GE
Sensing & Inspection Technologies

Flow

AquaTrans™ UTX878
Liquid Flow Ultrasonic Transmitter
User's Manual

imagination at work

910-253 Rev. D1
December 2009

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Information Paragraphs

- **Note** paragraphs provide information that provides a deeper understanding of the situation, but is not essential to the proper completion of the instructions.
- **Important** paragraphs provide information that emphasizes instructions that are essential to proper setup of the equipment. Failure to follow these instructions carefully may cause unreliable performance.
- **Caution!** paragraphs provide information that alerts the operator to a hazardous situation that can cause damage to property or equipment.
- **Warning!** paragraphs provide information that alerts the operator to a hazardous situation that can cause injury to personnel. Cautionary information is also included, when applicable.

Safety Issues

WARNING! It is the responsibility of the user to make sure all local, county, state and national codes, regulations, rules and laws related to safety and safe operating conditions are met for each installation.

Auxiliary Equipment

Local Safety Standards

The user must make sure that he operates all auxiliary equipment in accordance with local codes, standards, regulations, or laws applicable to safety.

Working Area

WARNING! Auxiliary equipment may have both manual and automatic modes of operation. As equipment can move suddenly and without warning, do not enter the work cell of this equipment during automatic operation, and do not enter the work envelope of this equipment during manual operation. If you do, serious injury can result.

WARNING! Make sure that power to the auxiliary equipment is turned OFF and locked out before you perform maintenance procedures on the equipment.

Qualification of Personnel

Make sure that all personnel have manufacturer-approved training applicable to the auxiliary equipment.

Personal Safety Equipment

Make sure that operators and maintenance personnel have all safety equipment applicable to the auxiliary equipment. Examples include safety glasses, protective headgear, safety shoes, etc.

Unauthorized Operation

Make sure that unauthorized personnel cannot gain access to the operation of the equipment.

Environmental Compliance

Waste Electrical and Electronic Equipment (WEEE) Directive

GE Sensing & Inspection Technologies is an active participant in Europe's *Waste Electrical and Electronic Equipment* (WEEE) take-back initiative, directive 2002/96/EC.

The equipment that you bought has required the extraction and use of natural resources for its production. It may contain hazardous substances that could impact health and the environment.

In order to avoid the dissemination of those substances in our environment and to diminish the pressure on the natural resources, we encourage you to use the appropriate take-back systems. Those systems will reuse or recycle most of the materials of your end life equipment in a sound way.

The crossed-out wheeled bin symbol invites you to use those systems.

If you need more information on the collection, reuse and recycling systems, please contact your local or regional waste administration.

Visit **http://www.gesensing.com/environment/weee.htm** for take-back instructions and more information about this initiative.

Chapter 1. Installation

Chapter 2. Programming Site Data

Chapter 3. Displaying Data

Chapter 4. Configuring Meter Data

Chapter 5. Calibration

Chapter 6. Communications

Chapter 7. Error Codes and Diagnostics

Chapter 8. Specifications

Chapter 1. Installation

1.1 Introduction

To ensure safe and reliable operation of the AquaTrans™ UTX878 Liquid Flow Ultrasonic Flowmeter, the system must be installed and programmed in accordance with the guidelines established by GE Sensing's engineers. Those guidelines, explained in detail in this chapter, include the following topics:

- Unpacking the Model UTX878 system
- Selecting suitable sites for the electronics enclosure and the transducers
- Installing the transducers
- Installing the electronics enclosure
- Wiring the electronics enclosure

WARNING! Be sure to follow all applicable local safety codes and regulations for installing electrical equipment. Consult company safety personnel or local safety authorities to verify the safety of any procedure or practice.

!ATTENTION EUROPEAN CUSTOMERS!
To meet CE Mark requirements, all cables must be installed as described in Appendix B, *CE Mark Compliance*.

1.2 Unpacking

Carefully remove the electronics enclosure and the transducer/cable assembly from the shipping containers. Before discarding any of the packing materials, account for all components and documentation listed on the packing slip. The discarding of an important item along with the packing materials is all too common. If anything is missing or damaged, contact the factory immediately for assistance.

1.3 Site Considerations

Because the relative location of the transducers and the electronics enclosure is important, use the guidelines in this section to plan the UTX878 installation.

1.3.1 Electronics Enclosure Location

The standard UTX878 electronics enclosure is epoxy-coated aluminum rated for weatherproof Type 4X, IP67 applications. Typically, the enclosure is mounted as close as possible to the transducers. When choosing a site, make sure the location permits easy access to the electronics enclosure for programming, maintenance and service.

1.3.2 Transducer Location

For a given fluid and pipe, the Model UTX878's accuracy depends primarily on the location and spacing of the transducers. In addition to accessibility, when planning for transducer location, adhere to the following guidelines:

- Locate the transducers so that there are at least 10 pipe diameters of straight, undisturbed flow upstream and 5 pipe diameters of straight, undisturbed flow downstream from the measurement point. Undisturbed flow means avoiding sources of turbulence in the fluid such as valves, flanges, expansions, and elbows; avoiding swirl; and avoiding cavitation.
- Locate the transducers on a common axial plane along the pipe. Locate the transducers on the side of the pipe, rather than the top or bottom, since the top of the pipe tends to accumulate gas and the bottom tends to accumulate sediment. Either condition will cause increased attenuation of the ultrasonic signal. There is no similar restriction with vertical pipes. However, vertical pipes with downward flow should be avoided in order to insure a full pipe at the measurement point.

1.3.3 Cable Lengths

Locate the electronics enclosure as close as possible to the transducers. GE Sensing can supply UTX878 transducer cables in fixed lengths from 6 ft (2 m) up to 100 ft (30 m) in length for remote location of the electronics enclosure.

1.3.4 Transducer Cables

When installing the transducer cables, always observe established standard practices for the installation of electrical cables. Do not route transducer cables alongside high amperage AC power lines or any other cables that could cause electrical interference. Also, protect the transducer cables and connections from the weather and corrosive atmospheres. Do not run the transducer cables along a pipe with a surface temperature over 75°C (167°F).

IMPORTANT: *Use only the cables and transducers that have been supplied with the UTX878.*

1.4 Mounting the UTX878 Electronics Enclosure

The standard Model UTX878 electronics package is housed in a epoxy-coated aluminum weatherproof Type 4X, IP67 enclosure suitable for indoor or outdoor use. Figure 25 on page 21 shows the outline and installation drawing. Refer to Chapter 7, *Specifications*, for the mounting dimensions and the weight of this enclosure.

1.5 Making Electrical Connections

This section contains instructions for making all the necessary electrical connections to the Model UTX878 flow transmitter. Refer to Figure 27 on page 23 or Figure 28 on page 24 for a complete wiring diagram.

!ATTENTION EUROPEAN CUSTOMERS!
To meet CE Mark requirements, all cables must be installed as described in Appendix B, *CE Mark Compliance*.

WARNING! Always disconnect the line power from the Model UTX878 before removing the front cover.

1.5.1 Preparing the Unit Before Making Electrical Connections

Prepare the unit as described below before making any electrical connections.

1. Disconnect any previously wired power line from the unit.
2. Remove the cover screws and open the front cover.

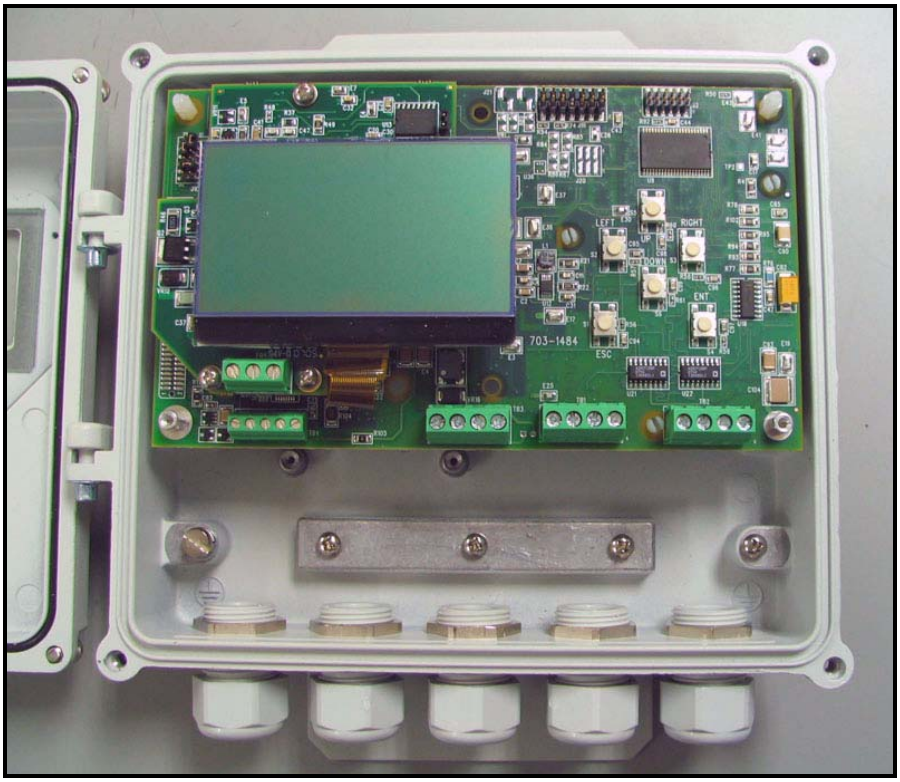


Figure 1: UTX878 Electronics with Cover Opened

1.5.1 Preparing the Unit Before Making Electrical Connections (cont.)

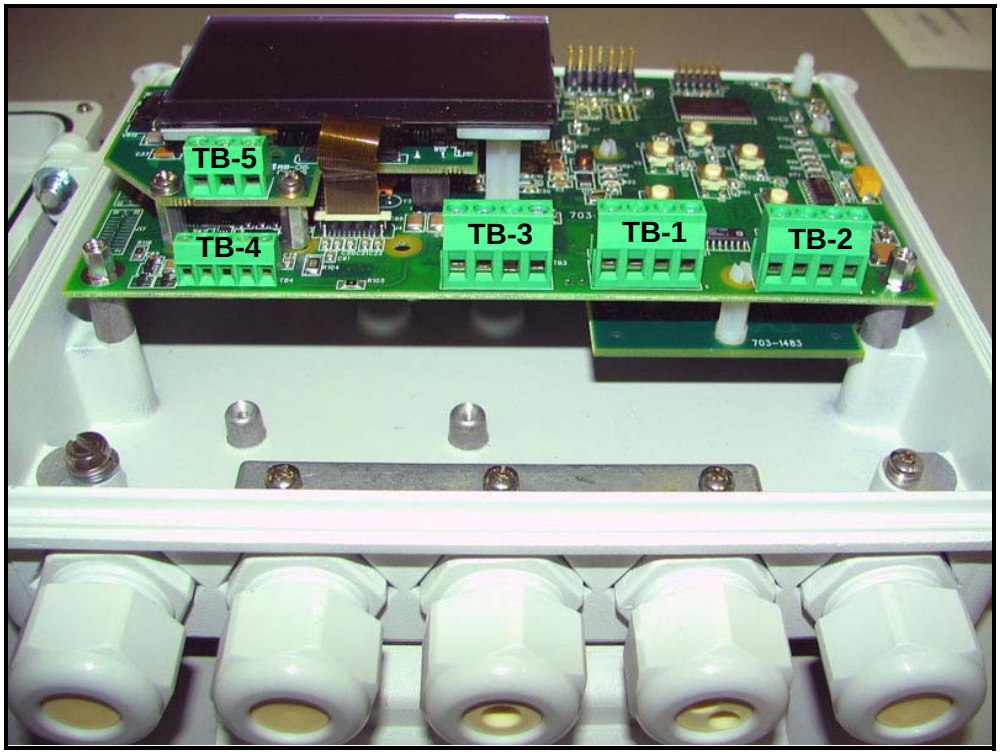


Figure 2: Terminal Block Locations

3. Install any required cable clamps on the appropriate conduit holes on the bottom of the enclosure.
4. Determine if you have a a 4-wire HART Version or a Loop Power Version (2-wire) UTX878. Look at the serial number label on the right-hand edge of the unit (see Figure 3 below).

   - If the model number is **UTX878-H-...**, then your unit is configured as a 4-wire HART Version.

   - If the model number is **UTX878-A-...**, or *ANY OTHER MODEL NUMBER DESCRIPTOR*, then your unit is configured as a Loop Power Version (2-wire).

Figure 3: Serial Number Label on Right-Hand Edge of Unit

Proceed to the next section to make the desired wiring connections.

1.5.2 Wiring the Loop Power Version (2-Wire)

The standard low power Model UTX878 operates on 15-30 VDC loop power. The label on the side of the electronics enclosure lists the meter's required line voltage and power rating. Be sure to connect the meter only to the specified line voltage **with a shielded/twisted pair cable**.

Refer to Figure 27 on page 23 to locate the power terminal block and connect the line power as follows:

1. Follow the instructions on page 3 to prepare the unit before you connect power.

!ATTENTION EUROPEAN CUSTOMERS!
To meet CE Mark requirements, all cables must be installed as described in Appendix B, *CE Mark Compliance*.

2. Connect the UTX878 case to the earth ground with a grounding cable.

3. Strip 1/4-in. of insulation from the end of each of the two line power leads.

4. Route the shielded cable through the conduit hole and connect the power leads to the power terminal block as shown in Figure 27 on page 23. Tie the shield drain wire to the ground bus bar inside the UTX878, but **leave the shield wire open on the power supply end** (to avoid AC ground loops and for CE certification).

5. Leaving a small amount of slack, secure the power line with the cable clamp.

Note: *If you are using a 4-20 mA loop current measuring resistor, add the resistor in series with the power supply Loop_Rtn end (TB3-2). You must configure the loop current measuring equipment as follows:*

- *The negative side (–) of the probe goes to the power supply side of the resistor.*
- *The positive side (+) of the probe goes to the UTX878 side of the resistor.*

6. If you are installing the UTX878 for the first time, refer to Chapter 2, *Programming Site Data*, and program the sections from page 28 to page 36 (the *Status, Transducer, Pipe, Fluid* and *Path* options) to determine the appropriate transducer spacing to position the transducers (refer to *Installing the Transducers* on page 8).

1.5.3 Wiring the 4-Wire HART Version

The optional 4-wire HART Model UTX878 operates on 24 VDC power. The label on the side of the electronics enclosure lists the meter's required line voltage and power rating. Be sure to connect the meter only to the specified line voltage **with a shielded/twisted pair cable**.

Refer to Figure 28 on page 24 to locate the power terminal block and connect the line power as follows:

1. Follow the instructions on page 3 to prepare the unit before you connect power.

!ATTENTION EUROPEAN CUSTOMERS!
To meet CE Mark requirements, all cables must be installed as described in Appendix B, *CE Mark Compliance*.

2. Connect the UTX878 case to the earth ground with a grounding cable.

3. Strip 1/4-in. of insulation from the end of each of the four line power leads.

4. Route the shielded cable through the conduit hole. Connect the 24 VDC power leads to the 24 VDC power terminal block and the 4-20 mA + HART power leads to the 4-20 mA + HART terminal block as shown in Figure 28 on page 24. Tie the shield drain wire to the ground bus bar inside the UTX878, but **leave the shield wire open on the power supply end** (to avoid AC ground loops and for CE certification).

5. Leaving a small amount of slack, secure the power line with the cable clamp.

Note: *If you are using a 4-20 mA loop current measuring resistor, add the resistor in series with the power supply Loop_Rtn end (TB3-2). You must configure the loop current measuring equipment as follows:*

- *The negative side (–) of the probe goes to the power supply side of the resistor.*
- *The positive side (+) of the probe goes to the UTX878 side of the resistor.*

6. If you are installing the UTX878 for the first time, refer to Chapter 2, *Programming Site Data*, and program the sections from page 28 to page 36 (the *Status, Transducer, Pipe, Fluid* and *Path* options) to determine the appropriate transducer spacing to position the transducers (refer to *Installing the Transducers* on page 8).

1.5.4 Wiring the Option Cards

Follow the instructions on pages 1-4 before wiring the option cards.

1.5.4a Wiring the Totalizer Option

Refer to Figure 27 on page 23 or Figure 28 on page 24 to locate the totalizer terminal block and connect the totalizer option card as follows:

1. Follow the instructions on pages 1-4 to prepare the unit before you connect power.

!ATTENTION EUROPEAN CUSTOMERS!
To meet CE Mark requirements, all cables must be installed as described in Appendix B, *CE Mark Compliance.*

2. Connect the UTX878 case to the earth ground with a grounding cable.

3. Strip ¼ in. of insulation from the end of each of the two option card leads.

4. Route the shielded cable through the conduit hole and connect the totalizer card to the totalizer card terminal block as shown in Figure 27 on page 23 or Figure 28 on page 24. Tie the shield drain wire to the ground bus bar inside the UTX878, but **leave the shield wire open on the power supply end** (to avoid AC ground loops and for CE certification).

5. Leaving a small amount of slack, secure the totalizer option card line with the cable clamp.

6. Connect the two totalizer option cards leads to the safety barrier. Barriers must be installed in accordance with the barrier manufacturer's specifications.

1.5.4b Wiring the Alarm Switch Option

Refer to Figure 27 on page 23 or Figure 28 on page 24 to locate the alarm terminal block and connect the alarm option card as follows:

1. Follow the instructions on pages 1-4 to prepare the unit before you connect the card.

!ATTENTION EUROPEAN CUSTOMERS!
To meet CE Mark requirements, all cables must be installed as described in Appendix B, *CE Mark Compliance.*

2. Connect the UTX878 case to the earth ground with a grounding cable.

3. Strip 1/4-in. of insulation from the end of each of the two option card leads.

4. Route the shielded cable through the conduit hole and connect the alarm card to the alarm card terminal block (see Figure 27 on page 23 or Figure 28 on page 24). Tie the shield drain wire to the ground bus bar inside the UTX878 to the closest grounding screw, but **leave the shield wire open on the other power supply end** (to avoid AC ground loops and for CE certification).

5. Leaving a small amount of slack, secure the totalizer alarm switch output option card line with the cable clamp.

6. Connect the two totalizer alarm switch output option cards leads to the safety barrier. Barriers must be installed in accordance with the barrier manufacturer's specifications.

1.6 Installing the Transducers

The transducers that have been specially designed for use with the UTX878 are available in four models: 4 MHz for ½" to 1½" pipes, 2 MHz for 1" to 4" pipes, 1 MHz for 2" to 12" pipes and 0.5 MHz for 8" to 20" pipes. They typically support 2-traverse applications.

1.6.1 Transducers for Smaller Pipes

The pre-attached cables come in lengths from 6 to 100 ft. Figure 4 below shows a typical UTX878 transducer, while the outline and installation drawing for the clamping fixture appears in Figure 26 on page 22.

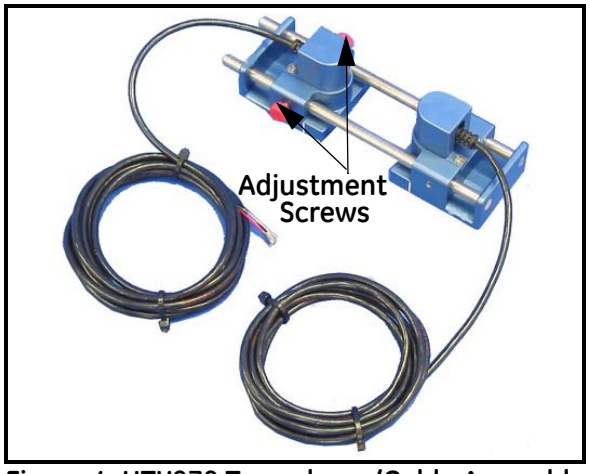


Figure 4: UTX878 Transducer/Cable Assembly

1.6.1a Setting Transducer Spacing

If you have not already obtained the transducer spacing, you must program the *Status*, *Transducer, Pipe*, *Fluid* and *Path* options of the *Program* menu (page 28 to page 36) to calculate the appropriate setting. To set the desired transducer spacing:

1. Loosen the red screws on the adjustable transducer (shown in Figure 4 above).
2. Slide the adjustable transducer on the rails until you have positioned it at the desired spacing. Use the ruler on the rails and the white tick mark on the transducer housing to assist in setting the correct spacing.
3. Tighten the red screws to secure the transducer to the rails.

Note: *If your application requires one or three traverses, you can remove the adjustable transducer from the rails and use it as a separate transducer at a 180° angle from the stationary transducer, as shown in Figure 5 below.*

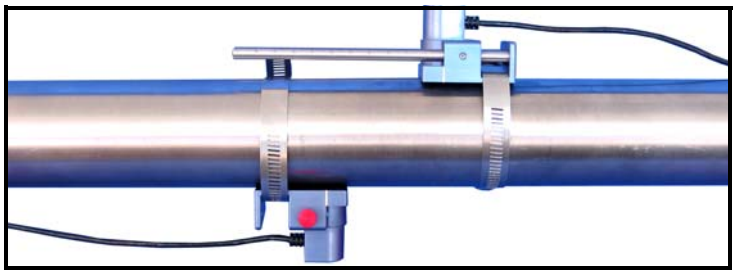


Figure 5: Positioning for 1 or 3-Traverse Applications

1.6.1b Installing the Transducers on the Pipe

Note: *Some pipe preparation may be required before securing the transducers to the pipe. Remove any paint or coating from the surface in contact with the transducers. A flat, smooth surface is ideal.*

1. Apply the supplied couplant to the transducer faces, as shown in Figure 6 below.

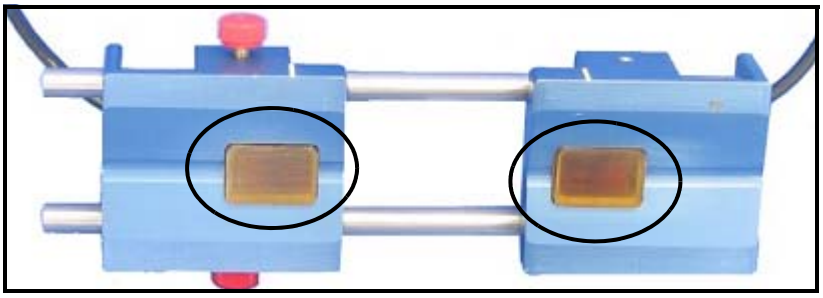


Figure 6: The Transducer Faces

2. Put the transducer fixture at the desired location on the pipe. Secure it with the supplied stainless steel clamps. Figure 7 below illustrates a typical installation.

Note: *Installation on the sides (at 3 and 9 o'clock) of the pipe is ideal. The top of the pipe might contain bubbles, while the bottom might contain sediment.*

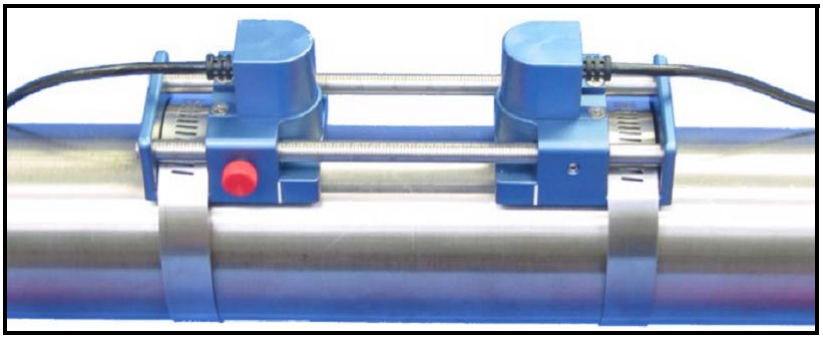


Figure 7: A Typical Transducer Installation

Once on the pipe, an internal spring mechanism ensures proper mechanical pressure by "pressing" the transducer face against the pipe surface. Refer to *Wiring the Transducers* on page 19 to wire the transducer cables to the UTX878.

1.6.2 Transducers for Larger Pipes

The CF-ES clamping fixture acts as a permanent transducer holder. The fixture has two blocks that are used for double- and single-traverse methods. Steel straps secure the blocks to the pipe for a permanent installation.

The blocks are positioned properly using the spacing dimension calculated by the flowmeter. Then the transducers are mounted into the blocks. Figure 8 below shows a long block.

The transducer installation consists of mounting the CF-ES to the pipe and then mounting the transducers into the blocks. Refer to the appropriate section that follows for instructions:

- Double-traverse Method - see below
- Single-traverse Method - see page 14.

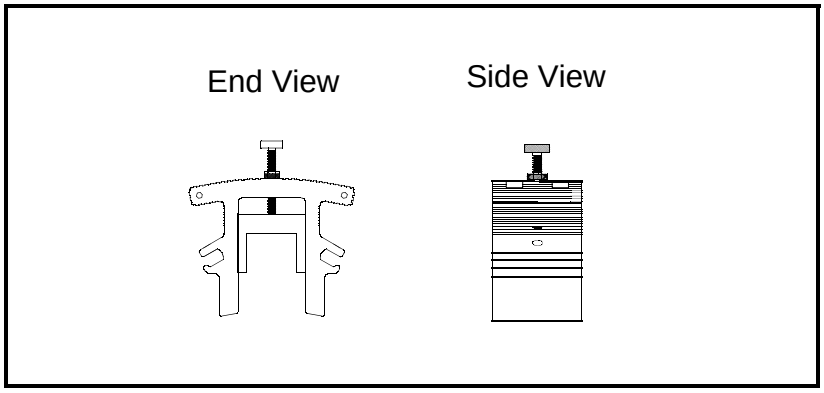


Figure 8: CF-ES Clamping Fixture Block

1.6.2a The Double-Traverse Method - CF-ES

Note: *The instructions in this section can also be used for a multiple-traverse method. However, you must use an EVEN number of traverses. The distance the signal travels from one side of the pipe wall to the opposite side of the pipe wall is considered one traverse. For more than two traverses, consult the factory.*

There are three advantages in using the double-traverse method:

- Accuracy is improved because the signal is in the fluid longer than with a single-traverse.
- This configuration can reduce some effects of an underdeveloped flow profile.
- If there is enough pipe length available, the double-traverse fixture is easier to install.

The procedure for mounting the CF-ES involves marking the pipe for the desired spacing, fastening the clamping fixture on the pipe and then mounting the transducers into the fixture.

You will need a level and a marker or scribe to locate and mark the transducer locations on the pipe.

1. Obtain the transducer spacing dimension S, as calculated by the meter.
2. Be sure the location you have chosen for the installation has at least 10 pipe diameters of straight, undisturbed flow upstream and 5 pipe diameters downstream of the measurement point.
3. Prepare the pipe where you intend to place the clamping fixture by making sure it is clean and free of loose material. Sanding, though usually not required, may be necessary to take off any high spots. Be careful to preserve the original curvature of the pipe.
4. Find the top of the pipe and use a level to draw a line parallel to the pipe's axis, as shown in Figure 9 below.

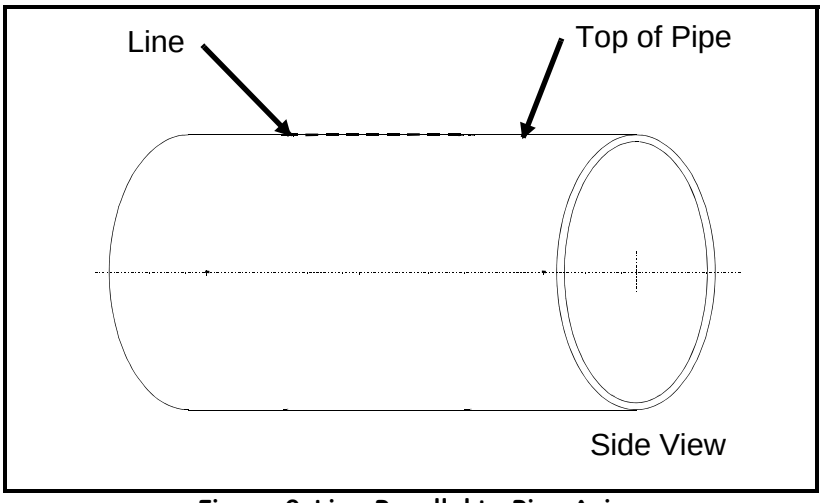


Figure 9: Line Parallel to Pipe Axis

5. Make two marks (shown in Figure 10 below) on the line equal to the transducer spacing distance S, as calculated by the meter.

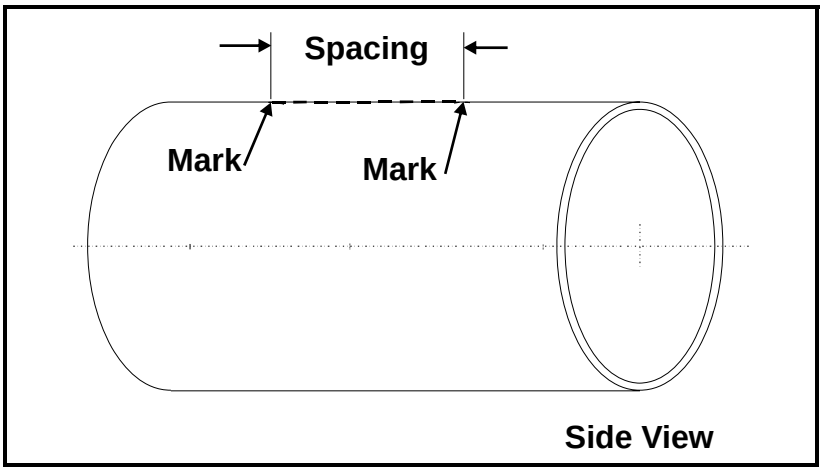


Figure 10: Marks for Transducer Spacing on Inscribed Line

1.6.2a The Double-Traverse Method - CF-ES (cont.)

6. From each of the marks, measure around the circumference of the pipe in the same direction a distance equal to one quarter the pipe's circumference, as shown in Figure 11 below. Make a crossmark with a marker or scribe.

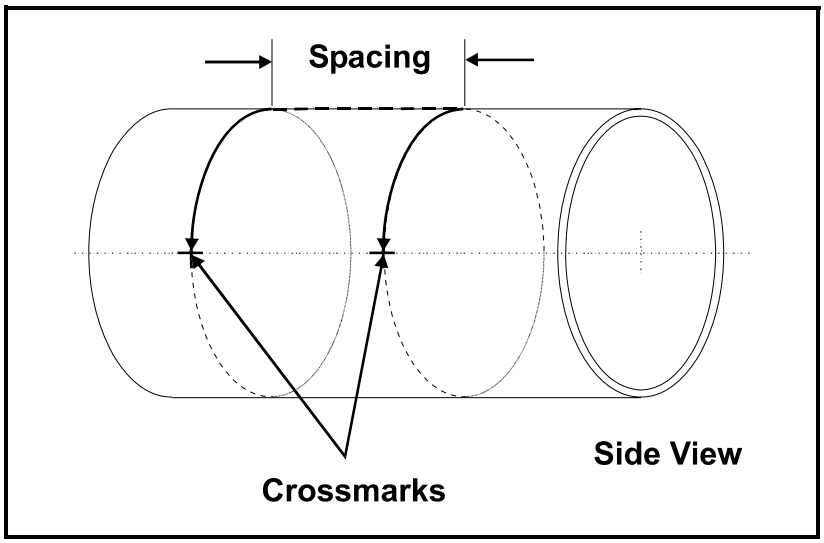


Figure 11: Measuring a Quarter-Circumference

7. Center one of the blocks over one of the crossmarks on the pipe. Align the block so that the pressure bolt is over the center of the mark. Secure the block by wrapping the two straps around the block and pipe and tightening them. Make sure the turnbuckles are at least 1/2 pipe diameter away from the block, as shown in Figure 12 below.

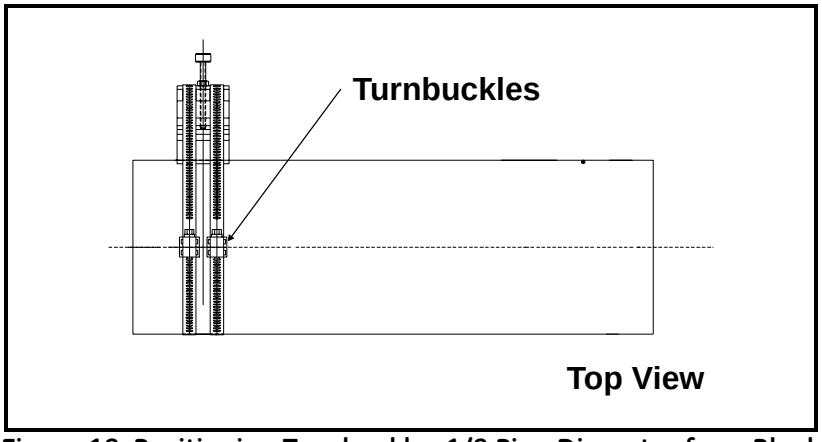


Figure 12: Positioning Turnbuckles 1/2 Pipe Diameter from Block

8. Repeat Step 7 to install the other block over the other crossmark (Figure 13 below).

Note: *Make sure both straps are perpendicular to the bottom of the block. If the straps are slanted, the slack will cause the block to slide. The slack may also change the transducer spacing after the transducers are mounted.*

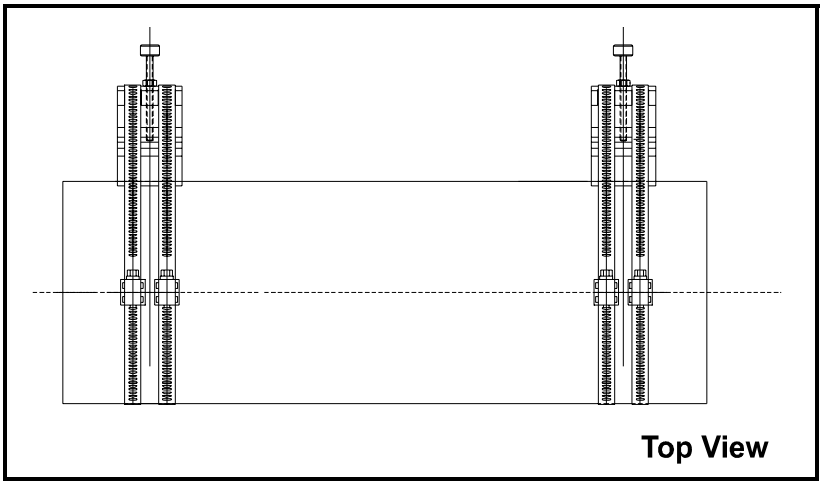


Figure 13: Positioning Both Blocks

Figure 14 below shows a double-traverse installation without transducers. Proceed to *Mounting Transducers into the CF-ES* on page 17.

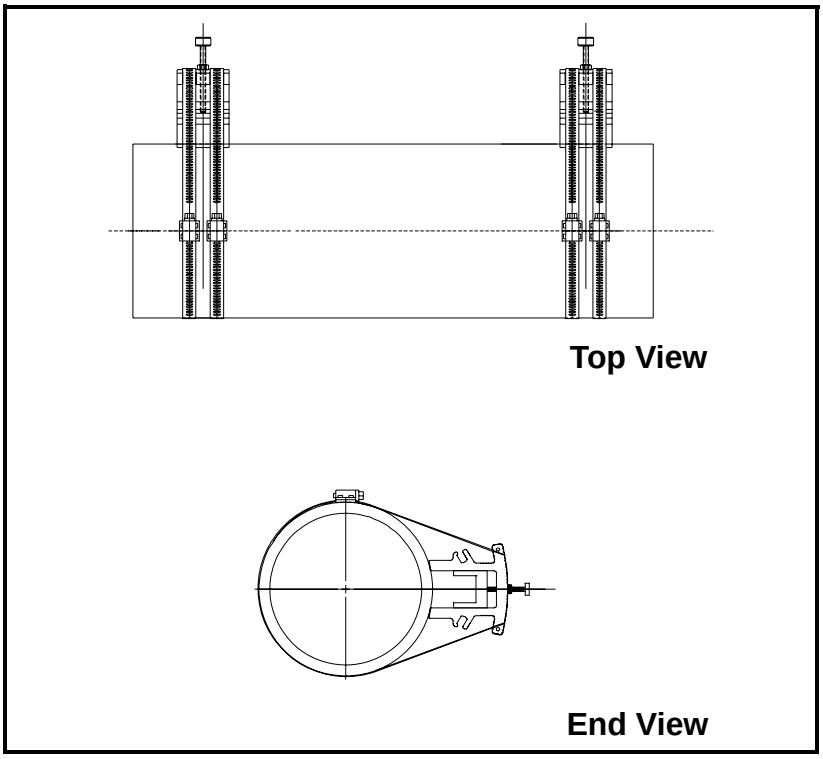


Figure 14: A Double-Traverse CF-ES Installation without Transducers

1.6.2b The Single-Traverse Method - CF-ES

Note: *The instructions in this section can also be used for a multiple-traverse method. However, you must use an ODD number of traverses. The distance the signal travels from one side of the pipe wall to the opposite side of the pipe wall is considered one traverse.*

The procedure for mounting the CF-ES involves marking the pipe for the desired spacing, fastening the fixture to the pipe and then mounting the transducers into the fixture.

You will need a level and marker or scribe to locate the transducers on the pipe.

1. Obtain the transducer spacing dimension S, as calculated by the meter.

2. Be sure the location you have chosen for the installation has at least 10 pipe diameters of straight, undisturbed flow upstream and 5 pipe diameters downstream of the measurement point.

3. Prepare the pipe where you intend to place the CF-ES by making sure it is clean and free of loose material. Sanding, though usually not required, may be necessary to take off any high spots. Be careful to preserve the original curvature of the pipe and not to eradicate the marks on the pipe.

4. Find the top of the pipe and use a level to draw a line parallel to the pipe's axis, as shown in Figure 15 below.

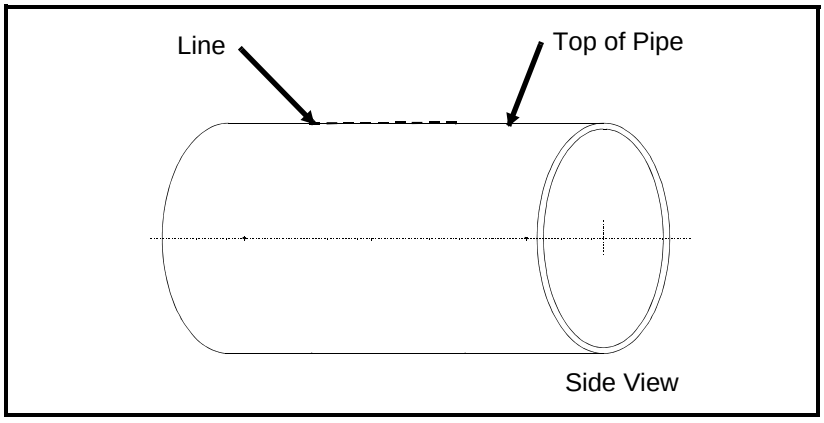


Figure 15: Drawing Line Parallel to Pipe Axis

5. Make two marks (shown in Figure 16 below) on the line equal to the transducer spacing distance S, as calculated by the meter.

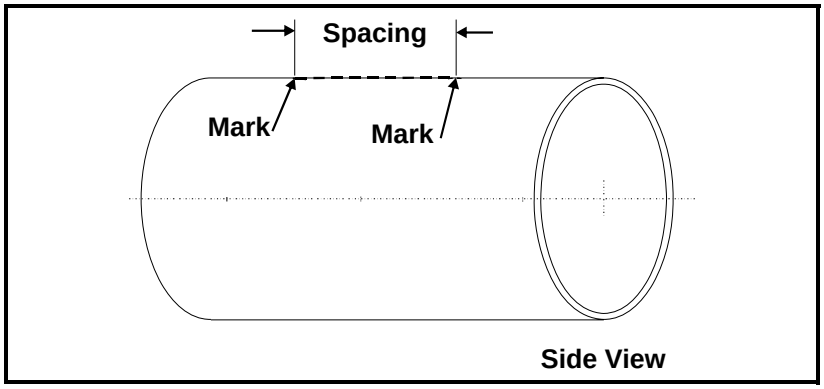


Figure 16: Marking Transducer Spacing

6. From one of the marks, measure around the circumference of the pipe a distance equal to one quarter the pipe's circumference, as shown in Figure 17 below. Make a crossmark with a marker or scribe.

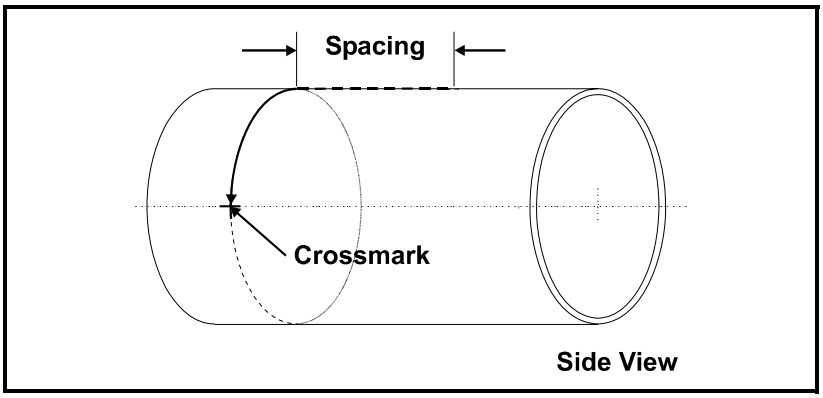


Figure 17: Measuring a Quarter of the Pipe's Circumference

7. From the other mark, go in the opposite direction around the pipe for one quarter the circumference and make another crossmark, as shown in Figure 18 below.

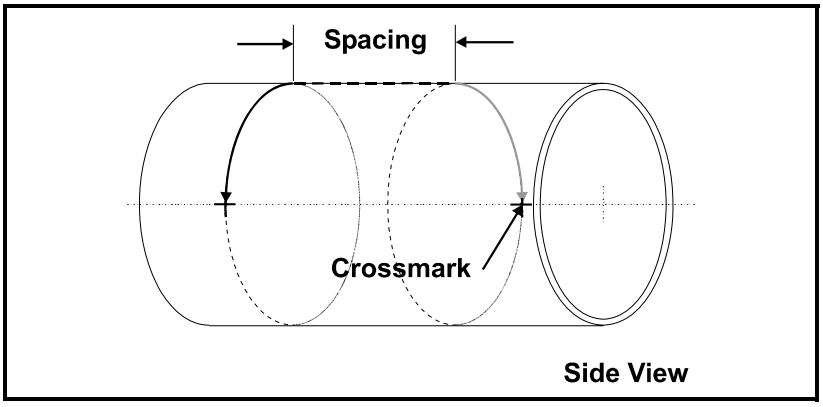


Figure 18: Measuring the Second Quarter Circumference

8. Center one of the blocks over one of the crossmarks on the pipe. Align the block so that the pressure bolt is over the center of the crossmark. Secure the block by wrapping two straps around the block and pipe and tightening them. Make sure the turnbuckles are at least 1/2 pipe diameter away from the block, as shown in Figure 19 below.

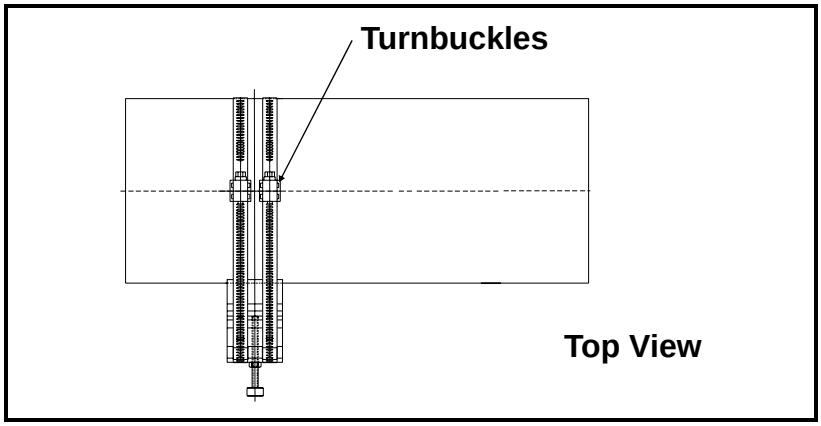


Figure 19: Positioning Turnbuckles

1.6.2b The Single-Traverse Method - CF-ES (cont.)

9. Repeat Step 8 to install the other block over the other punch mark.

Note: *Make sure both straps are perpendicular to the bottom of the block (Figure 20 below). If the straps are slanted, the slack will cause the block to slide. The slack may also change the transducer spacing after the transducers are mounted.*

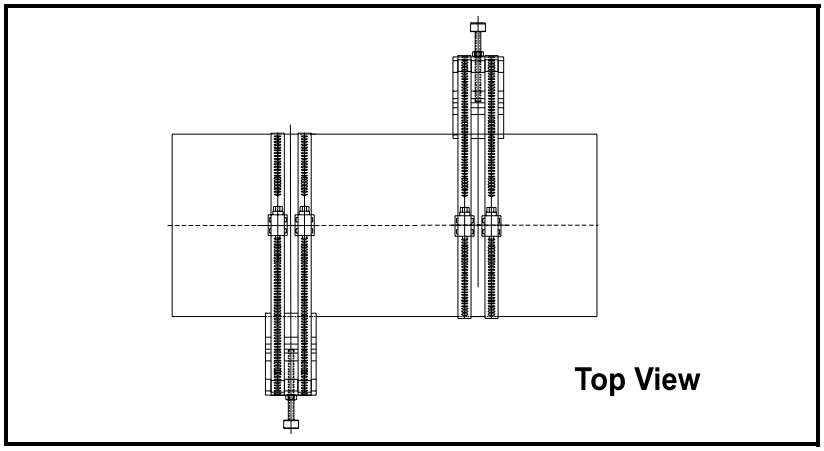


Figure 20: Correct Strap Positioning

Figure 21 below shows a single-traverse installation without transducers. Proceed to *Mounting Transducers into the CF-ES* on the next page.

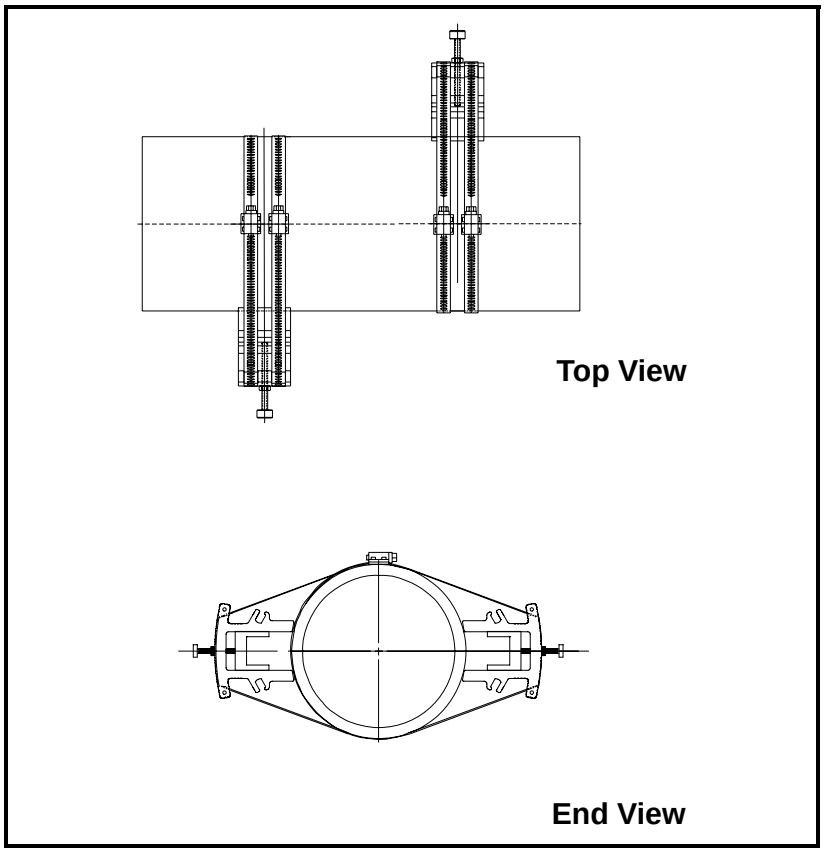


Figure 21: A Single-Traverse CF-ES Installation without Transducers

1.6.2c Mounting Transducers into the CF-ES

The last step of installation is mounting the transducers into the clamping fixture.

To mount the transducers into the CF-ES, use the following steps:

1. Take one of the transducers and apply a thin bead of couplant down the center of its face approximately the size of a toothpaste bead (Figure 22 below).

IMPORTANT: *To prevent the loss of couplant, do not slide the transducer with couplant along the surface of the pipe when mounting.*

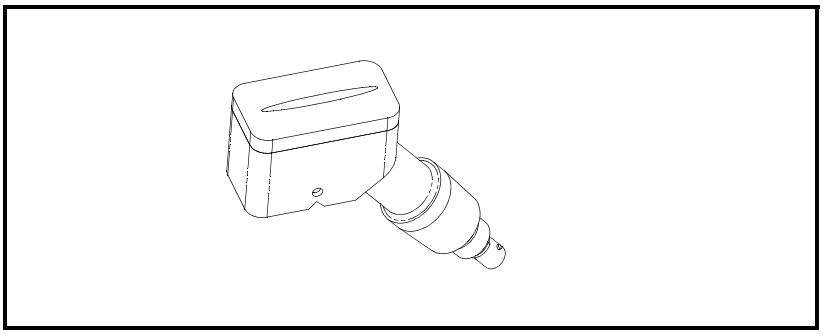


Figure 22: Applying Couplant to Transducer

2. Place the transducers in the appropriate blocks. Make sure the transducers are oriented as shown in Figure 23 below.

Note: *If the transducer cables are already connected, you must determine the upstream and downstream directions of the pipe and place the transducers into the appropriate blocks.*

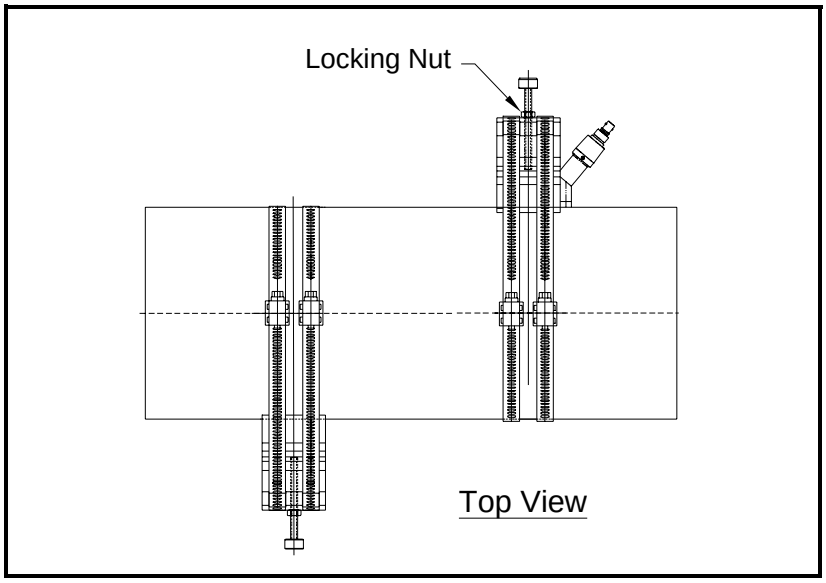


Figure 23: Transducer Orientation

1.6.2c Mounting Transducers into the CF-ES (cont.)

3. Use the pressure bolt to secure the transducer in place. The pressure bolt should fit into the dimple. Hand-tighten enough to hold the transducer in place. Do not overtighten so that the fixture lifts off the pipe.

4. Tighten the locking nut on the pressure bolt (see above).

IMPORTANT: *When using the CF-ES in a pipe location with possible mechanical vibration, the locking nut must be used to secure the position of the pressure bolt on the transducer after the bolt has been hand-tightened into the transducer dimple. For additional resistance to vibration a thread lock compound or a stainless steel washer and lock washer may also be used. These items can be ordered from GE by requesting a "special" clamping fixture and specifying either the thread lock or the washers.*

5. Repeat Steps 1 to 6 to mount the other transducer in the remaining block. See Figure 24 below for completed installations.

WARNING! Before performing the next step make sure power to the flowmeter electronics has been disconnected.

6. Make transducer cable connections as described on the next page.

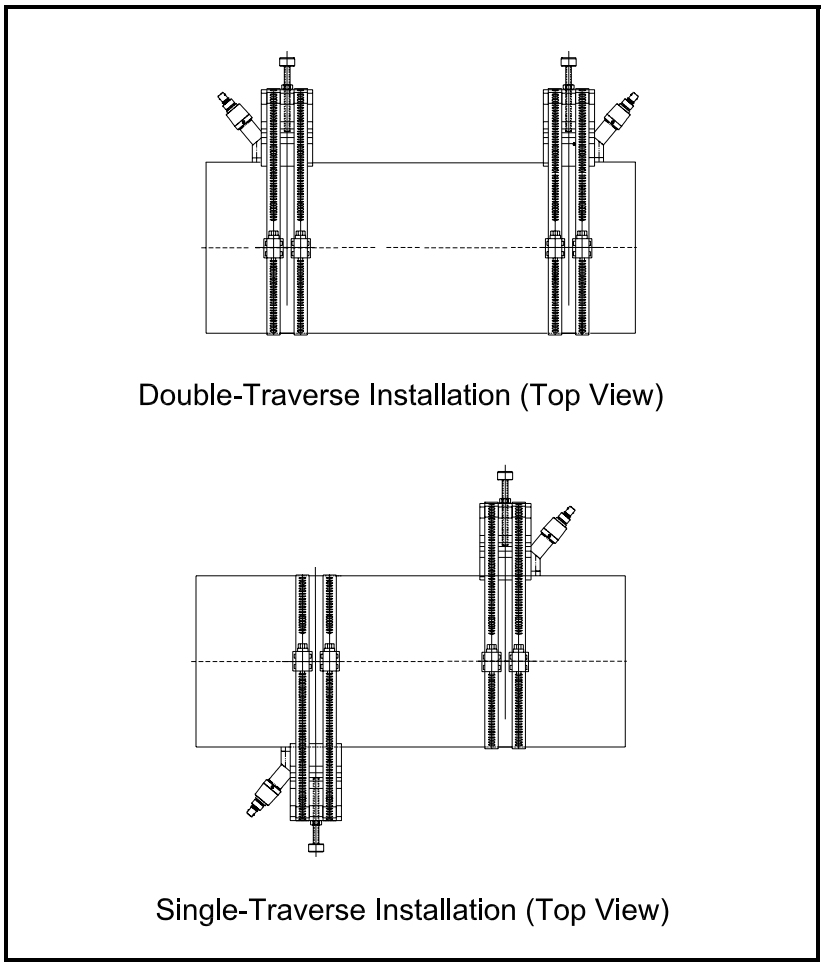


Figure 24: Completed CF-ES Installations with Transducers

Note: *If you have mounted the transducers into the CF-ES properly, the two transducer cable connectors will face away from each other as shown in the above figure.*

1.6.3 Wiring the Transducers

Follow the instructions on page 3 before wiring the transducers.

WARNING! Before connecting the transducers, discharge any static buildup by shorting the twisted pairs of the transducer cables to the metal shield on the cable connector.

1. Refer to the wiring diagram in Figure 27 on page 23 or Figure 28 on page 24 and connect the transducer cables to the terminal block (TB-1) for Channel 1. Then, secure the cable clamp.

Note: *The RED cable leads are the SIG (+) leads and the BLACK cable leads are the RTN (-) leads. The shield cable leads are connected to the ground bus.*

!ATTENTION EUROPEAN CUSTOMERS!
To meet CE Mark requirements, all cables must be installed as described in Appendix B, *CE Mark Compliance*.

2. For a 2-path averaging UTX878, repeat step 1 to connect the CH2 transducers to the terminal block for Channel 2. It is not required that both channels/paths of a 2-Channel unit be connected.

Note: *The UTX878 uses two channels or paths to make more accurate flow measurement by averaging, subtracting or adding the channels/paths together.*

3. Connect the transducer shield wires to the UTX878 ground bus.

4. Do one of the following:

- Proceed to the next section to wire the UTX878 RS232 serial port, if desired.
- Replace the front cover on the enclosure and tighten the screws.

Note: *A channel must be activated before it can begin taking measurements. See Chapter 2,* Programming Site Data, *for instructions.*

1.6.4 Wiring the RS232 Serial Port

The Model UTX878 flow transmitter is equipped with a built-in RS232 serial communications port. Proceed to the section below for wiring instructions. For more information on serial communications, refer to the *EIA-RS Serial Communications* manual (916-054).

Note: *When HART is enabled, RS232 will not work. The user must disable HART in the software to get access to PanaView.*

Use the serial port to connect the Model UTX878 flow transmitter to an ANSI terminal or a personal computer. The RS232 interface is wired as Data Terminal Equipment (DTE), and the signals available at the COMMUNICATION terminal block are shown in Table 1 on page 20.

1. Follow the instructions on page 3 to prepare the unit before you connect power.

2. Use the information in Table 1 on page 20 to construct a suitable shielded cable for connecting the Model UTX878 to the external device. If desired, an appropriate cable may be purchased from GE Sensing.

Note: *The DTR and RTS signals power the UTX878 communication circuit and are required for proper operation. Consult the factory if you have additional questions.*

1.6.4 Wiring the RS232 Serial Port (cont.)

Note: *Signal names that imply direction (e.g., transmit and receive) are named from the point of view of the DTE device (the GE Sensing meter is usually considered the DTE device). When the RS232 standard is strictly followed, these signals are labeled with the same name and pin # on the DCE device side as well. Unfortunately, the convention is not followed because the DTE and DCE side get confused. Therefore, connections that imply direction are changed to reflect their direction on the DCE side.*

Table 1: RS232 Connection to DCE or DTE Device

Communication TB4	Colors for GE Cable 704-845	Signal Description	DCE DB25 Pin #	DCE DB9 Pin #	DTE DB25 Pin #	DTE DB9 Pin #
1	White	DTR	20	4	20	4
2	Yellow	RTS	4	7	4	7
3	Green	Signal Ground	7	5	7	5
4	Black	UTX878 (Transmit)	2	3	3	2
5	Red	UTX878 (Receive)	3	2	2	3

3. Feed the flying leads end of the cable through the conduit hole and wire the leads to the RS232 terminal block (TB4) as shown in Figure 27 on page 23 or Figure 28 on page 24. Connect the other end of the cable to the ANSI terminal or personal computer, and secure the cable clamp.

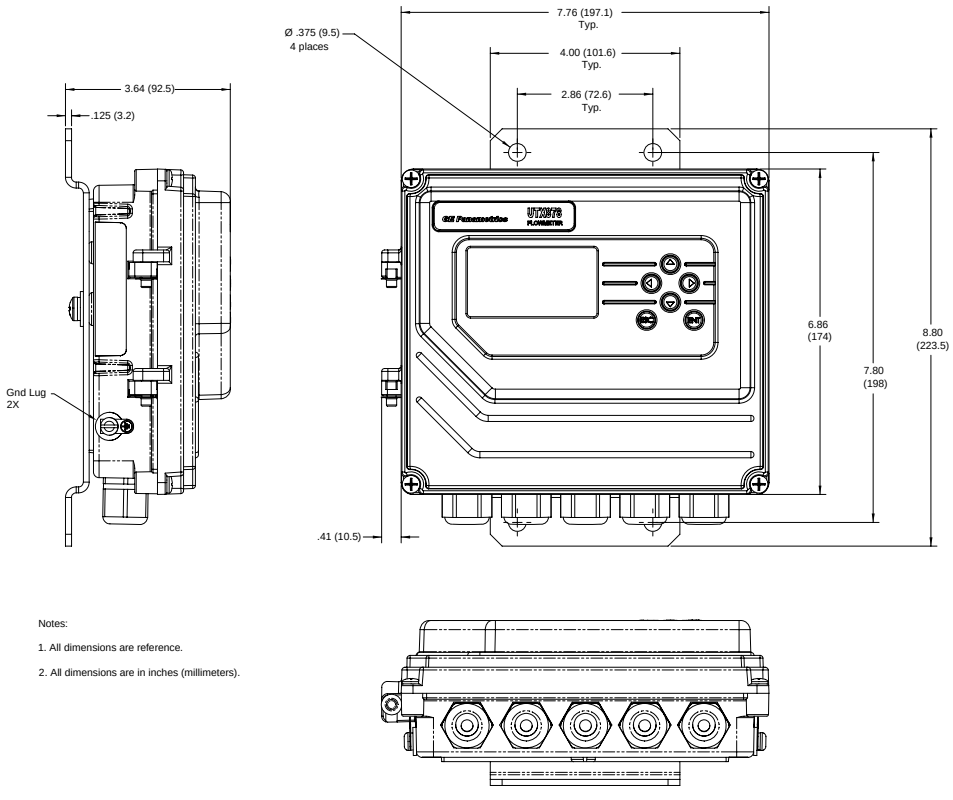
4. Tie the shield drain wire to the UTX878 ground bus bar.

!ATTENTION EUROPEAN CUSTOMERS!
To meet CE Mark requirements, all cables must be installed as described in Appendix B, *CE Mark Compliance.*

After the wiring has been completed, replace the front cover on the enclosure and tighten the screws. Consult the user's manual for the external device to configure it for use with the UTX878.

Procedure Options. After the UTX878 has been completely installed and wired, reconnect the line power.

- Check the diagnostics (discussed in Chapter 6, *Error Codes and Diagnostics*) to ensure that the UTX878 has been properly set up.
- Refer to Chapter 2, *Programming Site Data*, to program the meter for taking flow rate measurements.

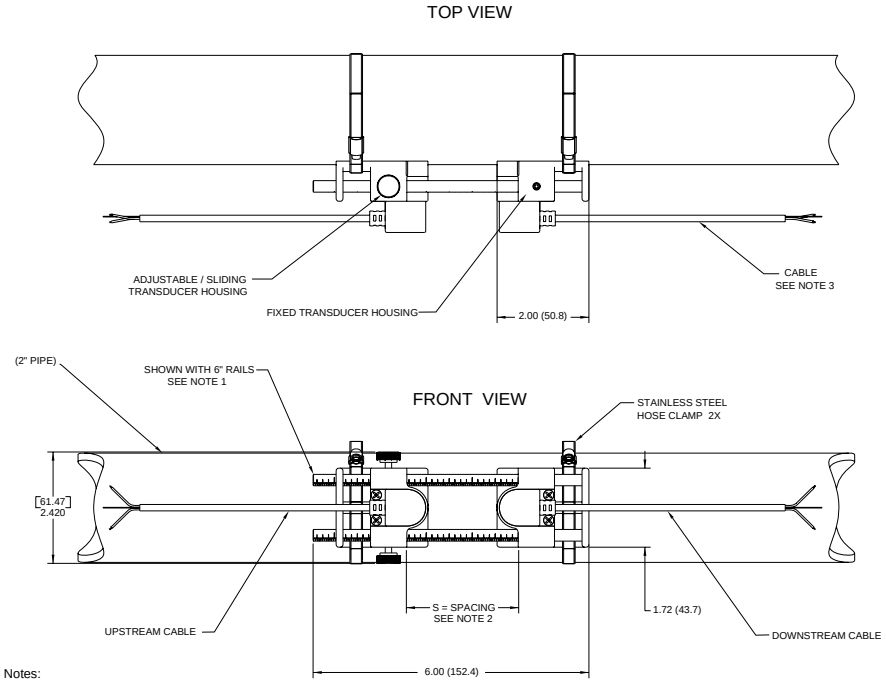


Notes:

1. All dimensions are reference.

2. All dimensions are in inches (millimeters).

Figure 25: Outline and Installation UTX878-2-HART (ref. dwg #712-1419)



Notes:

1. Shown with 6" English / Metric scale for pipe range.
   Size of 1/2" (12.7mm) to 3" (101.6mm), optional 11" English / Metric
   Scale for pipe range size 1/2" (12.7mm) to 8" (203.2mm) not shown.
2. Spacing is calculated from the flowmeter program.
3. For cable length options, refer to the Bill of Materials 573-030.
4. Dimensions are in inches (millimeters).
   All dimensions are for reference only.

Figure 26: Clamping Fixture Outline and Installation (ref. dwg #570-076)

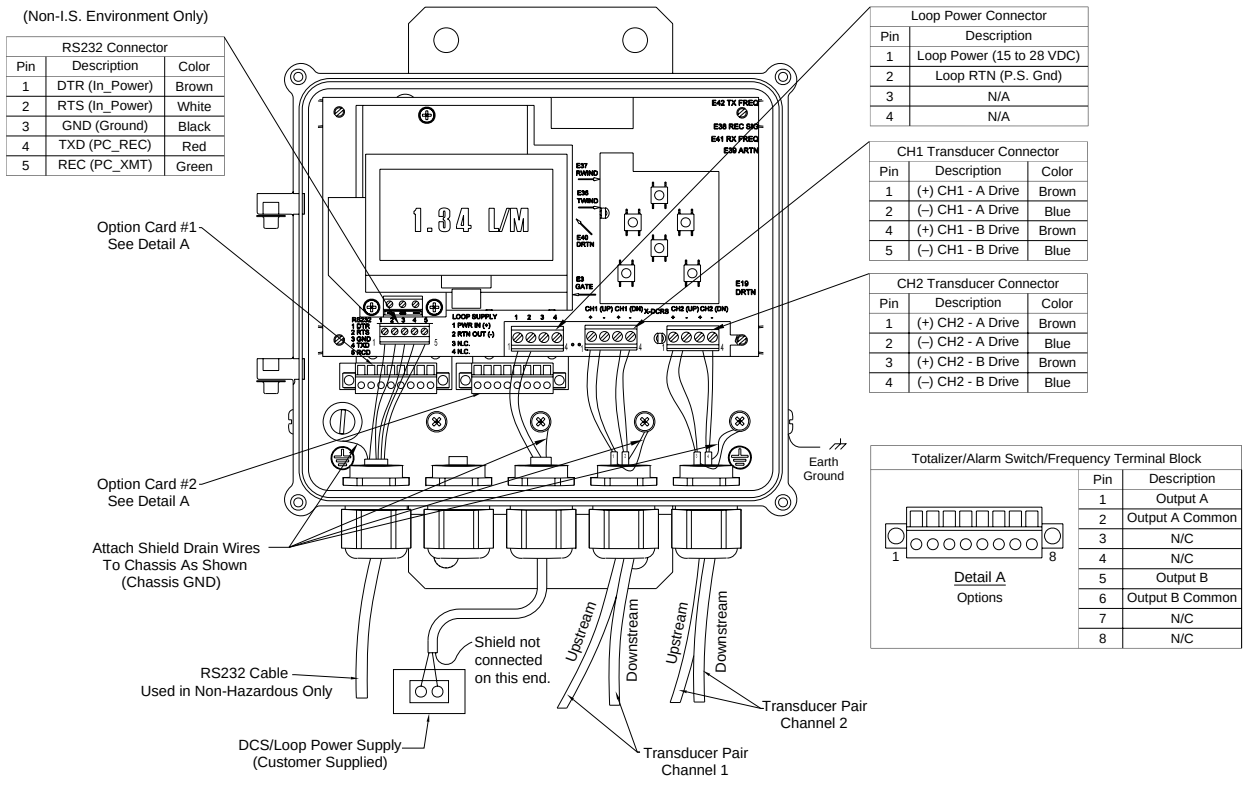


Figure 27: Standard Loop-Powered UTX878 - Wiring Diagram (ref. dwg #702-528-00)

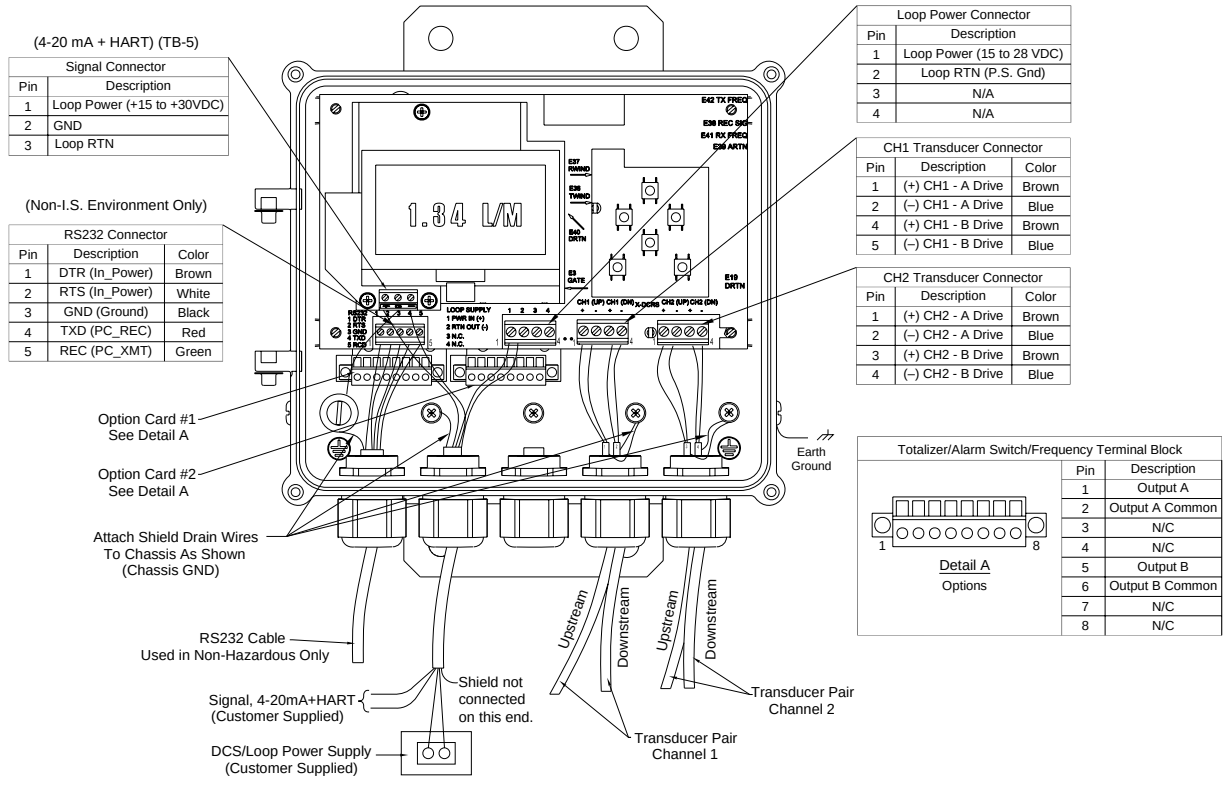


Figure 28: Optional 4-Wire UTX878 with HART - Wiring Diagram (ref. dwg #702-528-01)

Chapter 2. Programming Site Data

2.1 Introduction

The Model UTX878 flow transmitter includes a *User Program* that provides access to the various programmable features of the instrument.This chapter describes step-by-step programming instructions using the internal keypad, shown below in Figure 29.

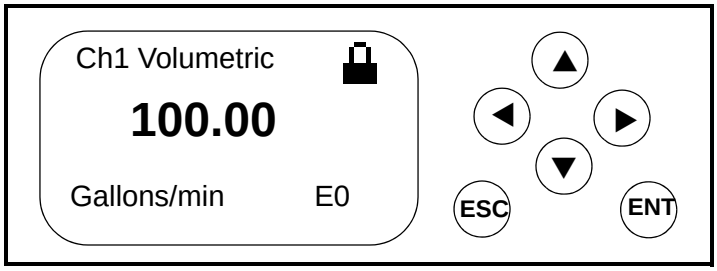


Figure 29: A UTX878 Display and Keypad

Refer to the appropriate section for a discussion of the following PROG menu options:

- Status - activate or deactivate one or both channels/paths

Note: *The UTX878 can use two channels or paths to make more accurate flow measurement by averaging, subtracting or adding the channels/paths together.*

- Transducer - enter data for preprogrammed or special clamp-on transducers
- Pipe - enter pipe parameters
- Fluid - enter fluid type and Reynolds Correction data
- Path - enter number of traverses and transducer spacing (for clamp-on transducers)
- Signal - entering signal parameters such as Delta-T offset, zero cutoff and velocity averaging
- K Factor - entering the Meter Correction (K) Factor as a single value or as a table of values
- Error Limits - entering minimum and maximum signal, velocity, amplitude and soundspeed.

To measure flow rate with the UTX878 you must, at a minimum, activate the channel/path(s), and enter transducer, pipe and fluid parameters. As a programming aid, Appendix A includes a complete set of menu maps for the user program, and Figure 41 on page 77 offers the menu map for the *PROG* menu.

Note: *This manual will describe only the programming of Channel 1. To program Channel 2 of a 2-channel/path meter, simply repeat the same procedures presented for Channel 1.*

2.2 Unlocking and Locking the UTX878

To prevent unauthorized tampering with either the display or the user program, the UTX878 offers a pair of security codes. Once you have set the security level, an operator requires one of these codes to change either the display (Prog Lock) or the display and the user program (Full Lock).

Note: *To speed up the key response of the UTX878, deactivate CH1 (and CH2), as described on page 28. Remember to reactivate the channels when programming is complete.*

2.2.1 Unlocking the UTX878

To unlock the display and/or the user program:

1. Press [ESC], [ENT], [ESC]. A Security Check window, similar to Figure 30 below, opens.

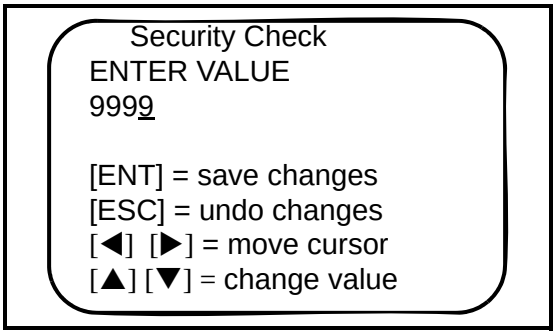


Figure 30: Security Check Window

2. Using the arrow keys, change the code number to the value desired for your security level.

- For Prog Lock (granting access only to the display), the number is **2719.**
- For Full Lock (granting access to the display and user program), the number is **7378.**

3. Press [ENT]. The display screen reappears, with the lock removed or partially unlocked. Security will remain at this level until you change the level in the user program, as described on page 27.

2.2.2 Locking the UTX878

You can access the security level in two ways.

From the display screen:

1. Press the [▶] key three times, until the lock in the upper right corner is highlighted.
2. Press [ENT], and proceed to step 4 below.

From the User Program:

1. Press [ESC]. The UTX878 enters the User Program.
2. Press the [▶] key until *USER* is bracketed.
3. The menu highlights *Set Security.* Press [ENT].
4. The screen shows three options:
   - *Full Lock*, which prevents a user from changing any part of the display or user program without the appropriate code:
   - *Prog Lock*, which allows a user to change the display but not to enter the user program:
   - *Unlocked*, which allows access to both the display and the user program.

Scroll to the desired option and press [ENT] twice.

5. Press [ESC] to return to the User Program, or continue pressing [ESC] to return to the display screen. If you have chosen to fully lock the UTX878, the screen appears similar to Figure 31 below, with a solid lock in the upper right corner. (For a meter with only the user program locked, the lock shows a keyhole in the center.)

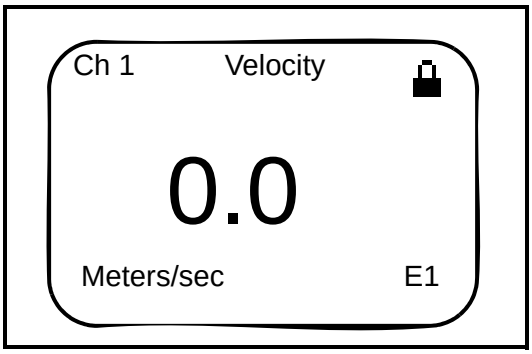


Figure 31: UTX878 Screen with Locked Program

2.3 Activating a Channel/Path (Status)

In the *Status* submenu of the *PROG* menu, you can activate or deactivate a channel/path. While the channel/path should be activated when you receive your unit, you should verify that the channel/path is active before you begin programming. When following the programming instructions, refer to Figure 41 on page 77. Remember to record all programmed data in Appendix C, *Data Records.*

To access the *Status* submenu:

1. Press [ESC]. The UTX878 enters the *User Program*.
2. Press the [▶] key until PROG is bracketed in the top left corner and press [ENT].
3. Use the [▲] and [▼] keys to scroll to the desired channel and press [ENT]. The screen appears similar to Figure 32 below.

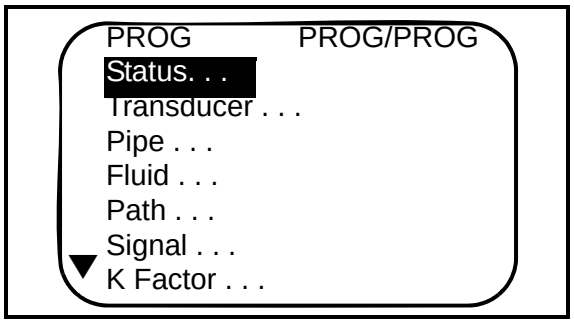


Figure 32: The PROG Menu

4. Press [ENT] to open the *Status* submenu.
5. The screen offers two options, ON and OFF. Use the [▲] and [▼] keys to scroll to the desired selection and press [ENT].

IMPORTANT: *On any menu, if you scroll to a different option, press* [ENT] *twice to select that option (once to enter and again to confirm the selection).*

6. Press [ESC] (or [ENT] twice if you have selected the other option) to return to the channel menu.

Procedure Options. After completing the above steps, the user program returns to the *PROG* menu. Do one of the following:

- To enter transducer data, press the [▼] key to highlight the *Transducer* listing and press [ENT].
- To program in other menus, refer to Appendix A, *Menu Maps*, to navigate to the desired menu.
- To leave the User Program, press [ESC] three times.

2.4 Entering Transducer Parameters

The *Transducer* submenu enables you to enter parameters for clamp-on or wetted transducers (preprogrammed or special). Remember to record all programmed data in Appendix C, *Data Records*.

Note: *If you have programmed the* Status *submenu, proceed directly to Step 4. If you scroll to a different option, press* [ENT] *twice to select that option (once to enter and again to confirm the selection).*

To access the *Transducer* submenu:

1. Press [ESC]. The UTX878 enters the User Program.

2. Press the [▶] key until PROG is bracketed in the top left corner and press [ENT].

3. Use the [▲] and [▼] keys to scroll to the desired *Channel* and press [ENT].

4. Scroll to the *Transducer* submenu and press [ENT].

2.4.1 Clamp-on Transducers

1. Scroll to *Clamp-on* and press [ENT].

2. Scroll to either *Preprogrammed* (for the standard transducers) or *Other* (for special transducers), and press [ENT].

3. The program also asks for the Wedge Temperature. Scroll to the *Wedge TMP* option and press [ENT]. Then use the [▲] and [▼] keys to enter the temperature, and press [ENT].

Note: *The wedge temperature of the transducer can be approximated by inputting an average value for the surface temperature of the outside pipe wall.*

4. Do one of the following:

2.4.1a Pre-programmed Clamp-on Transducers

1. For pre-programmed transducers, scroll to the desired *Transducer Number* [UTXDR-**407** (2 MHz), UTXDR-**408** (4 MHz), UTXDR-**409** (0.5 MHz)] or UTXDR-**410** (1.0 MHz)] and press [ENT].

2. Press [ESC] three times to return to the PROG menu.

2.4.1b Other Clamp-on Transducers

IMPORTANT: *Other (special) transducers have no engraved number on the housing and are rarely used. Examine the transducer housing carefully for a number.*

1. The first required parameter is the *Frequency.* Press [ENT] to open the Frequency window. Then scroll to the frequency of your transducer (from 0.5 to 4.00 MHz) and press [ENT].

2. The meter next asks for the *Time Delay (Tw).* Scroll to the *Tw* option and press [ENT]. Then use the arrow keys to enter the time provided by GE Sensing (in microseconds), and press [ENT].

3. The next parameter is the *Wedge Angle*, the angle of the transducer's ultrasonic transmission in the transducer wedge. Scroll to the *Wedge Ang* option and press [ENT]. Use the arrow keys to enter the provided angle (in degrees), and press [ENT].

4. To enter the *Wedge Soundspeed*, scroll to the *Wedge SS* option and press [ENT]. Use the arrow keys to enter the provided soundspeed (in m/s or ft/s), and press [ENT].

2.4.1b Other Clamp-on Transducers (cont.)

5. The final parameter is the Temperature Coefficient. Scroll to the *TempCo* option and press [ENT]. Use the arrow keys to enter the provided coefficient, and press [ENT]. Set the coefficient to 0 if you are unsure of the value.

You have completed entering parameters for other clamp-on transducers. Press [ESC] until you reach the PROG menu to continue programming, or continue pressing [ESC] to resume displaying data.

2.4.2 Wetted Transducers

1. Scroll to *Wetted* and press [ENT].

2. Scroll to either *Preprogrammed* (for the standard transducers) or *Other* (for special transducers), and press [ENT].

3. Do one of the following:

2.4.2a Pre-programmed Wetted Transducers

1. For pre-programmed transducers, scroll to the desired *Transducer Number* and press [ENT].

2. Press [ESC] three times to return to the PROG menu.

2.4.2b Other Wetted Transducers

IMPORTANT: *Other (special) transducers have no engraved number on the housing and are rarely used. Examine the transducer housing carefully for a number.*

1. The first required parameter is the *Frequency.* Press [ENT] to open the Frequency window. Then scroll to the frequency of your transducer (from 0.5 to 3.00 MHz) and press [ENT].

2. The meter next asks for the *Time Delay (Tw).* Scroll to the *Tw* option and press [ENT]. Then use the arrow keys to enter the time provided by GE Sensing (in microseconds), and press [ENT].

You have completed entering parameters for other transducers. Press [ESC] until you reach the PROG menu to continue programming, or continue pressing [ESC] to resume displaying data.

2.5 Entering Pipe Parameters

In the *Pipe* submenu, you can specify preprogrammed or special pipe parameters. While following the programming instructions, refer to Figure 41 on page 77. Remember to record all programmed data in Appendix C, *Data Records.*

Note: *If you are in the* PROG *menu, proceed directly to Step 4. If you scroll to a different option, press* [ENT] *twice to select that option (once to enter and again to confirm the selection).*

To access the *Pipe* submenu:

1. Press [ESC]. The UTX878 enters the User Program.
2. Press the [▶] key until PROG is bracketed and press [ENT].
3. Use the [▲] and [▼] keys to scroll to the desired *Channel* and press [ENT].
4. Scroll to the *Pipe* submenu and press [ENT].

2.5.1 Entering the Pipe Material

1. The menu offers two options, *Material* and *Lining*. Be sure the *Material* option is highlighted, and press [ENT].
2. Two other options now appear, *Preprogrammed* and *Other.* Scroll to the desired option, and press [ENT].
3. The menu now varies with your choice in Step 2.

- For preprogrammed materials, a list of materials opens. Table 2 on page 32 covers the available preprogrammed materials on the list. Press the [▼] or [▲] keys to scroll to the appropriate material. Press [ENT] to confirm the choice.
- For other materials, the meter asks for the material *Soundspeed*. Press [ENT] to open the window. Then use the arrow keys to enter the known soundspeed, and press [ENT].

2.5.1 Entering the Pipe Material (cont.)

Table 2: Preprogrammed Pipe Materials

Pipe Material Category	Specific Material
Al - Aluminum	Rolled or None
Brass	None
Cu - Copper	Annealed, Rolled or None
CuNi - Copper/Nickel	70% Cu 30% Ni or 90% Cu 10% Ni
Glass	Pyrex, Flint, or Crown
Gold	Hard-drawn
Inconel	None
Iron	Armco, Ductile, Cast, Electrolytic
Monel	None
Nickel	None
Plastic	Nylon, Polyethylene, Polypropylene, PVC (CPVC), or Acrylic
Steel	Carbon Steel, Mild or Stainless Steel
Tin	Rolled
Titanium	None
Tungsten	Annealed, Carbide, Drawn
Zinc	Rolled

4. The next required parameter is either the outside diameter *(OD)* or the circumference *(OD x* π). Scroll to the measured parameter and press [ENT]. For either measurement, enter the desired value and press [ENT].

Note: *Obtain the required information by measuring either the pipe outside diameter (OD) or circumference at the transducer installation site. The data may also be obtained from standard pipe size tables found in* Soundspeeds and Pipe Size Data *(914-004).*

5. The meter also requires the *Wall Thickness (WT)*. Scroll to the WT option, and press [ENT]. Use the arrow keys to enter the known thickness, and press [ENT].

Note: *To obtain an accurate pipe wall thickness measurement, use an ultrasonic thickness gauge.*

6. If you have selected certain materials (such as carbon or stainless steel, cast iron, PVC and CPVC), the UTX878 offers the option of entering the pipe dimensions by a standardized schedule. (This option does not appear unless you have selected one of these materials; if you have, proceed to step a below.) Once you enter the nominal pipe size and schedule number, the UTX878 determines the OD and wall thickness from an internal table.

a. Scroll to the *Schedule* option, and press [ENT].

b. A list of pipe sizes opens, from 15 to 400 mm (0.5 to 16 in.). Scroll to the desired pipe size, and press [ENT].

c. A list of schedules opens. Scroll to the desired schedule, and press [ENT].

You have finished entering the pipe parameters. Press [ESC] until you return to the *Pipe Material/Lining* window, or continue pressing [ESC] to return to the data display window.

2.5.2 Entering Pipe Lining Data

To access the *Lining* option:

1. From the *Pipe* submenu, scroll to the *Lining* option, and press [ENT].
2. Two options appear, *Material* and *Thickness*. Be sure *Material* is highlighted, and press [ENT].
3. Two other options now appear, *Preprogrammed* and *Other.* Scroll to the desired option, and press [ENT].
4. The menu now varies with your choice in Step 3.

- For preprogrammed linings, the screen shows a list of *Lining Materials*, listed in Table 3 below. Scroll to the appropriate material. If the pipe has no lining, select "None." Press [ENT] to confirm the choice.
- For other materials, the next screen asks for the lining *Soundspeed*. Press [ENT] to open the soundspeed window. Use the arrow keys to enter the known soundspeed, and press [ENT].

Table 3: Preprogrammed Lining Materials

Lining Material Options
None
Tar/Epoxy
Glass (Pyrex)
Asbestos Cement
Mortar
Rubber
PTFE

Note: *If your pipe lining is not on the drop-down list, consult the factory for further information.*

Procedure Options. You have finished entering data in the *Pipe* submenu. Do one of the following:

- To program in other options, press [ESC] until you return to the PROG menu.
- To program in other menus, refer to Appendix A, *Menu Maps*, to navigate to the desired menu.
- To leave the User Program, press [ESC] until the display screen reappears.

2.6 Entering Fluid Data

The *Fluid* submenu allows you to specify the fluid you are measuring, as well as the Reynolds Correction factor and tracking windows. While following the programming instructions, refer to Figure 41 on page 77. Remember to record all programmed data in Appendix C, *Data Records.*

Note: *If you are in the* PROG *menu, proceed directly to Step 4. If you scroll to a different option, press* [ENT] *twice to select that option (once to enter and again to confirm the selection).*

To access the *Fluid* submenu:

1. Press [ESC]. The UTX878 enters the User Program.

2. Press the [▶] key until PROG is bracketed in the top left corner and press [ENT].

3. Use the [▲] and [▼] keys to scroll to the desired *Channel* and press [ENT].

4. Scroll to the *Fluid* submenu and press [ENT].

2.6.1 Entering Fluid Type

5. Two options appear, *Fluid Type* and *Reynolds*. Scroll to *Fluid Type* and press [ENT].

6. The *Normal* heading appears.

- For *Normal* fluids, you can program the expected fluid *Temperature*. Scroll to the *Temperature* option and press [ENT]. Then use the arrow keys to enter the process temperature, and press [ENT].

7. You can now select between *Preprogrammed* and *Other* fluids. Scroll to the desired option, and press [ENT].

- If you selected *Preprogrammed*, the UTX878 supplies a list of preprogrammed fluids, as shown in Table 4 below. Scroll to the desired fluid and press [ENT].
- If you selected *Other*, the UTX878 asks for the fluid soundspeed. Scroll to the soundspeed option and press [ENT]. Use the arrow keys to enter the appropriate soundspeed, and press [ENT].

Table 4: Preprogrammed Fluid Types

Water (0-260°C)	Lube Oil (X200)	Freon (R-12)
Sea Water	Methanol (20°C)	Diesel
Oil (22°C)	Ethanol	Gasoline
Crude Oil	LN2 (-199°C)	

8. Press the [ESC] key until you return to the *Fluid Type* window mentioned in Step 5.

2.6.2 Entering Reynolds Correction Data

Reynolds Correction is a correction factor based on the Kinematic Viscosity and flow rate of the fluid. It is necessary, as the velocity of the fluid measured along a diametrical path must be related to the total area average velocity over the entire pipe cross-section. This factor should be ON in most applications, including all those that use clamp-on transducers. To access Reynolds Correction data:

1. From the *Fluid Type* window (mentioned in step 5 on page 34), scroll to *Reynolds* and press [ENT].

2. The screen shows three options: *Off*, *Single* and *Table*. Scroll to the desired option, and press [ENT].

3. The menu varies, depending on your selection in Step 2.

- If you select *Off*, no further choices are available.
- If you select *Single*, the UTX878 will select and automatically display the *Kinematic Viscosity.* To change the value, press [ENT]. Use the arrow keys to change the value (available in document #914-004, *Soundspeeds and Pipe Size Data*), and press [ENT].
- If you select *Table*, the screen displays three options: *Units*, *Rows Used* and *Edit Table.*

  a. If you scroll to *Units* and press [ENT], the screen displays two more options: *Soundspeed* and *Diagnostic*. If you select *Soundspeed* and press [ENT], the screen displays the measurement units (either metric or English). Press [ESC] or [ENT] to return to the previous screen. But if you scroll to *Diagnostic* and press [ENT], the meter asks for the type of signal to be used, Signal Strength *Up* or Signal Strength *Dn*. Scroll to the appropriate signal, and press [ENT].

  b. If you select *Rows Used*, the program asks for the number of *rows* you wish to use. Enter the desired number (from 2 to 20) and press [ENT].

  c. If you select *Edit Table*, the table opens with a series of *rows*. Scroll to the desired row, and press [ENT].

  d. For each row, the screen displays the Reynolds Correction number (X) and the Kinematic Viscosity (KV). If you wish to change either value, scroll to the value and press [ENT]. Use the arrow keys to change the value (available in document #914-004, *Soundspeeds and Pipe Size Data*), and press [ENT].

  e. Repeat steps c and d until you have programmed all of your available data (from 2 to 20 rows).

Press [ESC] until you return to the PROG menu, or continue pressing [ESC] until the display screen reappears.

2.6.3 Entering Tracking Windows Data

Note: *When you select the* Wetted *type transducer, the* Normal *and* Tracking *menu options appear under* Fluid/Fluid Type. *If you select the* Clamp-On *type transducer, only the* Normal *menu option appears under* Fluid/Fluid Type.

2.7 Entering Path Data

In the *Path* submenu, you can specify and check the path taken by the transducer signal. Remember to record all programmed data in Appendix C, *Data Records.*

Note: *If you are in the PROG menu, proceed directly to Step 4. If you scroll to a different option, press* [ENT] *twice to select that option (once to enter and again to confirm the selection).*

To access the *Path* submenu:

1. Press [ESC]. The UTX878 enters the User Program.
2. Press the [▶] key until *PROG* is bracketed and press [ENT].
3. Use the [▲] and [▼] keys to scroll to the desired *Channel* and press [ENT].
4. Scroll to the *Path* submenu and press [ENT].
5. The meter first asks for the number of *Traverses*, or times the signal crosses the pipe. Press [ENT], scroll to the number of traverses for your installation, and press [ENT] to confirm the entry.

Note: *The great majority of UTX applications call for two traverses. Figure 33 below illustrates signal paths for a typical two-traverse installation.*

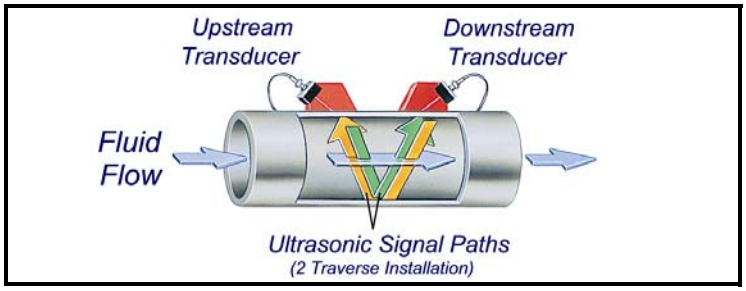


Figure 33: Signal Paths for a Two-Traverse Installation

6. The remaining prompt displays the *Transducer Spacing*, as calculated from the information entered. Use this number to set the spacing of the transducers. (The minimum spacing is 0.9 in.)
   If necessary, you can overwrite the spacing to match the actual physical spacing of the transducers. Press [ENT] to open the Spacing window, and use the arrow keys to change the value. Then press [ENT] to confirm the value.

IMPORTANT: *It is recommended that you do not use a spacing other than the one calculated by the UTX878. However, if you do use a different spacing, do not change the spacing by more than ±10% from that calculated by the UTX878.*

Press [ESC] until you return to the *PROG* menu, or continue pressing [ESC] until the display screen reappears.

2.8 Entering Signal Parameters

In the *Signal* submenu, you can set parameters that affect the transducer signal:

CAUTION! The SIGNAL default settings are suitable for most applications. Consult the factory before changing any of these applications.

- Delta-T Offset
- Zero Cutoff
- Errors Allowed
- Peak Detection Method and Thresholds
- Zero Intercept
- Transmit Sample Size
- Velocity Averaging

While following the programming instructions, refer to Figure 41 on page 77.

Note: *If you are in the PROG menu, proceed directly to Step 4. If you scroll to a different option, press* [ENT] *twice to select that option (once to enter and again to confirm the selection).*

To enter the *Signal* submenu:

1. Press [ESC]. The UTX878 enters the User Program.
2. Press the [▶] key until *PROG* is bracketed and press [ENT].
3. Use the [▲] and [▼] keys to scroll to the desired *Channel* and press [ENT].
4. Scroll to the *Signal* option and press [ENT].
5. The first prompt, *Delta-T Offset*, is the difference between the upstream and downstream transit times of the transducer signals. It should normally be set to 0. Press [ENT], use the arrow keys to enter the new value, and press [ENT] to confirm your entry.
6. The next prompt asks for the *Zero Cutoff*. Near "zero" flow, the UTX878 may have fluctuating readings due to small offsets (caused by factors such as thermal drift in the fluid). The zero cutoff causes velocity measurements less than the cutoff to be reported as zero. To set the cutoff, press [ENT], and use the arrow keys to enter the new value. Press [ENT] to confirm your entry.
7. The *Errors Allowed* prompt specifies the number of errors the UTX878 can record before displaying an error message. Press [ENT], and use the [▲] and [▼] keys to scroll to the appropriate number of errors (from 0 to 16). Press [ENT] to confirm your entry.

2.8 Entering Signal Parameters (cont.)

8. The next prompt asks for the *Peak Detection* method. In the "Peak" method, the peak is identified by testing a derivative of the signal. In the "Threshold" method, the peak is identified as the point where the signal crosses a threshold that is a percentage of the maximum signal detected. The peak method is more reliable in identifying the signal in dynamic conditions, while the threshold method is more reliable in marginal signal conditions.

Note: *Do not change the peak detection method or values unless recommended by GE Sensing.*

a. Press [ENT]. The screen shows the two display options, *Peak* and *Threshold.* Scroll to the desired option, and press [ENT].

b. The next screen depends on your selection in Step a.

- If you select *Peak*, no further options are available. Press [ESC] to return to the Signal menu.
- If you select *Threshold* and press [ENT], the screen shows three parameters: *Min Threshold, Max Threshold* and *Percent of Peak.* For each parameter, press [ENT]. Use the arrow keys to enter the new value, and press [ENT].

9. The next parameter is *Zero Intercept*. To select the *Zero Intercept*, scroll to the desired option (*Sinc* or *Spline*) and press [ENT].

10. The next parameter is the *Transmit Sample Size*, the number of pulses each transducer (upstream and downstream) emits. It is set to 32 by default. Press [ENT], and use the [▲] and [▼] keys to scroll to the new number (from 1 to 32). Press [ENT] to confirm the entry.

11. The final prompt asks for *Velocity Averaging*, in which users select a certain number of velocity measurements to average together to smooth out noise in the signal. Press [ENT], and use the [▲] and [▼] keys to scroll to the desired number. (Selections include none, 2, 5, 10, 30, 60 and Statistics. The Statistics option increases averaging under steady flow conditions, but allows for a rapid response to step changes in flow rate.) Press [ENT] to confirm your entry.

You have completed entering parameters in the *Signal* option. Press [ESC] until you return to the PROG menu, or continue pressing [ESC] until the display screen reappears.

2.9 Entering the Meter Correction (K) Factor

With the *K Factor* submenu, you can calibrate or adjust the UTX878 readings to another flow reference. While following the programming instructions, refer to Figure 41 on page 77. To enter K Factor data:

Note: *If you are in the* PROG *menu, proceed directly to Step 4. If you scroll to a different option, press* [ENT] *twice to select that option (once to enter and again to confirm the selection).*

1. Press [ESC]. The UTX878 enters the *User Program*.

2. Press the [▶] key until PROG is bracketed in the top left corner and press [ENT].

3. Use the [▲] and [▼] keys to scroll to the desired *Channel* and press [ENT].

4. Scroll to the *K Factor* submenu and press [ENT].

5. The screen shows three options: *Off, Single* and *Table*. Scroll to the desired option, and press [ENT].

6. The menu varies, depending on your selection in Step 5.

- If you select *Off,* no further choices are available.
- If you select *Single*, the UTX878 displays the *K Factor.* To change the value, press [ENT]. Use the arrow keys to change the value and press [ENT].

IMPORTANT: *If you have enabled the Reynolds Correction factor in the Fluid option, the K factor should be set to 1.00. Otherwise, the typical factor is between 0.5 and 2.00.*

- If you select *Table*, the screen displays three options: *Units, Rows Used* and *Edit Table*.

  a. If you scroll to *Units* and press [ENT], the screen displays the selected measurement units (either metric or English). Press [ESC] or [ENT] to return to the previous screen.

  b. If you select *Rows Used*, the program asks for the number of *rows* you wish to use. Enter the desired number (from 2 to 20) and press [ENT].

  c. If you select *Edit Table*, the table opens with a series of *rows*. Scroll to the desired row, and press [ENT].

  d. For each row, the screen displays the X (velocity) value and the K Factor. If you wish to change either value, scroll to the value and press [ENT]. Use the arrow keys to change the value and press [ENT].

  e. Repeat steps **c** and **d** until you have programmed all available data (from 2 to 20 rows).

Press [ESC] until you return to the PROG menu, or continue pressing [ESC] until the display screen reappears.

2.10 Entering Error Limits

The Error Limits option enables you to set limits for an incoming signal. When the signal falls outside the programmed limits, an error indication appears on the display screen. To set error limits, follow the steps below.

Note: *If you are in the* PROG *menu, proceed directly to Step 4. If you scroll to a different option, press* [ENT] *twice to select that option (once to enter and again to confirm the selection).*

1. Press [ESC]. The UTX878 enters the *User Program*.
2. Press the [▶] key until PROG is bracketed in the upper left corner and press [ENT].
3. Use the [▲] and [▼] keys to scroll to the desired *Channel* and press [ENT].
4. Scroll to the *Error Limits* option and press [ENT].
5. The first prompt asks for the *Minimum Signal* limit for the transducer signal received by the UTX878. The E1:LOW SIGNAL error message appears if the signal strength falls below the limit programmed here. Press [ENT]. Use the arrow keys to change the value and press [ENT].
6. Repeat the steps above for the *Maximum Signal* limit.
7. The next prompt calls for the *Minimum Velocity* limit. Press [ENT]. Use the arrow keys to change the value and press [ENT].
8. Repeat the steps above to change the *Maximum Velocity* limit. (The E3: VELOCITY RANGE error message appears if the velocity falls outside the minimum and maximum limits.)
9. The meter now asks for the *Min Amplitude*, the lower limit for the amplitude discriminator. The discriminator measures the size of the transducer signal sent from the UTX878. If the signal falls outside these limits, the E5: AMPLITUDE error message appears. Press [ENT]. Use the arrow keys to change the value and press [ENT].
10. Repeat these steps for the *Max Amplitude*, the upper limit for the discriminator.
11. The next prompt asks for the acceptable limits for the *Soundspeed*, based on conditions in your particular system. The E2: SOUNDSPEED error message appears if the fluid soundspeed exceeds that entered in the Fluid submenu by more than this percentage. Press [ENT]. Use the arrow keys to change the percentage and press [ENT].
12. The final prompt asks for the *Acceleration* limit for detecting cycle skipping. The E6: ACCELERATION error message appears if the velocity changes by more than this limit from one reading to the next. Press [ENT]. Use the arrow keys to change the value and press [ENT].

Procedure Options. You have finished entering data in the PROG menu. Do one of the following:

- To program in other menus, refer to Appendix A, *Menu Maps*, to navigate to the desired menu.
- To return to the display screen, press [ESC] until the display screen reappears.
- To configure the display, proceed to the next chapter.

Chapter 3. Displaying Data

3.1 Introduction

The Model UTX878 flow transmitter includes a Liquid Crystal Display (LCD) that can display up to two variables simultaneously. Users can change the number of variables, the displayed measurements and units, and the contrast level of the LCD.

3.2 Setting Up the Display

You can configure either of two channels for your particular requirements. When you first power up the installed UTX878, the display screen appears similar to Figure 34 below.

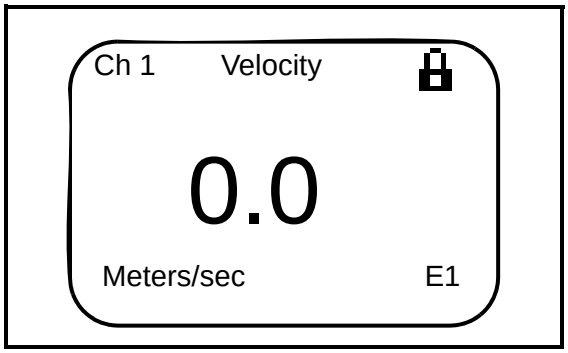


Figure 34: A Typical Display Screen

To change the display screen, press either the [◀] or [▶] keys. The screen will highlight one of the parameters, as shown in Figure 35 below.

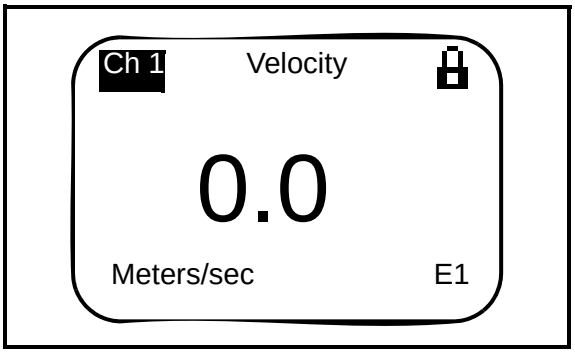


Figure 35: Display Screen with Highlighted Parameter

If you press the [▶] key, the UTX878 highlights the channel parameter in the upper left; if you press the [◀] key, it highlights the error code parameter in the lower right. Continue pressing the [◀] or [▶] key to reach the desired parameter. When you have highlighted that parameter, press [ENT].

IMPORTANT: *On any menu, if you scroll to a different option, press* [ENT] *twice to select that option (once to enter and again to confirm the selection).*

3.2.1 Changing the Channel

Note: *This option is available only for 2-channel versions of the UTX878.*

The first parameter on the screen in the upper left is the *Channel Number.* You can change the display to show either of the two channels, or the average, sum or difference of the channels.

1. When you have highlighted the channel number, press [ENT].

2. The screen displays a list of options:

- Channel 1
- Channel 2
- AVG (2-Path)
- SUM
- DIFF
- AVG ((Ch1 + Ch2)/2)

Note: *The 2-Path Avg option is intended for applications where two sets of transducers are installed in the same location in the same pipe to improve accuracy and the UTX878 operates in AVE 2-Path mode. With this function enabled, the UTX878 performs error handling only if both channels/paths are in error. If this function is disabled, error handling occurs when either channel/path goes into error.*

Scroll to the desired option, and press [ENT]. The display screen reappears with the new channel.

3.2.2 Changing the Measurement Parameter

The next parameter, in the center, is the measurement parameter (velocity, volumetric, forward or reverse total, soundspeed and diagnostic parameters). To change the measurement parameter:

1. Use the [◀] or [▶] key to highlight the measurement parameter, and press [ENT].

2. The screen displays a list of parameters:

- Velocity
- Volumetric
- Fwd Total
- Rev Total
- Soundspeed
- Diagnostic

Scroll to the desired parameter, and press [ENT]. The display screen reappears with the new measurement.

Note: *To select a particular diagnostic parameter or unit, select* Diagnostic *and proceed to* Changing the Measurement Units *on page 43.*

3.2.3 Adjusting the Numeric Display Format

When you highlight the numeric display, you can control both its positioning and the number of decimal places displayed to the right of the decimal point.

1. Use the [◀] or [▶] key to highlight the numeric display, and press [ENT].
2. The Format window opens, with four options: Width (the width of the numeric display), Decimal (the number of decimal places), Min and Max (the respective minimum and maximum values displayed). Use the [▲] or [▼] key to scroll to the desired option, and press [ENT].
3. The menu now varies with your choice in Step 2.

- *If you select Width:*

The program offers a choice of widths from 0 (least wide) to 8 (widest). Use the [▲] and [▼] keys to enter the desired width and press [ENT].

- *If you select Decimal:*

The program offers a choice of decimal places from 0 (no places) to 4. Use the [▲] and [▼] keys to enter the desired number of places and press [ENT].

- *If you select Min or Max:*

The program displays the programmed minimum or maximum value.

4. After making your selection, press [ESC] twice to return to the display screen with the changed parameter.

3.2.4 Changing the Measurement Units

In addition to changing the measurement parameter, you can select (for some parameters) the particular units in which that parameter will be displayed. (For a list of output measurement units, see Chapter 7, *Specifications.*)

Note: *To choose between metric and English units, refer to Chapter 4,* Configuring Meter Data.

1. Use the [◀] or [▶] key to highlight the measurement units, and press [ENT].
2. The screen displays a list of measurement units (or, for Diagnostic, a list of diagnostic parameters). Scroll to the desired unit, and press [ENT]. The display screen reappears with the new measurement units.
3. Press [ESC]. The display screen returns with the changed measurement unit.

Note: *For the velocity and soundspeed parameters, it is not possible to change the display unit.*

3.2.5 Interpreting the Error Message

The parameter in the lower right corner, represented by E and a number (E1, E2, etc.) is an error message that signals a particular problem with the measurement. To access an explanation of the error, use the [◀] or [▶] key to highlight the error code and press [ENT]. The screen appears similar to Figure 36 below.

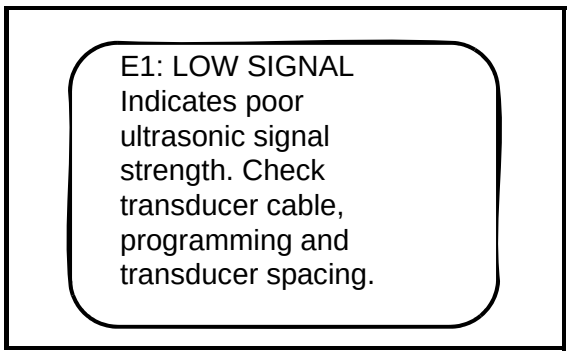


Figure 36: A Typical Error Message Explanation

Press [ESC] to return to the display screen. For an explanation of all error codes, refer to Chapter 6, *Error Codes and Diagnostics.*

3.3 Setting Screen Contrast

For viewer convenience, you can reset the contrast level of the display screen. To change the contrast:

1. Press [ESC]. The UTX878 enters the *User Program*.
2. Press the [▶] key until *DISP* is bracketed in the upper left corner.
3. The menu highlights the *Contrast* option. Press [ENT].
4. Use the [▲] and [▼] keys to enter the desired contrast level from 0 to 100%. (The default value is 30%.) As you scroll, the screen visibly changes contrast. When you have reached the desired contrast level, press [ENT].

Note: *The display is visible over the entire UTX878 temperature range without contrast adjustment.*

5. Press [ESC] to return to the *User Program*, or continue pressing [ESC] to return to the display screen.

3.4 Setting the Number of Screen Views

You can also choose to display either one or two measurement parameters, on the same or different channels. To select the number of views:

1. Press [ESC]. The UTX878 enters the *User Program*.
2. Press the [▶] key until *DISP* is bracketed.
3. Scroll to the *Views* option, and press [ENT].
4. Scroll to the desired number of views, and press [ENT].
5. Press [ESC] to return to the *User Program*, or continue pressing [ESC] to return to the display screen.

Chapter 4. Configuring Meter Data

4.1 Introduction

The CONFIG menu in the UTX878 *User Program* enables you to set global parameters for the meter that suit your individual preferences. The available parameters include:

- Metric or English units
- 4-20 Loop Settings (low and high values)
- Communication settings
- Resetting totals
- Totalizer error handling

To enter the CONFIG menu from the display screen, press [ESC] (to enter the *User Program*) and press the [▶] key once. While following the programming instructions, refer to Figure 42 on page 78.

Note: *The* 4-20Loop *menu is used to set the base/span/units for both the single loop and the HART 4-wire devices. The* CAL *menu is used for both the single loop and the HART loop devices, when configured for 4-wire.*

Note: *If the program is locked, follow the directions on page 26 to unlock the user program.*

4.2 Entering Global Units

In the *Units* submenu, you can choose to display all measurements in either metric or English formats.

Note: *You cannot choose to display some measurements in English formats and others in metric.*

To access the *Units* submenu:

1. Press [ESC]. The UTX878 enters the *User Program.*
2. Press the [▶] key until CONFIG is bracketed and press [ENT].
3. Press [ENT] to enter the *Units* submenu.
4. Use the [▲] and [▼] keys to scroll to the desired selection (metric or English) and press [ENT]. The UTX878 returns to CONFIG menu.

IMPORTANT: *On any menu, if you scroll to a different option, press* [ENT] *twice to select that option (once to enter and again to confirm the selection).*

4.3 Entering Base (Zero) and Span Output Values

The *4-20 Loop* submenu enables you to enter the information needed to set up output parameters: unit type, base (zero) and span values, and error handling. To enter data in the *4-20 Loop* submenu:

1. Press [ESC]. The UTX878 enters the *User Program.*
2. Press the [▶] key until CONFIG is bracketed and press [ENT].
3. Press [▼] to reach the *4-20 Loop* submenu, and press [ENT].

4.3.1 Entering Output Type and Units

1. In the *4-20 Loop* submenu, press [ENT] to enter the *Units* option.
2. The menu displays six options: Channel 1, Channel 2, AVG, 2Path AVG, SUM, and DIFF. Use the [▲] and [▼] keys to scroll to the desired option, and press [ENT].

Note: *Channel 2, AVG, 2Path AVG, SUM and DIFF are available only for a two-channel UTX878.*

3. The screen now displays three measurement parameters: *Velocity, Volumetric*, and *Soundspeed*. Scroll to the desired selection and press [ENT].
4. The menu now asks for the unit type.
   - For velocity or soundspeed measurements, the menu offers a single selection (either feet/sec or meters/sec, depending on your choice of units). Press [ENT] to confirm the entry and return to the previous menu.
   - For volumetric, the menu offers a list of output units (either metric or English). Scroll to the desired units and press [ENT].

Press [ESC] until you return to the CONFIG menu.

4.3.2 Entering Base and Span Values

1. In the *Loop* option, press [▼] and [ENT] to enter the *Base* option.
2. The *Base* window opens. Use the arrow keys to enter the desired base (4 mA) value for the analog output, and press [ENT].
3. The UTX878 returns to the Loop menu. Press [▼] and [ENT] to enter the *Span* option.
4. The *Span* window opens. Use the arrow keys to enter the desired span (20 mA) value for the analog output, and press [ENT].

4.3.3 Entering Error Handling

1. The UTX878 returns to the *Loop* option. Press [▼] and [ENT] to enter the *Error Level* option.
2. The screen displays a list of error options as defined in Table 5 below, Table 6 and Table 7 on page 47. Scroll to the desired option and press [ENT].

Table 5: Error Options and Responses for a 1-Channel Path/Meter

Option	Output Response
Hold Value	Holds the last “good” reading.
Force HI (20 mA)	Forces the outputs to the high set point.
Force LO (4 mA)	Forces the outputs to the low set point.
Force HH (22 mA)	Forces the outputs ª10% above the high set point.
Force LL (3.8 mA)	Forces the outputs ª10% below the low set point.
Force Value	Forces the outputs to a preprogrammed value.

4.3.3 Entering Error Handling (cont.)

- If you select Force Value (as shown in Table 5 on page 46), the meter asks for a specific value. Use the arrow keys to enter the desired value, and press [ENT].

AVG 2PATH is an independent totalizer, which uses the AVG 2PATH volumetric to calculate the totalizer value. Composite channels (AVG, SUM and DIFF) continue to calculate when either channel goes into error, and will display if either channel is in error.

Table 6: Non-Totalizer Two-Path Averaging Truth Table

CH1	CH2	AVG 2PATH Calculation (Non-Total Values)
OK	OK	(CH1 + CH2)/2
OK	ERR	CH1
ERR	OK	CH2
ERR	ERR	Hold Last Value

Table 7: Error Options and Responses for a 2-Channel/Path Meter

When Measuring	Display Response	Totalizer Response When Error Handling is	
		Totalize on Error? (YES)	Totalize on Error? (NO)
CH1 or CH2 (vel, vol, etc.)	Holds last "good" reading.	Holds last "good" reading and continues to totalize based on that "good" reading.	Stops totalizing.
AVE (2-Path)	See Table 6 above.		
SUM	Adds two channels/paths using the last "good" reading.		
DIF	Subtracts two channels/paths using the last "good" reading.		
AVE	Adds two channels/paths using the last "good" reading.		

Note: *Average 2-Path is in error only when both channels are in error (or disabled).*

Press [ESC] until you return to the CONFIG menu, or continue pressing [ESC] until the display screen reappears.

4.4 Entering RS232 Communication Settings

With the *Communication* submenu, you can set the parameters by which the UTX878 communicates to a PC or terminal over the RS232 interface. You can set the Node ID as well as the baud rate, parity, stop bits and data bits.

Note: *The user can use either HART interface or RS232 interface, but both cannot be used simultaneously. The default communication interface is HART. To move from one communication interface to the other, select the required interface and then confirm it. To access the Communication submenu:*

1. Press [ESC]. The UTX878 enters the *User Program.*

2. Press the [▶] key until *CONFIG* is bracketed and press [ENT].

3. Press the [▼] key until *Communication* is highlighted. Then press [ENT].

4. The next window offers several selections: *Node ID*, *RS232*, *HART* and *Confirm Interface*. Use the [▲] and [▼] keys to scroll to the desired option and press [ENT].

- If you select *Node ID*, the meter asks for a specific ID number. Use the arrow keys to enter the desired number (from 1 to over 255) and press [ENT].
- If you select *RS232*, a list of five options appears. Scroll to the desired option and press [ENT].
  - **a.** The first option asks for the RS232 *Status*. Scroll to the desired selection (*ON* or *OFF*), and press [ENT]. (If you are not using RS232, selecting *OFF* increases response time at lower power settings.)
  - **b.** The next option asks for the *Baud Rate*. The available choices extend from 9,600 to 115,200 baud. Scroll to the desired selection and press [ENT].
  - **c.** The next option asks you to select parity type *None*. Scroll to the desired selection and press [ENT].
  - **d.** The next prompt asks you to select one or two *Stop Bits*. Scroll to the desired selection and press [ENT].
  - **e.** The next option asks you to select eight *Data Bits*. Scroll to the desired selection and press [ENT].
  - **f.** The final option is the protocol type. Scroll to *Panacom* and press [ENT].
- If you select *HART*, the meter asks for a specific HART Device ID number. Use the arrow keys to enter the desired number (from 0 to over 16777215) and press [ENT]. In this case Baud Rate = 1200, Parity = Odd, Data length = 8, and stop bits = 1.

Note: *After selecting HART or RS232 in the Communication menu, in order for the change to become active, Confirm Interface must be selected (see below and Confirming the Interface on page 49).*

- If you select *Confirm Interface*, a list of two options *YES* or *NO* appears. Scroll to the desired option and press [ENT]
  - **a.** If you select *YES*, then the newly selected communication interface will get in to affect and restart the meter.
  - **b.** If you select *NO*, then there is no change in the communication interface.

5. Press [ESC] twice to return to the *CONFIG* menu, or continue pressing [ESC] until the display screen reappears.

Note: *The HART option is available only in a 4-wire UTX.*

4.5 Activating HART

If the current communication interface is RS232, and to switch to the HART interface:

1. Press [ESC]. The UTX878 enters the *User Program.*
2. Press the [▶] key until *CONFIG* is bracketed.
3. Press the [▼] key until *Communication* is highlighted. Then press [ENT].
4. From the *Communication* submenu, select *HART* and press [ENT].
5. You will then be asked to confirm the *Device ID*. Once this is completed, press [ENT].
6. Press [ESC] to go to the *Communication* sub menu. Select *Confirm Interface* and press [ENT].
7. Select *YES* and press [ENT]. The meter will restart and the newly selected interface gets affected.

4.6 Activating RS232

If the current communication interface is HART, and to switch to the RS232 interface:

1. Press [ESC]. The UTX878 enters the *User Program*.
2. Press the [▶] key until *CONFIG* is bracketed.
3. Press the [▼] key until *Communication* is highlighted. Then press [ENT].
4. From the *Communication* submenu, select *RS232* and press [ENT]. A list of six options appears.
5. Select *RS232 Status* and press [ENT]
6. Select *On* and press [ENT] twice.
7. Press [ESC] to go to the *Communication* sub menu. Select *Confirm Interface* and press [ENT].
8. Select *YES* and press [ENT]. The meter will restart and the newly selected interface gets affected.

4.7 Confirming the Interface

1. Press [ESC]. The UTX878 enters the *User Program.*
2. Press the [▶] key until *CONFIG* is bracketed and press [ENT].
3. Press the [▼] key until *Communication* is highlighted. Then press [ENT].
4. From the *Communication* submenu, select *Confirm Interface* and press [ENT].
5. Select *YES* or *NO* and press [ENT].

The interface will be confirmed or not confirmed.

Note: *Once Confirm Interface has been selected, the meter will reboot to initiate the change.*

4.8 Resetting Forward and Reverse Totals

At times, you may need to clear and reset forward and reverse totals computed by the Forward and Reverse Totalizers. To reset the totals:

1. Press [ESC]. The UTX878 enters the *User Program.*
2. Press the [▶] key until CONFIG is bracketed and press [ENT].
3. Press the [▼] key until *Reset Totals* is highlighted. Then press [ENT].
4. The next window asks you to choose the *Channel* (1 or 2), *2PATH AVG*, or *All.* Use the [▲] and [▼] keys to scroll to the desired channel and press [ENT].
5. The next screen displays three choices: *Reset Fwd Total, Reset Rev Total* or *Reset Both*. Scroll to the desired choice and press [ENT].

4.9 Handling Totalizer Errors

In the *Totalizer Errors* option, you can program each channel (Channel 1, Channel 2, or AVG 2-Path) to totalize on an error or not. The AVG 2-Path is an independent totalizer which uses the AVG 2-Path volumetric to calculate the totalizer value. To determine whether the UTX878 totalizes when it encounters an error:

1. Press [ESC]. The UTX878 enters the *User Program.*
2. Press the [▶] key until CONFIG is bracketed and press [ENT].
3. Press the [▼] key until *Totalizer Errors* is highlighted. Then press [ENT].
4. The next window asks you to choose the *Channel* (1 or 2) or *AVG 2PATH*. Use the [▲] and [▼] keys to scroll to the desired option and press [ENT].
5. The final window asks whether the UTX should *Totalize on Error?* Use the [▲] and [▼] keys to scroll to *Yes* or *No* and press [ENT]. The totalizer response appears in Table 8 below.

Table 8: Totalizer Error Handling (CH1, CH2, AVG-2Path)

Totalize on Error?	Totalizer Response
Yes	Holds last "good" reading and continues to totalize, based on that "good" reading.
No	Stops totalizing.

Note: *Totalizers are stored within 3 minutes of a power-down.*

Procedure Options. You have finished entering data in the CONFIG menu. Do one of the following:

- To program in other menus, refer to Appendix A, *Menu Maps*, to navigate to the desired menu.
- To return to the display screen, press [ESC] until the display screen reappears.

Chapter 5. Calibration

5.1 Introduction

In the CALIB menu, you can calibrate and trim the analog outputs and inputs and check other meter functions. This chapter also covers updating UTX878 software over the RS232 interface.

Before performing calibration of the UTX878, be sure the following equipment is available:

- 0-30 VDC, 100 mA variable power supply
- Current meter capable of precisely measuring 4 to 20 mA current levels
- PC with RS232 Cable and *Hyperterminal* software (available on Windows operating systems)

While following the programming instructions, refer to Figure 43 on page 79.

5.2 Updating UTX878 Instrument Software

1. To set up the RS232, connect one end of a 9-pin RS232 cable to the COM-1 serial port on a PC and the other end to terminal block TB4 on the UTX878, as described in Chapter 1, *Installation*.

Note: *The RS232 cable connection is not limited to the COM-1 serial port of your PC. You can connect the RS232 cable to any available RS232 serial port on the PC, and follow the same instructions as for the COM-1 port.*

2. On your PC, set up the *Hyperterminal* program.

Note: *The use of* Hyperterminal *is shown here as an example. If you are using a different communications software, see its manual for detailed instructions.*

a. From the PC Start Menu, click *Programs/Accessories/Communications/Hyperterminal* to open the Hyperterminal window.

b. If the call is not connected, click on *New Connection* and enter a name. Click OK.

c. In the *Connect To* window, select COM 1 as the desired port.

d. In the *Properties* window, set the following parameters:

- Bits per second: 19200
- Data bits: 8
- Parity: None.
- Stop Bits: 1
- Flow control: None

5.2 Updating UTX878 Instrument Software (cont.)

3. From the UTX878 FACTORY menu, scroll to the *Upgrade* option and press [ENT] twice. When the UTX878 prompts you to confirm, select Yes and press [ENT], or

With the UTX878 powered off, press and hold the left arrow key ([◀]) on the keypad. Turn the power on, and release the key after about two seconds. The UTX screen should appear as follows:

```
Loader vX.X
Boot is flash.
Load by Software.

Load: via Comm?
Y=[ENT], N=[ESC].
```

The Hyperterminal window on your PC should appear as follows:

```
GE Sensing Loader vX.X XX/XX/XX
Load requested by Software.
Load Flash via RS232 (Y/N)?
```

Press "Y" on the PC keyboard to load the software, or press "N" to abort the process.

4. If you press "Y," the following screen appears on the PC:

```
GE Sensing Loader vX.X XX/XX/XX
Load requested by Software.
Load Flash via RS232 (Y/N)?

Ready to receive update via XMODEM-CRC.
Start upload now, or CTRL-X to cancel:C
```

In Hyperterminal, select *Transfer*, and then *Send File*. (The protocol should be Xmodem.) Use *Browse* to locate the file, which will have a .cod extension. Double click on this file and click the *Send* button. The screens on the UTX878 and on Hyperterminal should both display the status of the transfer. The Hyperterminal screen should appear as follows:

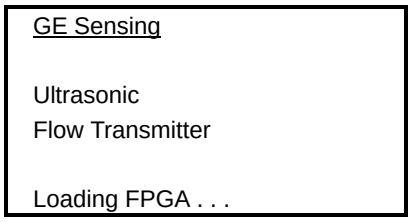
```
Update complete.
Program CRC valid.

Writing Signature Block . . .OK

System will restart in 10 seconds.
```

5.2 Updating UTX878 Instrument Software (cont.)

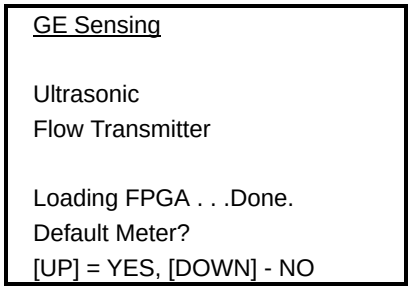
Note: *If you have another file to update, press and hold the left arrow key ([◀]) when the UTX878 displays "Restart in 10 sec." The meter will enter the reload mode immediately.*

5. Repeat steps 3 and 4 for each file that needs to be loaded.

6. To ensure the UTX878 operates correctly, GE recommends defaulting the meter after software updates. Press and hold the [ENT] and [ESC] keys when the UTX878 displays the following screen:



7. After several seconds, release the keys when the following screen appears:



Press the up arrow key ([▲]) to default the meter, or the down arrow key ([▼]) to cancel the default.

Note: *After the UTX878 has been defaulted, it restarts in the locked mode. Refer to page 26 for instructions on unlocking the meter.*

8. To check that the software has been loaded correctly, proceed to the next section.

5.3 Checking the Meter Software

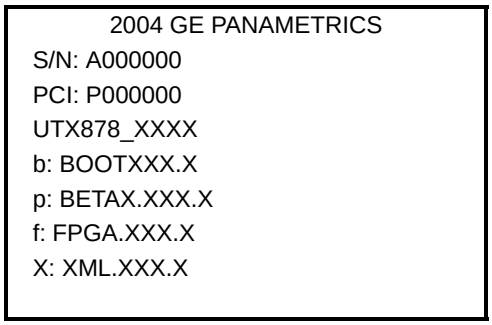
1. Turn power on. The display should boot up with a typical cycling procedure. After initialization, the display should show Ch 1 Velocity, 0.00, Meters/Sec and EX.

2. To verify which version of software has been loaded:

a. Press [ESC] to enter the *User Program.*

b. Press the [▶] key until FACTORY is highlighted. Scroll to the *Versions* option and press [ENT].

c. Press [ENT] again to enter *Main*. The display should appear similar to the screen below.



5.4 Trimming 4-20 mA Using the Keypad

1. In the *User Program*, scroll to CAL with *4-20 Loop* highlighted. Press [ENT].

2. Scroll to *Mode* and press [ENT]. In the *Mode* window, scroll to *Test[Trim]* and press [ENT].

3. Return to the *Loop* window, and scroll to *Percent.*

4. In the *Percent* window, use the arrow keys to set the percentage to 100%. Press [ENT]. Record the value shown on the current meter.

5. Now use the arrow keys to set the percentage to 0%. Press [ENT]. Record the value shown on the current meter.

6. Return to the *Loop* window, and scroll to *Base Trim*. Press [ENT].

7. Use the arrow keys to enter the base trim value, the value recorded in step 5. (The loop current should now be the same as the current meter. It should read 4.0 +/-0.01 mA.) Press [ENT].

8. Repeat steps 3 and 4.

9. Return to the *Loop* window, and scroll to *Span Trim*. Press [ENT].

10. Use the arrow keys to enter the span trim value, the value recorded in step 4. (The loop current should now be the same as the current meter. It should read 20.0 +/-0.01 mA.) Press [ENT].

11. Return to the *Loop* window, and scroll to *Mode*. Press [ENT]. Scroll to *Normal*, and press [ENT].

5.5 Multi Drop Function

In Multi drop mode, loop current is set to a fixed value of 4mA. In this mode, the meter cannot execute the HART commands which affect the loop current (*Enter/Exit Fixed Current Mode*, *Trim Loop Current Zero* and *Trim Loop Current Gain*).

To keep the meter in Multi drop mode:

1. In the User Program, scroll to *CAL* with the 4-20 Loop highlighted and press [ENT].

2. Scroll to *Mode* and press [ENT].

3. In the Mode window, scroll to *Multi drop* and press [ENT].

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Chapter 6. Communications

6.1 RS232 Communications

RS232 communications is used to connect the UTX878 to a computer. This is typically done only for troubleshooting a UTX878 installation, to log data for a finite period of time, or to save a site file.

A user may utilize the optional *Instrument Interface Software*, installed on a PC, to connect to a UTX878 meter with RS232 communication, using a computer Serial COM port.

Figure 37: Connecting the UTX878 to a Computer Equipped with PanaView Software

6.2 HART Communications

HART Communications is a bi-directional industrial field communication protocol used to communicate between intelligent field instruments and host systems. HART is the global standard for smart process instrumentation, and the majority of smart field devices installed in plants worldwide are HART-enabled.

HART is a master-slave field communications protocol developed in the late 1980's to facilitate communication with Smart field devices. HART stands for *Highway Addressable Remote Transducer.* The HART protocol makes use of the *Bell 202 Frequency Shift Keying* (FSK) standard to superimpose digital communication signals at a low level on top of the 4-20mA, as shown in the following graph.

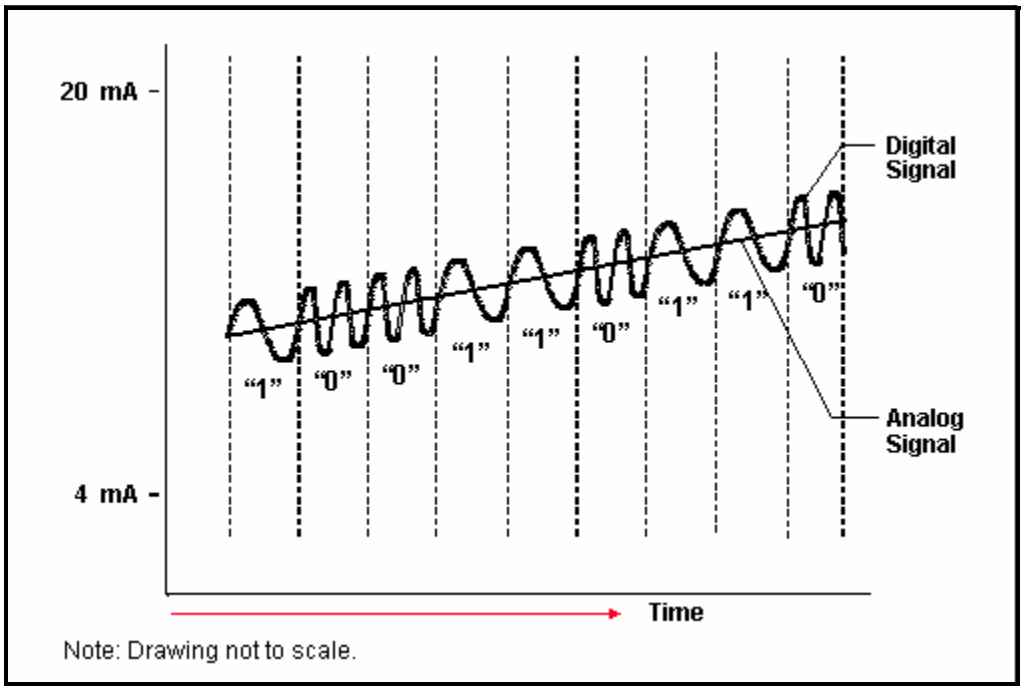

Figure 38: HART Superimposing Digital Communication Signals

The implementation of HART in the UTX878 Ultrasonic Flowmeter is an option in the meter. The implementation is a 4-wire installation given that power is supplied on a separate +24VDC input. A separate output set of communication wires is used for the 4-20mA output, and the HART communication protocol on top of that 4-20mA signal.

The UTX878 HART implementation requires no DD file. The implementation uses common practice commands and universal commands, and hence the device can communicate with a 375 communicator using Generic DD.

The UTX878 HART implementation is done according to HART Standard, Revision 6.

6.2.1 HART Connections

If the meter is loaded with HART firmware, a label called **UTX878_HART** will be displayed under *[FACTORY] \ Versions*. If the meter does not load with HART firmware, a label **UTX878** will be displayed. Connect the meter with a HART communication device (*Primary Master* or *Secondary Master*) as in Figure 39 below.

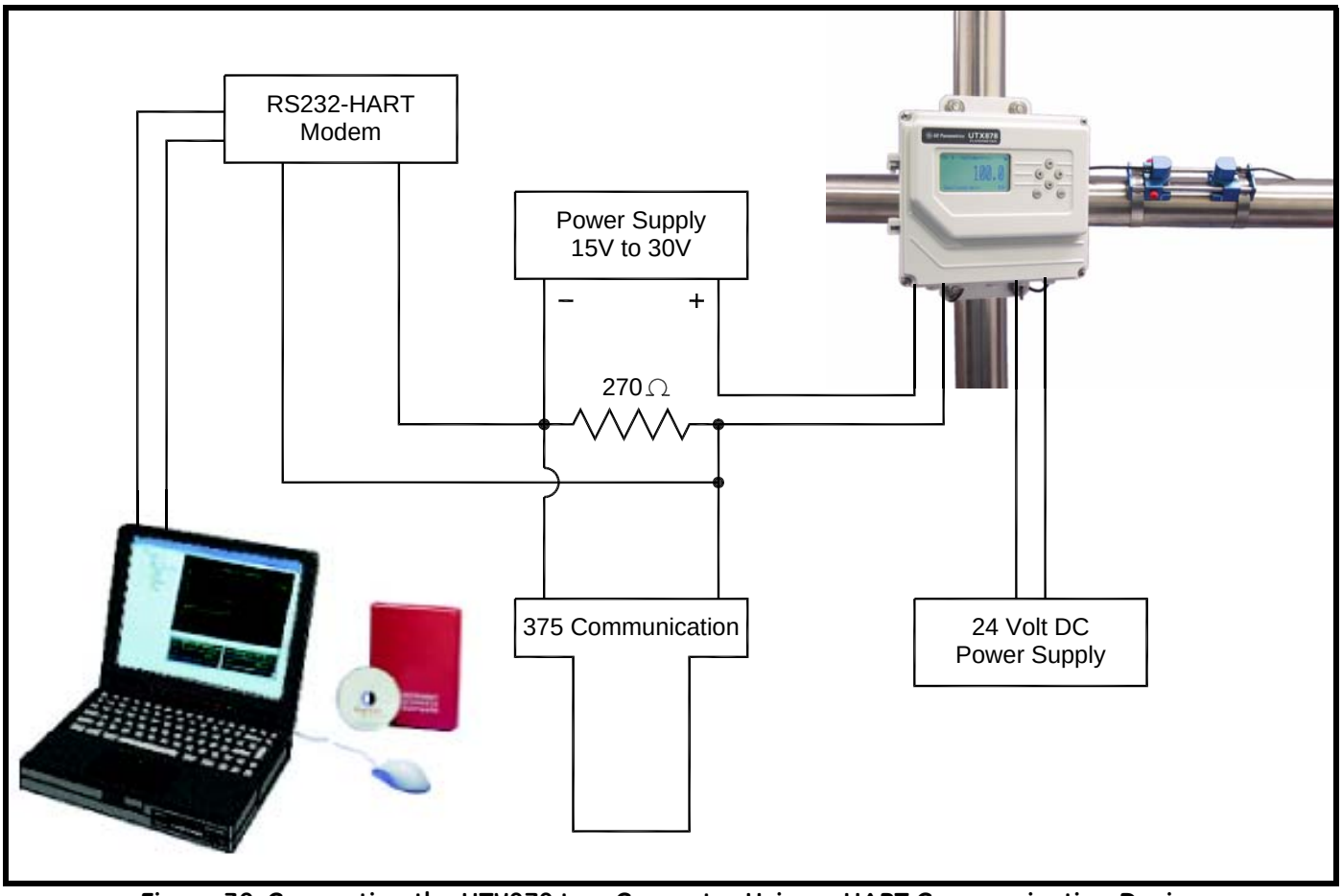

Figure 39: Connecting the UTX878 to a Computer Using a HART Communication Device

6.2.2 HART Functions

The UTX878 Hart implementation offers following functions:

- Setting Velocity or Volumetric or Sound Speed as a Primary variable
- Reading all diagnostic parameters
- Writing PV Range Values
- Setting the upper-range value (push the SPAN button)
- Setting the lower-range value (push the ZERO button)
- Setting PV units
- Trimming DAC gain and Zero
- Setting Loop Current
- Resetting the device
- Error Handling
- Clearing Totals using Set Device Variable Command

The UTX878 HART implementation supports the following device variables.

Table 9: Device Variables Supported by the UTX878 HART Implementation

Measurement	CH1	CH2	AVG2 PATH	SUM	DIFF	AVG	Metric	English
Velocity	0	25	50	75	100	125	m/s	ft/sec
Volumetric	1	26	51	76	101	126	lt/sec, lt/min, lt/hr, ml/dwy, m^3/sec, m^3/min, m^3/hr	ft^3/sec, ft^3/min, ft^3/hr, gal/sec, gal/min, gal/hr, mgal/day, bbl/sec, bbl/min, bbl/hr
FWD Total	2	27	52	77	102	127	m^3, lts	ft^3, gals, Barrels
REV Total	3	28	53	78	103	128	m^3, lts	ft^3, gals, Barrels
Reynolds #	4	29	54	79	104	129	none	none
K(RE)	5	30	55	80	105	130	none	none
K-Factor	6	31	56	81	106	131	none	none
Soundspeed	7	32	57	82	107	132	m/s	ft/sec
UP Transit	8	33	58	83	108	133	sec	sec
DN Transit	9	34	59	84	109	134	sec	sec
Delta T	10	35	60	85	110	135	sec	sec
Gain Up [dB]	11	36	61	86	111	136	dB	dB
Gain Down [dB]	12	37	62	87	112	137	dB	dB
Up Signal Strength	13	38	63	88	113	138	none	none
DN Signal Strength	14	39	64	89	114	139	none	none
UP Amp	15	40	65	90	115	140	none	none
DN Amp	16	41	66	91	116	141	none	none
UP Signal Q	17	42	67	92	117	142	none	none
DN Signal Q	18	43	68	93	118	143	none	none
UP +– Peak	19	44	69	94	119	144	none	none
DN +– Peak	20	45	70	95	120	145	none	none
Thresh UP	21	46	71	96	121	146	percentage	percentage
Thresh Down	22	47	72	97	122	147	percentage	percentage
Norm Factor	23	48	73	98	123	148	none	none
Cycle Time	24	49	74	99	124	149	sec	sec

For more information on HART, please visit the HART website at: http://www.hartcomm2.org/index.html

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Chapter 7. Error Codes and Diagnostics

7.1 Introduction

The Model UTX878 flow transmitter is a reliable, easy to maintain instrument. When properly installed and operated, as described in Chapter 1, *Installation*, the meter provides accurate flow rate measurements with minimal user intervention. However, if a problem should arise with the electronics enclosure or transducers, this chapter explains how to troubleshoot the Model UTX878. Indications of a possible problem include:

- display of an error message on the LCD screen
- erratic flow readings
- readings of doubtful accuracy (i.e., readings that are not consistent with readings from another flow measuring device connected to the same process).

If any of the above conditions occurs, proceed with the instructions presented in this chapter.

7.2 Error Codes

If a problem occurs with the electronics or transducers, a built-in error code message system greatly simplifies the troubleshooting process.

All of the possible UTX878 error code messages are discussed in this chapter, along with the possible causes and the recommended actions. When an error code is generated, it will appear in the lower right corner of the LCD screen, as discussed in Chapter 3.

If an error message appears on the display screen during operation of the Model UTX878, refer to the appropriate section of this chapter for instructions on how to proceed.

7.2.1 E0: No Error

Problem: No error condition currently exists.

Cause: This message appears briefly to confirm that the response to another error message has corrected the problem.

Action: No action is required.

7.2.2 E1: Low Signal

Problem: Poor ultrasonic signal strength or the signal exceeds the limits entered via the *User Program*.

Cause: Poor signal strength may be caused by a defective cable, a flowcell problem, a defective transducer or a problem in the electronics console. A signal that exceeds the programmed limits is probably caused by the entry of an improper value in the Error Limits option of the *User Program*.

Action: Using the procedures in Chapter 1, check the components listed above. Also, check the value entered into the Signal Strength *Error Limits* option, as described on page 40.

7.2.3 E2: Soundspeed Error

Problem: The soundspeed exceeds the limits programmed in the Error Limits option of the *User Program*.

Cause: The error may be caused by incorrect programming, poor flow conditions or poor transducer orientation.

Action: Compare the measured soundspeed to tabulated nominal values for the process fluid and correct any programming errors. Refer to the sections on *Fluid and Pipe Problems* (page 66) and on *Transducer Problems* (page 68) to correct any problems.

7.2.4 E3: Velocity Range

Problem: The velocity exceeds the limits programmed in the *Error Limits* option of the *User Program*.

Cause: This error may be caused by the entry of improper programming data or by poor flow conditions and/or excessive turbulence.

Action: Make sure the actual flow rate is within the programmed limits. Also, check the value entered into the *Error Limits* option, as described on page 40. Refer to the sections on *Fluid and Pipe Problems* (page 66) and on *Transducer Problems* (page 68) to correct any problems.

7.2.5 E4: Signal Quality

Problem: The signal quality is outside the limits programmed in the *Error Limits* option of the *User Program*.

Cause: The peak of the upstream or downstream correlation signals has fallen below the correlation peak limit, as set in the *Error Limits* option on page 40. This may be caused by a flowcell or electrical problem.

Action: Check for sources of electrical interference and verify the integrity of the electronics console by temporarily substituting a test flowcell that is known to be good. Check the transducers and relocate them, if necessary.

7.2.6 E5: Amplitude Error

Problem: The signal amplitude exceeds the limits programmed in the *Error Limits* option of the *User Program*.

Cause: Solid or gas particulates may be present in the flowcell. The error could also be caused by poor coupling for clamp-on transducers.

Action: Refer to the section on *Fluid and Pipe Problems* (on page 66) to correct any flowcell problems.

7.2.7 E6: Cycle Skip, Accel.

Problem: The acceleration exceeds the limits programmed in the *Error Limits* option of the *User Program*.

Cause: This condition is usually caused by poor flow conditions or improper transducer alignment.

Action: Refer to the sections on *Fluid and Pipe Problems* (page 66) and on *Transducer Problems* (page 68) to correct any problems.

7.2.8 E7: Analog Out Error

Problem: The current setting is outside the programmed limits.

Cause: The calculated output value exceeds the programmed limits.

Action: Verify that the 4-20 loop configuration base and span settings are correct for your process.

7.2.9 E29: Stale Data

Problem: Stale signal data.

Cause: The meter is not processing flow information correctly.

Action: Power cycle the meter, and if E29 is still present, consult GE Sensing.

7.2.10 E30: Channel Disabled

Problem: The channel is not available.

Cause: The channel has been turned off.

Action: Enter the PROGRAM menu and enable the channel (see page 28).

7.2.11 E31: Invalid Calibration

Problem: The calibration is invalid.

Cause: Improper calibration for the application has been entered.

Action: Consult GE Sensing.

7.3 Displaying Diagnostic Parameters

The Model UTX878 offers built-in *Diagnostic Parameters* to aid in the troubleshooting of transducer and/or electrical problems. To access these parameters, do the following:

1. From the display screen, press [ESC].

Note: *If the display screen is locked, you will need to enter* [ESC], [ENT], [ESC] *and the security code. Refer to page 26 for details.*

2. Press the [▶] key. The screen will highlight the *channel* you wish to check. Be sure the desired channel appears on the screen (or change it, as discussed in Chapter 3).

3. Press the [▶] key to scroll to the *measurement* entry in the upper right. Press [ENT]. Be sure *Diagnostic* is highlighted, and press [ENT].

4. Press the [▶] key twice to access the *units* parameter. Press [ENT]. Scroll to the desired Diagnostic unit (as described in Table 10 on page 66) and press [ENT].

5. If desired, repeat steps 1-4 for the other channel.

Table 10: Available Diagnostic Parameters

Option Bar	Description	Good	Bad
Delta-T[ns]	Displays the transit time difference between the upstream and downstream signals.	≤1 nsec	>1 nsec
Amp Up	Displays the value for the signal amplitude of the upstream transducer.	24 ± 5	<19 or >29
Amp Dn	Displays the value for the signal amplitude of the downstream transducer.	24 ± 5	<19 or >29
T Up [µs]	Displays the upstream ultrasonic signal transit time.	N.A.	N.A.
T Dn [µs]	Displays the downstream ultrasonic signal transit time.	N.A.	N.A.
Gain Up [dB]	Displays upstream gain in dB.	N.A.	N.A.
Gain Dn [dB]	Displays downstream gain in dB.	N.A.	N.A.
Signal Up	Displays the signal strength for the upstream transducer.	50-75	<50 or >75
Signal Dn	Displays the signal strength for the downstream transducer.	50-75	<50 or >75
Thresh Up [%]	Displays the value at which the UTX878 detects the signal arrival time for the upstream transducer.	-100 - +100	<-100 or >100
Thresh Dn [%]	Displays the value at which the UTX878 detects the signal arrival time for the downstream transducer.	-100 - +100	<-100 or >100
Norm Factor	Displays the normalization factor.	0.85 - 1.0	<0.85
P# Up	Displays signal peaks for the upstream transducer.	100-924	<100 or >924
P# Dn	Displays signal peaks for the downstream transducer.	100-924	<100 or >924
Quality Up	Displays the signal quality for the upstream transducer.	≥ 1200	–400 to +400
Quality Down	Displays the signal quality for the downstream transducer.	≥ 1200	–400 to +400
Reynolds #	Displays the Reynolds number.	N.A.	N.A.
k(Re)	K factor, based on the Reynolds number.	N.A.	N.A.
Cycle Time [ms]	Time for the reading cycle to complete.	N.A.	N.A.
KFactor	Meter K calibration factor	0.5-2.0	<0.5 or >2.0
#Errors	Number of errors present.	0<Programmed Error Limit	≥Programmed Error Limit

7.4 Fluid and Pipe Problems

If preliminary troubleshooting with the *Error Code Messages* and/or the *Diagnostic Parameters* indicates a possible problem, proceed with this section. Measurement problems fall into two categories:

- fluid problems
- pipe problems.

Read the following sections carefully to determine if the problem is indeed related to the fluid or the pipe. If the instructions in this section fail to resolve the problem, contact the factory for assistance.

7.4.1 Fluid Problems

Most fluid-related problems result from a failure to observe the flowmeter system installation instructions, as described in Chapter 1, *Installation*. Refer to Chapter 1, *Installation,* to correct any installation problems.

If the physical installation of the system meets the recommended specifications, it is possible that the fluid itself may be preventing accurate flow rate measurements. The fluid being measured must meet the following requirements:

1. *The fluid must be homogeneous, single-phase, relatively clean and flowing steadily.* Although a low level of entrained particles may have little effect on the operation of the Model UTX878, excessive amounts of solid or gas particles will absorb or disperse the ultrasound signals. This interference with the ultrasound transmissions through the fluid will cause inaccurate flow rate measurements. In addition, temperature gradients in the fluid flow may result in erratic or inaccurate flow rate readings.
2. *The fluid must not cavitate near the measurement point.* Fluids with a high vapor pressure may cavitate near the measurement point. This causes problems resulting from gas bubbles in the fluid. Cavitation can usually be controlled through proper system design.
3. *The fluid must not excessively attenuate ultrasound signals.*
   Some fluids, particularly those that are very viscous, readily absorb ultrasound energy. In such a case, an `E1` error code message will appear on the display screen to indicate that the ultrasonic signal strength is insufficient for reliable measurements.
4. *The fluid soundspeed must not vary excessively.*
   The Model UTX878 will tolerate relatively large changes in the fluid soundspeed, as may be caused by variations in fluid composition and/or temperature. However, such changes must occur slowly. Rapid fluctuations in the fluid soundspeed, to a value that is considerably different from that programmed into the UTX878, will result in erratic or inaccurate flow rate readings. Refer to Chapter 2, *Programming Site Data*, to make sure that the appropriate soundspeed is programmed into the meter.

7.4.2 Pipe Problems

Pipe-related problems may result either from a failure to observe the installation instructions, as described in Chapter 1, *Installation*, or from improper programming of the meter. By far, the most common pipe problems are the following:

1. *The collection of material at the transducer location(s).*
   Accumulated debris at the transducer location(s) will interfere with transmission of the ultrasound signals. As a result, accurate flow rate measurements are not possible. Realignment of the measurement point or transducers often cures such problems. Refer to Chapter 1, *Installation*, for more details on proper installation practices.
2. *Inaccurate pipe measurements.*
   The accuracy of the flow rate measurements is no better than the accuracy of the programmed pipe dimensions. Measure the pipe wall thickness and diameter with the same accuracy desired in the flow rate readings. Also, check the pipe for dents, eccentricity, weld deformity, straightness and other factors that may cause inaccurate readings. Refer to Chapter 2, *Programming Site Data*, for instructions on programming the pipe data.
3. *The inside of the pipe must be relatively clean.* Excessive build up of scale, rust or debris will interfere with flow measurement. Generally, a thin coating or a solid well-adhered build up on the pipe wall will not cause problems. Loose scale and thick coatings (such as tar or oil) will interfere with ultrasound transmission and may result in incorrect or unreliable measurements.

7.5 Transducer Problems

Ultrasonic transducers are rugged, reliable devices. However, they are subject to physical damage from mishandling and chemical attack. Clamp-on transducers are also subject to installation variables such as physical misalignment and faulty coupling to the pipe on which they are mounted.

Because the UTX878 uses clamp-on transducers, the following list concerns potential clamp-on problems. Contact GE Sensing if you cannot solve a transducer-related problem.

7.5.1 Clamp-on Transducer Problems

1. **POOR COUPLING TO PIPE:** Clamp-on transducers must be in close contact with the pipe. Make sure the pipe wall is smooth and generally free of paint. The couplant material must fill voids between the transducer and the pipe, and must be firmly coupled or bonded to both the pipe and the transducer. The pipe and transducer must be clean and dry for permanent couplant, such as grease or epoxy, to adhere properly. Enough pressure must be applied to the transducer by its clamp to hold it firmly against the pipe.
2. **MISALIGNMENT:** The transducer transmits relatively narrow beams of ultrasound; therefore; transducer alignment is critical to assure that the beam can travel from one transducer to the other without undue attenuation. Be sure to exactly follow the instructions that came with your transducers and clamping fixtures. Also, be sure that the actual transducer spacing agrees with the calculated spacing (S).
3. **INTERNAL DAMAGE:** Ultrasonic transducers consist of a ceramic “crystal” bonded to the transducer case. The bond between the crystal and the case may be damaged by extreme shock and by temperature extremes. The crystal itself can also be damaged by the same conditions. The internal wiring can be corroded or shorted if contaminants enter the transducer housing.
4. **PHYSICAL DAMAGE:** Transducers may be physically damaged by dropping them onto a hard surface or striking them against another object.

IMPORTANT: *Transducers must be replaced in pairs. Refer to Chapter 2,* Programming Site Data*, to program the new transducer data into the meter.*

5. **CYCLE SKIP CONDITION:** A cycle skip is usually caused by a distorted or altered signal due to poor couplant, bad pipe wall or unusual fluid disturbances. To resolve a cycle skip, recouple both transducers with proper couplant. Check your couplant for temperature ranges. In addition, make sure the pipe wall is free of paint and rust.

Contact the factory if you cannot solve a transducer-related problem.

7.6 Power Supply Noise

7.6.1 Problem

Several customers have reported lockup and/or rebooting problems with UTX878 flowmeters. It was discovered that there are 2 Vpp spikes coming from the customer's power supply.

7.6.2 Analysis

Typically, modern industrial power supplies are switch mode or switching type. This type of power supply requires a load of at least 20% of the maximum rating. If the load is less, the switching circuit will run inefficiently and generate voltage spikes on the output.

7.6.3 Solution

In order to resolve the power supply output voltage spike problem, a power resistor must be added across the terminals of the customer's power supply before the DCS input. Below is a wiring diagram of the modification:

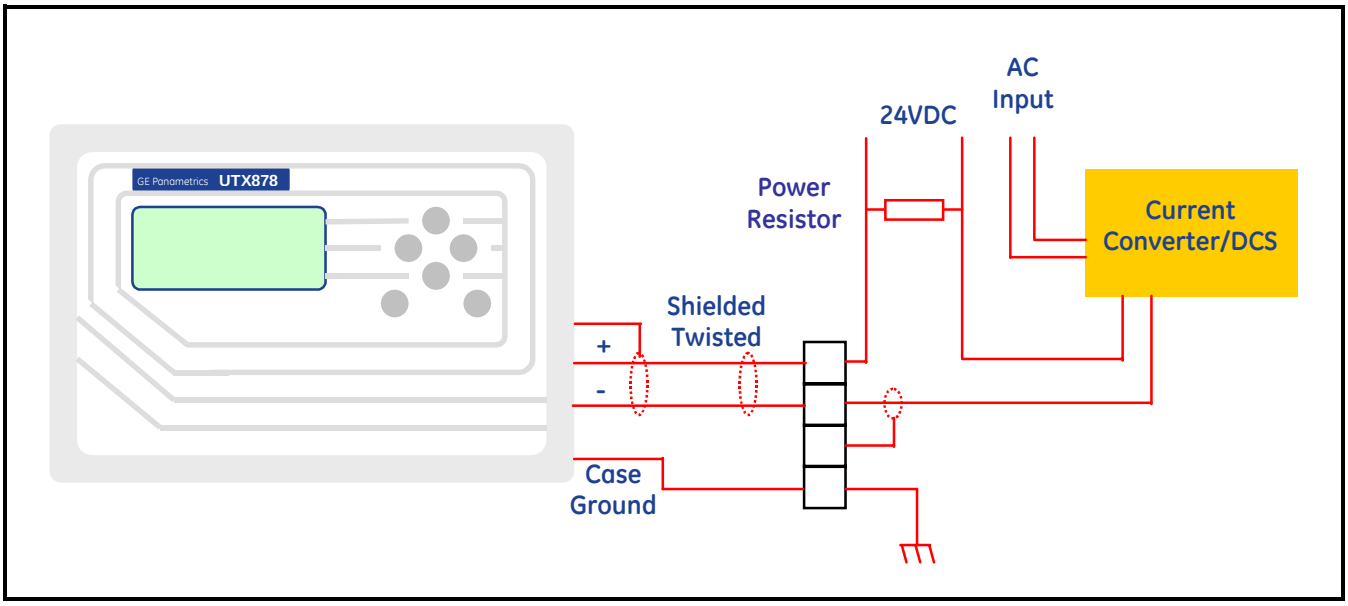

Figure 40: Wiring Modification to Eliminate Power Supply Noise

The resistor must be chosen to have the total power supply load of 20 to 25%. The resistance and power ratings are listed in Table 11 below:

Table 11: Resistor Ratings

Power Supply Rating	Resistance	Resistor Power Rating
0.25 Amps	470 Ω	≥ 2.0 W
0.50 Amps	220 Ω	≥ 30 W
0.75 Amps	150 Ω	≥ 5.0 W
1.00 Amps	120 Ω	≥ 7.0 W

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Chapter 8. Specifications

8.1 General Specifications

The general specifications for the Model UTX878 flow transmitter are divided into the following categories:

8.1.1 Hardware Configuration

Channel Options:
Standard: 2-Channel/Path (programming for 1 or 2 paths).

Enclosure:
Epoxy-coated aluminum, weatherproof, Type 4X, IP67

Dimensions:
Weight 3.9 lb (2 kg)
Size (h x w x d) 8.8 x 8.2 x 3.6 in. (220 x 210 x 90 mm)

8.1.2 Environmental

8.1.2a Electronics

Ambient Operating Temperature:
-4° to +140°F (-20° to +60°C)

Storage Temperature:
-40° to +158°F (-20° to +70°C)

8.1.3 Measurement Parameters

Volumetric flow, totalized flow, and flow velocity

8.1.4 Keypad

Six-button external keypad

8.1.5 Flow Accuracy (% of Reading)

Pipe Diameter (ID) > 6 in. (150 mm):
±1% to 2% of reading typical

Pipe Diameter (ID) ≤ 6 in. (150 mm):
±2% to 5% of reading typical

Note: *Accuracy depends on pipe size and whether measurement is one-path or two-path. Accuracy to ±0.5% of reading may be achievable with process calibration.*

8.1.6 Range

–40 to +40 ft/s (-12.2 to +12.2 m/s)

8.1.7 Rangeability

400:1

8.1.8 Repeatability

±0.1% to 3% of reading

Note: *Specifications assume a fully developed flow profile, with a straight run of pipe 10 diameters upstream and 5 diameters downstream, and flow velocity greater than 1 ft/s.*

8.1.9 Fluid Types

Acoustically conductive fluids, including most clean liquids and many with entrained solids or gas bubbles.

8.2 Electrical Specifications

The electrical specifications for the Model UTX878 flow transmitter are divided into the following categories:

8.2.1 Power Requirements

8.2.1a Standard Device:

15-30 VDC loop powered, 2 W max

8.2.1b HART Device:

24 VDC

8.2.1c Output Drive Capability:

$$\text{Max. load (ohms)} = [50 \times (\text{PSV} - 15)] - \text{Rc}$$

where:
PSV = power supply voltage in volts DC, and
Rc = cable resistance, 22 AWG cable has 0.04 ohm/ft

For example:
Given a 24-VDC power supply and a 1,000-ft cable (22 AWG, 0.04 ohm/ft),

$$\text{Rc} = 1000 \text{ ft} \times 0.04 \text{ ohm/ft} = 40 \text{ ohms}$$

$$\text{Max. load} = [50 \times (24 - 15)] - 40$$
$$= [50 \times 9] - 40$$
$$= 410 \text{ ohms}$$

Note: *The maximum load the UTX878 can drive is 500 ohms.*

8.2.1d Power Consumption:

660 mW, depending on the loop voltage and current.
In a loop-powered configuration,

$$\text{Power Consumption} = \text{Loop current} \times \text{Input power supply voltage}$$

8.2.2 Memory

FLASH memory, field-upgradable

8.2.3 Operating Mode

Correlation Transit-Time™ Mode with clamp-on transducers

8.2.4 Input/Output Specifications

8.2.4a Digital Display:

128 X 64 LCD, configurable to display up to 2 measurement parameters.

8.2.4b Digital Communications:

Standard: RS232 serial port for PC or terminal.

8.2.4c Analog Output:

4-20 mA on power loop

8.2.4d Cable and Length:

Transducer: 25 ft, 50 ft, 100 ft integral with transducer
Power: Shielded 2-wire, twisted pair, 24 gauge

8.2.4e Certifications:

System complies with EMC Directive 2004/108/EC, and wetted transducers comply with PED 97/23/EC for DN<25.
UL Listed to UL 508 Industrial Control equipment.

8.3 Transducer Specifications

8.3.1 Clamp-on Transducers

8.3.1a Temperature Range:

UTXDR - 407 and 408: –40° to 248°F (–40° to 120°C)
UTXDR - 409 and 410: –40° to 302°F (–40° to 150°C)

8.3.1b Cable Temperature Rating:

–40° to 167°F (–40°C to 75°C)

8.3.1c Frequency:

UTXDR - 407: 2 MHz
UTXDR - 408: 4 MHz
UTXDR - 409: 0.5 MHz
UTXDR - 410: 1.0 MHz

8.3.1d Mounting:

Fixture with stainless steel strap.

8.3.1e Certifications:

Type 4X. IP65

8.4 Pipe Size and Materials

8.4.1 Clamp-on Transducers

8.4.1a Pipe Materials:

Can clamp to all metals and most plastics. (Consult GE Sensing for concrete, composite materials and highly corroded or lined pipes.)

8.4.1b Pipe Sizes:

UTXDR - 408: 0.5 to 1.5 in. (13 to 38 mm)
UTXDR - 407: 1 to 4 in. (25 to 102 mm)
UTXDR - 410: 2 to 12 in. (51 to 305 mm)
UTXDR - 409: 8 to 20 in. (203 to 508 mm)

8.4.1c Area Classifications:

Standard general-purpose.
UTXDR - 407 and 408: IP67
UTXDR - 409 and 410: IP66

Appendix A. Menu Maps

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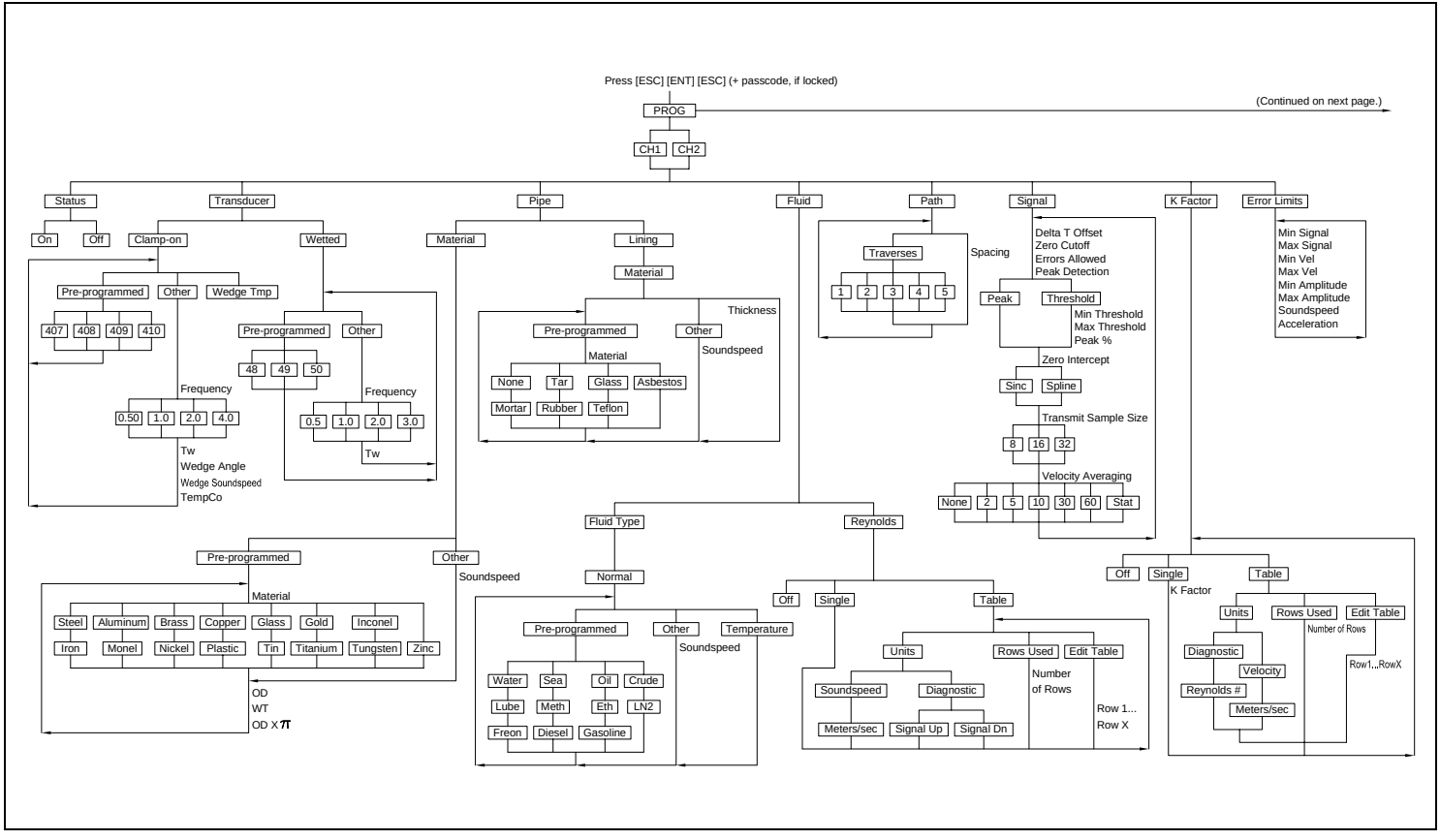

Figure 41: UTX878 PROG Menu

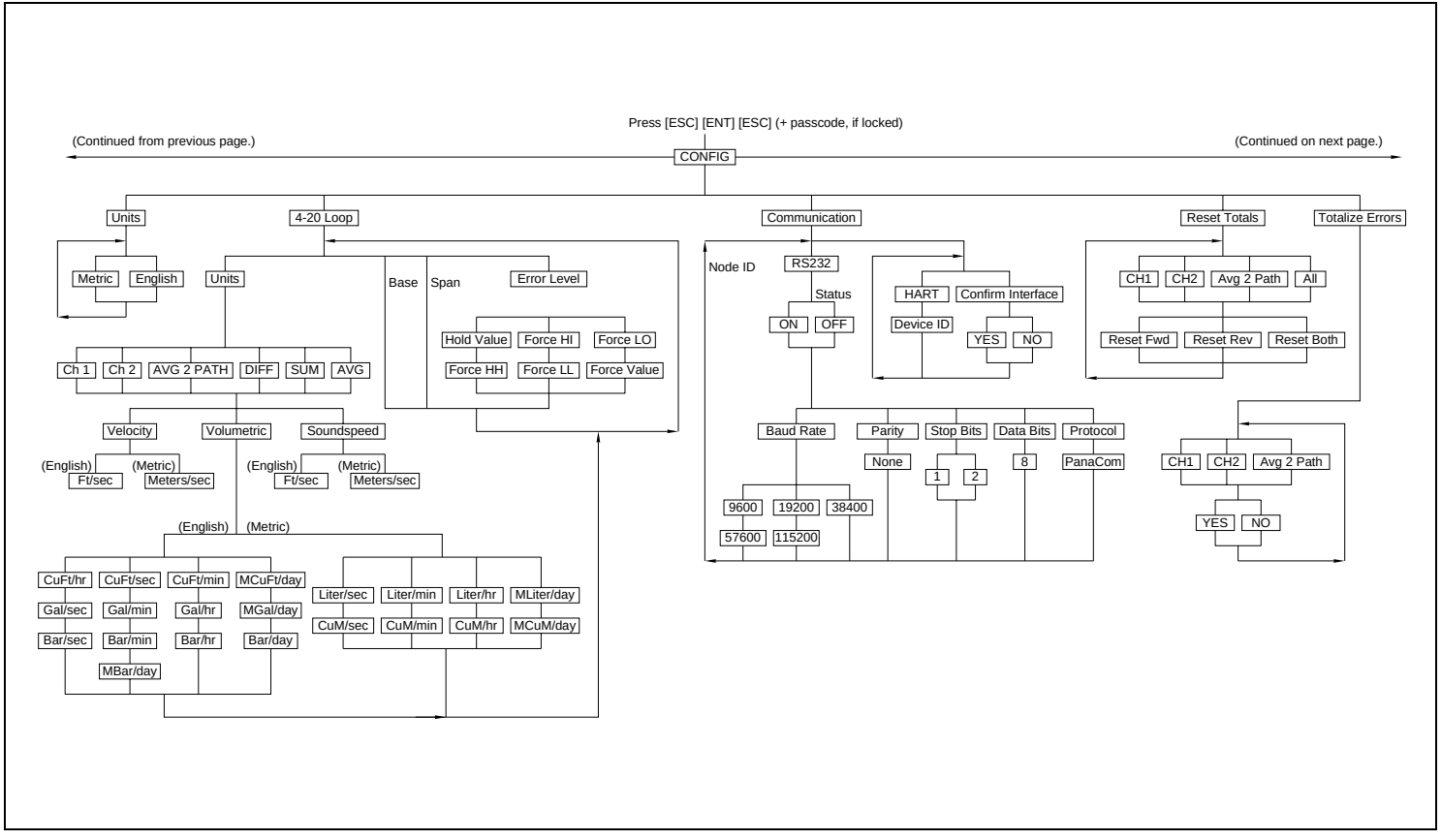

Figure 42: UTX878 CONFIG Menu

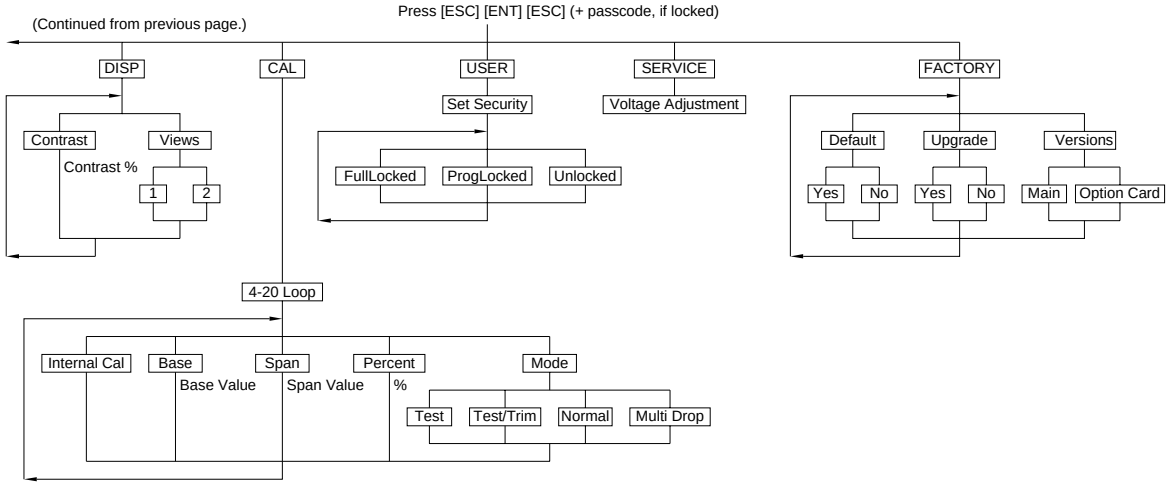

Figure 43: UTX878 DISP, CAL, USER, SERVICE and FACTORY Menus

Appendix B. CE Mark Compliance

B.1 Introduction

For CE Mark compliance, the Model UTX878 flow transmitter must meet the EMC directive.

IMPORTANT: *CE Mark compliance is required only for units intended for use in EEC countries.*

B.2 EMC Compliance

In addition to the standard wiring requirements, the electrical connections must be shielded and grounded as in Table 12 below for EMC compliance. After all the necessary electrical connections have been made, seal any unused cable entry holes.

Note: *If the instructions in this appendix are followed, the unit will comply with the EMC Directive 2004/108/EC.*

Table 12: Wiring Modifications

Connection	Cable Type	Termination Modification
Transducer	Shielded cable	Terminate shield to case
Power	Shields, twisted pair	Terminate shield to case
Shielding	Wires enclosed in a properly-grounded metal conduit do not require additional shielding.	

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Appendix C. Data Records

C.1 Site Data

After the Model UTX878 flow transmitter has been installed, specific site data must be entered via the *User Program*, prior to operation. Record that information in Table 13 below.

Table 13: Site Data

General Information					
Model #			Serial #		
Software Vers.			Setup Date		
Channelx-Status					
Channel 1			Channel 2 (if applicable)		
Channel Status	Off[1] On		Channel Status	Off[1] On	
Channelx-Pipe Parameters					
Channel 1			Channel 2 (if applicable)		
Trans. Type	Clamp-On		Trans. Type	Clamp-On	
Transducer #			Transducer #		
Other Transducers			***Other Transducers***		
Wedge Temp			Wedge Temp		
Frequency (Hz)			Frequency (Hz)		
Tw (µs)			Tw (µs)		
Wedge Angle (°)			Wedge Angle (°)		
Wedge Sndspd			Wedge Sndspd		
Pipe Material			Pipe Material		
All Clamp-On Transducers			***All Clamp-On Transducers***		
Pipe O.D.			Pipe O.D.		
Pipe Wall			Pipe Wall		
Path Length (P)			Path Length (P)		
Axial Length (L)			Axial Length (L)		
Lining	Yes	No	Lining	Yes	No
Lining Material			Lining Material		
Lining Sndspd			Lining Sndspd		
Lining Thickness			Lining Thickness		
Track. Window.	Yes	No	Track. Window.	Yes	No
Fluid Type			Fluid Type		
Other/Sndspd			Other/Sndspd		
Reynolds Corr.	Off	Active	Reynolds Corr.	Off	Active
KV Input Sel.	Table	Static	KV Input Sel.	Table	Static
Kin. Visc.			Kin. Visc.		
Cal. Factor			Cal. Factor		
# of Traverses			# of Traverses		
Trans. Spacing			Trans. Spacing		

Table 13: Site Data (cont.)

Channelx-Error Limits						
Channel 1				Channel 2 (if applicable)		
Min. Signal				Min. Signal		
Max. Signal				Max. Signal		
Min.Velocity				Min.Velocity		
Max. Velocity				Max. Velocity		
Min. Amplitude				Min. Amplitude		
Max. Amplitude				Max. Amplitude		
Soundspeed				Soundspeed		
Acceleration				Acceleration		
Channelx-Signal						
Channel 1				Channel 2 (if applicable)		
Delta T Offset				Delta T Offset		
Zero Cutoff				Zero Cutoff		
# of Errors				# of Errors		
Detection	Peak	Threshold		Detection	Peak	Threshold
Min. Thresh%	N/A			Min. Thresh%	N/A	
Max. Thresh%	N/A			Max. Thresh%	N/A	
Xmit Sam. Size	N/A			Xmit Sam. Size	N/A	
Vel. Averaging				Vel. Averaging		
Global-CONFIG						
System Units	English	Metric		Node ID		
4/20 Units				Baud Rate		
4/20 Base				Parity		
4/20 Span				Stop Bits		
Error Level				Data Bits		
Channelx-Display						
Channel 1				Channel 2 (if applicable)		
Vol. Units				Vol. Units		
Totalizer Units				Totalizer Units		
Channelx- KFACTOR Table						
K-Factor Table				**K-Factor Table**		
Channel 1				Channel 2 (if applicable)		
K-Factor Row #	Velocity	K Factor		K-Factor Row #	Velocity	K Factor
1				1		
2				2		
3				3		
4				4		
5				5		

Table 13: Site Data (cont.)

Channelx- KFACTOR Table (cont.)						
6				6		
7				7		
8				8		
9				9		
10				10		
11				11		
12				12		
13				13		
14				14		
15				15		
16				16		
17				17		
18				18		
19				19		
20				20		
Channelx- Reynolds Number Table						
Channel 1				Channel 2 (if applicable)		
Reynolds Row #	Units	kRe		K-Factor Row #	Units	kRe
1				1		
2				2		
3				3		
4				4		
5				5		
6				6		
7				7		
8				8		
9				9		
10				10		
11				11		
12				12		
13				13		
14				14		
15				15		
16				16		
17				17		
18				18		
19				19		
20				20		

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Appendix D. Service Record

D.1 Introduction

Whenever any service procedure is performed on the Model UTX878 flow transmitter, the details of the service should be recorded in this appendix. An accurate service history of the meter can prove very helpful in troubleshooting any future problems.

D.2 Data Entry

Record complete and detailed service data for the Model UTX878 in Table 14 below. Make additional copies of the table as needed.

Table 14: Service Record

Date	Description of Service	Performed By

Table 14: Service Record (cont.)

Date	Description of Service	Performed By

D.3 Diagnostic Parameters

After a successful initial installation of the Model UTX868 and whenever any system malfunction is noticed, the values for the diagnostic parameters should be entered in Table 15 below.

Table 15: Diagnostic Parameters

Channel 1			*Channel 2*		
Delta-T[ns]			Delta-T[ns]		
Amp Up			Amp Up		
Amp Dn			Amp Dn		
T Up [µs]			T Up [µs]		
T Dn [µs]			T Dn [µs]		
Gain Up [dB]			Gain Up [dB]		
Gain Dn [dB]			Gain Dn [dB]		
Signal Up			Signal Up		
Signal Dn			Signal Dn		
Thresh Up [%]			Thresh Up [%]		
Thresh Dn [%]			Thresh Dn [%]		
Norm Factor			Norm Factor		
P# Up			P# Up		
P# Dn			P# Dn		
Quality Up			Quality Up		
Quality Down			Quality Down		
Reynolds #			Reynolds #		
k(Re)			k(Re)		
Cycle Time [ms]			Cycle Time [ms]		

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Numerics

A

B

C

D

E

F

R

S

T

GE
Sensing

DECLARATION OF CONFORMITY

We,

GE Sensing
1100 Technology Park Drive
Billerica, MA 01821
USA

declare under our sole responsibility that the

AquaTrans™ AT868 Liquid Flow Ultrasonic Transmitter

AquaTrans™ UTX878 Liquid Flow Ultrasonic Transmitter

to which this declaration relates, are in conformity with the following standards:

- EN 61326-1:2006, Class A, Table 2, Industrial Locations
- EN 61326-2-3:2006
- EN 61010-1:2001, Over voltage Category II, Pollution Degree 2

following the provisions of Directives 2004/108/EC EMC and 2006/95/EC Low Voltage.

The *units listed above and any transducers supplied with them (spoolpieces are addressed under a separate declaration of conformity)* do not bear CE marking for the Pressure Equipment Directive, as they are supplied in accordance with Article 3, Section 3 (sound engineering practices and codes of good workmanship) of the Pressure Equipment Directive 97/23/EC for DN<25.

2009
Year of Issue

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