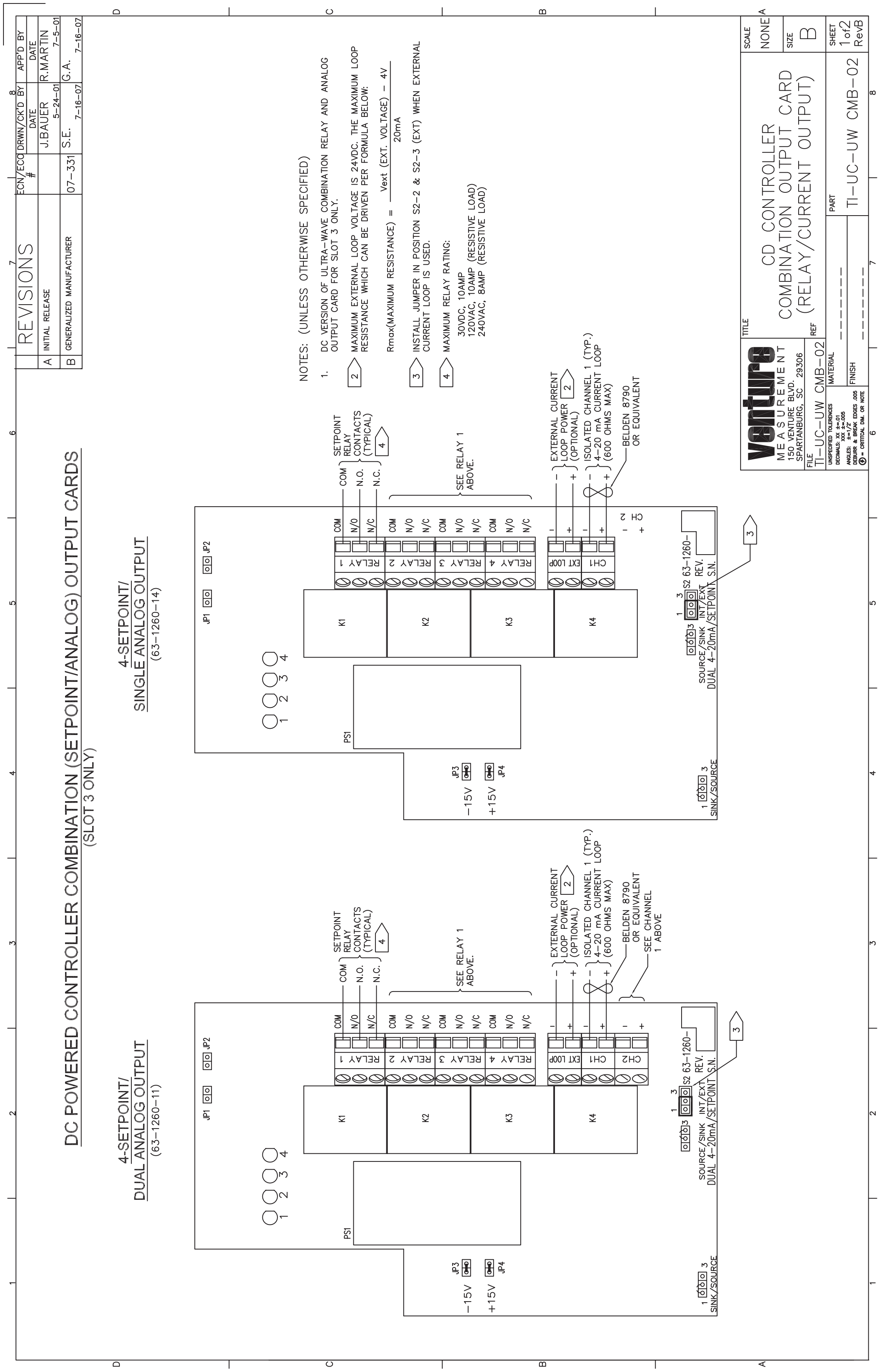

AC POWERED CONTROLLER CURRENT OUTPUT CARDS
(SLOT 3 ONLY)
8-CHANNEL CURRENT CARD (63-1241-01)
4-CHANNEL CURRENT CARD (63-1241-02)
2-CHANNEL CURRENT CARD (63-1241-03)
TO CONTROLLER MOTHERBOARD J6
EXTERNAL CURRENT LOOP POWER (OPTIONAL) 3
ISOLATED CHANNEL 1 (TYP.) 4-20 mA CURRENT LOOP (600 OHMS MAX)
BELDEN 8790 OR EQUIVALENT
SEE CHANNEL 1 WIRING ABOVE
EXT LOOP S2
EXT INT
63-1241- REV.: S.N.:
T1
TB1
TB2
EXT LOOP
CH1
CH2
CH3
CH4
CH5
CH6
CH7
CH8
J1
J2
J3
J4
GND CH/GND
GND AGND
4
NOTES: (UNLESS OTHERWISE SPECIFIED)
1. AC POWERED VERSION OF CONTROLLER ANALOG OUTPUT CARD FOR SLOT 3 ONLY.
2. MAXIMUM OF 2 ANALOG OUTPUTS PER SONOCELL TRANSDUCER.
3 MAXIMUM EXTERNAL LOOP VOLTAGE IS 24VDC. THE MAXIMUM LOOP RESISTANCE WHICH CAN BE DRIVEN PER FORMULA BELOW:
Rmax(MAXIMUM RESISTANCE) = Vext (EXT. VOLTAGE) − 4V / 20mA
4 INSTALL JUMPER IN POSITION S2-2 & S2-3 (EXT) WHEN EXTERNAL CURRENT LOOP IS USED.
REVISIONS
ECN/ECO # | DRWN/CK'D BY | APP'D BY
A INITIAL RELEASE | J.BAUER 5-24-01 | R.MARTIN 7-5-01
B GENERALIZED MANUFACTURER | 07-331 S.E. 7-16-07 | G.A. 7-16-07
venture MEASUREMENT
150 VENTURE BLVD.
SPARTANBURG, SC 29306
TITLE
CURRENT OUTPUT CARD
AC POWERED
FILE T1-UC-UW XMT-0 REF
MATERIAL
FINISH
PART T1-UC-UW XMT-01
SCALE NONE
SIZE B
SHEET 1 of 1
RevB

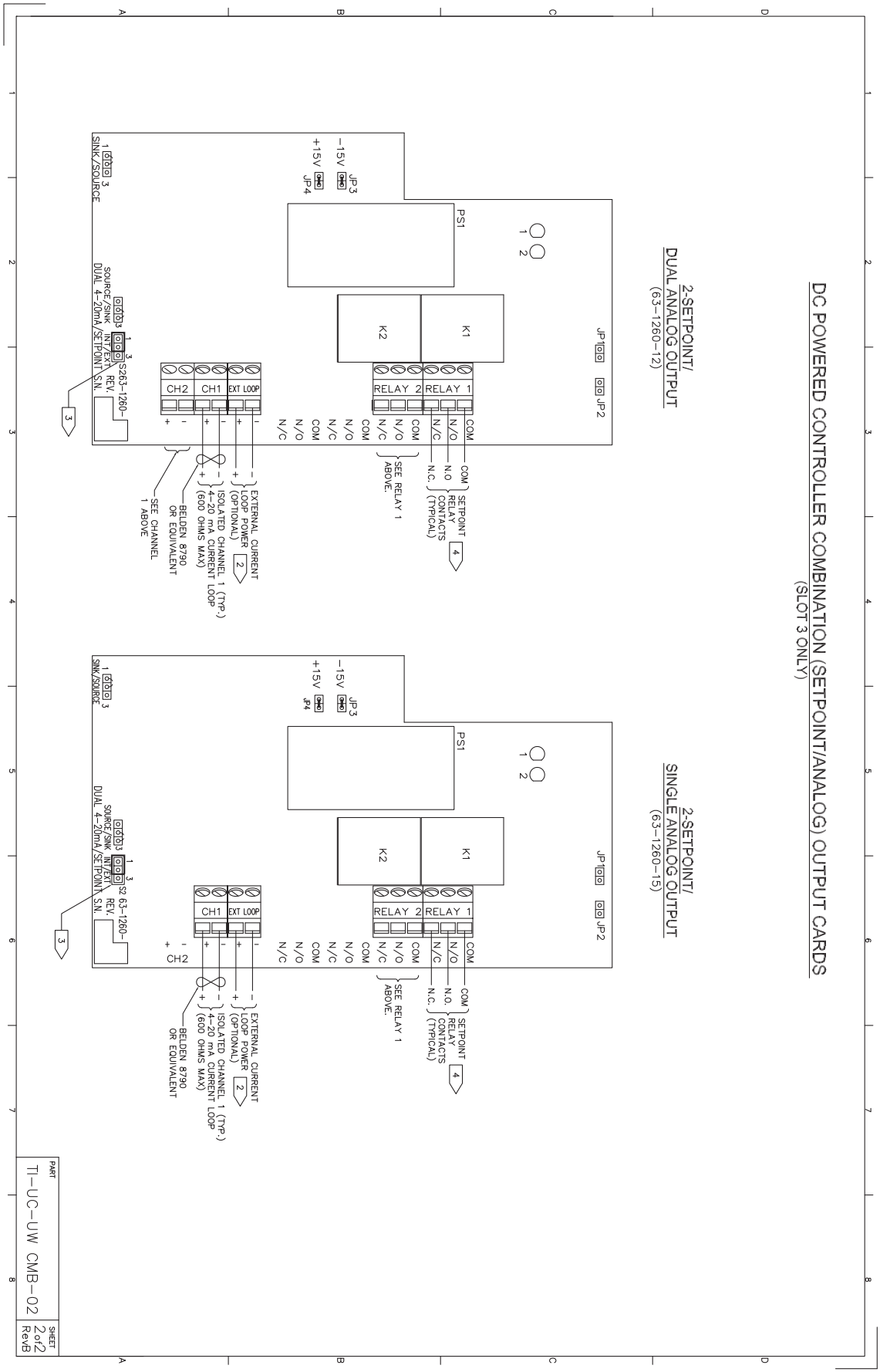

DC POWERED CONTROLLER CURRENT OUTPUT CARD
(SLOT 3 ONLY)
2 CHANNEL ANALOG OUTPUT
(63-1260-13)
REVISIONS
A INITIAL RELEASE
B GENERALIZED MANUFACTURER
NOTES: (UNLESS OTHERWISE SPECIFIED)
1. DC POWERED VERSION OF CONTROLLER ANALOG OUTPUT CARD FOR SLOT 3 ONLY.
2. MAXIMUM OF 2 ANALOG OUTPUTS PER SONOCELL TRANSDUCER.
3 MAXIMUM EXTERNAL LOOP VOLTAGE IS 24VDC. THE MAXIMUM LOOP RESISTANCE WHICH CAN BE DRIVEN PER FORMULA BELOW:
Rmax(MAXIMUM RESISTANCE) = Vext (EXT. VOLTAGE) - 4V / 20mA
4 INSTALL JUMPER IN POSITION S2-2 & S2-3 (EXT) WHEN EXTERNAL CURRENT LOOP IS USED.
JP1 JP2
JP3 JP4
-15V
+15V
PS1
COM N/O N/C COM N/O N/C COM N/O N/C COM N/O N/C
EXT LOOP
CH 1
CH 2
(-) (+) (-) (+) (-) (+)
EXTERNAL CURRENT LOOP POWER (OPTIONAL)
ISOLATED CHANNEL 1 (TYP.) 4-20 mA CURRENT LOOP (500 OHMS MAX)
BELDEN 8790 OR EQUIVALENT
SEE CHANNEL 1 ABOVE
S2 63-1260- REV.
SOURCE SINK
DUAL 4-20mA SETPOINT
S.N.
SINK/SOURCE
CURRENT OUTPUT CARD
DC POWERED
venture MEASUREMENT
150 VENTURE BLVD.
SPARTANBURG, SC 29306
FILE TI-UC-UW XMT-02
REF
MATERIAL
FINISH
PART TI-UC-UW XMT-02
SCALE NONE
SIZE B
SHEET 1 of 1
Rev B

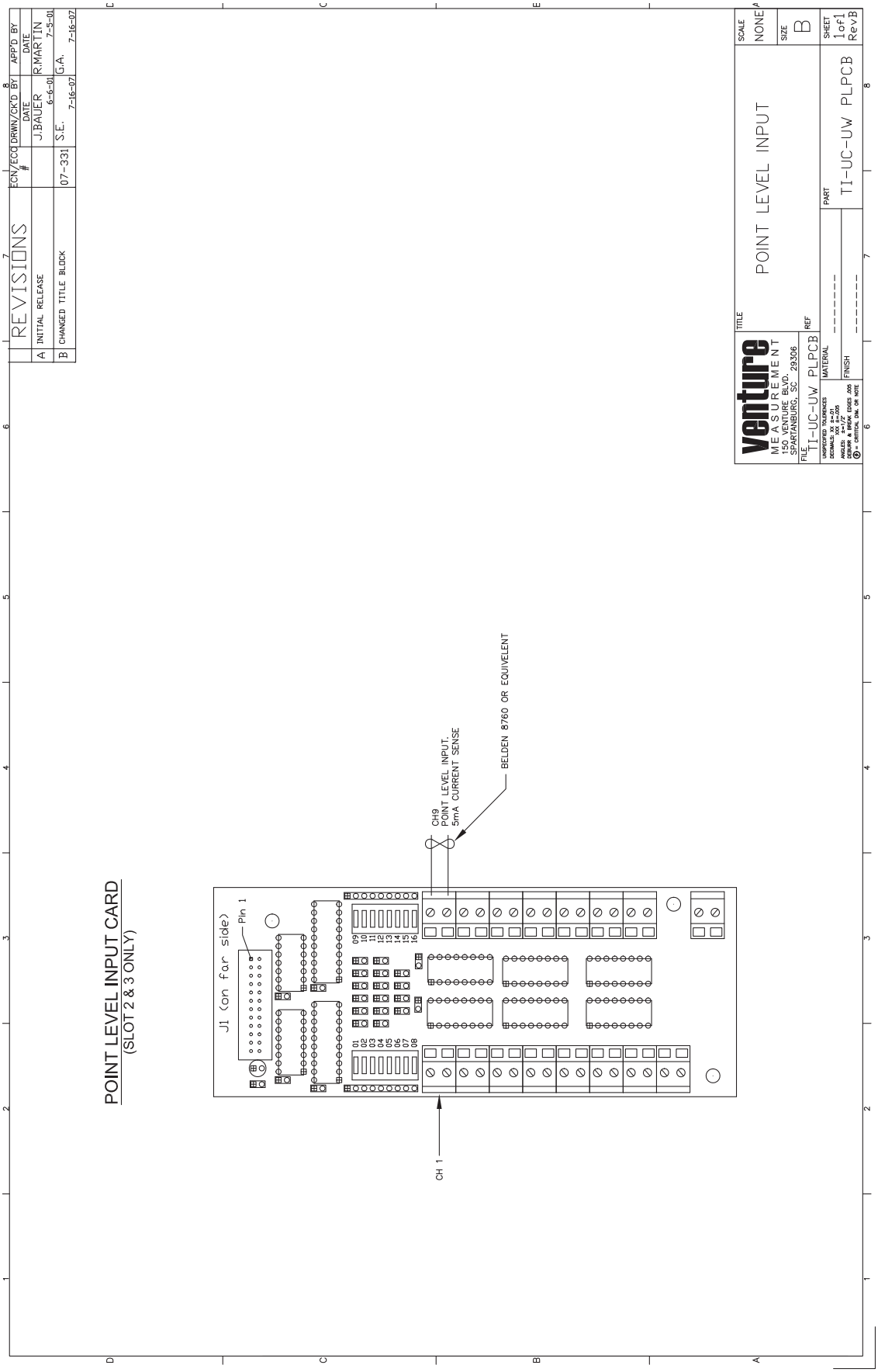

RELAY OUTPUT CARDS
(SLOT 2 AND 3 ONLY)
8-CHANNEL
RELAY CARD
5-CHANNEL
RELAY CARD
63-1240-
REV.
S.N.
CH8 CH7 CH6 CH5 CH4 CH3 CH2 CH1
K8 K6 K4 K2 K7 K5 K3 K1
N/C N/O COM
COM
N/O
N/C
SETPOINT
RELAY CONTACTS
(TYPICAL)
4
SEE
CHANNEL 1
(TYPICAL)
NOTES: (UNLESS OTHERWISE SPECIFIED)
1. CONTROLLER RELAY OUTPUT CARD FOR SLOTS 2 AND 3 ONLY
2. MAXIMUM OF 8-RELAYS PER SONOCELL TRANSDUCER.
3. INSTALL THE HIGHER CAPACITY CARD IN THE FIRST AVAILABLE SLOT WHEN USING MORE THAN ONE RELAY OUTPUT CARD.
4 MAXIMUM RELAY RATING:
30 VDC, 10A
120VAC, 10AMP (RESISTIVE LOAD)
240VAC, 8AMP (RESISTIVE LOAD)
REVISIONS
DESCRIPTION ECN/ECO DRWN/CK'D BY APP'D BY
A INITIAL RELEASE 07-331 J.BAUER 5-24-01 R.MARTIN 7-5-01
B GENERALIZED MANUFACTURER S.E. 7-16-07 G.A. 7-16-07
DRWN/CK'D DATE
APP'D DATE
Venture
MEASUREMENT
150 VENTURE BLVD
SPARTANBURG, SC 29306
TITLE
RELAY OUTPUT CARD
FILE TI-UC-UW RLY-01
REF
MATERIAL
FINISH
PART
TI-UC-UW RLY-01
SCALE NONE
SIZE B
SHEET 1 of 1
REV B

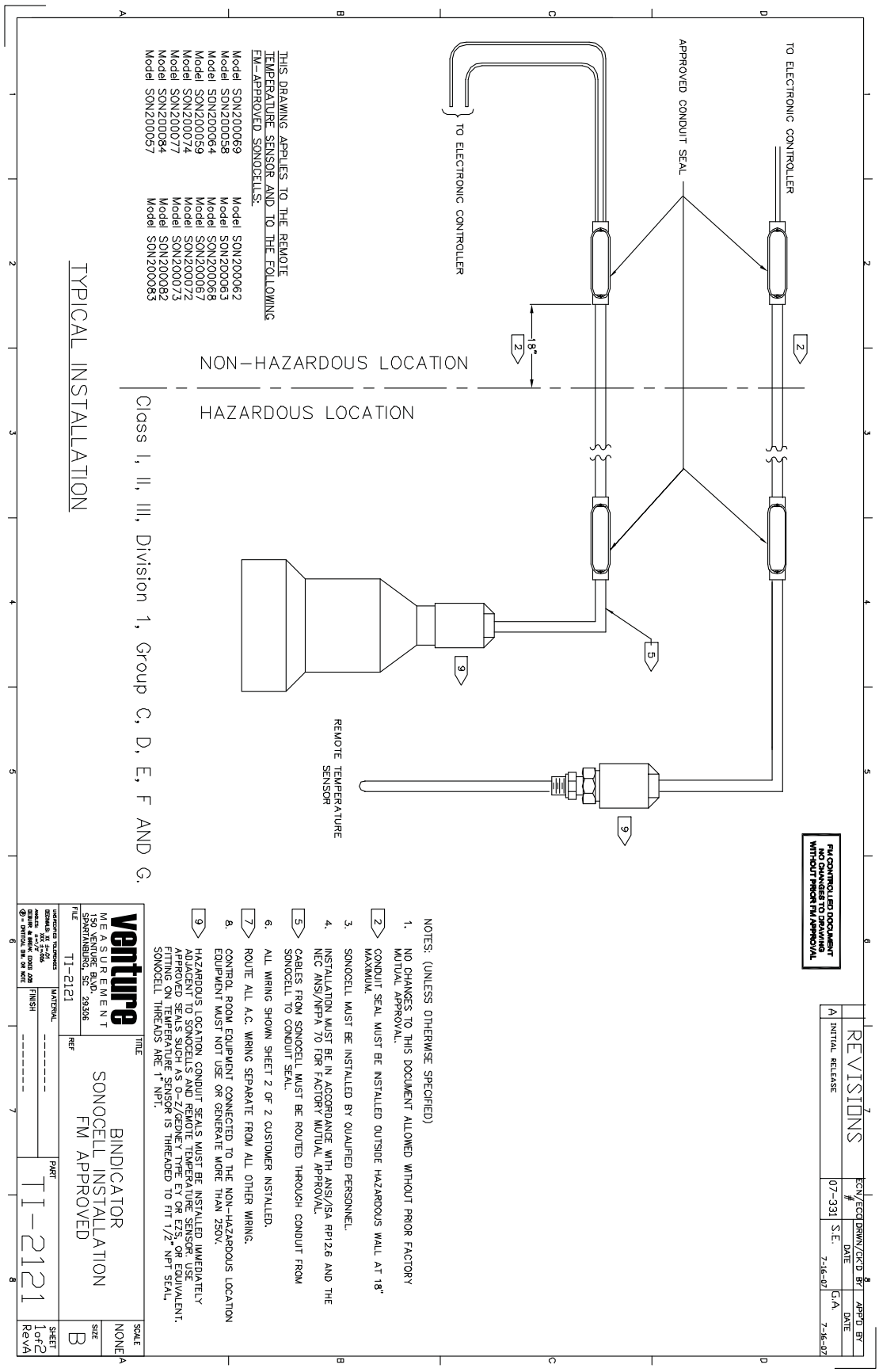

AC POWERED CONTROLLER COMBINATION (SETPOINT/ANALOG) OUTPUT CARDS
(SLOT 3 ONLY)
TO CONTROLLER MOTHERBOARD J6
4-SETPOINT/
DUAL ANALOG OUTPUT
(63–1260–01)
4-SETPOINT/
SINGLE ANALOG OUTPUT
(63–1260–04)
J1 J2 RED WHT AC in
JP1 JP2
T1
K1 K2 K3 K4
RELAY 1 RELAY 2 RELAY 3 RELAY 4 EXT LOOP CH 1 CH 2
COM N/O N/C
COM N.O. N.C. SETPOINT RELAY CONTACTS (TYPICAL)
SEE RELAY 1 ABOVE.
EXTERNAL CURRENT LOOP POWER (OPTIONAL)
ISOLATED CHANNEL 1 (TYP.) 4–20 mA CURRENT LOOP (600 OHMS MAX)
BELDEN 8790 OR EQUIVALENT
SEE CHANNEL 1 ABOVE
SINK/SOURCE
SOURCE/SINK INT/EXT
DUAL 4–20mA/SETPOINT
S2 63–1260– REV. S.N.
NOTES: (UNLESS OTHERWISE SPECIFIED)
1. AC POWERED VERSION OF ULTRAWAVE COMBINATION RELAY AND ANALOG OUTPUT CARD FOR MOTHERBOARD OPTION SLOT 3 ONLY.
2 MAXIMUM EXTERNAL LOOP VOLTAGE IS 24VDC. THE MAXIMUM LOOP RESISTANCE WHICH CAN BE DRIVEN PER FORMULA BELOW:
Rmax(MAXIMUM RESISTANCE) = Vext (EXT. VOLTAGE) – 4V / 20mA
3 INSTALL JUMPER IN POSITION S2–2 & S2–3 (EXT) WHEN EXTERNAL CURRENT LOOP IS USED.
4 MAXIMUM RELAY RATING:
– 30VDC, 10AMP
– 120VAC, 10AMP (RESISTIVE LOAD)
– 240VAC, 8AMP (RESISTIVE LOAD)
REVISIONS
ECN/ECO # | DRWN/CK'D BY DATE | APP'D BY DATE
A INITIAL RELEASE | J.BAUER 5–24–01 | R.MARTIN 7–5–01
B GENERALIZED MANUFACTURER | 07–331 | S.E. 7–16–07 | G.A. 7–16–07
venture MEASUREMENT
150 VENTURE BLVD.
SPARTANBURG, SC 29306
FILE TI–UC–UW CMB–01
TITLE AC POWERED CONTROLLER COMBINATION OUTPUT CARD, RELAY/CURRENT OUTPUT
SCALE NONE
SIZE B
PART TI–UC–UW CMB–01
SHEET 1of2 RevB


AC POWERED CONTROLLER COMBINATION (SETPOINT/ANALOG) OUTPUT CARDS
(SLOT 3 ONLY)
2-SETPOINT/
DUAL ANALOG OUTPUT
(63-1260-02)
2-SETPOINT/
SINGLE ANALOG OUTPUT
(63-1260-05)
TO CONTROLLER MOTHERBOARD J6
AC in
RED
WHT
K1
K2
RELAY 1
RELAY 2
COM
N/O
N/C
SETPOINT RELAY CONTACTS (TYPICAL)
N.O.
N.C.
SEE RELAY 1 ABOVE.
EXTERNAL CURRENT LOOP POWER (OPTIONAL)
ISOLATED CHANNEL 1 (TYP.) 4-20 mA CURRENT LOOP (600 OHMS MAX)
BELDEN 8790 OR EQUIVALENT
SEE CHANNEL 1 ABOVE
CH 1
CH 2
EXT LOOP
SOURCE/SINK INT/EXT
DUAL 4-20mA/SETPOINT
SINK/SOURCE
REV.
S.N.
63-1260-
PART
TI-UC-UW CMB-01
SHEET
2 of 2
RevB


DC POWERED CONTROLLER COMBINATION (SETPOINT/ANALOG) OUTPUT CARDS
(SLOT 3 ONLY)
4-SETPOINT/
DUAL ANALOG OUTPUT
(63-1260-11)
4-SETPOINT/
SINGLE ANALOG OUTPUT
(63-1260-14)
REVISIONS
ECN/ECO # | DRWN/CK'D BY DATE | APP'D BY DATE
A INITIAL RELEASE | J.BAUER 5-24-01 | R.MARTIN 7-5-01
B GENERALIZED MANUFACTURER | 07-331 | S.E. 7-16-07 | G.A. 7-16-07
NOTES: (UNLESS OTHERWISE SPECIFIED)
1. DC VERSION OF ULTRA-WAVE COMBINATION RELAY AND ANALOG OUTPUT CARD FOR SLOT 3 ONLY.
2 MAXIMUM EXTERNAL LOOP VOLTAGE IS 24VDC. THE MAXIMUM LOOP RESISTANCE WHICH CAN BE DRIVEN PER FORMULA BELOW:
Rmax(MAXIMUM RESISTANCE) = Vext (EXT. VOLTAGE) - 4V / 20mA
3 INSTALL JUMPER IN POSITION S2-2 & S2-3 (EXT) WHEN EXTERNAL CURRENT LOOP IS USED.
4 MAXIMUM RELAY RATING:
30VDC, 10AMP
120VAC, 10AMP (RESISTIVE LOAD)
240VAC, 8AMP (RESISTIVE LOAD)
SETPOINT RELAY CONTACTS (TYPICAL) 4
COM
N.O.
N.C.
SEE RELAY 1 ABOVE.
EXTERNAL CURRENT LOOP POWER 2 (OPTIONAL)
ISOLATED CHANNEL 1 (TYP.) 4-20 mA CURRENT LOOP (600 OHMS MAX)
BELDEN 8790 OR EQUIVALENT
SEE CHANNEL 1 ABOVE
RELAY 1
RELAY 2
RELAY 3
RELAY 4
EXT LOOP
CH1
CH2
K1
K2
K3
K4
PS1
JP1
JP2
JP3
JP4
-15V
+15V
1 2 3 4
S2 63-1260- REV.
INT/EXT S.N.
SETPOINT
SOURCE/SINK
DUAL 4-20mA
SINK/SOURCE
TITLE
CD CONTROLLER
COMBINATION OUTPUT CARD
(RELAY/CURRENT OUTPUT)
Venture
MEASUREMENT
150 VENTURE BLVD.
SPARTANBURG, SC 29306
FILE TI-UC-UW CMB-02
SCALE NONE
SIZE B
PART TI-UC-UW CMB-02
SHEET 1of2 RevB


DC POWERED CONTROLLER COMBINATION (SETPOINT/ANALOG) OUTPUT CARDS
(SLOT 3 ONLY)
2-SETPOINT/
DUAL ANALOG OUTPUT
(63-1260-12)
2-SETPOINT/
SINGLE ANALOG OUTPUT
(63-1260-15)
PS1
K1
K2
JP1
JP2
JP3
JP4
RELAY 1
RELAY 2
CH1
CH2
EXT LOOP
SINK/SOURCE
SOURCE/SINK
INT/EXT
REV.
S/N.
63-1260-
DUAL 4-20mA/SETPOINT
SEE RELAY 1 ABOVE.
SETPOINT RELAY CONTACTS (TYPICAL)
N.O.
N.C.
COM
EXTERNAL CURRENT LOOP POWER (OPTIONAL)
ISOLATED CHANNEL 1 (TYP.) 4-20 mA CURRENT LOOP (600 OHMS MAX)
BELDEN 8790 OR EQUIVALENT
SEE CHANNEL 1 ABOVE
PART
TI-UC-UW CMB-02
SHEET
2 of 2
RevB


REVISIONS
ECN/ECO #
DRWN/CK'D BY
DATE
APP'D BY
DATE
A INITIAL RELEASE
J.BAUER 6-6-01
R.MARTIN 7-5-01
B CHANGED TITLE BLOCK
07-331
S.E. 7-16-97
G.A. 7-16-97
TITLE
POINT LEVEL INPUT
venture MEASUREMENT
150 VENTURE BLVD.
SPARTANBURG, SC 29306
FILE TI-UC-UW PLPCB
REF
MATERIAL
FINISH
PART TI-UC-UW PLPCB
SCALE NONE
SIZE B
SHEET 1 of 1
REV B
POINT LEVEL INPUT CARD
(SLOT 2 & 3 ONLY)
J1 (on far side)
Pin 1
CH9
POINT LEVEL INPUT.
5mA CURRENT SENSE
BELDEN 8760 OR EQUIVELENT
CH 1


TO ELECTRONIC CONTROLLER
APPROVED CONDUIT SEAL
TO ELECTRONIC CONTROLLER
18"
NON-HAZARDOUS LOCATION
HAZARDOUS LOCATION
REMOTE TEMPERATURE SENSOR
Class I, II, III, Division 1, Group C, D, E, F AND G.
TYPICAL INSTALLATION
THIS DRAWING APPLIES TO THE REMOTE TEMPERATURE SENSOR AND TO THE FOLLOWING FM-APPROVED SONOCELLS:
Model SON200069 Model SON200062
Model SON200058 Model SON200063
Model SON200064 Model SON200068
Model SON200059 Model SON200067
Model SON200074 Model SON200072
Model SON200077 Model SON200073
Model SON200084 Model SON200082
Model SON200057 Model SON200083
FM CONTROLLED DOCUMENT
ANY CHANGES TO THIS DOCUMENT WITHOUT PRIOR FM APPROVAL
NOTES: (UNLESS OTHERWISE SPECIFIED)
1. NO CHANGES TO THIS DOCUMENT ALLOWED WITHOUT PRIOR FACTORY MUTUAL APPROVAL.
2. CONDUIT SEAL MUST BE INSTALLED OUTSIDE HAZARDOUS WALL AT 18" MAXIMUM.
3. SONOCELL MUST BE INSTALLED BY QUALIFIED PERSONNEL.
4. INSTALLATION MUST BE IN ACCORDANCE WITH ANSI/ISA RP12.6 AND THE NEC ANSI/NFPA 70 FOR FACTORY MUTUAL APPROVAL.
5. CABLES FROM SONOCELL MUST BE ROUTED THROUGH CONDUIT FROM SONOCELL TO CONDUIT SEAL.
6. ALL WIRING SHOWN SHEET 2 OF 2 CUSTOMER INSTALLED.
7. ROUTE ALL A.C. WIRING SEPARATE FROM ALL OTHER WIRING.
8. CONTROL ROOM EQUIPMENT CONNECTED TO THE NON-HAZARDOUS LOCATION EQUIPMENT MUST NOT USE OR GENERATE MORE THAN 250V.
9. HAZARDOUS LOCATION CONDUIT SEALS MUST BE INSTALLED IMMEDIATELY ADJACENT TO SONOCELLS AND ZT-REMOTE TEMPERATURE SENSOR. USE APPROVED SEALS SUCH AS CROUSE-HINDS EYS, OR EQUIVALENT. FITTING ON TEMPERATURE SENSOR IS THREADED TO FIT 1/2" NPT SEAL. SONOCELL THREADS ARE 1" NPT.
REVISIONS
A INITIAL RELEASE ECN/ECO # 07-331 DRWN/CK'D BY S.E. DATE 7-16-07 APP'D BY G.A. DATE 7-16-07
venture MEASUREMENT 150 VENTURE BLVD. SPARTANBURG, SC. 29306
FILE T1-2121
REF
TITLE BINDICATOR SONOCELL INSTALLATION FM APPROVED
MATERIAL ---------
FINISH ---------
PART T1-2121
SCALE NONE
SIZE B
SHEET 1 of 2 RevA

Appendix F: Error Codes

If you make an error entering an equation in a math channel, the SonoTracker™ will respond in one of two ways:

- After you enter the equation and press the Enter Key, the SonoTracker™ will not be able to compile the equation, and will respond with a compile error code.
- After you enter the equation and press the Enter Key, the SonoTracker™ will respond with *Script Compile Successful*. However, when you switch to vessel monitoring for the math channel, the SonoTracker™ 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 C10=, but you are in channel 9).

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).

10— Equal sign in incorrect place (e.g., C9=C2+C3=C4)

11 — Equation includes an illegal character, such as a '.' or a '+', at the end
(e.g., C1=C2+2. is illegal but C9=C2+2.0 or C5=C2+2 are allowable)
12 — Incorrect, duplicated character (e.g., C9=CC2+2)
13 — Incorrect use of an operator (e.g., C9=C2+*2)
14 — Operator missing (e.g., C9=C2C2)

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.

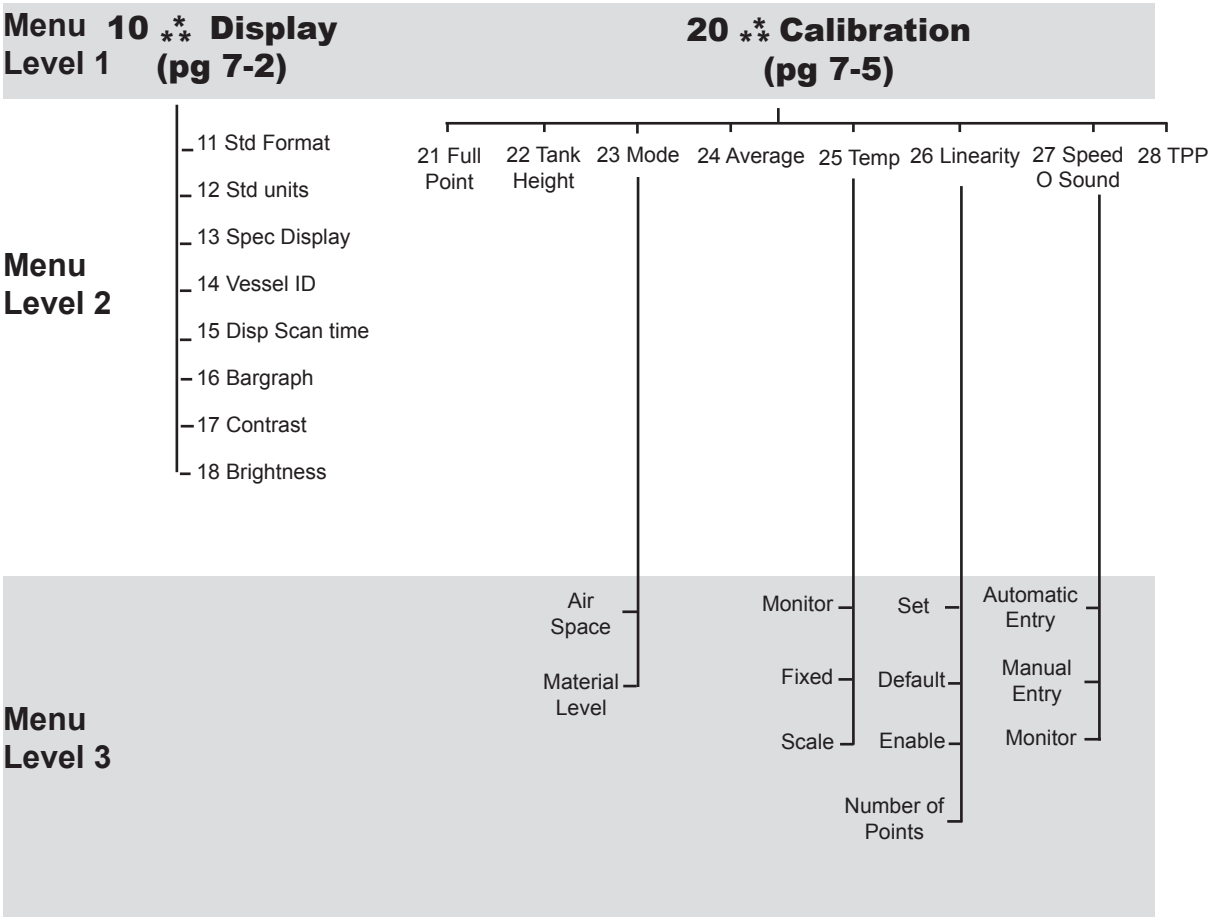
4 — Result from intermediate channel being input into this channel is too large.
Solution: Correct and/or scale the equation for the intermediate channel.

5 — Result is too large to display.
Solution: Scale down the result by using the divide function.

Appendix G: Menu Tree & Hot Keys

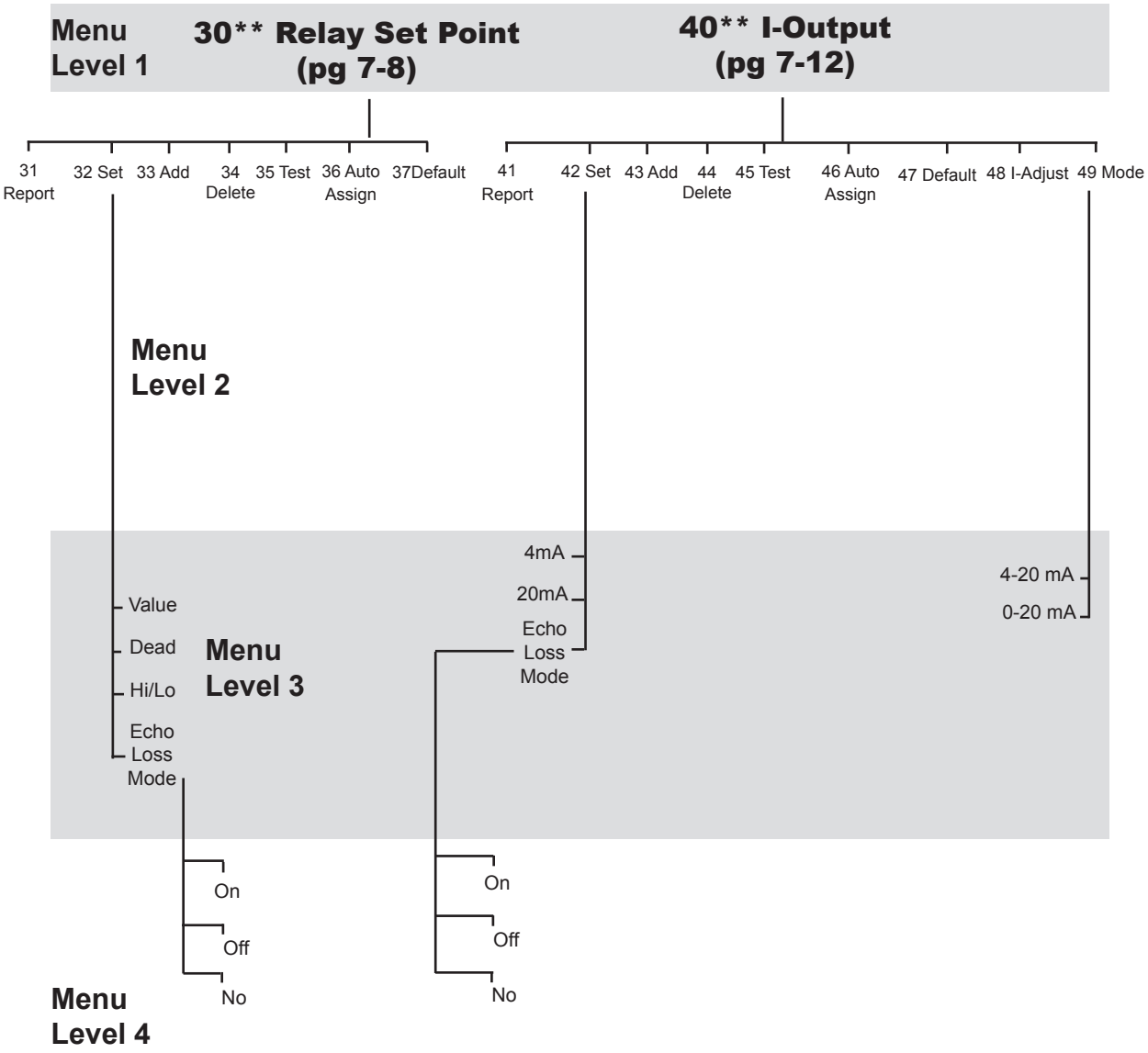
Following is a summary of the keyboard functions (hot keys) you can use when vessel monitoring.

- **Switch from Auto Mode to Manual Mode or vice versa —**
  Press the Auto/Man Key (Auto LED illuminates when the SonoTracker™ is in Auto Mode).
- **Scroll through the Channels when in Manual Mode (Auto LED off) —**
  Press the Up Arrow or Down Arrow Key.
- **Switch from Channel Monitoring to Menu Tree —**
  Press the Menu Key while in the Manual Mode.
- **Switch from Numerical display to Bar Graph display or vice versa for a particular channel —**
  If you set up the bar graph (see Chapter 7, Display Menu), press the Enter Key while in the Manual Mode to toggle between numerical display and bar graph display. F2 will also switch.
- **View Raw Target (level and differential level applications only) —**
  Press the F1 Key while in the Manual Mode to change the top line of the display to show the raw target. The raw target is the 'raw' distance from the
  face of the transducer to the target, before averaging, tracking, filtering, etc. are applied.
- **View Temperature of current Level channel —**
  Press the F2 key while in manual mode to change the top line of the display, showing the airspace temperature.
- **View other Flow Parameters (flow applications only) —**
  While in the Manual Mode you can change the display to show any of the following parameters: *Head* (current head), *Temperature* (current temperature), *Total* (total flow since the last time you reset the total flow to 0), *MaxF* (maximum flow since the last time you reset), *MinF* (minimum flow since the last time you reset), *AvgF* (average flow since the last time you reset), and *RLY* (number of setpoint relays for the channel). Press the F1 Key to cycle the top line of the display, the F2 Key to cycle the bottom line of the display and the F3 key to cycle both at once.
- **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** SonoTracker™ **Software Revision letter and Date of Release —**
  Press the "." Key briefly while in the Manual Mode.
- **Enter 6600 to Default or press F3—**
  Defaults the system; as well as Pressing ENTER at power up.



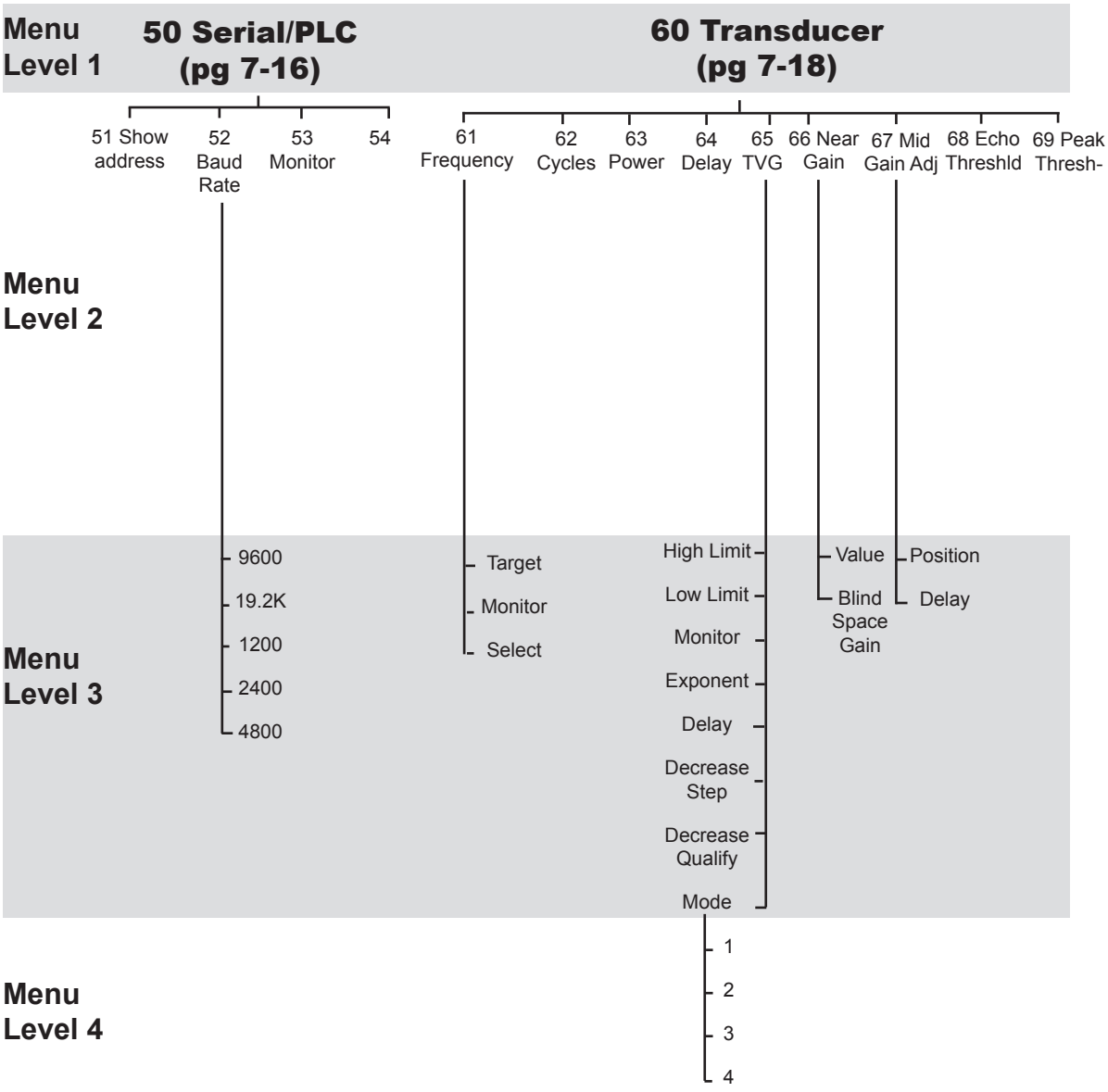
*Parameters change for Math Channels.
**Parameters change for Flow Channels.

Figure 3-4a.SonoTracker™ Menu Tree (continued)



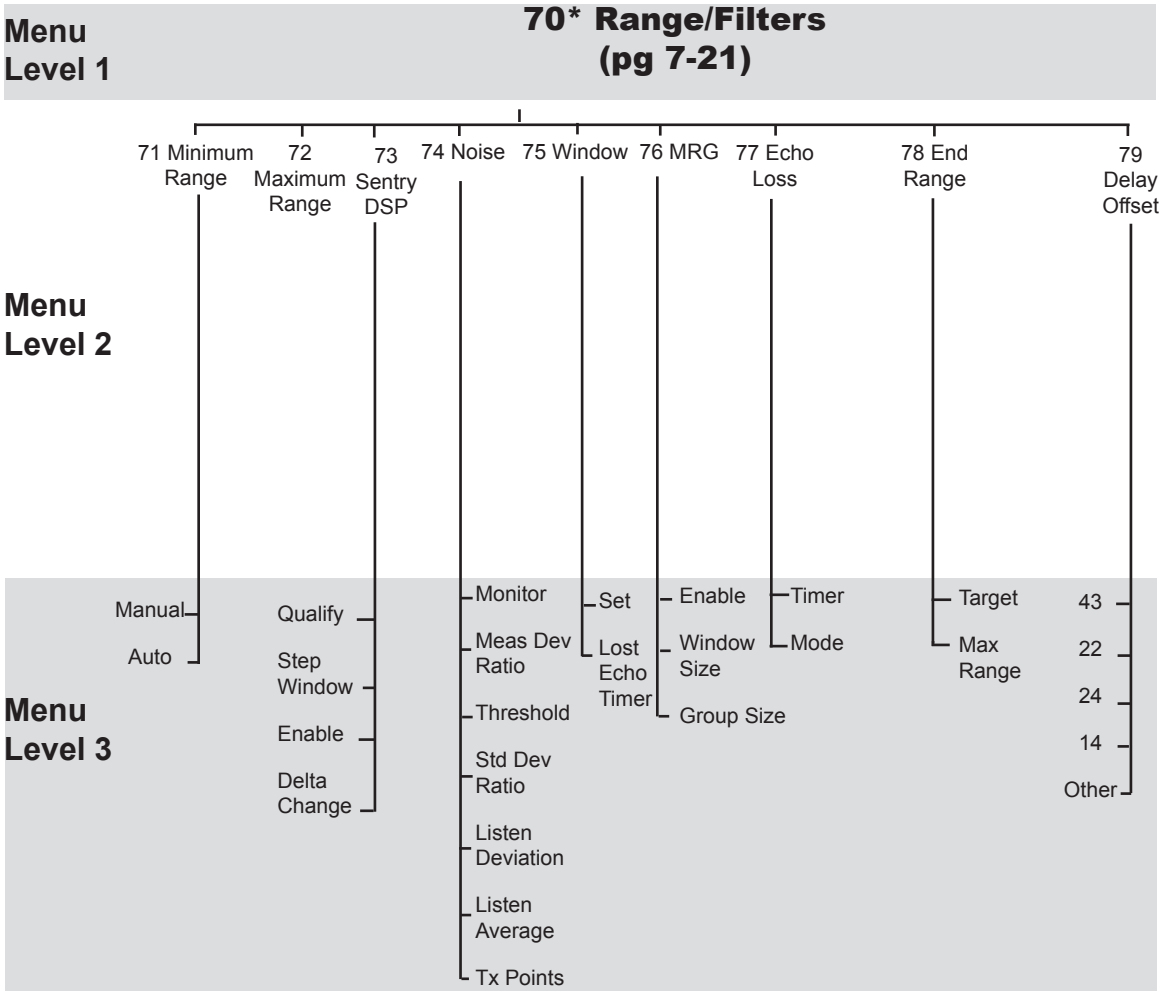
*Parameters change for Math Channels.
**Parameters change for Flow Channels.

Figure 3-4b. SonoTracker™ Menu Tree (continued)



* Submenus are available for PLC only if your SonoTracker™ includes an Allen-Bradley RIO PCB or Profibus. See *A-B RIO Interface Manual for Profibus Interface Manual* for detailed information.

Figure 3-4c. SonoTracker™ Menu Tree (continued)



*Parameters change for Math Channels.
**Parameters change for Flow Channels.

Figure 3-4d. SonoTracker™ Menu Tree (continued)

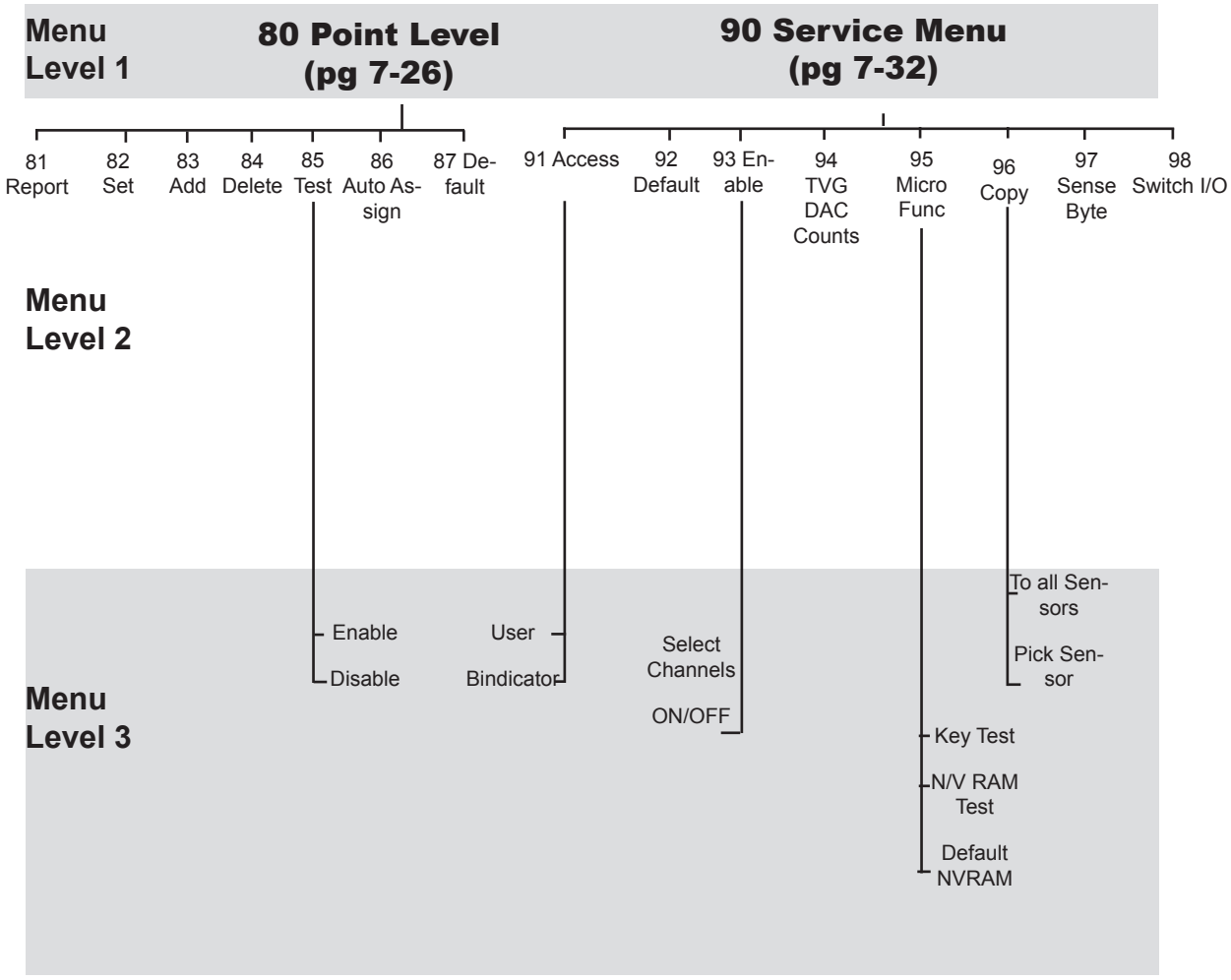


Figure 3-4e. SonoTracker™ Menu Tree

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