BINMINDER 9300

OPERATION AND INSTALLATION MANUAL

BinMinder 9300™
Material Level Interface Sensor

Rev. 1.34a

Doc. No. 1066-0002 Rev. 1.34a

Entech Design, Inc.
315 South Locust
Denton, Texas 76201

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1. PRODUCT DESCRIPTION

Single BinMinder 9300 processor provides multiple point level sensing in liquids (up to four sensors)

Non Contact Measurement

Easily installed, conduit entry on processor/display unit possible on two sides

Outstanding temperature stability, accuracy and repeatability.

Sophisticated algorithms for range extraction, utilizing powerful 32 bit Digital Signal Processing (DSP) microprocessor.

System incorporates experience from thousands of underwater acoustic instruments installed worldwide.

Superior performance based on current technology and modern design procedures.

Provides exceptional RFI/EMI and transient immunity on all communications and power.

Four (4) 4-20 mA outputs

Four (4) SPDT status relays

RS 232 and RS485 communications port for multiple unit installations.

All these features plus the ease of programming, make this instrument the number one choice for interface level measurement in liquids.

2. APPLICATIONS

The BinMinder 9300 is designed to monitor the levels of materials in various processes and to regulate the control loops, start and stop motors, and initiate events based on measured process conditions.

Some applications for the units are listed below:

- *Water & Wastewater Treatment Clarifiers*
- *Water & Wastewater Gravity & DAF Thickeners*
- *Raw Water Clarifiers*
- *Acid/Caustic Tanks for Liquid Level Detection*
- *Sumps, lagoons, settling ponds*
- *Industrial Process Thickeners*
- *Salt Brine Tanks*
- *Material Inventory Tanks*
- *Process Thickeners*
- *Dewatering/Hydro Bins*
- *Pyrite Holding/Transfer Tanks*
- *FGD Thickeners*
- *Surge & Settling Tanks*
- *Oil/Water separators*

3. FEATURES

3.1 MULTIPLE POINT UNIT

The BinMinder 9300 is capable of operating four transducers and can measure levels in four tanks (or at four points in one tank).

3.2 PROGRAMMING

Programming is accomplished via a menu system, a membrane keypad, and a graphical LCD display. To ensure all programmed settings remain uncorrupted in the event of a power outage, the system employs nonvolatile storage of programmed parameters.

The menu has two levels of settings which can be set by the user: STANDARD and password-protected ADVANCED. If desired, the user may also enable a lockout of the menu allowing only personnel who know the user-selected password to enter the menu system. See section 8.2.6 for a more thorough description of Advanced Settings and Menu Lockout.

3.3 DISPLAY

The system has a graphical display with four (4) formats.

1. Digital Display - displays digital output of measured Range or Level. (See 7.1.1)
2. Data Display - displays the vessel echo profile. (See 7.1.2)
3. Vessel Overview - displays overview graphic of material levels in configured vessels. (See 7.1.3)
4. Menu System - displays setup and configuration information. (See 8.2)

The display is a backlit LCD dot matrix display, with user adjustable contrast.

3.4 SYSTEM CONFIGURATION

The BinMinder 9300 offers the user numerous configuration and setup parameters.

3.5 MODULARITY AND CONFIGURATION

The BinMinder 9300 processor unit is designed to accept from one to four sensors. The unit is configured at the factory with four 4 to 20 mA Outputs and four Status Relays.

3.6 TEMPERATURE

Operating temperatures for the system processor is from -40°F to +140°F ambient. The standard transducer is rated to operate while continuously submerged in liquids at temperatures ranging from +35°F to 120°F. Transducers should not be stored at temperatures below -40°F.

Transducers suitable for continuous operation at temperatures to 310°F (154°C) are available.

3.7 4 TO 20 mA OUTPUTS

The system is equipped with four internally powered Current Loops, one for each of the four transducers. The Current Loops are protected against transients and reverse polarity.

3.8 RS232/RS485 INTERFACE

3.8.1. PC Interface and Diagnostic Mode

When the unit is used with the RS232 interface and an application specific software package, the user is capable of visualizing the system operation on a PC or LapTop computer.

3.9 RELAYS

The system is configured with four (4) single pole/double throw (SPDT) status relays. Relay ratings are:

Nominal switching capacity	10 A @ 250VAC 10 A @ 30 VDC

Permits direct drive of heavy loads eliminating the need for further interface.

4. INSTALLATION

4.1 UNPACKING

All shipping cartons should be opened carefully. When using a box cutter, do not plunge the blade deeply into the box, as it potentially could cut or scratch equipment components. Carefully remove equipment from each carton checking it against the packing list before discarding any packing material. If there is any shortage or obvious shipping damage to the equipment, report it immediately to Entech Design (940-898-1173).

4.2 TRANSDUCER (SENSOR) - (See Figs. 4.0 & 4.1)

4.2.1 Locating the Transducer

- Position the transducer at an elevation in the tank so that it is fully submerged at all times that measurements are required, typically 6 in. below the normal water level.
- Ensure an unobstructed path between the transducer and the bottom of the tank. (Rotating subsurface rakes and flights that pass beneath the transducer do not interfere with normal operation of the instrument.)
- Select a location that minimizes the presence of gas bubbles, high flow and heavy solid concentration dynamics in the process liquid near the transducer.
- Typical installation in a round clarifier or thickener is 1/3 to 2/3 the distance from the sidewall to the center of the tank with the transducer mounted from the walkway safety railing.
- Typical installation in a rectangular clarifier or thickener is along the length of the clarifier in the third of the tank nearest the sludge discharge sump.

4.2.2 Installing the Transducer

- The transducer housing is designed to accept a 3/4 inch NPT male threaded pipe or conduit. Feed the integral transducer cable through the mounting pipe and tighten by hand until snug. **CAUTION: extreme over-tightening may crack the transducer housing.**
- Position the transducer such that it is 6 in. below the water surface and the mounting pipe is perpendicular to the water surface. Secure the mounting pipe in place with pipe clamps.
- Optional hinged or flex-mount brackets are available and are required in the case that there is surface skimming equipment that passes the location of the transducer. Rotate the transducer mounting pipe so that the integral transducer shield contacts the skimmer arm squarely. Assure that the transducer moves freely away from the passing skimmer equipment.

- Optional transducer mounting brackets are available to extend the mounting pipe away from its connection point at the handrail to provide clearance from obstructions.
- If desired, the transducer cable may be extended up to 1500 ft. Install transducer cables in grounded metal conduit. Do not run in cable trays or duct banks with variable frequency drives or other high voltage sources. (See Section 5.3.1 for more details.)

4.3 PROCESSOR (See Fig. 4.0)

4.3.1 Locating the Processor

- The processor may be located inside a building or it may be field-mounted.
- Locate the processor so that the maximum cable length to any transducer does not exceed 1500 ft.
- Avoid locating the processor near or in a room with variable frequency drives or other high voltage equipment.

4.3.2 Installing the Processor

- Mount the processor at a convenient height for viewing the control panel and displays. Allow sufficient clearance above the processor for full swing of the door for instrument service.
- Secure to a wall or panel using the included A-48 mounting tabs. Alternately, attach to a local handrail using the optional Processor Mounting Assembly.

4.4 START-UP AND OPERATION

4.4.1 System Parameters

The software parameters for BinMinder have been carefully developed and refined over many years to reduce operator or user interaction with the unit. It is recommended that all default parameters be used unless specifically instructed by Entech Design, Inc.

If application information has been provided by the customer, operating parameters in the instrument are factory adjusted for the requirements of the specific application and only require customer entry of basic tank configuration dimension, as indicated below.

CAUTION: Altering Advanced Settings without factory assistance may result in faulty operation or instrument failure. Call 940-898-1173 for Customer Service support.

4.4.2 Instrument Initialization

It is essential that the proper Tank Depth and Zero Adjust be entered into the system for it to calibrate and function properly. This information must be entered the first time the unit is installed and powered on.

When power is applied, the instrument will initiate an Automatic Initialization routine and INITIALIZING POINT 1 will be viewable in the display window. At this point, the following procedure must be executed for the instrument to correctly perform the Automatic Initialization routine.

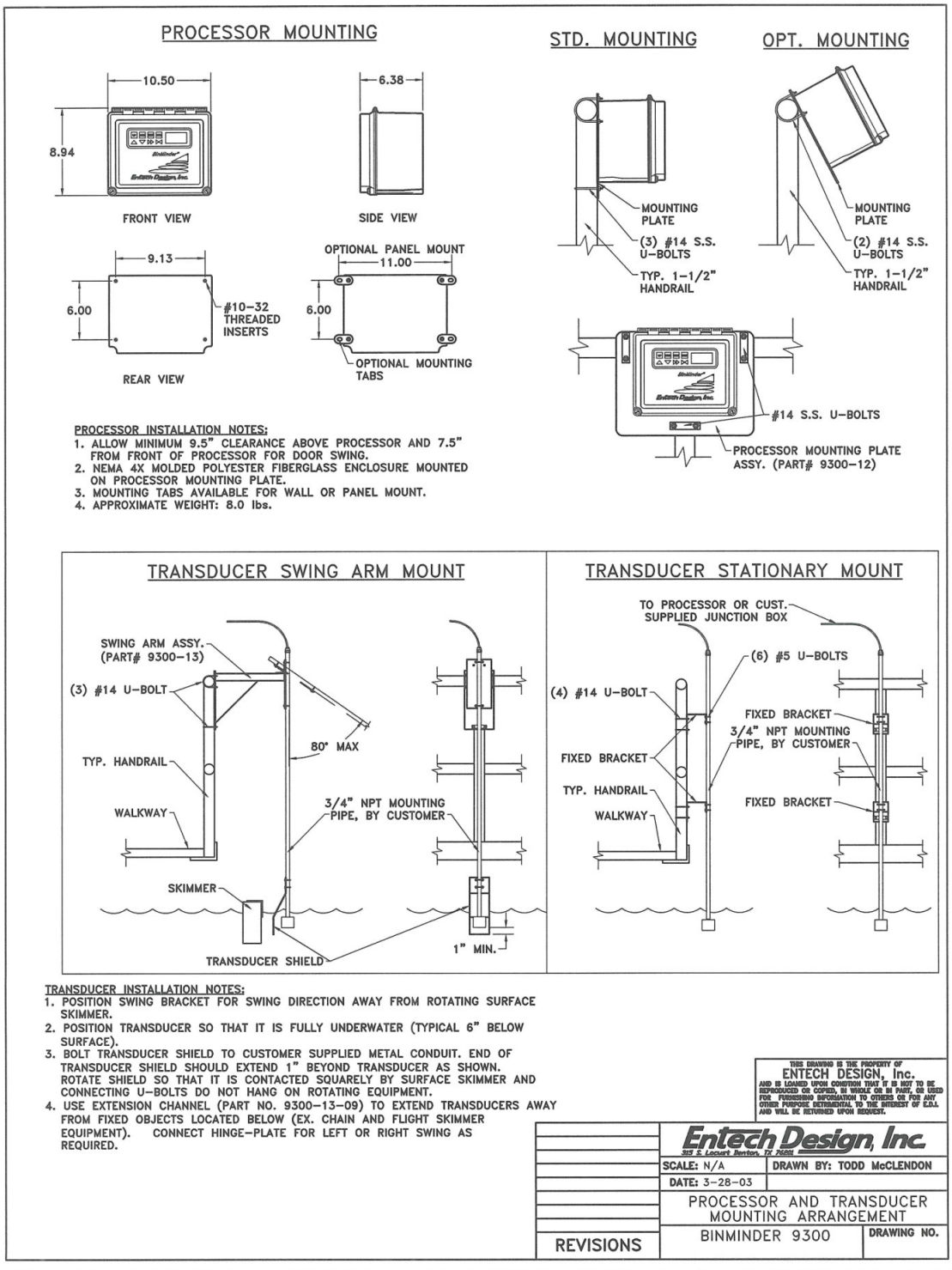
1. Press NEXT to interrupt the Initialization routine and enter the menu system.
2. Using the UP or DOWN arrow key, highlight Modify Points and press NEXT, highlight Point 1 and press NEXT, highlight Tank Configuration and press NEXT.
3. Highlight Tank Depth and press NEXT, then using the UP or DOWN arrow key, enter the distance from the water surface to the bottom of the tank - with the measurement taken at the location of the transducer. **NOTE: Failure to enter an accurate dimension will result in faulty operation and measurement error.** Press the ENTER key to save.
4. Using the UP or DOWN arrow key, highlight Zero Adjust and press NEXT, then using the UP or DOWN arrow key, enter the distance from the water surface to the bottom of the transducer. **NOTE: Failure to enter an accurate dimension will result in faulty operation and measurement error**. Press the ENTER key to save. Continue to press the ENTER key until you "back out" of the menu.
5. If the instrument is configured for multiple transducers, repeat Steps 2 through 4 for each additional Point.
6. Allow the instrument to operate uninterrupted for approximately two minutes for each measurement point.

NOTE: The Automatic Initialization routine may also be activated by selecting REBOOT TRACK in the MODIFY POINTS menu.

During the initialization process or routine, the system adapts various parameters to the specific process. This routine allows the gain to adjust properly based on the dynamics and the relative clarity of the process liquid.

After the proper gain levels have been achieved, the unit begins interpreting information in order to locate and track to the blanket.

An INITIALIZING message lets the user know the start-up process is currently active. Once initializing is complete, the INITIALIZING message window will be replaced by the Digital Display screen. At this point, the system should be functioning properly. See Section 8.0 - Instrument Programming, for more detailed discussion on modifying system software parameters.


PROCESSOR MOUNTING
10.50
8.94
FRONT VIEW
6.38
SIDE VIEW
9.13
6.00
#10-32 THREADED INSERTS
REAR VIEW
OPTIONAL PANEL MOUNT
11.00
6.00
OPTIONAL MOUNTING TABS
STD. MOUNTING
MOUNTING PLATE
(3) #14 S.S. U-BOLTS
TYP. 1-1/2" HANDRAIL
OPT. MOUNTING
MOUNTING PLATE
(2) #14 S.S. U-BOLTS
TYP. 1-1/2" HANDRAIL
#14 S.S. U-BOLTS
PROCESSOR MOUNTING PLATE ASSY. (PART# 9300-12)
PROCESSOR INSTALLATION NOTES:
1. ALLOW MINIMUM 9.5" CLEARANCE ABOVE PROCESSOR AND 7.5" FROM FRONT OF PROCESSOR FOR DOOR SWING.
2. NEMA 4X MOLDED POLYESTER FIBERGLASS ENCLOSURE MOUNTED ON PROCESSOR MOUNTING PLATE.
3. MOUNTING TABS AVAILABLE FOR WALL OR PANEL MOUNT.
4. APPROXIMATE WEIGHT: 8.0 lbs.
TRANSDUCER SWING ARM MOUNT
SWING ARM ASSY. (PART# 9300-13)
(3) #14 U-BOLT
TYP. HANDRAIL
WALKWAY
80° MAX
3/4" NPT MOUNTING PIPE, BY CUSTOMER
SKIMMER
TRANSDUCER SHIELD
1" MIN.
TRANSDUCER STATIONARY MOUNT
TO PROCESSOR OR CUST. SUPPLIED JUNCTION BOX
(6) #5 U-BOLTS
(4) #14 U-BOLT
FIXED BRACKET
3/4" NPT MOUNTING PIPE, BY CUSTOMER
FIXED BRACKET
TYP. HANDRAIL
WALKWAY
FIXED BRACKET
TRANSDUCER INSTALLATION NOTES:
1. POSITION SWING BRACKET FOR SWING DIRECTION AWAY FROM ROTATING SURFACE SKIMMER.
2. POSITION TRANSDUCER SO THAT IT IS FULLY UNDERWATER (TYPICAL 6" BELOW SURFACE).
3. BOLT TRANSDUCER SHIELD TO CUSTOMER SUPPLIED METAL CONDUIT. END OF TRANSDUCER SHIELD SHOULD EXTEND 1" BEYOND TRANSDUCER AS SHOWN. ROTATE SHIELD SO THAT IT IS CONTACTED SQUARELY BY SURFACE SKIMMER AND CONNECTING U-BOLTS DO NOT HANG ON ROTATING EQUIPMENT.
4. USE EXTENSION CHANNEL (PART NO. 9300-13-09) TO EXTEND TRANSDUCERS AWAY FROM FIXED OBJECTS LOCATED BELOW (EX. CHAIN AND FLIGHT SKIMMER EQUIPMENT). CONNECT HINGE-PLATE FOR LEFT OR RIGHT SWING AS REQUIRED.
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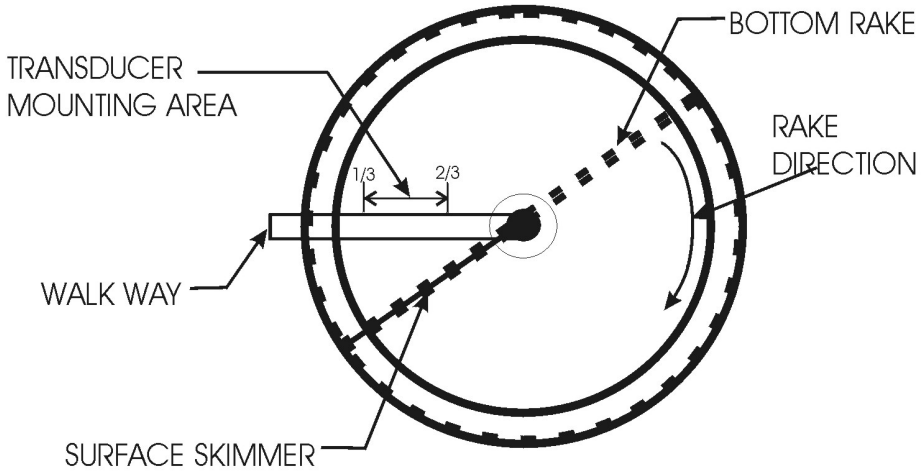
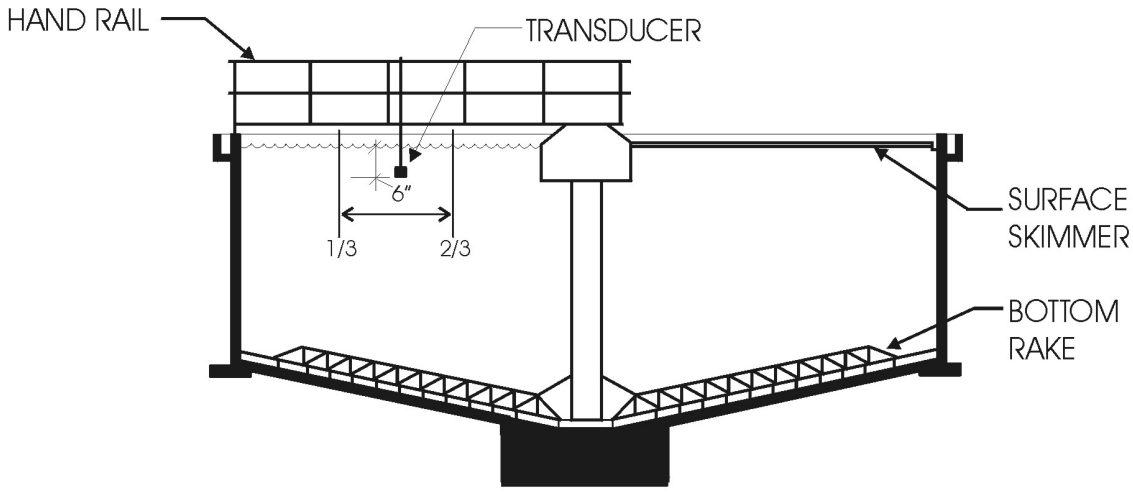
Entech Design, Inc.
SCALE: N/A
DRAWN BY: TODD McCLENDON
DATE: 3-28-03
PROCESSOR AND TRANSDUCER MOUNTING ARRANGEMENT
BINMINDER 9300
DRAWING NO.
REVISIONS

FIGURE 4.0



CIRCULAR CLARIFIER



TYPICAL SECTION

TYPICAL ROUND CLARIFIER

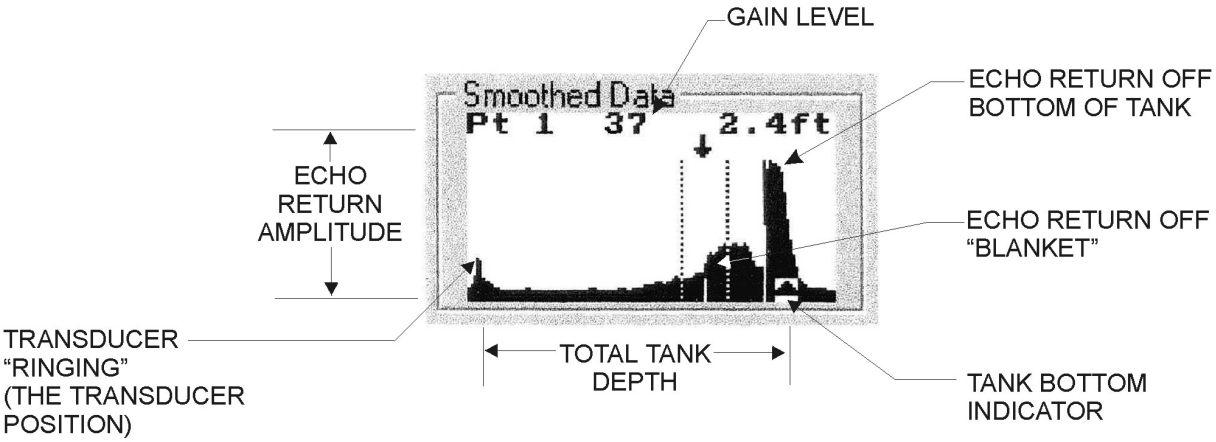
FIGURE 4.1

5. GENERAL RETURN ECHO PATTERN RECOGNITION

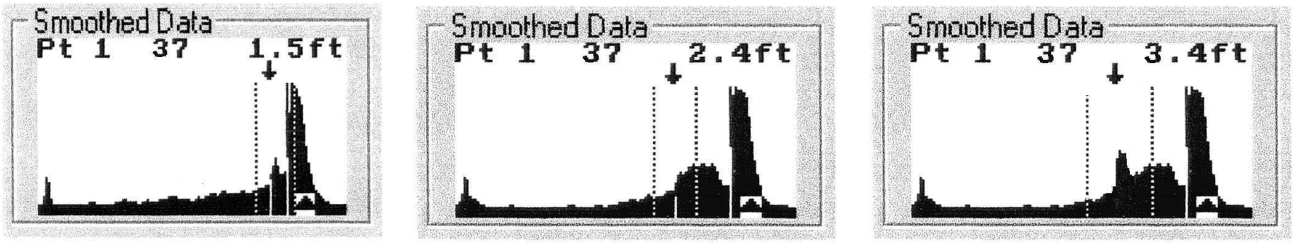
Understanding the return echo that is processed by BinMinder is a key element for troubleshooting and understanding the system. The following are typical examples of echo profiles from a wastewater clarifier. While they certainly may differ from facility to facility, they give the user a reference to discern an appropriate echo pattern from an inappropriate profile.

If your application produces patterns substantially different than these, you should call 940-898-1173 for Customer Service support.

DATA DISPLAY SCREEN LEGEND



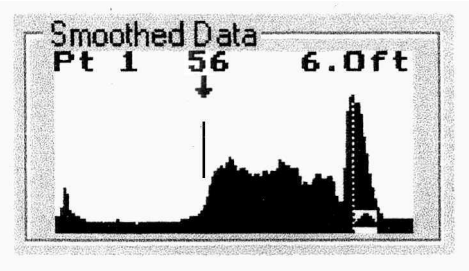
TYPICAL ECHO PATTERNS FROM A CLARIFIER



While variants can be innumerable, the above return signals or echo patterns are typical "finger prints" from a clarifier with a low lying blanket. The pattern at left would be typical of a secondary clarifier with a low blanket. The pattern at center has a slightly deeper, more

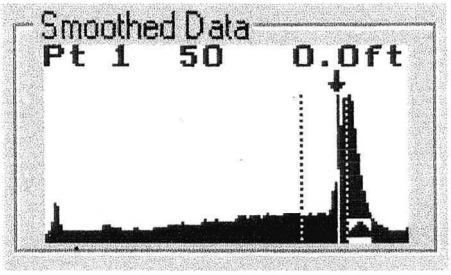
defined blanket. The pattern at right could be from a secondary clarifier with a deep, well-defined interface or a primary clarifier.

ECHO PATTERNS FOR A RAW WATER CLARIFIER



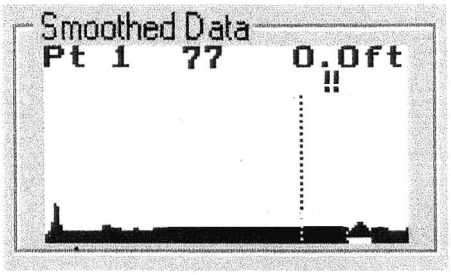
Note deeper flock or sediment blanket which produces more signal.

ECHO PATTERN WITH "BASICALLY" EMPTY TANK

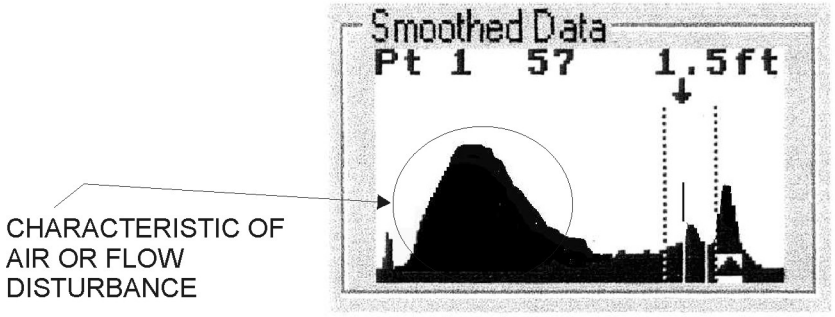


Note "flat line" return through the tank with prominent bottom echo.

ECHO PATTERN WITH LOSS OF SIGNAL



This will occur when the sensor is out of the water, totally "fouled" with build-up and in need of cleaning or with certain component failures. If this pattern subsists, thoroughly clean the sensor and insure it is submerged in the process. Note flat line signal, very high gain value, and double exclamation marks (!!) meaning "no signal".



This signal is characteristic of a "poor" sensor location or disturbed process, usually a result of continual air entrainment in the process or disruptive clarifier flow dynamics. In many cases, this is a localized issue and can be resolved by relocating the transducer. Note large echo "disturbance" return near transducer, along with relatively "weak" return echo off bottom.

6. POWER, WIRING & CONNECTIONS

6.1 POWER REQUIREMENTS

AC power requirements are 110-125 VAC/250mA, or 200-250 VAC/125mA, 50/60Hz.

Use only copper conductors.

There is a 1A Fuse on the Power Supply Board.

A user supplied disconnect switch on a separate 15A circuit breaker should be located near the processor unit.

The unit is designed for continuous operation.

Power line transient protection is provided with Metal Oxide Varistors (MOV), capable of switching in 15ns, and carrying up to 1200 Amps. In the event of a transient that exceeds 275V, these MOVs will cause the fuse to blow. These MOVs have UL and CSA approvals.

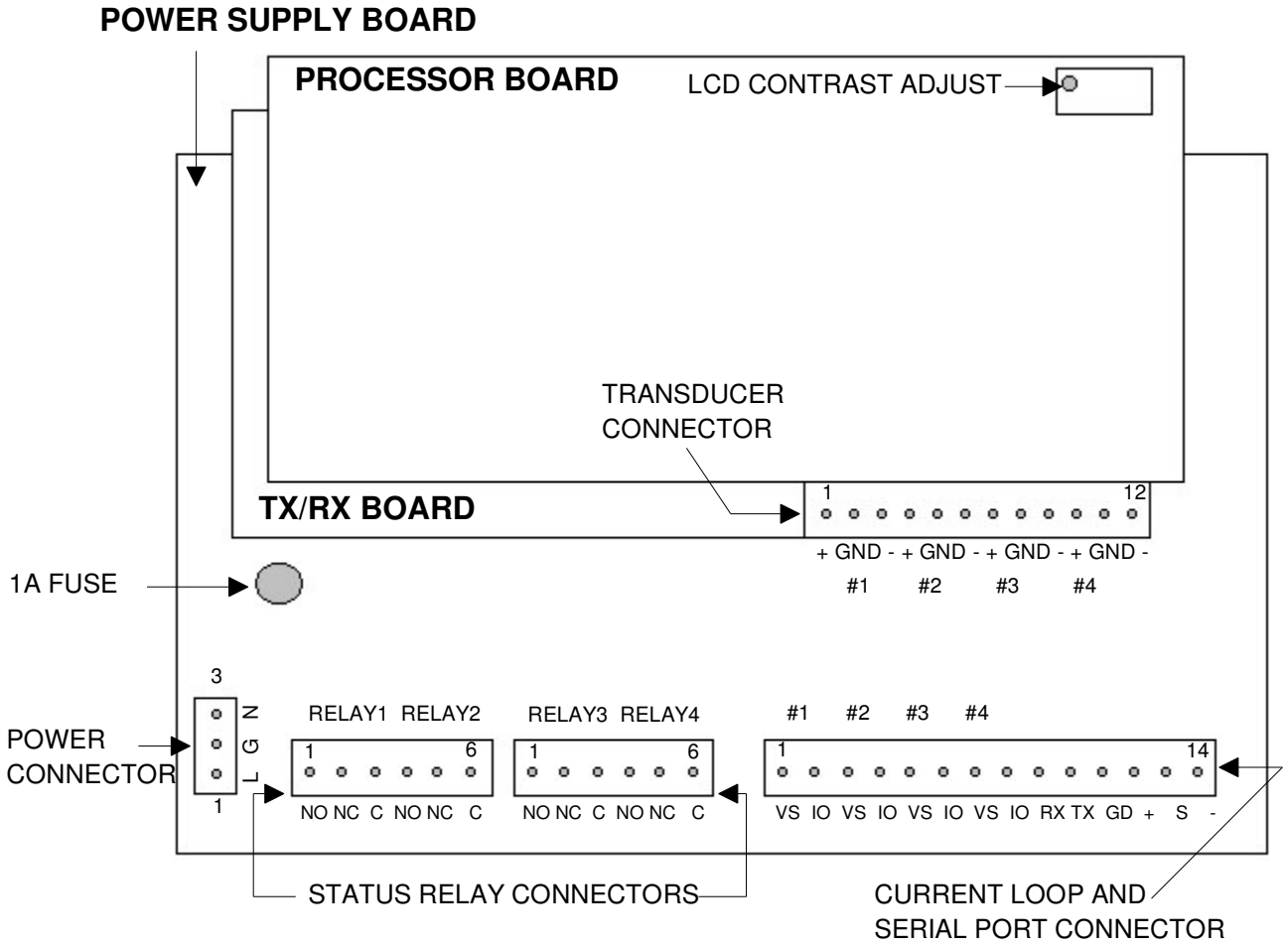
Power line noise and interference is filtered by an in-line EMI filter. The filter has CSA, UL and VDE approvals.

6.2 TRANSDUCER WIRING

Twenty (20) feet of transducer telemetry cable is supplied with the unit. Belden 9463 Twin Ax shielded cable or equal should be used for additional wiring between the element and the processor if required. The transducer may be located up to 1500 ft. from the processor.

CAUTION
Take care not to damage the jacket of the telemetry cable upon installation so as to avoid water ingress into the transducer.

6.3 CUSTOMER CONNECTIONS



6.3.1 TRANSDUCERS

The system will accept up to four (4) transducers. Transducer connections are made to a 12 position PHOENIX type connector.

The standard transducer is designed with a 3/4" NPT female thread housing to provide for simple attachment to user supplied conduit.

Locate the transducer in the process liquor, typically near the top of the tank and directed perpendicular to the sediment that is to be measured.

The transducer must be completely submerged for proper operation. Avoid locating the transducer within eighteen (18) inches of the perimeter of the tank or directly above internal tank equipment to prevent undesired interference with the path of the acoustic signal. Temporary interference from passing tank equipment (i.e. submerged rakes) is dampened by the Unit and typically does not adversely affect measurements.

Secure conduit to a walkway handrail or other tank structure. NOTE: Use of a hinged swing bracket assembly and transducer shield is required in situations where a surface skimmer or other moving equipment comes in contact with the transducer.

TRANSDUCER CONNECTIONS-

TRANSDUCER CONNECTION TABLE

PIN #	PIN NAME	DESCRIPTION
1	XDCR1POS	Connect to transducer positive (clear jacket)
2	GND	Connect to shield
3	XDCR1NEG	Connect to transducer negative (blue jacket)
4	XDCR2POS	Connect to transducer positive (clear jacket)
5	GND	Connect to shield
6	XDCR2NEG	Connect to transducer negative (blue jacket)
7	XDCR3POS	Connect to transducer positive (clear jacket)
8	GND	Connect to shield
9	XDCR3NEG	Connect to transducer negative (blue jacket)
10	XDCR4POS	Connect to transducer positive (clear jacket)
11	GND	Connect to shield
12	XDCR4NEG	Connect to transducer negative (clear jacket)

NOTE: Reverse connection of the transducer Positive and Negative wires with Auto Clean Wiper Transducer will result in permanent damage to the transducer wiper motor.

Belden 9463 Twin-Ax cable (or equal) is required for use where additional telemetry cable is required.

Never install transducer cable in the same conduit or bundle that carries power wiring, relay coil drives, relay contact leads or other high level voltages or currents.

If possible, avoid mounting the processor or transducer cabling next to high voltage sources such as breakers, fuse block, or terminal strips. Also avoid magnetic field sources such as large transformers, motor control relays, motors and specifically variable frequency drives which can generate large amounts of harmonic noise.

6.3.2 POWER CONNECTIONS

Power connections are made to a three position Phoenix type connector.

POWER CONNECTION TABLE (JP5)

PIN #	PIN NAME	DESCRIPTION
1	L/L1	LINE
2	G	GROUND
3	N/L2	NEUTRAL

6.3.3 STATUS RELAY ACTUATORS

The system is equipped with 4 status relay devices. These are arranged in two pairs. Connections are made with two 6 position PHOENIX type connectors.

Relay ratings are:

Nominal switching capacity 10 A @ 250V AC
10 A @ 30 V DC

RELAY BANK 1 CONNECTION TABLE (JP3)

PIN #	PIN NAME	
1	RELAY 1	NORMALLY OPEN
2	RELAY 1	NORMALLY CLOSED
3	RELAY 1	COMMON
4	RELAY 2	NORMALLY OPEN
5	RELAY 2	NORMALLY CLOSED
6	RELAY 2	COMMON

RELAY BANK 2 CONNECTION TABLE (JP7)

PIN #	PIN NAME
1	RELAY 3 NORMALLY OPEN
2	RELAY 3 NORMALLY CLOSED
3	RELAY 3 COMMON
4	RELAY 4 NORMALLY OPEN
5	RELAY 4 NORMALLY CLOSED
6	RELAY 4 COMMON

6.3.4 CURRENT LOOP OUTPUTS AND SERIAL PORTS

6.3.4.1 Current Loops

The system is equipped with four Isolated 4-20 mA current loops capable of operating into a load impedance of 250Ω, one current loop being assigned for each of the four transducers. If the recording or monitoring device is not designed for this impedance, the 4-20mA output signal may be adversely affected.

Connections are made to a 14 position PHOENIX type connector, which also has connections for an Isolated RS485, and a Non Isolated RS232.

Reverse polarity protection is provided.

Supply Voltage: The current loops are internally powered.

6.3.4.2 Isolated RS485

For applications where an RS485 interface is available, multiple units can be connected to the multidrop RS485.

Isolation: The RS485 isolation will withstand 1600Vrms for 1 minute, or 2000Vrms for 1 second.
Transient and overvoltage protection: The RS485 system has transient protection, by very fast voltage limiting, and continued overvoltage protection is provided by PTC Thermistors with UL approval.

6.3.4.3 RS232

The RS232 is intended for applications where there are short connections between the BinMinder and the computer. There is no isolation and no transient protection.

CAUTION
Do not use the RS232 in environments where there is a possibility of large voltage transients. To avoid this, the RS232 wires should be placed in a grounded conduit (see harmonic noise discussion in Section 4.3.1.).

6.3.4.4 Current Loop, RS485, RS232 Connection Table (JP2)

PIN #	PIN NAME	DESCRIPTION
1	LOOP1 VS	4-20mA Current loop - Positive
2	LOOP1 IO	Loop current - Negative
3	LOOP2 VS	4-20mA Current loop - Positive
4	LOOP2 IO	Loop current - Negative
5	LOOP3 VS	4-20mA Current loop - Positive
6	LOOP3 IO	Loop current - Negative
7	LOOP4 VS	4-20mA Current loop - Positive
8	LOOP4 IO	Loop current - Negative
9	RS232 RX	RS232 Receive
10	RS232 TX	RS232 Transmit
11	RS232 GND	RS232 Ground (non isolated)
12	RS485 +	RS485 Positive
13	RS485 S	RS485 Shield
14	RS485 -	RS485 Negative

6.3.5 GENERAL CONNECTION RECOMMENDATIONS

Wires should be stripped to a length of 0.25".

Recommended terminal screw fastening torque is 7 in-lbs.

Recommended wire size range: AWG #12 stranded or AWG 14-26 stranded and solid. Cables should be run in a dedicated grounded metal conduit with no other cables.

7. DISPLAY LAYOUT

The front panel consists of four (4) membrane keys and an LCD display.

7.1 GRAPHIC DISPLAY TYPE

The graphic display can be used to display one of three (3) different informational screens, or allows the user to configure the system by use of the menu system. Upon system power-up, the unit will default to the Digital Display.

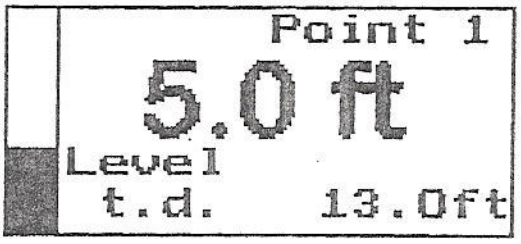
All three display modes can be accessed by depressing the UP or DOWN membrane key.

If more than one transducer is utilized with a single processor, the selected display screen will automatically toggle from point to point (Point 1, Point 2, etc.) alternating at the rate of the Dwell setting which is assigned in Setup.

The following is a description of each of the System Informational Screens:

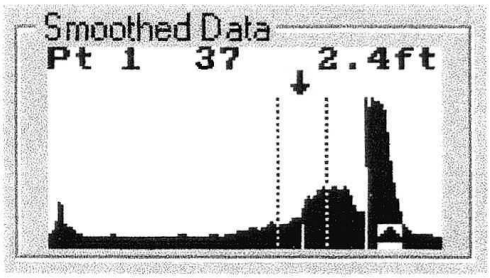
7.1.1 DIGITAL DISPLAY

This display shows the distance in units (ft, m, etc.) from either the transducer location to the material interface (RANGE) or from the bottom of the vessel to the material interface (LEVEL).



7.1.2 DATA DISPLAY

This display graphically illustrates the returned signal strength as a function of range. This is a very useful mode of display when the unit is first installed since it allows the user to visualize the distribution of material in the vessel. It is also very useful to return to this display mode after making any acoustic adjustments in the System Setup Menu.



7.1.2.1 DATA SCREEN SYMBOLS

The following symbols are displayed on the Data Screen:

↓ The down arrow indicates the current tracking position based on operator selected tracking parameters (see Algorithm and Threshold). This tracking position represents the identified interface and corresponds with the value of all system outputs of Range or Level data.

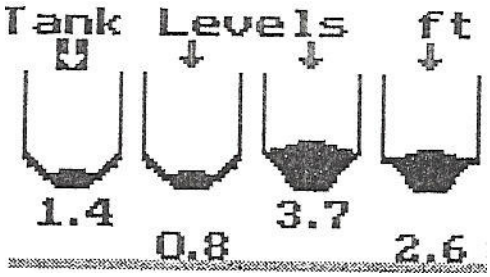
!! The double exclamation mark indicates that the current signal is insufficient for normal tracking purposes. This symbol will appear when the transducer is removed from the process liquor, as in the case of a surface skimmer making contact with a transducer mounted to a swing bracket assembly.

← The left arrow indicates that a Candidate that meets the tracking parameters has been located to the left of the current gate position. The tracker will move to that Candidate only if it persists in that location for a substantial period of time.

→ The right arrow indicates that a Candidate that meets the tracking parameters has been located to the right of the current gate position. The tracker will move to that Candidate only if it persists in that location for a substantial period of time.

7.1.3 VESSEL OVERVIEW DISPLAY

The Overview Display depicts from one to four vessels in general overview format, displaying the material level in each. The number of vessels shown on this display corresponds to the number of transducers (Points) as configured in System Setup. The numbers displayed about each vessel indicate the distance in units (ft, m, etc.) from either the transducer location to the material interface (RANGE) or the bottom of the vessel to the material interface (LEVEL).



8. INSTRUMENT PROGRAMMING

Instrument programming can be accomplished in the field or on the bench.

The following section describes navigation through the menu system and select program parameters.

8.1 FRONT PANEL KEYPAD

The unit front control panel contains four (4) membrane buttons or (keys) and a LCD display. These features allow the user to program the unit by "navigating" through the menu system to select appropriate settings.

The buttons and their basic functions are:

UP: *used to scroll through menu items* and/or to increase the numerical value of a system parameter.

DOWN: *used to scroll through menu items* and/or decrease the numerical value of a system parameter.

NEXT: *used to enter and advance from one Menu level to the next* in the menu system. NOTE: Depressing the NEXT button while at a parameter level will cause the unit to return to the previous menu level and will not save a change in the parameter value.

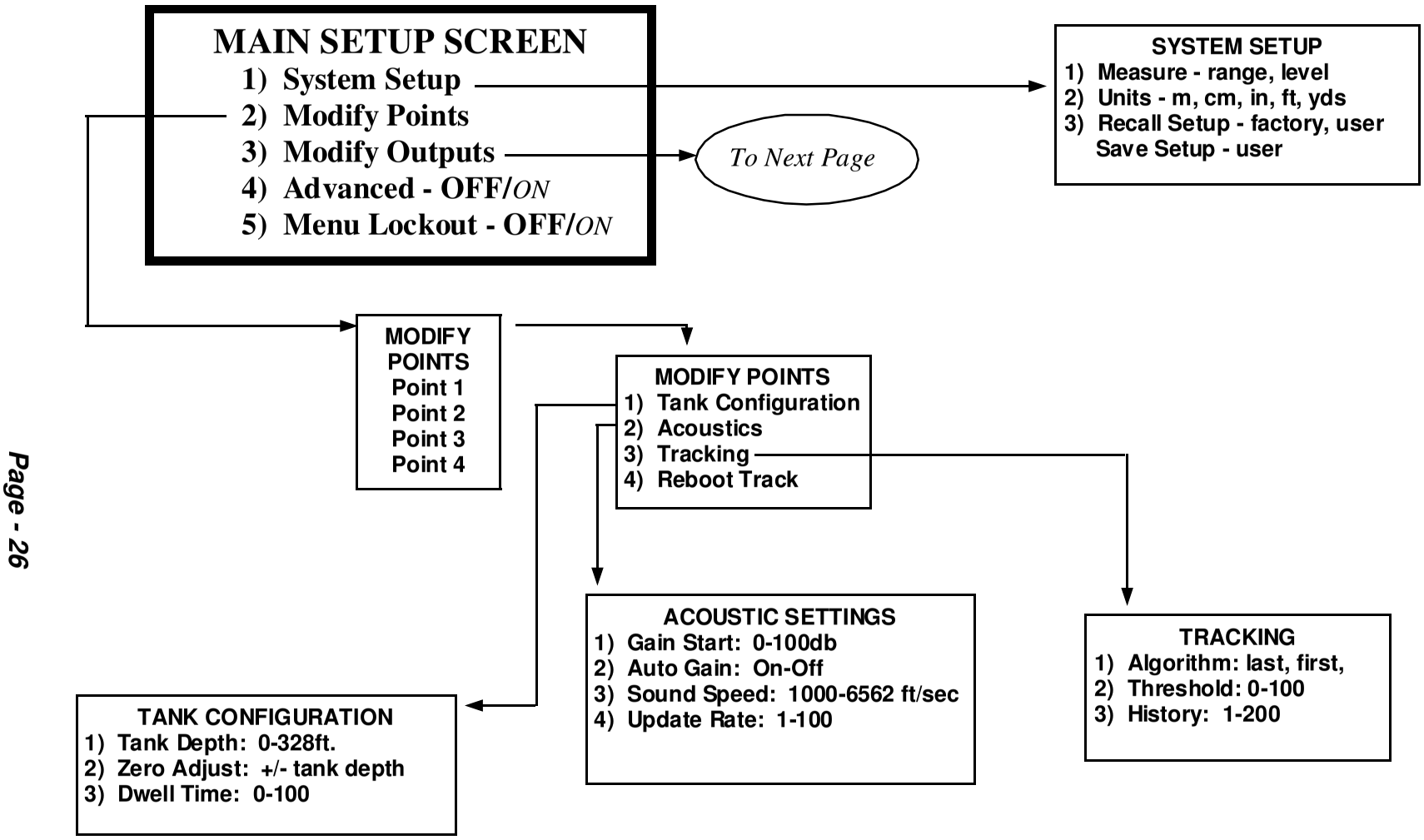
ENTER: *used to confirm or save parameter settings*, return to the previous menu level and/or "back out" of the menu system.

8.2 MENU ORGANIZATION AND NAVIGATION

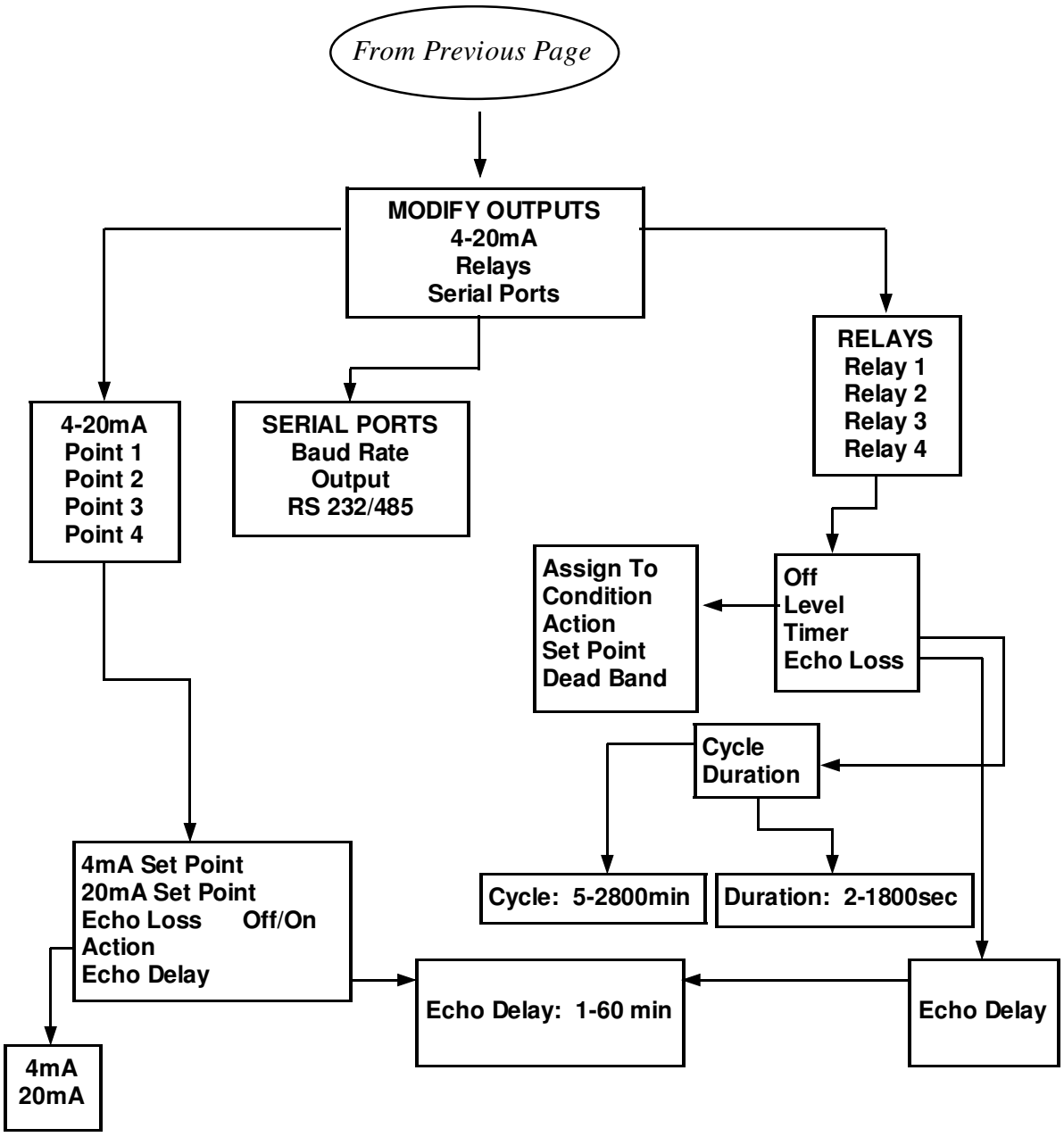
The menu system may be displayed with Advanced Settings OFF or ON. With Advanced Settings OFF, the user has access to the primary system parameters that are required for normal setup and operation. With Advanced Settings ON (discussed in the BinMinder Advanced Troubleshooting Manual), the complete menu system is displayed and the user may modify all parameters.

When the unit is initially powered, the system defaults to settings that were established at the factory and Advanced Settings are OFF. If new settings are input by the user, the changes are stored in non-volatile memory. In the event of power loss, the user configured program will be retained as default.

If the user enters the Menu System and does not initiate a keystroke (depress a key) for two (2) minutes, the system will abort back to the Data Display.


MAIN SETUP SCREEN
1) System Setup
2) Modify Points
3) Modify Outputs
4) Advanced - OFF/ON
5) Menu Lockout - OFF/ON
To Next Page
SYSTEM SETUP
1) Measure - range, level
2) Units - m, cm, in, ft, yds
3) Recall Setup - factory, user
Save Setup - user
MODIFY POINTS
Point 1
Point 2
Point 3
Point 4
MODIFY POINTS
1) Tank Configuration
2) Acoustics
3) Tracking
4) Reboot Track
ACOUSTIC SETTINGS
1) Gain Start: 0-100db
2) Auto Gain: On-Off
3) Sound Speed: 1000-6562 ft/sec
4) Update Rate: 1-100
TRACKING
1) Algorithm: last, first,
2) Threshold: 0-100
3) History: 1-200
TANK CONFIGURATION
1) Tank Depth: 0-328ft.
2) Zero Adjust: +/- tank depth
3) Dwell Time: 0-100

menu134a


From Previous Page
MODIFY OUTPUTS
4-20mA
Relays
Serial Ports
4-20mA
Point 1
Point 2
Point 3
Point 4
SERIAL PORTS
Baud Rate
Output
RS 232/485
RELAYS
Relay 1
Relay 2
Relay 3
Relay 4
Assign To
Condition
Action
Set Point
Dead Band
Off
Level
Timer
Echo Loss
Cycle
Duration
4mA Set Point
20mA Set Point
Echo Loss Off/On
Action
Echo Delay
Cycle: 5-2800min
Duration: 2-1800sec
Echo Delay: 1-60 min
Echo Delay
4mA
20mA

8.2.1 Entering The Menu System

To enter the menu system, depress the NEXT button. This allows user access to the menu windows. Note: While the menu system is accessed, data collection is basically "on hold" and the unit continues to output the last signal processed.

8.2.2 Scrolling Within A Menu Window

Depress the UP or Down buttons to scroll the desired option or parameter into the highlighted (reverse video) box.

8.2.3 Advancing To a Menu Window

Depress the NEXT button to advance to the next menu window.

8.2.4 Changing a Parameter

Once the user has navigated to the desired menu window and scrolled the desired parameter into the highlighted box, depress ENTER to save the setting and return to the preceding menu level.

8.2.5 Backing Up In and/or Exiting the Menu System

You may back up in the menu system by depressing the ENTER button. To exit the menu system, press ENTER repeatedly.

8.2.6 Activating the Menu Lockout

The user can enable a lockout allowing only personnel who know the user-selected password to enter the menu system. To enable, enter the menu system, highlight the Menu Lockout option and press NEXT. Then scroll to ON and press ENTER. The user is then prompted to set a password using a three position graphic.

Using the UP or DOWN key, scroll to a desired symbol and press ENTER. The system will automatically advance the highlight to the second graphic. Use the UP or DOWN key to scroll to the desired symbol and press ENTER. Repeat to select the third symbol. **Note: If the Menu Lockout is enabled, it is extremely important that you do not forget your password for menu access. This Password may only be overridden by re-cycling power to the unit while depressing the ENTER key. System parameters will revert to Factory Settings, therefore, application specific parameters must be re-entered manually.**

8.3 MENU OPTIONS / PARAMETERS

8.3.1 System Setup

8.3.1.1 Measure

Establishes whether the unit will report the Level of material as measured from the bottom of the vessel, or the Range (distance) to the material as

measured from the top of the vessel. NOTE: Precise Tank Depth and Zero Adjust parameters must be established for accurate Level calculation.

The options for Measure are: Range, Level

8.3.1.2 Units

This parameter establishes the desired units of measure for system displays and outputs.

Once established, the selected Unit applies uniformly throughout all system settings, displays and outputs. The established Unit applies globally for all transducers.

The options for Units are: ft, in, m, cm

Select and enter the desired units of measure based on user preference.

8.3.1.3 Recall/Save Setup

This feature allows the user to recall the Factory Preset and save and recall user established setup configuration.

The options for Recall Setup are: Factory Preset, User

Press ENTER after highlighting the desired setup to reactivate previously established settings.

The options for Save Setup are: User

Press ENTER after highlighting User to Save the established system settings.

NOTE: Factory settings are standard presets in all units regardless of the intended application of the unit. Current settings more appropriate for the specific intended use may have been established at the Factory prior to shipment and saved under USER.

8.3.2 Modify Points

This menu section provides access to individual Points (transducers) to establish parameters that are unique to each Point. Upon entry into the Modify Points menu, a list of previously defined points will be displayed.

Scroll to the desired Point and press NEXT to proceed.

8.3.2.1 Tank Configuration

Tank Configuration settings are the parameters that relate to the physical

characteristics of the vessel, the location of the transducer and the measurement range requirements.

8.3.2.1.1 Tank Depth

The defaulted value for Tank Depth is 12.0 ft., however, it can be adjusted from 0 to 328 ft.

Tank Depth is used in conjunction with Zero Adjust (location of the transducer) to calculate Level measurements. The Unit uses these values to determine its position relative to the bottom of the tank. Accurate Tank Depth and Zero Adjust values must be entered for accurate Level calculations.

Tank Depth and Zero Adjust must be measured from the same reference point (Generally: the top of the tank).

8.3.2.1.2 Zero Adjust

The range for Zero Adjust is: + entered Tank Depth to - entered Tank Depth.

Defaulting to 0.5 ft., Zero Adjust establishes the location of the transducer (sensor) in relation to the top of the vessel. A positive value indicates that the transducer is located that distance below the top of the tank (top of tank is often, but not always defined by the liquid level).

8.3.2.1.3 Dwell Time

The range for Dwell Time is: 0 - 100

Dwell Time establishes the number of data Updates that are processed and displayed for a particular Point (transducer) before automatically progressing to the next Point.

The actual amount of time spent at a position is determined by Dwell Time in combination with the Update Rate setting. With Update Rate and Dwell Time each set to 1, the Unit will dwell at the Point for approximately two seconds. With Update Rate set to 2 and Dwell time set to 5, for example, the Unit will operate at the Point for approximately 20 seconds (since each update represents two seconds in time).

Setting Dwell Time to zero for a particular Point will cause the unit to bypass that Point.

NOTE: System outputs continue to report last measured Range/Level data while other Points are being updated.

8.3.2.2 Acoustics

Acoustic settings are the parameters that affect the strength and other characteristics of the return echo signal.

8.3.2.2.1 Gain Start

The range for Gain Start is: 0 - 100 dB

GAIN amplifies the return signal. GAIN START establishes the specific operating GAIN when AUTO GAIN is set to OFF. With AUTO GAIN set to ON, GAIN START limits the operating GAIN to START GAIN +/- a gain band.

With Auto Gain ON, the Gain Start parameter is set automatically during Initialization in response to the process conditions.

The optimal operating gain level will vary with differing process conditions, but in most instances will generally operate in the range of 30 to 60.

8.3.2.2.2 Auto Gain

The options for Auto Gain are: On, Off

Auto Gain allows the Unit to automatically raise and lower the operating gain level in response to the demands of the operating environment.

8.3.2.2.3 Sound Speed

The range for Sound Speed is: 1000 - 6562 ft/sec

Sound Speed is used to calibrate the unit for the requirements of a specific application. The speed of sound varies with temperature and physical characteristics of liquors. Sound Speed may be adjusted to calibrate the unit based on a known interface or object (i.e. bottom of the tank). Increase Sound Speed to lower the Unit's measurement Range value. Decrease Sound Speed to increase the measurement Range value.

8.3.2.2.4 Update Rate

The range for Update Rate is 1 to 100.

Update Rate determines the amount of acoustic signal data that is

collected and averaged prior to updating the Displays and measurement outputs. An Update Rate of 1 refreshes the measurement approximately every two seconds. An Update Rate of 2 refreshes every four seconds, and so on.

8.3.2.3 Tracking

Tracking settings are the parameters that establish the ability to locate and track the desired interface.

8.3.2.3.1 Algorithm

The options for Algorithm are:

First, Last

The operator selected Algorithm establishes the desired tracking logic for a particular application. It also determines the specific interface that the operator wants to track when multiple tracking Candidates are present. **NOTE: In many situations, signal return echo from the bottom of the tank is present and represents a potential tracking Candidate.**

First Algorithm - First Algorithm causes the Unit to track the Candidate (interface) nearest to the transducer.

Last Algorithm - Last Algorithm causes the Unit to track the Candidate (interface) that is most distant to the transducer.

Note: The unit will not track to a Candidate in the Wall Zone (i.e. tank bottom) when another interface is present.

8.3.2.3.2 Threshold

The range for Threshold is: 0 to 100

Threshold establishes the minimum return signal required (at a particular Candidate location) in order for a Candidate to be considered for tracking. Threshold operates in conjunction with the selected Algorithm to track to the desired interface location.

8.3.2.3.3 History

The range for History is: 1 to 200

History establishes a filter relative to the number of signal updates that are averaged to establish the location of the tracking point. A History of 1 causes

the Unit to update the tracking point based on a single Update. A History of 5 causes the Unit to update the tracking point based on a rolling average of the last five Updates.

This filter allows the user to take into account the normal rate of change in the particular application and eliminate the possibility of tracking to transient and spurious signal.

8.3.2.4 Reboot Track

This function initializes the tracking and Auto Gain routines and causes the Unit to begin the process of searching for interface Candidates. Data supplied to all system outputs is affected.

To reboot the tracker, depress ENTER while REBOOT TRACK is highlighted.

As discussed in section 4.4.2, when the user forces a Reboot Track, the start-up routine is invoked for a two-minute initializing period. This message will no longer be displayed after completion of the initializing routine.

8.3.3. Modify Outputs

8.3.3.1 4-20mA

8.3.3.1.1 4mA Set Point

The Set Point range for 4mA output is: 0.0 to 110% of Tank Depth.

The 4mA Set Point is the set point at which the system will output 4mA on the Isolated Current Loop.

In the case that Level is the selected Measure, the 4mA setting should be the level (usually near the bottom of the vessel) at which you want the system to output 4mA on the Isolated Current Loop. A valid Tank Depth must be entered in the Modify Points Menu and the Set Point must be between Min Range and Max Range.

In the case that Range is the selected Measure, the 4mA setting should be the level (usually near the transducer) at which you want the system to output 4mA on the Isolated Current Loop.

8.3.3.1.2 20 mA Set Point

The Set Point range for 20mA output is: 0.0 to 110% of Tank Depth.
The 20mA Set Point is the set point at which the system will output 20mA on the Isolated Current Loop.

In the case that Level is the selected Measure, the 20mA setting should be the level (usually near the transducer) at which you want the system to output 20mA on the Isolated Current Loop.

In the case that Range is the selected Measure, the 20mA setting should be the level (usually near the bottom of the vessel) at which you want the system to output 20mA on the Isolated Current Loop.

8.3.3.1.3 Echo Loss

A 4-20mA output may be assigned the additional function of alarming loss of echo. With the Echo Loss function turned ON, the unit will output the mA current as determined by the user selected Action parameter during periods of Echo Loss.

8.3.3.1.3.1 Action

The range for Action is: 4mA or 20mA

8.3.3.1.3.2 Echo Delay

The range for Echo Delay is: 1 to 60 minutes

The Echo Delay parameter establishes the amount of time that must elapse after loss of echo for the 4-20mA to output the selected Action (4mA or 20mA).

NOTE: The Echo Delay parameter is applied to both 4-20mA Echo Loss and Relay Echo Loss functions and cannot be assigned different values when a Relay and a 4-20mA output are used in conjunction with the same measurement point (See 8.3.3.2.4 Echo Loss).

8.3.3.2 Relays

There are four (4) on-off status relays installed in the BinMinder 9300. Each of these relays may be in one of the following states: OFF, LEVEL, TIMER, or ECHO LOSS.

8.3.3.2.1 Off

Any relay in this state is disabled.

8.3.3.2.2 Level

Any relay in this state may be assigned to any of the Points (or transducers), or all relays may be assigned to one Point if so desired.

8.3.3.2.2.1 Assign To

The options for Assign To are: 1,2,3,4

This parameter is used to assign relays to a particular point or transducer. If you wish to assign one (1) relay to a transducer, Enter 1. If you wish to assign three (3) relays to a particular transducer, Enter 3.

8.3.3.2.2.2 Condition

The options for Condition are:

<= "Less than or equal to"

>= "Greater than or equal to"

8.3.3.2.2.3 Action

The options for Action are: Open, Close

Use this parameter to cause the relay to Open or Close when a particular Condition is met.

8.3.3.2.2.4 Set Point

The range for Set Point is: 0 to 328 ft.

The Set Point is the Range/Level at which the relay will determine if the Condition has been met and then it will perform the Action.

8.3.3.2.2.5 Dead Band

Dead Band causes the unit to hold the activated relay "Action" (i.e. Open, Close) until the measured Level or Range changes by the Dead Band value.

8.3.3.2.3 Timer

Any relay in this state is governed by a timer. This timer has a Cycle and a Duration. If, for example, a relay is set to Timer and has a cycle of 120 minutes and a duration of 10 seconds, then once every two hours (120 minutes) the relay is energized for 10 seconds.

8.3.3.2.3.1 Cycle

The range for Cycle is: 5 to 2880 minutes (5 minutes to 2 days)

Use this parameter to determine the length of time between enabling the relay.

8.3.3.2.3.2 Duration

The range for Duration is: 2 to 1800 seconds (2 seconds to 30 minutes)

Use this parameter to determine the length of time the relay is to be enabled.

8.3.3.2.4 Echo Loss

A relay in this state is assigned for the purpose of alarming loss of echo. A relay assigned to this function is automatically associated with the corresponding measurement point (i.e. Relays 1, 2, 3, 4 are associated with measurement Points 1, 2, 3, 4, respectively).

8.3.3.2.4.1 Echo Delay

The range for Delay is: 1 to 60 minutes

The Echo Delay parameter establishes the amount of time that must elapse after loss of echo before the relay will be energized.

NOTE: The Echo Delay parameter is applied to both the Relay and the 4-20mA Echo Loss functions and cannot be assigned different values when a Relay and a 4-20mA output are used in conjunction with the same measurement Point (See 6.3.3.1.3 Echo Loss).

8.3.3.3 Serial Port

Serial Port settings provide RS232 serial port communication compatibility with a variety of input devices and activate data output to the serial port. Serial Port settings apply globally for all transducers.

The options for Serial Port are: Baud Rate, Parity, Transmit, Output

8.3.3.3.1 Baud Rate

The options for Baud Rate are: 1200, 2400, 4800, 9600, 19200, with the standard rates.

Set for compatibility with the requirements of the anticipated input device.

8.3.3.3.2 Output

The options for Output are: ASCII, WinBin

Choose the appropriate type to configure the serial string for communication with the expected input device.

9. MAINTENANCE

PREVENTATIVE MAINTENANCE

It is recommended that the Transducer face be inspected and cleaned at regular three (3) month intervals to prevent buildup of material on the face. When the buildup of material becomes too great, it can adversely affect performance.

If you find that cleaning must take place on a very frequent basis (daily / weekly) or cleaning is more frequent than desired, self-cleaning transducers with wipers are available. Please contact Entech Design at 940-898-1173 for details.

As a general practice, visually inspect the analyzer monthly during normal clarifier “walk downs”, to determine that there are no obvious signs of damage to the equipment and that mounting brackets and hardware are secure. Tighten mounting bolts as may be required.

Observe the transducer to assure that it is fully submerged below the surface of the water and that there are no rags or similar debris wrapped around it. Clear rags and debris from the transducer with an extension brush or by flushing with water.

If your clarifier employees a surface skimmer, watch skimmer flights as they pass the location of the transducer to assure that the flights contact the transducer shield-rod allowing it to flex freely and rotate the transducer out of the path of the flights.

10. WARRANTY

ONE YEAR PRODUCT WARRANTY

Entech Design, Inc. products will be replaced, put in good operating condition, or the purchase price refunded, at the option of Entech Design, Inc., free of charges except transportation, if defective in their manufacture, labeling, packaging, or shipping, and if notice of said defect is received by Entech Design, Inc. within one year from the date of shipment. The cost of such replacement, repair or refund of purchase price shall be the exclusive remedy for any breach of warranty, and Entech Design, Inc. shall not be liable to any person for consequential damages or injury or commercial loss resulting from any breach of warranty of fitness for a particular purpose, and makes no other warranty, express or implied, including implied warranty arising from course of dealing or usage of trade.

Warranty of Auto Clean Wiper Transducer, Part No. 9306-54 is void if the wiper blade is rotated by hand.

11. MANUAL ADDENDUM

11.1 Auto Clean Wiper Transducer (Part No. 9306-54)

11.1.1 Application

This transducer is recommended for use in applications in which there is the presence of gas bubbles in the process liquid that may collect on the face of the transducer. It is also recommended for any application in which scum, slime or other solids may form on the face of the transducer and require mechanical cleaning.

It is specifically recommended for use in water and wastewater treatment clarifiers and thickeners that do not have surface skimming equipment that provides the periodic cleaning effect of rotating the transducer out of the tank and splashing it back into the tank as the skimmer arm passes the location of the transducer. Use with Transducer Swing Arm Assembly.

11.1.2 Principle of Operation

The Auto Clean Wiper Transducer is powered by a 12VDC motor located in the transducer housing. Power to the motor is supplied from the BinMinder 9300 processor via the three-wire transducer signal cable that also provides AC power to the transducer sensor. Transducer pulse and return echo signals are not affected by the DC motor power that is superimposed on the cable.

An integrated circuit also located in the transducer housing controls the wiper timing and operation sequence. The wiper rotates four revolutions during six seconds of operation every 15 minutes. Transducers with other timing sequences are available as options.

11.1.3 Installation

The transducer is designed with a ¾" NPT female thread connection to provide simple attachment to a user supplied conduit. This connection is a direct replacement for the standard 9306-49 transducer.

Mounting location, potential sources of interference, and other factors that should be taken into account when installing the transducer are described in Section 4.2 of the BinMinder 9300 Operation and Installation Manual for the standard transducer. If installed using Transducer Swing Arm Assembly, ensure that the transducer wiper blade does not come in contact with surface skimmer equipment.

11.1.4 Transducer Connections

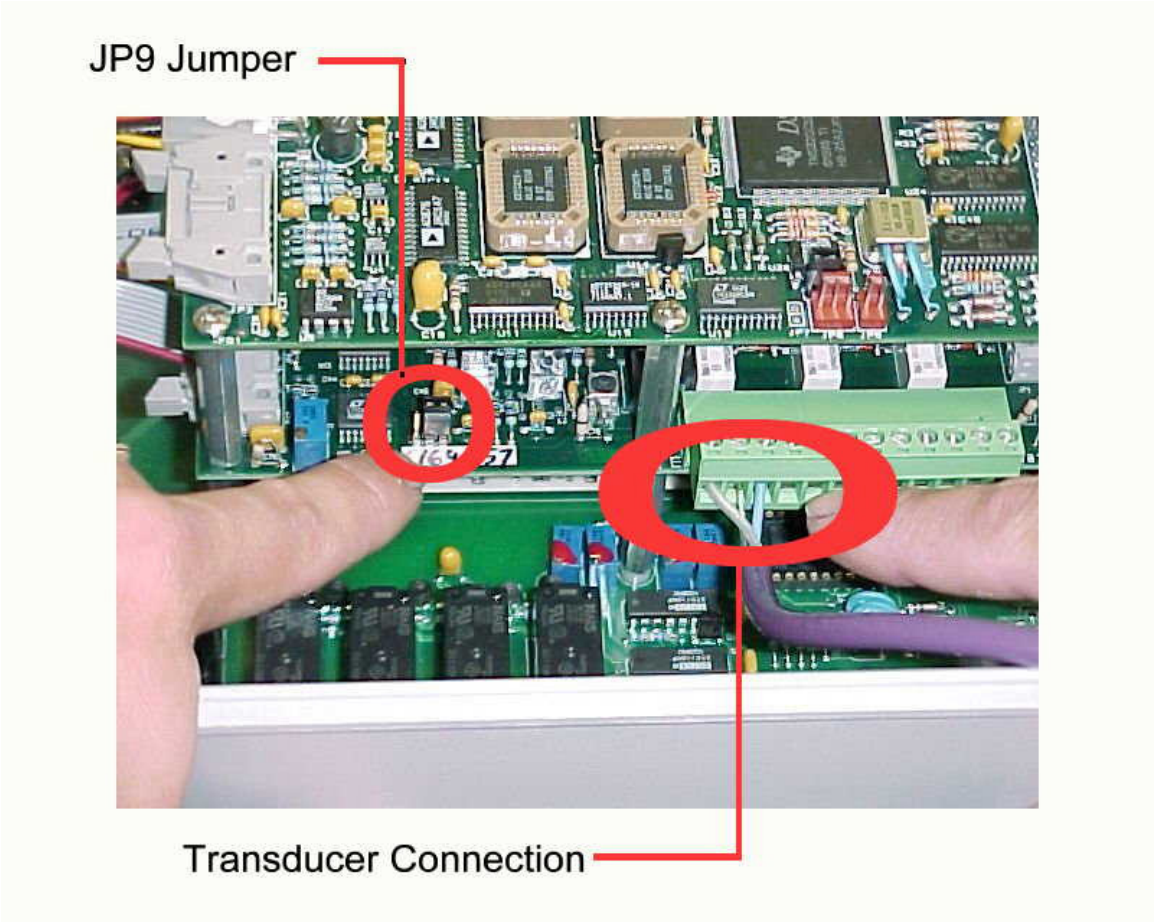
11.1.4.1 TRANSDUCER CONNECTIONS

TRANSDUCER CONNECTION TABLE

PIN #	PIN NAME	DESCRIPTION
1	XDCR1POS	Connect to transducer positive (clear jacket)
2	GND	Connect to shield
3	XDCR1NEG	Connect to transducer negative (blue jacket)
4	XDCR2POS	Connect to transducer positive (clear jacket)
5	GND	Connect to shield
6	XDCR2NEG	Connect to transducer negative (blue jacket)
7	XDCR3POS	Connect to transducer positive (clear jacket)
8	GND	Connect to shield
9	XDCR3NEG	Connect to transducer negative (blue jacket)
10	XDCR4POS	Connect to transducer positive (clear jacket)
11	GND	Connect to shield
12	XDCR4NEG	Connect to transducer negative (blue jacket)

11.1.4.2 JP9 Wiper Motor Power Activation Jumper

The wiper motor and circuitry is powered from the TX/RX board by way of the standard 12 pin PHOENIX type connector. As of February 2002, TX/RX boards are equipped with a wiper activation jumper (JP9) located on the front edge of the circuit board as illustrated below:

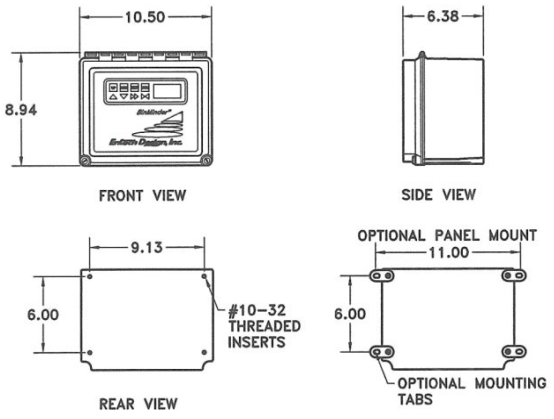


The JP9 Jumper must be attached to the center and right pin position for wiper motor operation. If the TX/RX board does not have a JP9 Jumper, contact Entech Design, Inc. for assistance.

IMPORTANT WARRANTY NOTICE: The one year material and workmanship Warranty is void if the wiper blade is rotated by hand. This is detrimental to the motor gear drive and will damage the unit.

Do Not Attempt to Rotate Wiper by Hand!!
This will void equipment warranty!!

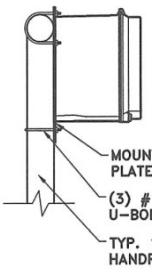
PROCESSOR MOUNTING



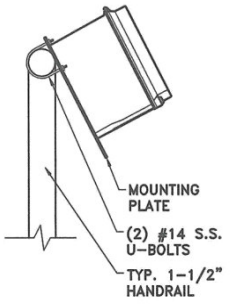
PROCESSOR INSTALLATION NOTES:

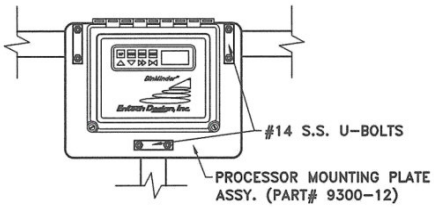
1. ALLOW MINIMUM 9.5" CLEARANCE ABOVE PROCESSOR AND 7.5" FROM FRONT OF PROCESSOR FOR DOOR SWING.
2. NEMA 4X MOLDED POLYESTER FIBERGLASS ENCLOSURE MOUNTED ON PROCESSOR MOUNTING PLATE.
3. MOUNTING TABS AVAILABLE FOR WALL OR PANEL MOUNT.
4. APPROXIMATE WEIGHT: 8.0 lbs.

STD. MOUNTING

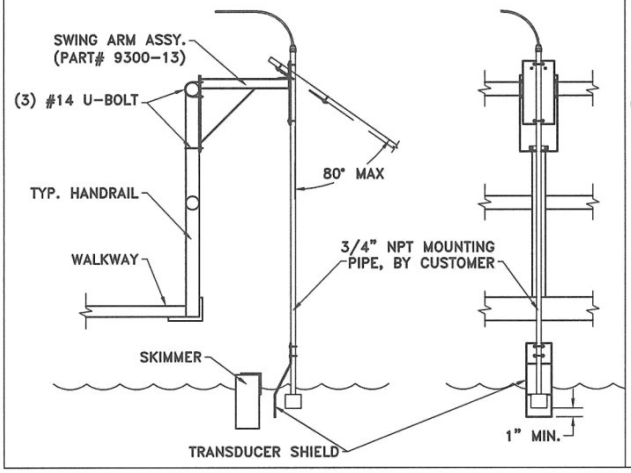


OPT. MOUNTING

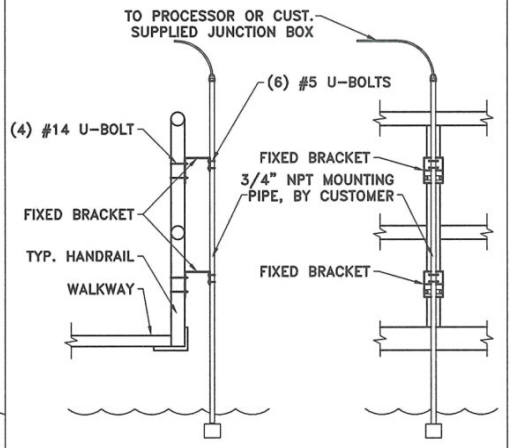




TRANSDUCER SWING ARM MOUNT



TRANSDUCER STATIONARY MOUNT



TRANSDUCER INSTALLATION NOTES:

1. POSITION SWING BRACKET FOR SWING DIRECTION AWAY FROM ROTATING SURFACE SKIMMER.
2. POSITION TRANSDUCER SO THAT IT IS FULLY UNDERWATER (TYPICAL 6" BELOW SURFACE).
3. BOLT TRANSDUCER SHIELD TO CUSTOMER SUPPLIED METAL CONDUIT. END OF TRANSDUCER SHIELD SHOULD EXTEND 1" BEYOND TRANSDUCER AS SHOWN. ROTATE SHIELD SO THAT IT IS CONTACTED SQUARELY BY SURFACE SKIMMER AND CONNECTING U-BOLTS DO NOT HANG ON ROTATING EQUIPMENT.
4. USE EXTENSION CHANNEL (PART NO. 9300-13-09) TO EXTEND TRANSDUCERS AWAY FROM FIXED OBJECTS LOCATED BELOW (EX. CHAIN AND FLIGHT SKIMMER EQUIPMENT). CONNECT HINGE-PLATE FOR LEFT OR RIGHT SWING AS REQUIRED.

	Entech Design, Inc. 315 S. Locust Denton, TX 76201	
	SCALE: N/A	DRAWN BY: TODD McCLENDON
	DATE: 3-28-03	
	PROCESSOR AND TRANSDUCER MOUNTING ARRANGEMENT	
REVISIONS	BINMINDER 9300	DRAWING NO.