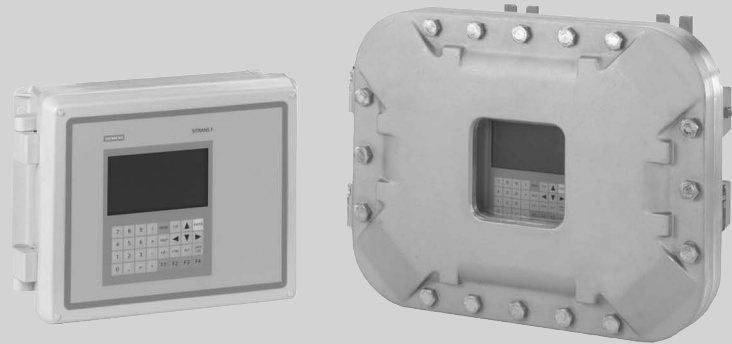


Ultrasonic Flowmeters

SITRANS FUG1010 IP65 NEMA 4X & IP66 NEMA 7
Gas 7ME361x, x=0,3

Operating Instructions - February 2011



SITRANS F

SIEMENS

SIEMENS

SITRANS F

Ultrasonic Flowmeters FUG1010 IP65 NEMA 4X

Operating Instructions

<u>Introduction</u>	1
<u>Safety notes</u>	2
<u>Description</u>	3
<u>Installing/Mounting</u>	4
<u>Connecting</u>	5
<u>Commissioning</u>	6
<u>Functions</u>	7
<u>Alarm, error, and system messages</u>	8
<u>Service and maintenance</u>	9
<u>Troubleshooting</u>	10
<u>Technical data</u>	11
<u>Appendix</u>	A
<u>Appendix</u>	B

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠ DANGER
indicates that death or severe personal injury will result if proper precautions are not taken.
⚠ WARNING
indicates that death or severe personal injury may result if proper precautions are not taken.
⚠ CAUTION
with a safety alert symbol, indicates that minor personal injury can result if proper precautions are not taken.
CAUTION
without a safety alert symbol, indicates that property damage can result if proper precautions are not taken.
NOTICE
indicates that an unintended result or situation can occur if the corresponding information is not taken into account.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation for the specific task, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

⚠ WARNING
Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be adhered to. The information in the relevant documentation must be observed.

Trademarks

All names identified by ® are registered trademarks of the Siemens AG. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

Table of contents

1	Introduction	9
1.1	Items supplied	9
1.2	History	10
1.3	Further Information	10
2	Safety notes	11
2.1	Laws and directives	11
2.2	Lithium batteries.....	12
2.3	Installation in hazardous area	12
2.4	Safety Notes.....	15
3	Description	21
3.1	FUG1010 features	21
3.2	NEMA 4X & NEMA 7 Transmitters	21
3.3	Applications.....	23
3.4	Theory of Operation	24
4	Installing/Mounting	33
4.1	Installation safety precautions.....	33
4.2	Determining a location	33
4.3	Use according to specifications	34
4.4	Application Guidelines	34
4.5	Mounting the Transmitter	35
5	Connecting	37
5.1	Safety notes for connecting	37
5.2	Transmitter Wiring.....	39
5.2.1	Connecting Power.....	39
5.2.2	Wiring Temperature Sensor to Transmitter	41
5.3	Navigating the Menu	44
5.4	Programming the Transmitter	46
5.5	Sensor Installation	51
5.5.1	Preliminary Installation Procedures	51
5.5.2	Reflect Mount.....	54
5.5.3	Direct Mount.....	58
5.5.4	1012T Mounting Tracks	63
5.5.5	Mounting Temperature Sensors	72

5.6	Sensor Wiring.....	74
6	Commissioning	77
6.1	General requirements	77
6.2	Commissioning.....	77
6.3	Installation Menus	80
7	Functions	85
7.1	Gas Parameters Menu	85
7.2	Gas Data Menu	93
7.3	Selecting Flow Units.....	93
7.4	Zero Flow Adjust Menu	97
7.5	Span Data	101
7.6	Analog Output Setup.....	106
7.7	Analog Input Setup.....	108
7.8	Analog Output Trim	111
7.9	Logger Control	115
7.10	Operation Adjust Menu Settings	118
7.11	Setting Relays	121
7.12	Memory Control.....	123
7.13	Resistive Temperature Device (RTD) Calibration.....	124
7.14	Reflexor	127
8	Alarm, error, and system messages	139
9	Service and maintenance	141
9.1	Maintenance.....	141
9.2	Technical support.....	141
9.3	Return procedures	142
9.4	Battery disposal.....	143
10	Troubleshooting	145
10.1	Troubleshooting	145
10.2	F4 Reset Procedure	147
10.3	Test Facilities Graph Screen.....	148
10.4	Site Setup Data	158
10.5	Force Transmit	163
11	Technical data	165
11.1	Technical Data	165

A	Appendix.....	167
A.1	Certificates	167
A.2	Ordering	167
A.3	I/O Connections and Wiring	167
A.4	RS-232 Connection.....	176
A.5	Flowrate Calibration and Calibration Tables.....	187
A.6	Setting Thermal Coefficient and Modulus of Elasticity	190
B	Appendix.....	193
B.1	Installation/Outline Drawings	193
	Glossary	195
	Index.....	201

Tables

Table 5- 1	TB3 and TB4 Wiring.....	43
Table 5- 2	Keypad Function Chart	45
Table 5- 3	Pipe Configuration Option List Definitions	48
Table 5- 4	Common Gases for Clamp-On Measurement (at 14 bar & 15.5°C / 200 psia & 60°F)	49
Table 5- 5	Temperature Sensors	72
Table 7- 1	Gas Flowmeters Menu Structure and Default Values	86
Table 7- 2	Syntax Rules	91
Table 7- 3	Example #1 - Density (kg-m/m3) vs. Pressure and Temperature	91
Table 7- 4	Z-factor vs. Pressure and Temperature.....	92
Table 7- 5	Example #2	92
Table 7- 6	Gas Data Menu Items	93
Table 7- 7	Totalizer Modes	95
Table 7- 8	Totalizer Controls (the "n" in <Fn> = channel number)*	97
Table 7- 9	Input/Output Wiring (TB2) - 7ME39400AL03 Expanded I/O Module.....	104
Table 7- 10	Open Collector User Resistor Recommendations	105
Table 7- 11	Analog Outputs	107
Table 7- 12	Analog Out Setup Data Categories	107
Table 7- 13	I/O Data Control Menu	110
Table 7- 14	Analog Out Trim Menu Structure	112
Table 7- 15	Logger Control Menu Option List.....	116
Table 7- 16	Relay Option List.....	122
Table 7- 17	Memory Control Menu	124

Table 7- 18	RTD Calibrate Menu Structure.....	126
Table 7- 19	Inline Metal and Plastic Pipe Cable Connections	130
Table 7- 20	Cursor Definitions.....	135
Table 7- 21	Diagnostic Data.....	137
Table 8- 1	Alarm Codes	139
Table 10- 1	Troubleshooting Tips.....	145
Table 10- 2	Description of Graph Screen Text Display Parameters	156
Table 10- 3	Hot Key Summary	157
Table 10- 4	Site Setup Menu Items.....	158
Table A- 1	Connection Diagrams and Part Numbers	167
Table A- 2	Input/Output Wiring (TB2) - 7ME3900AL01	168
Table A- 3	Input/Output Wiring (TB3) - 7ME3900AL01 I/O Module	170
Table A- 4	Connection Diagrams and Part Numbers	171
Table A- 5	Input/Output Wiring (TB2) - 7ME39400AL04 Expanded I/O Module.....	172
Table A- 6	Input/Output Wiring (TB3) - 7ME39400AL04 Expanded I/O Module.....	173
Table A- 7	Input/Output Wiring (TB4) - 7ME39400AL04 Expanded I/O Module.....	174
Table A- 8	Open Collector User Resistor Recommendations	175

Figures

Figure 3-1	Typical Transmitter Label.....	22
Figure 3-2	NEMA 4X Transmitter Case.....	22
Figure 3-3	NEMA 7 Case Enclosure with graphic display and keypad	23
Figure 4-1	Pipe Mounting and Mounting Locations for Transmitter	36
Figure 5-1	Input Power Plug (P10) Wiring.....	39
Figure 5-2	Analog Input Module Access.....	42
Figure 5-3	Single Channel Temperature Sensor Inputs.....	43
Figure 5-4	Keypad	44
Figure 5-5	Typical Installation Menu Screen Example.....	45
Figure 5-6	Reflect Mount (Pipe shown from above in 12 o'clock position)	51
Figure 5-7	Direct Mount (Pipe shown from above in 12 o'clock position)	52
Figure 5-8	Sensor Alignment (Horizontal Plane).....	53
Figure 5-9	Pipe Surface Preparation	54
Figure 5-10	Reflect Mount with Mounting Frames and Spacer Bar	55
Figure 5-11	Sensor.....	57

Figure 5-12	Sensor Installation	57
Figure 5-13	Mylar Spacing Guide.....	58
Figure 5-14	Wrap Strap Under Pipe and Attach to Adjusting Screw.....	59
Figure 5-15	Wrapping the Mylar Spacing Guide around the pipe (End View)	61
Figure 5-16	Finding the Halfway Distance	61
Figure 5-17	Aligning the Sensors for Direct Mode operation (End View)	62
Figure 5-18	Reflect Mount with Model 1012TN Mounting Track (Side View)	64
Figure 5-19	Direct Mount 180° opposed with Mounting Tracks	67
Figure 5-20	Wrapping the Mylar Spacing Guide around the pipe (End View)	69
Figure 5-21	Finding the Halfway Distance	69
Figure 5-22	Track Rail Alignment.....	70
Figure 5-23	REF and Number Index Pin Locations	71
Figure 5-24	Clamp-on Temperature Sensor	73
Figure 5-25	Insert Temperature Sensor	74
Figure 5-26	Sensor Cable Connections	75
Figure 6-1	Final Setup.....	78
Figure 6-2	Measuring Flow.....	78
Figure 7-1	7ME39400AL03 Main Board I/O Wiring.....	104
Figure 7-2	Sensor Mounting Examples	129
Figure 7-3	Adjacent Sensor Mounting.....	130
Figure 7-4	In-Line Sensor Mounting.....	131
Figure 7-5	Spectra Graph Display Screen	134
Figure 10-1	Test Facilities Graph Screen.....	149
Figure 10-2	Setting Digital Damping Factor	152
Figure 10-3	Setting the MinDamp Factor	153
Figure 10-4	Envelope Threshold Adjustment.....	155
Figure A-1	7ME39400AL01 I/O Module.....	168
Figure A-2	7ME39400AL04 Expanded I/O Module	171
Figure A-3	1015CPC-N Serial Interface Cable	177

Introduction

These instructions contain all the information you need for using the device.

The instructions are aimed at persons mechanically installing the device, connecting it electronically, configuring the parameters and commissioning it as well as service and maintenance engineers.

Note

It is the responsibility of the customer that the instructions and directions provided in the manual are read, understood and followed by the relevant personnel before installing the device.

1.1 Items supplied

- SITRANS FUG1010 IP65 (NEMA 4X) Transmitter
- SITRANS F Literature CD

Note

For additional items refer to your packing slip.

Inspection

1. Check for mechanical damage due to possible improper handling during shipment. All claims for damage are to be made promptly to the shipper.
2. Make sure the scope of delivery, and the information on the type plate corresponds to the ordering information.

1.2 History

The contents of these instructions are regularly reviewed and corrections are included in subsequent editions. We welcome all suggestions for improvement.

The following table shows the most important changes in the documentation compared to each previous edition.

Edition	Remarks
02 01/2011	Second Edition of Operating Instructions for SITRANS FUG1010 IP65 NEMA 4X flow meter. This document replaces all previous instructions for use. <ul style="list-style-type: none"><li>• Safety Note updates<li>• Transmitter label update
01 07/2010	First Edition of Operating Instructions for SITRANS FUG1010 IP65 NEMA 4X flow meter.

1.3 Further Information

The contents of these Operating Instructions shall not become part of or modify any prior or existing agreement, commitment or legal relationship. All obligations on the part of Siemens AG are contained in the respective sales contract which also contains the complete and solely applicable warranty conditions. Any statements contained herein do not create new warranties or modify the existing warranty.

Product information on the Internet


The Operating Instructions are available on the CD-ROM shipped with the device, and on the Internet on the Siemens homepage, where further information on the range of SITRANS F flowmeters may also be found:

Product information on the internet (<http://www.siemens.com/flow>)

Worldwide contact person

If you need more information or have particular problems not covered sufficiently by the operating instructions, please get in touch with your contact person. You can find contact information for your local contact person on the Internet:

Local contact person (<http://www.automation.siemens.com/partner>)

 CAUTION
Correct, reliable operation of the product requires proper transport, storage, positioning and assembly as well as careful operation and maintenance. Only qualified personnel should install or operate this instrument.

Note

Alterations to the product, including opening or improper repairs of the product, are not permitted.

If this requirement is not observed, the CE mark and the manufacturer's warranty will expire.

2.1 Laws and directives

General requirements

Installation of the equipment must comply with national regulations. For example, the National Electrical Codes.

Instrument safety standards

The device has been tested at the factory, based on the safety requirements. In order to maintain this condition over the expected life of the device the requirements described in these Operating Instructions must be observed.

CAUTION
Material compatibility
Siemens can provide assistance with the selection of sensor parts. However, the full responsibility for the selection rests with the customer and Siemens can take no responsibility for any failure due to material incompatibility.


CE marked equipment

The CE-mark symbolizes the compliance of the device with the following Directives:


- EMC-Directive 2004/108/EC
- Low voltage Directive 2006/95/EC
- ATEX Directive 94/9/EC

2.2 Lithium batteries

Lithium batteries are primary power sources with high energy content designed to represent the highest possible degree of safety.

 WARNING
Potential hazard Lithium batteries may present a potential hazard if they are abused electrically or mechanically. This is in most circumstances associated with the generation of excessive heat where internal pressure may cause the cell to rupture. Thus the following basic precautions should be observed when handling and using lithium batteries: <ul style="list-style-type: none">• Do not short-circuit, recharge or connect with false polarity.• Do not expose to temperature beyond the specified temperature range or incinerate the battery.• Do not crush, puncture or open cells or disassemble battery packs.• Do not weld or solder to the battery's body.• Do not expose contents to water.


2.3 Installation in hazardous area

 WARNING
Equipment used in hazardous areas must be Ex-approved and marked accordingly. It is required that the special conditions for safe use provided in the manual and in the Ex certificate are followed!


Hazardous area approvals

The device is approved for use in hazardous area and has the following approval:

- FM and CSA certified
- Class I, Division 1, Groups ABCD
- Class II, Division 1, Groups EFG
- ATEX

 WARNING
Make sure the hazardous area approval is suitable for the environment in which the device will be installed.




Intrinsically safe data

 WARNING
User must install unit with Siemens drawings. With intrinsically safe circuits, use only certified meters appropriate for the transmitter.
If a non-conforming supply unit is used, the "fail-safe" type of protection will no longer be effective and the approval certification will be invalid.

Hazardous area safety requirements

It is required that:

- Electrical connections are in accordance with Elex V (VO in explosion hazardous areas) and EN60079-14 (Installing Electrical Systems in Explosion Hazardous Areas).
- The protective cover over the power supply is properly installed. For intrinsically safe circuits the connection area can be opened.
- Appropriate cable connectors are used for the output circuits:
 - Intrinsically safe: blue
 - Non-intrinsically safe: black
- Sensor and transmitter are connected to the potential equalization.
For intrinsically safe output circuits potential equalization must be maintained along the entire connection path.
- When protective earth (PE) is connected, no potential difference between the protective earth (PE) and the potential equalization (PA) can exist, even during a fault condition.

 WARNING
Explosion Hazard "Flameproof enclosure" type of protection Only open devices with type of protection "Flameproof enclosure" (e.g. FUT1010 NEMA 7) in hazardous areas when the power to the device is turned off, otherwise there is a risk of explosion.
 WARNING
Explosion Hazard Laying of cables Cable for use in zone 1 and 2 must satisfy the requirements for having a proof voltage < AC 500 V applied between the conductor/ground, conductor/shield and shield/ground. Connect the devices that are operated in hazardous areas as per the stipulations applicable in the country of operation, e.g. for Ex "d" and "nA", permanent cables must be laid.
 WARNING
Explosion Hazard Devices with the common approval "Intrinsically safe" and "Flameproof" The following is applicable for devices with the common approval "Intrinsically safe" and "Flameproof" (Ex ia + Ex d): Before commissioning, make sure that the type of protection that is not suitable is permanently defaced on the nameplate to avoid improper use. If a non-conforming infeed is used, the "fail-safe" type of protection will no longer be effective.

2.4 Safety Notes

Safety Information for Hazardous Areas



! DANGER
Explosion Hazard. Will Cause Death, Serious Injury or Property Damage.
Restrict use and repair to qualified personnel.

! DANGER
Explosion Hazard
Death or severe personal injury and/or equipment and property damage will result if proper Hazardous (Classified) Locations installation precautions are not taken.

! DANGER
Explosion Hazard
The use of unauthorized parts in the repair of the equipment, tampering by unqualified personnel, or operation with the cover open in a Hazardous (Classified) Location will result in dangerous conditions which will cause death, serious injury, and/or equipment and property damage.

Follow all safety instructions contained or referenced herein.

! DANGER
Explosion Hazard
Death or severe personal injury and/or equipment and property damage will result due to improper installation or use of this equipment when located in a Hazardous (Classified) Location.

- Install as directed.
- Disconnect power source before servicing.
- Keep cover closed when equipment is operating.

 **WARNING**

Qualified personnel

This flowmeter system may only be set up and used in conjunction with this manual and the instructions on the electronic media provided. Installation, maintenance and operation of the flowmeter system may only be performed by qualified personnel. Within the context of this Manual, qualified persons are defined as persons who have the skills and knowledge related to the construction and operation of the electrical equipment and installations and have received safety training to recognize and avoid the potentially explosive hazards involved.

Qualified personnel posses the following qualifications

1. Is trained and authorized to energize, de-energize, clear, ground and tag circuits and equipment in accordance with established safety practices.
2. Is trained in the proper care and use of protective equipment such as rubber gloves, hard hat, safety glasses or face shields, flash clothing, etc., in accordance with established safety practices.
3. Is trained in rendering first aid

Note

This Manual does not purport to cover all details or variations in equipment, or to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise, which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the local Siemens sales office (www.siemens.com). The contents of this manual shall not become part of or modify any prior or existing agreement, commitment or relationship. The sales contract contains the entire obligation of Siemens. The warranty contained in the contact between the parties is the sole warranty of Siemens. Any statements contained herein do not create new warranties or modify the existing warranty.

Safety Information for Hazardous Areas

Note

Ratings under this heading apply to specific model families

Check Your Model Number:
FUG1010, 7ME3610 only

FM-CSA installation

Read, understand and follow all safety instructions on the electronic media provided. This equipment is rated for use in hazardous (classified) locations as stated below and must be installed according to the 1010-304 installation drawing provided on the media. Failure to install the equipment in the prescribed manner will result in unsafe operation. Follow all local jurisdictional safety codes when operating this equipment. When properly installed the equipment meets the following FM – CSA ratings.

Transmitter

- Intrinsically safe connections Class I and II, Division 1, Groups A, B, C, D, E, F and G;
- Nonincendive for Class I, Division 2, Groups A, B, C and D;
- Suitable for Class II Division 2, Groups E, F and G outdoor (Type 4X), Class III (CSA only)
- Temperature code T5 at an ambient of 40°C



Sensors

- Intrinsically safe Class I and II, Division 1, Groups A, B, C, D, E, F and G;
- Nonincendive for Class I, Division 2, Groups A, B, C and D;
- Suitable for Class II, Division 2, Groups E, F and G outdoor (Type 4X), Class III (CSA only)
- Temperature code T6 at an ambient of 40°C


ATEX installation

Read, understand and follow all safety instruction on the electronic media provided. This equipment complies with Directive 94/9/EC and is rated for use in potentially explosive atmospheres. The equipment markings are shown and explained below. Equipment must be installed according to the 1010-389 installation drawing provided on the media. Failure to install the equipment in the prescribed manner will result in unsafe operation. Follow all regional safety laws when operating this equipment. When properly installed the equipment meets the following ATEX ratings as stated in EC-Type Examination Certificate KEMA03ATEX1134

Transmitter Markings and Explanations

-  II (1) G [Ex ia] IIC – Transmitter located in the non-hazardous area with intrinsically safe circuits of category Ex ia, which can be connected to Category 1 Sensors
-  II 3 (1) G Ex nC [ia] IIC T5 – Category 3 Transmitter located in Zone 2 potentially explosive atmosphere with intrinsically safe circuits of category Ex ia, which can be connected to Category 1 Sensors in Zone 0
- IP65 – Ingress protection against solid bodies, rating of dust-tight and against liquid, rating of water jets

Sensors Markings and Explanations

-  II 1 G Ex ia IIC T5 – Category 1 Sensors located in Zone 0 potentially explosive atmosphere with intrinsically safe circuits of category Ex ia for use in potentially explosive atmosphere containing gases

Safety Information for Hazardous Areas

Note

Ratings under this heading apply to specific model families

Check Your Model Number: FUG1010, 7ME3613 only

FM-CSA installation

Read, understand and follow all safety instruction on the electronic media provided. This equipment is rated for use in hazardous (classified) locations as stated below and must be installed according to the 1010-443 installation drawing provided on the media. Failure to install the equipment in the prescribed manner will result in unsafe operation. Follow all local jurisdictional safety codes when operating this equipment. When properly installed the equipment meets the following FM – CSA ratings:

Transmitter

- Explosionproof for Class I, Division 1, Groups B, C, D;
- Dust-ignitionproof for Class II, Division 1, Groups E, F and G
- Intrinsically safe connections for Class I and II, Division 1, Groups A, B, C, D, E, F and G;
- Nonincendive for Class I, Division 2, Groups A, B, C and D;
- Suitable for Class II, Division 2, Groups E, F and G outdoor (Type 4X), Class III (CSA only)

Sensors

- Intrinsically safe Class I and II, Division 1, Groups A, B, C, D, E, F and G;
- Nonincendive for Class I, Division 2, Groups A, B, C and D;
- Suitable for Class II, Division 2, Groups E, F and G outdoor (Type 4X), Class III (CSA only)
- Temperature code T6 at an ambient of 40°C

ATEX installation

Read, understand and follow all safety instruction on the electronic media provided. This equipment is rated for use in explosive atmospheres as stated below and must be installed according to the 1010-464 installation drawing provided on the media. Failure to install the equipment in the prescribed manner will result in unsafe operation. Follow all regional safety laws when operating this equipment. When properly installed the equipment meets the following ATEX ratings as stated in EC-Type Examination Certificate KEMA03ATEX1134

Transmitter Markings and Explanations

- Ex II (1) G [Ex ia] IIC – Transmitter located in the non-hazardous area with intrinsically safe circuits of category Ex ia, which can be connected to Category 1 Sensors for use in potentially explosive atmosphere containing gases
- Ex II 3 (1) G Ex nC [ia] IIC T5 (Tamb = 0° To + 60°C) – Category 3 Transmitter located in Zone 2 potentially explosive atmosphere with intrinsically safe circuits of category Ex ia, which can be connected to Category 1 Sensors in Zone 0 potentially explosive atmosphere containing gases
- Ex II 2 (1) G Ex d [ia IIC] IIB+H2 T5 (Tamb = 0° To + 50°C) – Category 2 Transmitter located in Zone 1 potentially explosive atmosphere with intrinsically safe circuits of category Ex ia, which can be connected to Category 1 Sensors for use in potentially explosive atmosphere containing gases
- IP66 – Ingress protection against solid bodies, rating of dust-tight and against liquid, rating of heavy seas

Sensors Markings and Explanations

- Ex II 1 G Ex ia IIC T5 – Category 1 Sensors located in Zone 0 potentially explosive atmosphere with intrinsically safe circuits of category Ex ia for use in potentially explosive atmosphere containing gases

Safety Information for Hazardous Areas

Note

Ratings under this heading apply to specific model families

Check Your Model Number:
FUG1010 7ME3611 only

FM-CSA installation

Read, understand and follow all safety instruction on the electronic media provided. This equipment is rated for use in hazardous (classified) locations as stated below and must be installed according to the 1010-341 installation drawing provided on the media. Failure to install the equipment in the prescribed manner will result in unsafe operation. Follow all local jurisdictional safety codes when operating this equipment. When properly installed the equipment meets the following FM–CSA ratings:

Transmitter

- Explosionproof for Class I, Division 1, Groups B, C, D;
- Dust-ignitionproof for Class II, Division 1, Groups E, F and G
- Intrinsically safe connections for Class I and II, Division 1, Groups A, B, C, D, E, F and G;
- Nonincendive for Class I, Division 2, Groups A, B, C and D;
- Suitable for Class II, Division 2, Groups E, F and G outdoor (Type 4X), Class III (CSA only)

Sensors

- Intrinsically safe Class I and II, Division 1, Groups A, B, C, D, E, F and G;
- Nonincendive for Class I, Division 2, Groups A, B, C and D;
- Suitable for Class II, Division 2, Groups E, F and G outdoor (Type 4X), Class III (CSA only)
- Temperature code T6 at an ambient of 40°C

ATEX installation

Read, understand and follow all safety instruction on the electronic media provided. This equipment is rated for use in explosive atmospheres as stated below and must be installed according to the 1010-422 installation drawing provided on the media. Failure to install the equipment in the prescribed manner will result in unsafe operation. Follow all regional safety laws when operating this equipment. When properly installed the equipment meets the following ATEX ratings as stated in EC-Type Examination Certificate KEMA03ATEX2133

Transmitter

- Ex II 2 (1) G Ex d [ia] IIB+H2 – Category 2 Transmitter located in Zone 1 potentially explosive atmosphere with intrinsically safe circuits of category Ex ia, which can be connected to Category 1 Sensors for use in potentially explosive atmosphere containing gases
- IP65 – Ingress protection against solid bodies, rating of dust-tight and against liquid, rating of water jets

Sensors

- Ex II 1 G Ex ia IIC T5 – Category 1 Sensors located in Zone 0 potentially explosive atmosphere with intrinsically safe circuits of category Ex ia for use in potentially explosive atmosphere containing gases

Description

3.1 FUG1010 features

Description

The Siemens SITRANS FUG1010 IP65 NEMA 4X & IP66 NEMA 7 flowmeters achieve highly accurate flow measurement owing to the WideBeam ultrasonic transit-time technology. The sensors are mounted on the outside of the pipe, preventing contact with the medium.

The sensor construction makes installation and commissioning of even the largest sizes very straight forward and easy. The sensors deliver true multi-parameter measurements i.e. volume flow, density and temperature.

Note

This operating instructions manual applies to the following FUG1010 IP65 NEMA 4X & NEMA 7 operating systems: Version 3.02.00 and later and version 5.03.00 and later.

3.2 NEMA 4X & NEMA 7 Transmitters

SITRANS FUG1010 Transmitters

The SITRANS FUG1010 IP65 NEMA 4X and IP66 NEMA 7 series transmitters are available in Single Channel, 2 Channel, Dual Path and Multi-Path versions. The transmitters include a graphic display providing flow rate, diagnostics data and keypad interface to access on-screen software setup menus. Safety agency approved SITRANS FUG1010 series transmitters have hazardous area certification as indicated in the label examples below.

SITRANS FUG1010 NEMA Transmitter Labels

The transmitter label is located on the right side panel of the unit. The illustration shows a typical label but labels vary depending upon model and installation location.



Figure 3-1 Typical Transmitter Label

SITRANS FUG1010 Model Numbers

The SITRANS FUG1010 NEMA 4X model numbers:

- Single Channel - 7ME3610-1
- 2 Channel / 2 Path - 7ME3610-2
- 4-Channel / 4-Path - 7ME3610-9 (Wall Mount only)

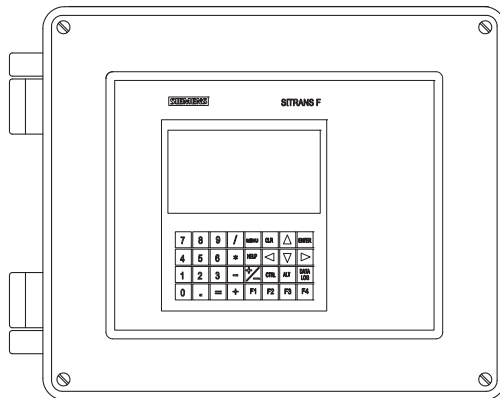


Figure 3-2 NEMA 4X Transmitter Case

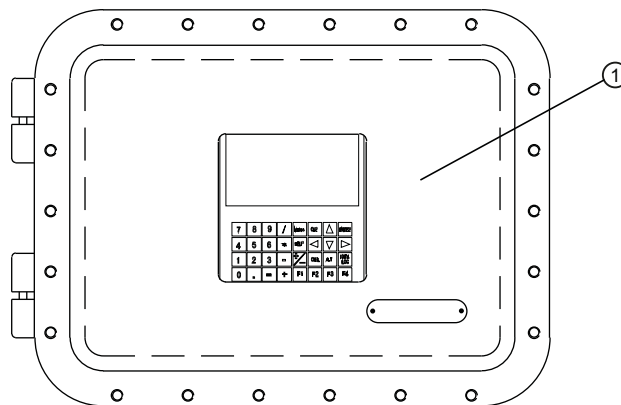
Note

The NEMA 4X Multi-Path transmitter case is slightly larger.

The SITRANS FUG1010 NEMA 7 model numbers:

- Single Channel - 7ME3613-1 (Wall Mount -H2 rated with display window)
- 2 Channel / 2 Path - 7ME3613-2 (Wall Mount -H2 rated with display window)
- 4 Channel / 4-Path - 7ME3613-9 (Wall Mount -H2 rated with display window)

⚠ CAUTION
Consult local codes for permit needed to setup FUG1010 IP66 NEMA 7 units using the graphic display and local keypad. Keypad access and setup must be done with cover opened.



① Standard Case Enclosure

Figure 3-3 NEMA 7 Case Enclosure with graphic display and keypad.

3.3 Applications

Measurement of media

SITRANS FUG1010 gas flowmeters are designed for measurement of a variety of gases. The transmitters are multi-parameter devices offering accurate measurement of mass flow, volume flow, density, and temperature.

Typical Applications

The typical applications of the flowmeter are:

- Lost and unaccounted for (LAUF) analysis
- Allocation measurement
- Flow survey verification
- Production well testing

3.4 Theory of Operation

- Underground storage applications
- Gas fired power stations

Typical Industries Served

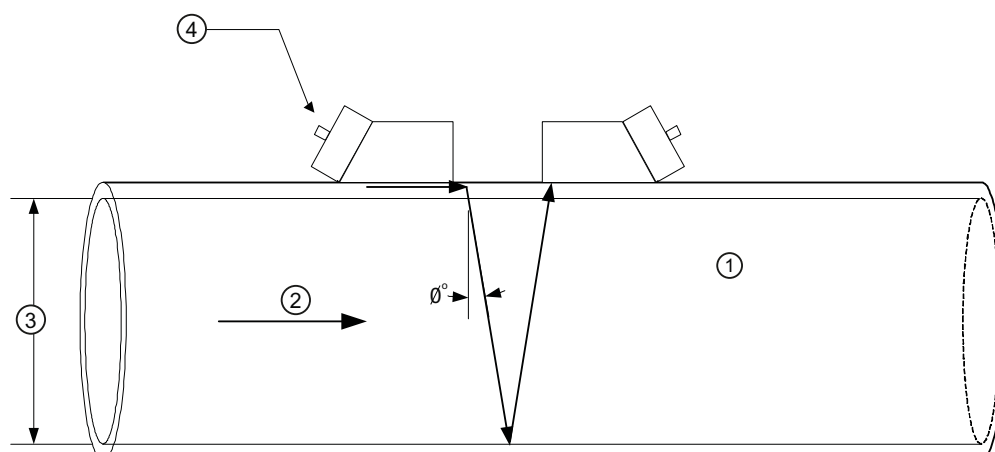
- Power Generation (Nuclear, Fossil, and Hydro)
- Chemical Processing
- Hydrocarbon Industries
- Hydrocarbon Transportation

3.4 Theory of Operation

The liquid flowmeter relies on the MultiPulse transit-time. Two Wide-Beam ultrasonic transducers per measuring path, alternating as transmitter and receiver, are used to interrogate the liquid flowing within the metering section. The resulting time of arrival for each direction of transmit (upstream and downstream) is then measured using a highly accurate and stable digital signal processing method.

Using this detection scheme, the flowmeter is capable of resolving the relative transit-time difference (dT) to within ± 100 psec. Considering typical liquid flow transit-time differences ranging from 1×10^4 to 1×10^6 psec, the flowmeter is capable of providing an exceptional turn-down ratio. The flowmeter also incorporates a correlation technique which enables the system to detect very high flow velocities with the same high degree of resolution. The ultrasonic transducers are designed with sufficient beam divergence characteristics to insure that the receive transducer will always have sufficient signal to maintain operation under conditions of high beam blowing, a condition that occurs under very high flow velocities where the path of the ultrasonic beam is actually blown past the receivable area of the transducer.

With accurate signal arrival time available, the flowmeter can compute the raw flow velocity from the measured upstream and downstream transit times.



- ① Velocity of Sound
- ② Flow Vector
- ③ Pipe ID
- ④ Wide Beam Sensors

$$\theta = \sin^{-1} (VOS / V_{\text{phase}})$$

Where:

VOS = Velocity of sound in liquid

 V_{phase} = Phase velocity of sensor

ID = Pipe inside diameter

 T_L = Transit time in liquid

DT = Measured Transit-Time difference

 V_F = Flow Velocity

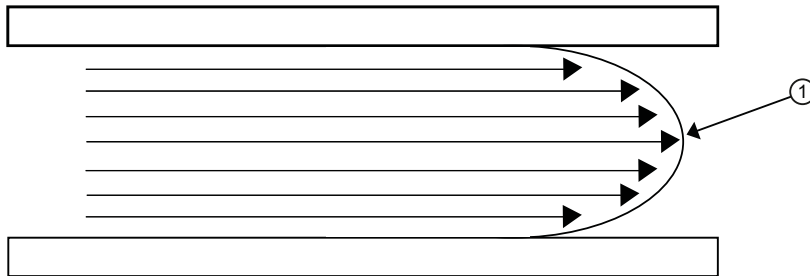
$$T_L = 2 * ID / (VOS * \cos \theta)$$

$$V_F = V_{\text{phase}} * DT / (2 * T_L)$$

Flow Profile Compensation

The flow equation shown above is only valid for "plug" flow, where the flow velocity is uniform across the entire cross-section of the pipe. Frictional forces between the fluid and the pipe wall cause the flow velocity to be nearly zero at the pipe wall and peaked toward the center of the pipe (as shown in the diagram below).

The acoustic beam traverses the center of the pipe and therefore must account for the influence that flow profile has on the line integration through a round pipe. The shape of this flow profile (for fully developed flow) is defined by the Reynolds number.



① Fluid velocity near the axis of the flow stream tends to be greater.

The Reynolds number is then computed as follows:

$$Rn = \frac{645 * \text{Pipe ID} * V_F}{\text{Viscosity}}$$

where:

viscosity = cS = cP/density

Pipe ID = inches

V_F = inches/sec

cS = kinematic viscosity

cP = absolute viscosity

The flowmeter then uses this computation of Reynolds number to compensate the raw flow velocity for conditions of laminar or turbulent flow profile as defined by an internal Reynolds compensation table. The flowmeter then converts the compensated flow velocity to volumetric flow rate.

$$\text{Rate} = V_F * \text{Comp}(Rn) * \text{Pipe area}$$

Volume Correction Algorithm

The flowmeter provides Standard Volume output by inferentially determining the liquid API @ 60°F (or the specified base temperature) and then applying the API standard (2540) algorithm as outlined below. Before describing API algorithm the steps required to obtain bulk or actual flow should be reviewed.

Based on the measured transit time difference (Δt), average transit time (T_N) and pipe dimensions, the RAW flow rate ($FLOW_{RAW}$) and liquid sonic velocity (VoS) are computed.

Using the liquid temperature input (Standard on FUS1010) and the optional user provided pressure input, the measured VoS is then compensated to the value expected for base temperature and pressure conditions (i.e. 15.5°C and 1 bara or 60°F and 14.7 psia). This compensated VoS is called Liquident.

$$\text{Liquident} = VoS + \text{TempSlope} * (t - \text{base temp}) + \text{PresSlope} * (p - \text{base pressure})$$

where: t = measured temperature (°F)

TempSlope = change in liquid sonic velocity per °F (Linear for petroleum products.)

PresSlope = change in liquid sonic velocity per PSI (Linear for petroleum products.)

Liquident provides an output that identifies the liquid independent of the operating temperature and pressure.

1. Through optimization the Liquident values (for a wide range of different liquids) can then be associated with an API@60°F as well as Viscosity @ 60°F. This information can be keyed into a lookup table within the flowmeter. This table then serves as a reference for dynamically inferring the liquid properties as different liquid batches enter the flow transducer. (The lookup function for this table will also interpolate and extrapolate for values between and outside the table values.)
2. Based on $FLOW_{RAW}$ and the inferred Viscosity, the current Reynolds # is computed. The Reynolds # value is used to correct the raw flow for non-plug flow profile. The compensated actual flow rate is then computed ($FLOW_{BULK}$).
3. The volume correction can now be computed using API standard 2540. Note: 60°F is used for the base temperature value in the example below, but this can be altered within the flowmeter menu.

a) $\rho_{60} = (141.5 * 999.012) / (131.5 + API60)$ where: ρ_{60} = density at 60°F (Kg/m³)

b) $\alpha_{60} = K_0 / \rho_{60}^2 + K_1 / \rho_{60}$ where K_0 and K_1 are coefficients of thermal expansion.

c) $\rho_t = \rho_{60} * EXP(-\alpha_{60} \Delta t (1 + 0.8 \alpha_{60} \Delta t))$ where $\Delta t = (t - 60)$ °F and t = measured temperature

d) Therefore the volume correction factor (VCF) = ρ_t / ρ_{60}

The final volume compensated flow rate is then: Std Flow = $FLOW_{BULK} * VCF$

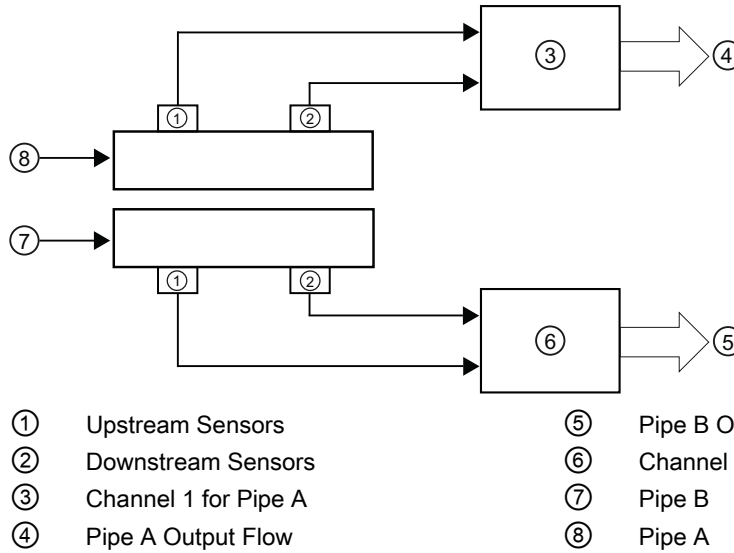
Flowmeter Types

The meter automatically conditions Installation Menu choices to suit the selected meter type. The following paragraphs introduce the available flowmeter types that include:

- 2-Channel
- 4-Channel
- 2-Path
- 4-Path
- Channel 1+2
- Channel 1-2
- Reflexor (Page 127)

2-Channel

Dual Channel provides two independent measurement channels that operate simultaneously. Depending on the specific model, Dual Channel supports: Clamp-on Transit-time, In-line Transit-time and Reflexor.

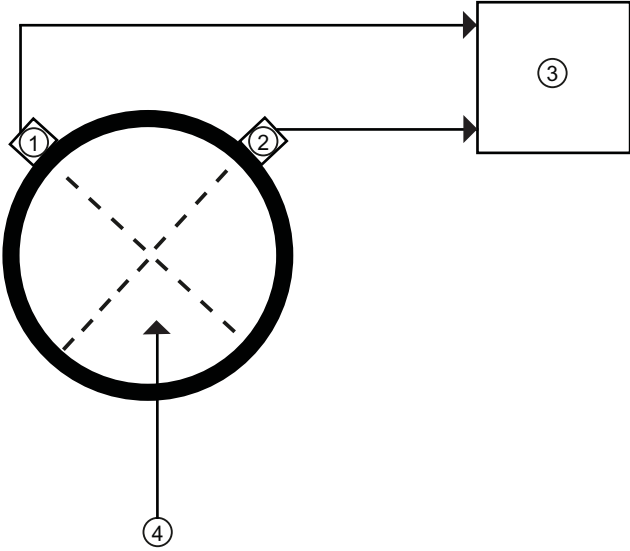


4-Channel

4 Channel provides four independent measurement channels that operate simultaneously. Depending on the specific model, 4 Channel supports: Clamp-on Transit-time, In-line Transit-time and Reflexor.

2-Path

2-Path flowmeters use two measurement channels to achieve a single output via a "virtual" third channel. The resultant data is the average of the two channels. Only clamp-on or in-line transit-time operation is allowed. Benefits include highest available precision and enhanced immunity to distorted flow profile conditions.

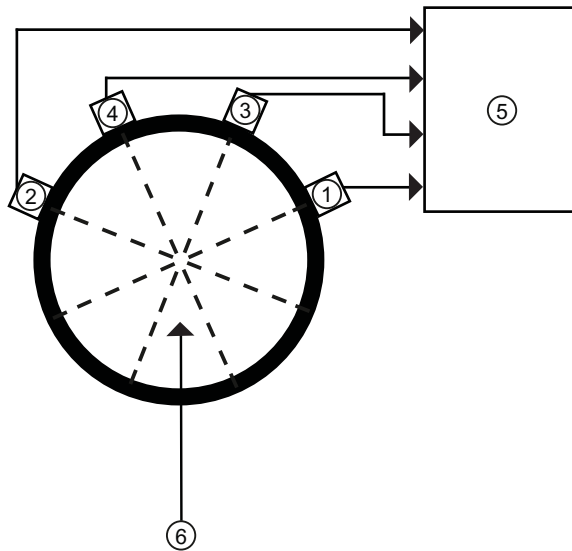


- ① Sensor Path 1
- ② Sensor Path 2

- ③ Average= (Path 1 + Path 2) / 2
- ④ Pipe (front view)

4-Path

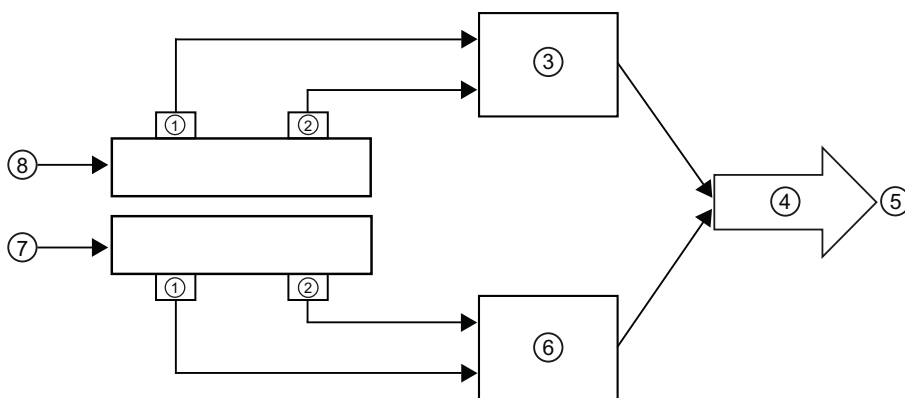
4-Path flowmeters use four measurement channels to achieve a single output via a "virtual" third channel. The resultant data is the average of the four channels.



- ① Sensor Path 1
- ② Sensor Path 2
- ③ Sensor Path 3
- ④ Sensor Path 4r
- ⑤ Average= (Path 1 + Path 2 + Path 3 + Path 4) / 4
- ⑥ Pipe (front view)

Channel 1+2 and Channel 1-2

Arithmetic operation produces data output via a virtual Channel 3, proportional to the sum or difference of the liquid and energy flow of two independent pipes. This requires setting the two channels to operate independently. Only clamp-on or in-line transit-time operation is supported.



- ① Upstream Sensors
- ② Downstream Sensors
- ③ Channel 1
- ④ CH 1 [+/-] CH 2
- ⑤ Output sum or difference of CH 1 & CH 2
- ⑥ Channel 2
- ⑦ Pipe B (front view)
- ⑧ Pipe A (front view)

Channel 1+2 produces a data output via a virtual Channel 3, proportional to the sum of the liquid and energy flow of two independent pipes. You have to set-up two channels independently. Only clamp-on or in-line transit-time operation is supported.

Channel 1-2 produces a data output via a virtual Channel 3, proportional to the difference of the liquid and energy flow of two independent pipes. You have to set-up two channels independently. Only clamp-on or in-line transit-time operation is supported.

Wide Beam Transmission

As shown in the figure above, an ultrasonic sensor induces an axial sonic beam within the wall of the pipe. These vibrations spread along the pipe wall and then enter the liquid in the form of a Wide Beam wave front traveling at an angle to the main pipe axis. The wide beam "rains" over the receiving sensor. The wide coverage of the receiver is necessary because the angle of the sonic beam is related to the liquid's sonic propagation velocity by Snell's Law.

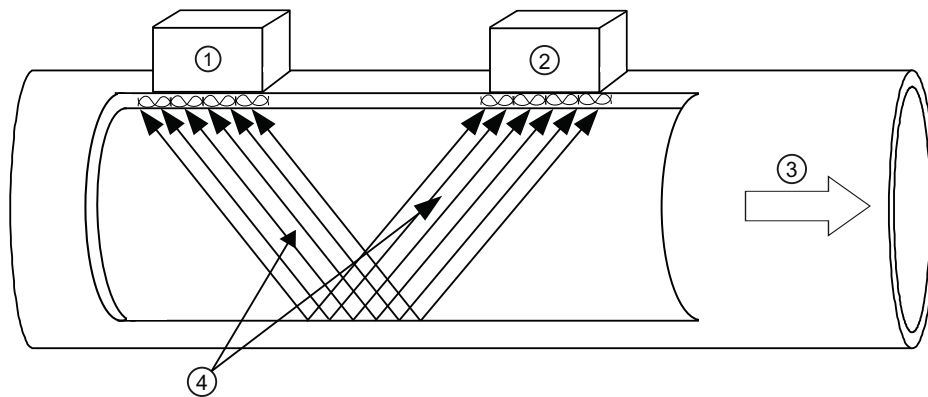
$$\text{Beam Angle} = \text{Arc Sine} \left(\frac{\text{Liquid Sonic Propagation Velocity}}{\text{Transducer Phase Velocity}} \right)$$

According to this formula, it can be stated that as the liquid sonic propagation velocity changes so will the angle between the sonic beam and the flow stream.

Therefore, a significant liquid sonic velocity shift could deflect a "narrow" beam transmission away from the receiving transducer entirely. The upstream vs downstream transit-time difference will also be affected by the changing (or refracting) beam angle. This makes it necessary for flowmeter systems to continuously compute this angle, since it is subject to varying degrees of refraction. The flowmeter derives the angle by knowing the fixed position of the transducers, the dimensions of the pipe and the measured transit-time.

Flow Calibration Factor

Normally, the flow stream is parallel to the axis of the pipe. On this basis, the calibration factor of a clamp-on ultrasonic flowmeter is proportional to the cosine of the beam angle relative to the pipe axis. However, this reveals that if the angle of flow stream is not in line with the pipe axis, the flow calibration factor could be compromised. This most often occurs when the transducer mounting location is within close proximity of a bend or other pipe obstruction.




- ① Upstream Sensor
- ② Downstream Sensor
- ③ Flow Direction
- ④ Wide Beam transmissions exchanged between the Upstream and Downstream sensors


Reflect mounting automatically corrects for non-axial flow or cross flow since the 2 vectors in a reflected beam are affected in opposite directions, such that the individual cross flow errors cancel each other.

Installing/Mounting


4.1 Installation safety precautions

 WARNING
In applications with working pressures/media that can be dangerous to people, surroundings, equipment or others in case of pipe fracture, we recommend that special precautions such as special placement, shielding or installation of a security guard or a security valve are taken when the sensor is mounted.

- Ensure that stresses and loading caused by e.g. earthquakes, traffic, high winds and fire damage if appropriate are taken into account during installation.
- Ensure that the flowmeter is installed such that it does not act as a focus for pipeline stresses. External loadings are not taken into account in the flowmeter design.
- Provide adequate protection to minimize any risk of contact with hot surfaces.

 WARNING
Prevent personal injuries by assuring that operation below pressure guards cannot take place, if working with vacuum or fluids boiling readily.

4.2 Determining a location

 WARNING
Electrical Shock Hazard Hazardous Voltage. May cause death or serious personal injury. Disconnect power before working on this product.

Upstream / Downstream

- Avoid long drop lines downstream from the sensor to prevent the meter pipe from draining.
- Avoid installing the sensor upstream of a free discharge in a drop line where possible.

4.3 Use according to specifications

Location in the system

The optimum location in the system depends on the application

- For liquid applications the presence of excessive gas or air bubbles in the fluid may result in erroneous measurements. Therefore, it is preferred not to install the sensor at the highest point in the system, where gas / air bubbles will be trapped. For liquids it is advantageous to install the sensor in low pipeline sections, at the bottom of a U-section in the pipeline.

4.3 Use according to specifications

"Use according to specifications" covers:

- Use within technical limits.
- Consideration of liquid specifications and references.
- Consideration of specifications as to installation, commissioning and maintenance.

Do NOT:

- Use the sensors as a footboard for installation purposes.
- Change the flowmeter in any way. For e.g. decomposition of material in connection with processing, welding and use of accessories and spare parts not approved by Siemens.

Note

If the flowmeter is not used according to the specifications, the manufacturer cannot be held responsible for any resulting damage.

4.4 Application Guidelines

Basic Requirements

- Determine pipe material and dimensions.
- Avoid vertical pipes flowing in a downward direction.
- Avoid installation of transducers on the top and bottom of horizontal pipes, if possible.
- Select a location with the longest straight run of pipe.
- Identify upstream piping configuration (elbow, reducer, etc.).
- Pipe surface should be smooth and, if necessary, free of paint.
- Avoid pressure reduction components upstream.

- Avoid mounting on or near weld seams.
- Pipe must be fully pressurized during set-up.

Note

Flowmeter Application Data menu [Pipe Configuration] parameter is preset for [Fully Developed] flow.

4.5 Mounting the Transmitter

 WARNING
--

Hazardous Voltage

May cause death or serious personal injury. Disconnect power before working on this product.
--

Wall Mounting

The transmitter can be mounted on any wall surface including wood, metal or concrete. Use the appropriate bolts and screws as needed for your mounting application and adhere to local codes. (See figure below for mounting bracket locations.)

Pipe Mounting

For installation on 2-inch standpipe use Pipe Mount Kit CQO:1012NMB-1 (optional - see catalog). See figure below.

Note

Pipe mounting kit CQO:1012NMB-1 is not available for NEMA 7 enclosures.

4.5 Mounting the Transmitter

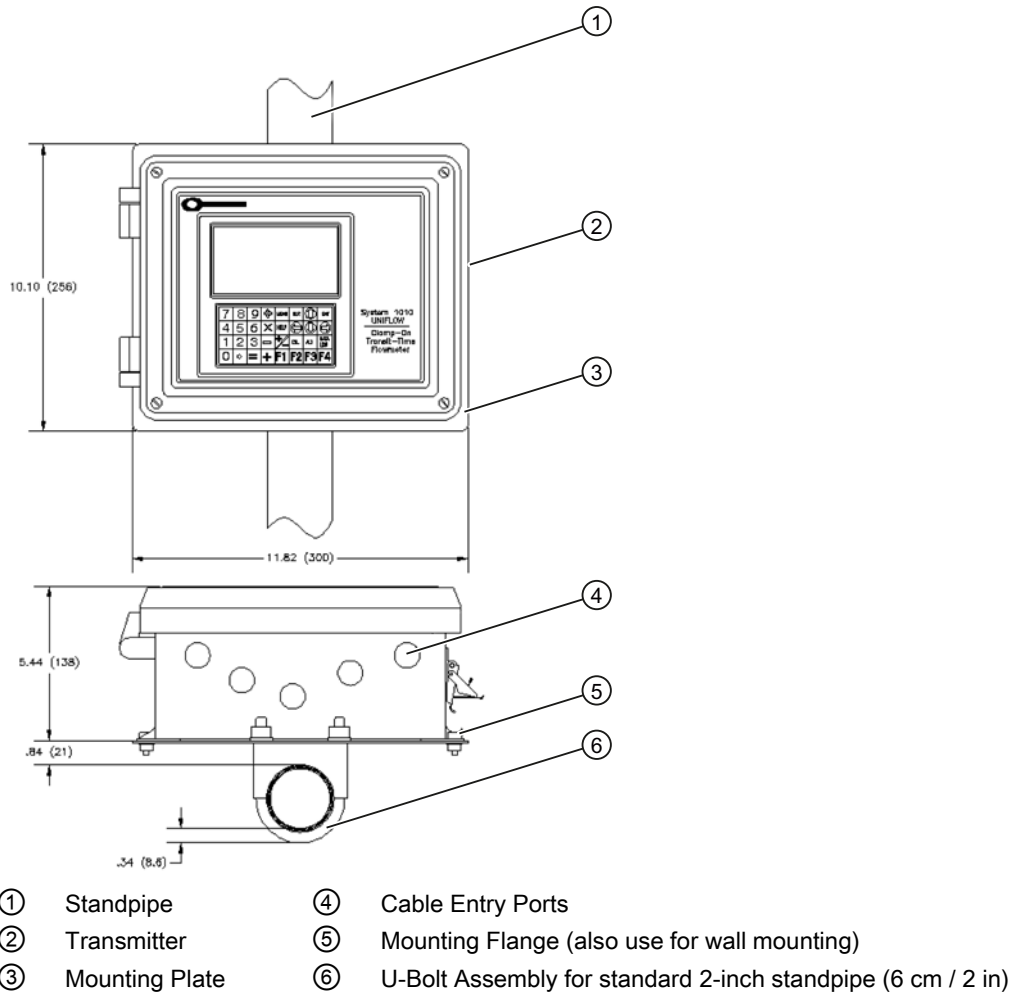



Figure 4-1 Pipe Mounting and Mounting Locations for Transmitter

Note

Use conduit fittings or cable glands on all cables.

 CAUTION
Install weather tight seals at all unused holes using proper cable conduit and close additional holes to IP65 standards.

Connecting







5.1 Safety notes for connecting

Use in hazardous locations

 WARNING
Only qualified personnel may carry out work on the electrical connections.

Before opening the terminal box check that:

- No explosion hazard exists
- Local safety codes and policy requirements have been followed
- All connection leads are potential free

 WARNING
Explosion Hazard "Flameproof enclosure" type of protection Only open devices with type of protection "Flameproof enclosure" in hazardous areas when the power to the device is turned off, otherwise there is a risk of explosion.
 WARNING
Explosion Hazard Hazardous areas Observe the type examination certificates or the test certifications applicable in your country if you use transmitters as category 1/2 equipment.
 WARNING
Explosion Hazard Intrinsically safe circuits With intrinsically safe circuits, use only certified meters appropriate for the transmitter. If a non-conforming supply unit is used, the "fail-safe" type of protection will no longer be effective and the approval certification will be invalid.
 WARNING
Explosion Hazard Laying of cables Cable for use in zone 1 and 2 must satisfy the requirements for having a proof voltage < AC 500 V applied between the conductor/ground, conductor/shield and shield/ground. Connect the devices that are operated in hazardous areas as per the stipulations applicable in the country of operation, e.g. for Ex "d" and "nA", permanent cables must be laid.
 WARNING
Explosion Hazard Devices with the common approval "Intrinsically safe" and "Flameproof" The following is applicable for devices with the common approval "Intrinsically safe" and "Flameproof" (Ex ia + Ex d): Before commissioning, make sure that the type of protection that is not suitable is permanently defaced on the nameplate to avoid improper use. If a non-conforming infeed is used, the "fail-safe" type of protection will no longer be effective.
 WARNING
Only commission the device after the device has been properly connected and, if required, closed.

5.2 Transmitter Wiring

5.2.1 Connecting Power

! DANGER

Electrical Shock Hazard

Turn off main power before installing AC connections to the transmitter. Contact with exposed wiring may lead to fire, electric shock or serious injury.

Note

If the transmitter is not already mounted and cabling has not been run, proceed to Mounting the Transmitter (Page 35) before connecting power.

1. Open the transmitter top cover by releasing the cover latch.
2. Unscrew the two power supply access cover fasteners and remove access cover.
3. Locate power supply connector J10. Using a flat blade screwdriver, remove plug P10 from connector J10. Set aside.

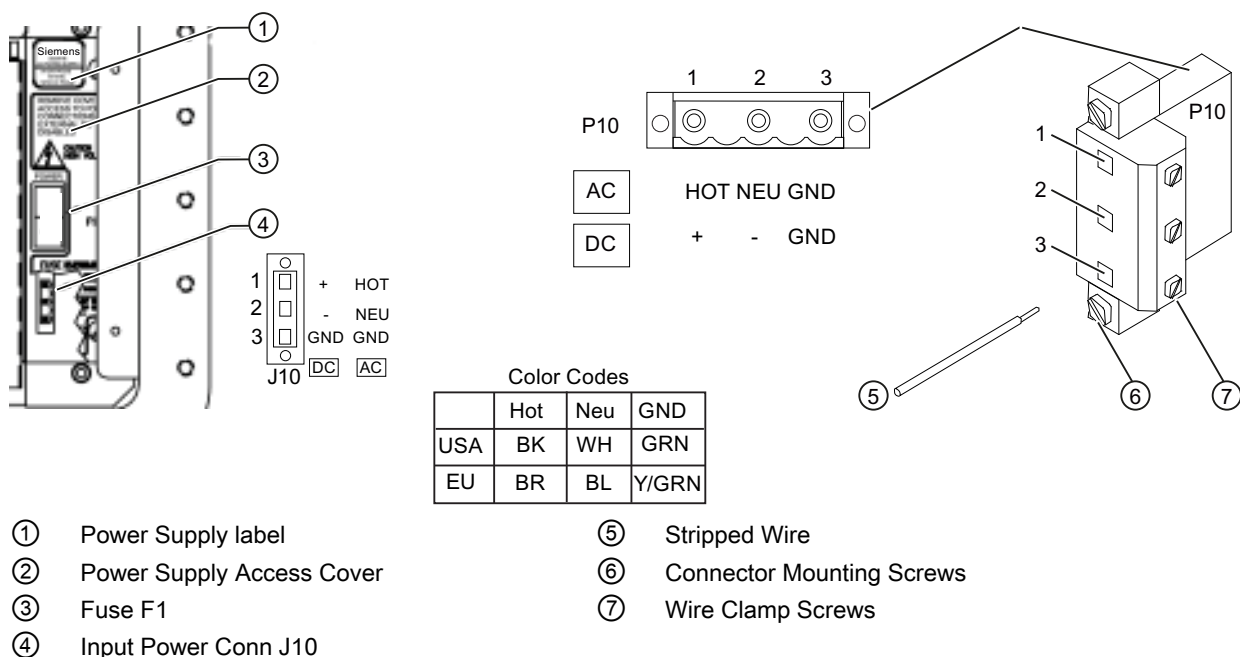


Figure 5-1 Input Power Plug (P10) Wiring

4. Pull the desired length of input power wires through a cable gland and into transmitter case before wiring connector.

- Wire input power connector P10 for AC or DC power depending on power supply provided.

Note

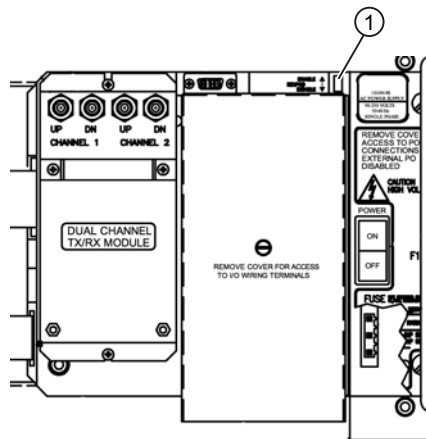
Dress cables and make sure cable length is not excessive as to impede proper replacement of access cover.

- Insert wires into wire entry holes and secure by tightening wire clamp screws (see figure above).

Note

Power Supply connector wires should be stripped AWG 12 - 18 stranded wire or solid conductors.

- Plug input power plug P10 into connector J10 and secure using two captive connector mounting screws.
- Replace access cover. Make sure Keypad Enable switch is in the "Enable" position (see below).



① Enable Switch

- If installing a Temperature Sensor board, go to Wiring Temperature Sensor to Transmitter (Page 41). If not, go to step 10.

⚠ CAUTION
Improper connections will damage power supply.

⚠ WARNING
Electrical Shock Hazard
Certain parts inside the device carry dangerous high voltage. The transmitter must be grounded and the top cover closed before applying power to the device.

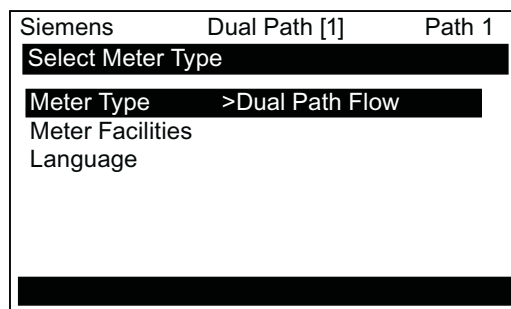
- Connect the power cables to the appropriate power source (90-240 VAC @ 50/60 Hz or 9-36 Vdc). Close top cover.

11. Apply power.
12. Within 10 seconds of power-up the main display will become active and a typical Siemens graphic will appear briefly. The screen also identifies the software version of the unit as shown below.




① Software Version (x.xx.xx)

13. Press the <MENU> key and the Main Menu will appear. (Language selection is not on Version 3 op systems.)

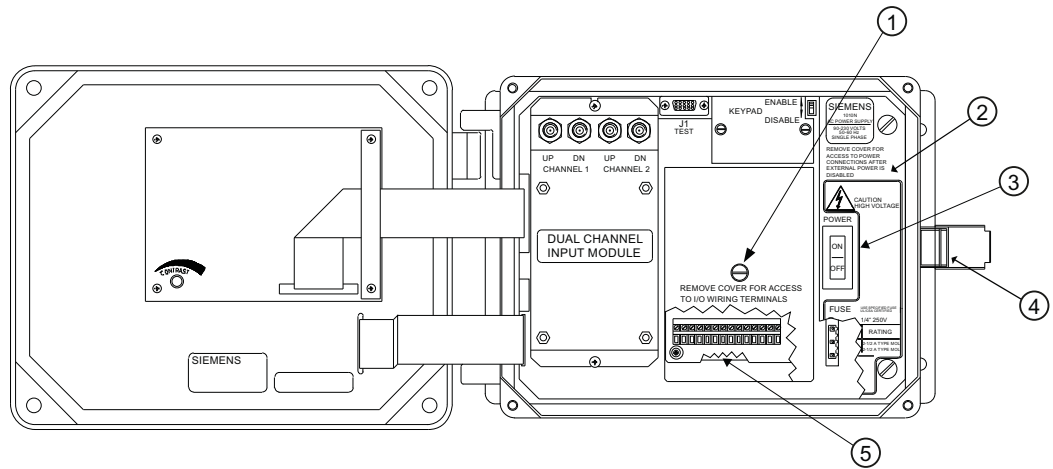


5.2.2 Wiring Temperature Sensor to Transmitter

Wiring Temperature Sensor to the Analog Input Module

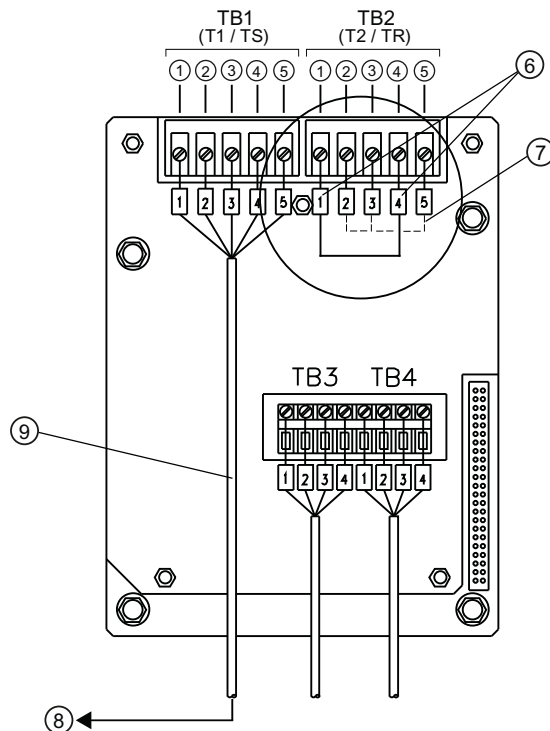
 WARNING
Electrical Shock Hazard
Set transmitter and instrumentation power to OFF when inserting or removing the Analog Input Module or when making connections to TB1, TB2, TB3 and TB4.

1. Disconnect power from the unit to the transmitter.
2. Open the transmitter top cover by releasing the cover latch.
3. Loosen the captive thumbscrew securing the Access Cover and remove Access Cover.
4. Using a flat-blade screwdriver, remove four captive screws securing the I/O board. Remove board and set it aside.



- ① Access Cover Screw
- ② Flowmeter
- ③ Power Switch
- ④ Latch
- ⑤ Access to Analog Input Module

Figure 5-2 Analog Input Module Access



- ① Black
- ② Orange
- ③ Brown
- ④ Red
- ⑤ Blue
- ⑥ Short Terminals 1 and 4 (For FUE1010 - TB2 is used for another Temperature sensor.)
- ⑦ Ground Terminals 2 and 3 to Terminal 5
- ⑧ To Sensor
- ⑨ 992EC Series Cable

Figure 5-3 Single Channel Temperature Sensor Inputs

Wiring Temperature Sensor Board

1. Using a flat-blade screwdriver, loosen Terminal Block TB1 and TB2 screws.
2. Wire the RTD liquid 992EC temperature cable as shown in the table below:

992EC Series Cable	Terminal TB1
Wire #1 (Black)	To TB1--1
Wire #2 (Orange)	To TB1--2
Wire #3 (Brown)	To TB1--3
Wire #4 (Red)	To TB1--4
Wire #5 GND/SHLD (Blue)	*To TB1--5

Note

*Do not attach this wire on the RTD side of the terminal.

3. Complete the temperature sensor current loop by shorting together terminals 1 and 4 of the unused TB2 temperature sensor terminal block.
4. Ground the voltage sensing leads (terminals 2 and 3 of TB2) by connecting them both to terminal 5.
5. Tighten all TB1 and TB2 terminal block screws.
6. Replace I/O Board and secure with four captive screws paying careful attention to pin alignment.
7. Replace Access Cover and finger tighten captive thumbscrew.

Note

TB3 and TB4 are also active analog inputs. See wiring table below.

Table 5- 1 TB3 and TB4 Wiring

Pin	TB3 Function	TB4 Function	Use	Description	Behaviour	Load	Wiring
1	AUX. 1 IN	AUX. 3 IN	lin1 Input	Analog current input referenced to meter ground.	4 to 20mA	200Ω	1000 ft. Max w/o factory approval
2	AUX. 1 COM	AUX. 3 COM	lin1 Common				
3	AUX. 2 IN	AUX. 4 IN	lin2 Input				
4	AUX. 2 COM	AUX. 4 COM	lin2 Common				

Notes on Analog Input Modules

Dual Path Models

- All units use T1 to report liquid temperature.
- The Analog Input of temperature takes priority over the built-in RTD (Resistive Thermal Device) measurement of temperature.

5.3 Navigating the Menu

Installation Menu Navigation

The Installation Menu Chart is a multi-level structure divided into three columns from left to right		
Level A - lists the major menu categories.		
Level B - list the menu cells associated with Level A. You can enter data into Level B menu cells that are display parameters in a column at the right of the screen.		
Level C - lists the Level B data		
Level A	Level B	Level C
	Recall Site Setup	Pump 1 Pump 2
	Channel Enable	
	Create/Name Site	
	Site Security	
	Delete Site Setup	
	Save/Rename Site	

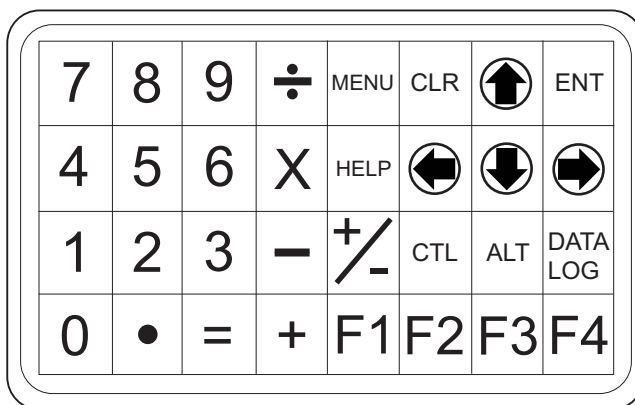


Figure 5-4 Keypad

Note

Use <Left Arrow> key to return to previous menus.

Table 5- 2 Keypad Function Chart

Keys	Description
MENU	Press to activate the Installation Menu.
ENT	Store numeric data, select from option lists, etc.
Left / Right Arrows	Menu navigation keys move cursor.
Up / Down Arrows	Same as <Left> and <Right> arrows. Scrolls option lists and graphic display screen.
CLR	Erases data or selects list options.
Numbers 0 - 9	Use to type numeric data.
Decimal Point	Use for decimal points in numeric data.
Math Operators	4-function math operations in numeric entry cells.
"F" Keys 1, 2, and 3	Caution: System Reset Key (use during power up).
CTL and ALT	Used as shift keys for alternative key functions.
DATALOG	Triggers immediate Datalogger report.
Plus and Minus [+ / -]	Changes the sign of numeric data.

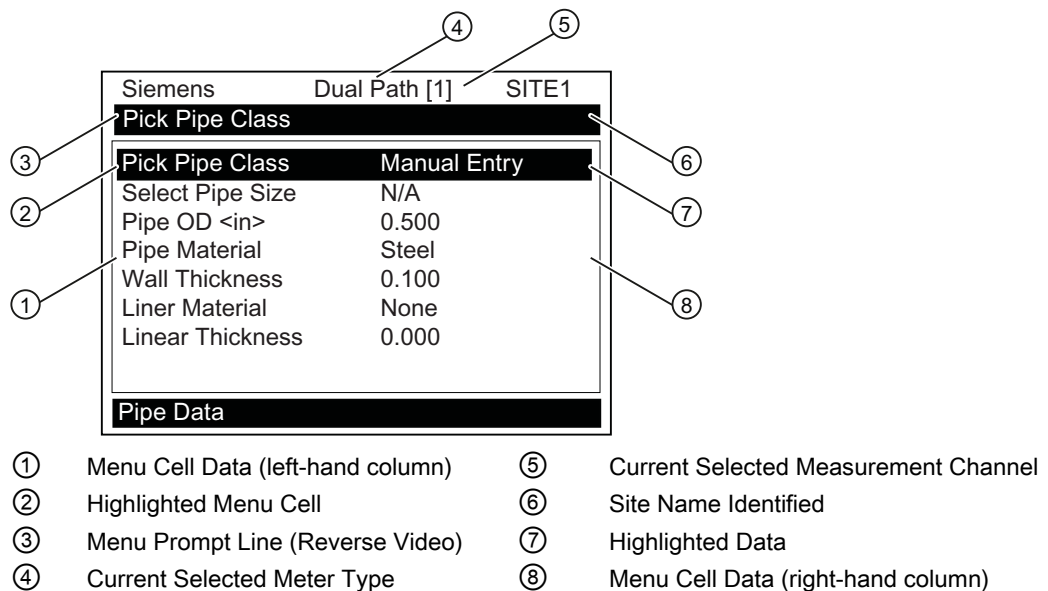


Figure 5-5 Typical Installation Menu Screen Example

5.4 Programming the Transmitter

Note

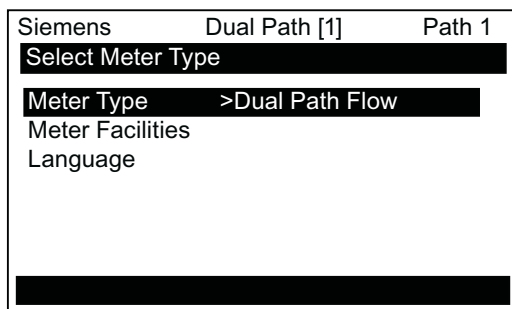
Before creating a site select a language and then English or Metric units from the Meter Facilities menu.

Note

To select English or metric units: In [Meter Type] menu, scroll to [Meter Facilities] menu. Press <Right Arrow> and select [Preferred Units]. Press <ENT> to select. Press <Left Arrow> and <Up Arrow> to return to main menu.

Select Meter Type

1. Press the <MENU> key and select the Meter Type.
2. Press the <Right Arrow> and scroll to [Dual Path Flow]
3. Press <ENT> to select. The [Dual Path Flow] menu will appear.



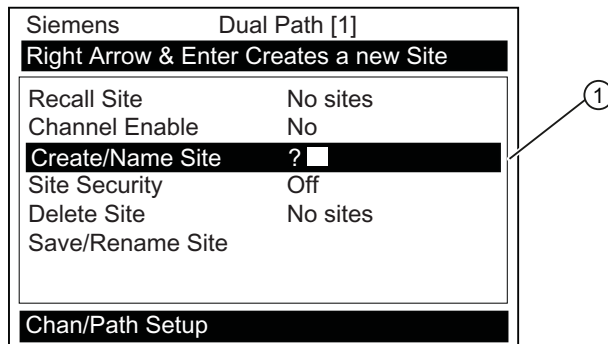
Create a Site

1. At the [Chan/Path Setup] menu press the <Right Arrow>.

Note

Before proceeding make sure that English or metric units have been selected.

2. Press <Down Arrow> to select the [Create/Name Site] menu and enter a Site name.
3. Press <Right Arrow> to create Site name.



① Insert desired name (8 characters maximum)

Note

To select letters: Press <Right Arrow> to cursor and then press <Up/Down Arrows> to select letters. Press <ENT> when done.

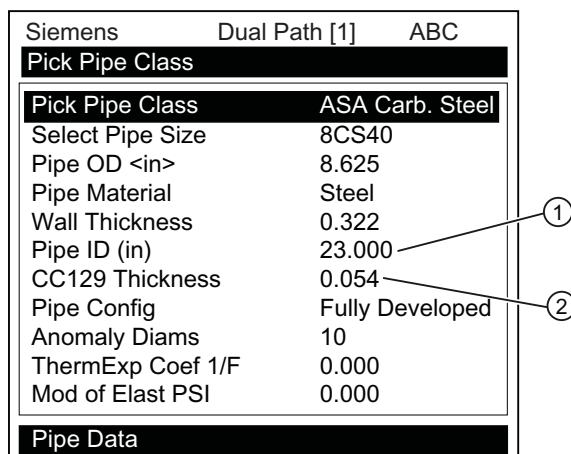
4. Press <Left Arrow> and return to the [Chan/Path Setup] menu.

Note

After the site configuration procedures that follow are complete the newly created site must be saved again to retain the new site data. Refer to the Save/Rename Site procedure below.

Selecting Pipe Data

1. Press the <Right Arrow> to select [Pick Pipe Class]. Press <Right Arrow> again and scroll to desired Pipe Class.
2. Press <ENT> to select.
3. Select Pipe Size from the pre-defined list or enter pipe dimensions and material manually.



① Enter ID directly if known. Pipe OD will be automatically adjusted.

② Refer to CC129 Material table to determine CC129 pipe damping material thickness.

Selecting CC129 Thickness

1. After selecting the appropriate sensor size (see Sensor Installation) determine the corresponding damping material final thickness using the CC129 thickness table and transfer entry to menu cell.
2. Press the <Left Arrow> and return to the main menu.

Selecting Pipe Configuration

1. Scroll down to [Pipe Config] and press the <Right Arrow>.
2. Select a configuration and number of pipe diameters that approximates the conditions upstream of your sensor mounting location. (Refer to definitions below.)
3. Press <ENT> to save selection.
4. Press the <Left Arrow> and return to the main menu.

Table 5- 3 Pipe Configuration Option List Definitions

Options	Definitions
Fully Developed	Fully developed flow, as would be expected for very long straight pipe runs or installation downstream of a flow condition.
1 Elbow	Single 90 degree Elbow upstream of sensor installation.
Dble Elbow+	Double out-of-plane Elbows upstream of sensor installation.
Dble Elbow-	Double in-plane Elbows upstream of sensor installation.
Valve	Not available at this time.
Expander	Pipe expansion upstream of sensor installation.
Reducer	Pipe reduction upstream of sensor installation.
Norm Entry	Not available at this time.
Header Inlet	Header or pipe manifold upstream of sensor installation.
Intrusions	Not available at this time.

Selecting Gas Parameters

It is recommended to edit the Gas Parameters immediately after creating a site. If reliable data is available for gas specific heat ratio, gas viscosity, sound velocity or gas compressibility factor, these settings should be modified. It is particularly important that the approximate (nominal) operating pressure be entered to allow for proper flow profile compensation.

Setting Fixed Pressure

1. At the Gas Parameters menu, scroll down to [Fixed Pres. PSIA].
2. Press the <Right Arrow> to select and edit the default Fixed Pressure value. (See table below for additional gas parameter values.)

Siemens	Dual Path [1]	ABC
Edit System Fixed Pressure		
Base Temp. F	60.0	
Base Pres. PSIA	14.700	
Spec. Heat Ratio	1.30	
Viscosity (cP)	0.0100	
Fixed MW g/mole	0.00	
Estimated Vs m/s	400	
Fixed Pres. PSIA	=14.700	
Z Base	1.000	
Z Actual	1.000	
AGA8 Comp.	No	
Gas Parameters		

The table below indicates the viscosity, specific heat ratio and estimated sound velocity (Vs) for some common gases. The default "Gas Parameters" are suitable for natural gas.

Table 5- 4 Common Gases for Clamp-On Measurement (at 14 bar & 15.5°C / 200 psia & 60°F)

Gas	Viscosity (cP)	Spec. heat Ratio (Cp/Cv)	Estimated Vs (m/s)
Carbon Monoxide	0.017	1.43	348
Ethane	0.010	1.32	281
Helium	0.019	1.66	1006
Hydrogen	1.410	1.41	1306
Methane	0.011	1.35	437
Natural Gas	0.011	1.33	400
Nitrogen	0.017	1.42	348
Oxygen	0.020	1.42	324

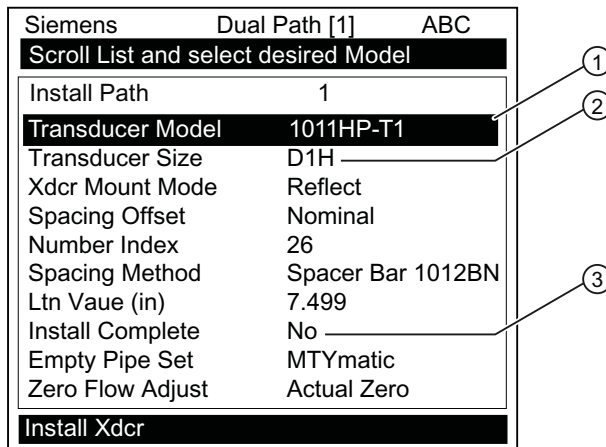
Standard Volume Compensation

If a direct standard volume output is required from the meter, then the entry of an AGA8 compensation table may be needed. Refer to the field manual for further details on configuring the meter for standard volume compensation.

Selecting Sensor

1. From the [Chan/Path Setup] menu, press the <Down Arrow> to select the [Install Xdcr] menu.
2. For multi-path meters select the first path to be installed (e.g., Path 1). Repeat this step for each additional path.

3. Press the <Right Arrow> to [Transducer Model]. Press <Right Arrow> and scroll to [1011HP-T1]. Press <ENT>.



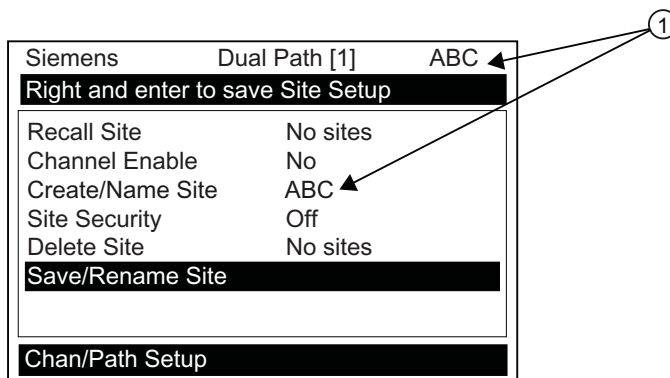
- ① Select based on type.
- ② Select based on size.
- ③ **After sensor is mounted select "Install."**

4. To select [Transducer Size], press <Right Arrow> and select [D1H]. Press <ENT>.
5. **IMPORTANT: Record Number Index and note Spacing Method.**

Save/Rename Site procedure

Whenever new site configurations are added to an existing site that site must be saved again to retain the new site changes.

1. **To save all programmed data to site**, press <Left Arrow> and then scroll up to [Chan/Path Setup].
2. Press <Right Arrow> and scroll to [Save/Rename Site].



- ① The saved site name now appears in the menu screen.
3. Press <Right Arrow> and then <ENT> to save all programmed data to site.
4. To return to the top menu level, continue to press the <Left Arrow> key.
5. **Sensors can now be mounted.**

5.5 Sensor Installation

5.5.1 Preliminary Installation Procedures

Reflect and Direct Sensor Mounting

Reflect and Direct mounting modes are supported for clamp-on sensors. The Flowmeter recommends a mounting mode after analyzing your pipe and liquid data entries.

Note

When installing sensors, do not key in the V/M (Version/Modification) label number as the Sensor Size.

Clamp-on Sensor Mounting Modes

The transmitter recommends a mounting mode after analyzing your pipe and liquid data entries. However, you can install clamp-on sensors in the way that best suits your application and the sensor type you have purchased.

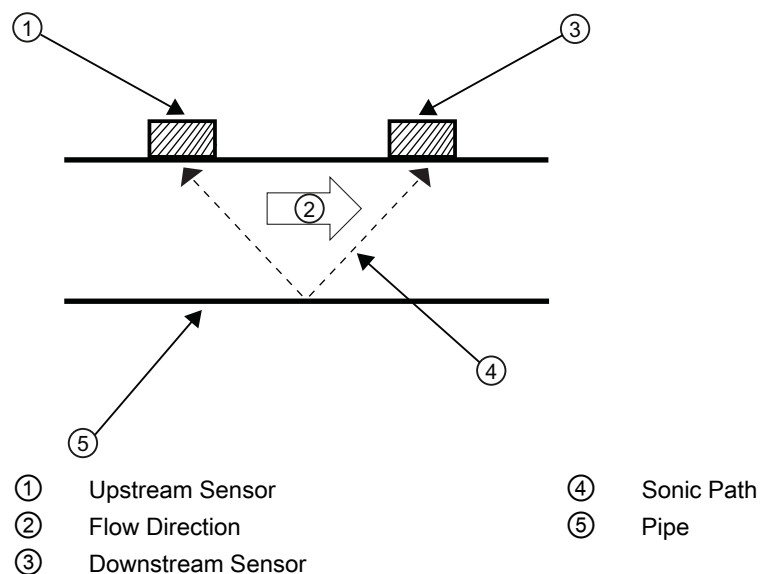


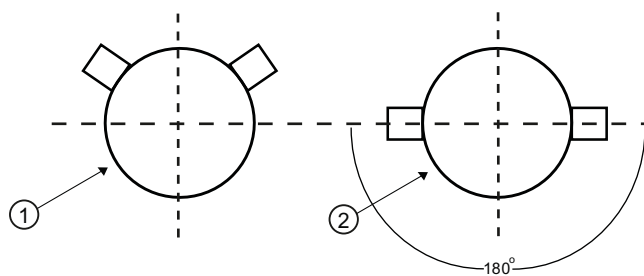
Figure 5-6 Reflect Mount (Pipe shown from above in 12 o'clock position)

Reflect mount is recommended whenever possible. This is the simplest way to mount the sensors. Also, Reflect mount resists abnormal flow profile conditions such as cross-flow within the flow stream. Reflect mount supports the AutoZero function, which zeroes the flowmeter automatically without user-participation. In addition, Reflect mount may be the only possibility if conditions do not allow access to the opposite side of the pipe.

Strap Mounting Kits	Pipe Diameter	SAE Band Sizes (Qty.)
7ME396000SM00	2" (50.8mm) to 7" (177.8mm)	#88 (2) #128 (2)
7ME396000SM10	2" (50.8mm) to 13" (330.2mm)	#88 (2) #152 (2)
7ME396000SM20	13" (330.2mm) to 24" (609.6mm)	#188 (2) #280 (2)
7ME396000SM30	24" (609.6mm) to 48" (1219.2mm)	#152 (4) #312 (4)

Selecting a location for the sensors

1. Locate the sensors downstream from the center of the longest available straight run. A location ten pipe diameters or greater downstream from the nearest bend will provide adequate flow profile conditions.
2. Do not, if possible, install the sensors downstream from a throttling valve, a mixing tank, the discharge of a positive displacement pump or any other equipment that could possibly aerate the liquid. The best location will be as free as possible from flow disturbances, vibration, sources of heat, noise, or radiated energy.
3. Avoid mounting the sensors on a section of pipe with any external scale. Remove all scale, rust, loose paint, etc., from the location.
4. Do not mount the sensors on a surface aberration (pipe seam, etc.)
5. Do not mount sensors from different ultrasonic flow meters on the same pipe. Also, do not run the sensor cables in common bundles with cables from other instrumentation. You can run these cables through a common conduit ONLY if they originate at the same flowmeter.
6. Never mount sensors under water, unless you order submersible units and you install them in accordance with factory instructions.
7. Avoid mounting sensors on the top or bottom of a horizontal pipe. The best placement on a horizontal pipe is either the ten o'clock and two o'clock position for Reflect Mode, or one sensor at nine o'clock and one sensor at three o'clock for Direct Mode. Mounting on a vertical pipe is recommended only if flow is in the upward direction. When mounting on a vertical pipe flowing in a downward direction make sure there is sufficient back pressure in the system to maintain a full pipe.



- ① Dual Path, Reflect Mount
 ② Dual Path, Direct Mount

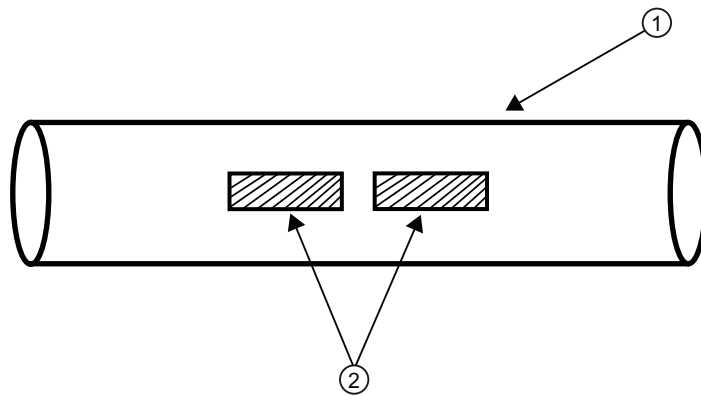
Figure 5-8 Sensor Alignment (Horizontal Plane)

Preparing the Pipe

1. Pick a mounting location with the longest straight run. You must have easy access to at least one side of your pipe. The pipe at the mounting location must remain full, even at zero flow.
2. Decide on your mounting mode (Direct or Reflect). Always use Reflect Mode whenever possible. You may only need to use Direct Mode if your pipe is plastic.
3. After receiving the spacing dimensions from the Installation Menu, prepare the pipe surface. De-grease the surface, if necessary, and remove any grit, corrosion, rust, loose paint, etc. Use abrasive material provided to provide a clean contact surface for the sensors.

Note

Please note that the instructions show vertical mounting for clarity purposes only. Do not install sensors on the top of a pipe.



- ① Pipe
- ② Cleaned Areas

Figure 5-9 Pipe Surface Preparation

4. Clean an area 13 mm (1/2-inch) on either side of the sensors.
5. Clean an additional 13 mm (1/2-inch) along the length of the sensors.

5.5.2 Reflect Mount

Sensor Installation

Reflect Mount -Installation using Mounting Frames and Spacer Bar

1. After receiving the spacing index from the Installation Menu, prepare the pipe surface area where the sensors will be mounted.
2. Degrease the surface and remove any grit, corrosion, rust, loose paint, etc.

Before beginning refer to the Reflect Mount Installation diagram example below.

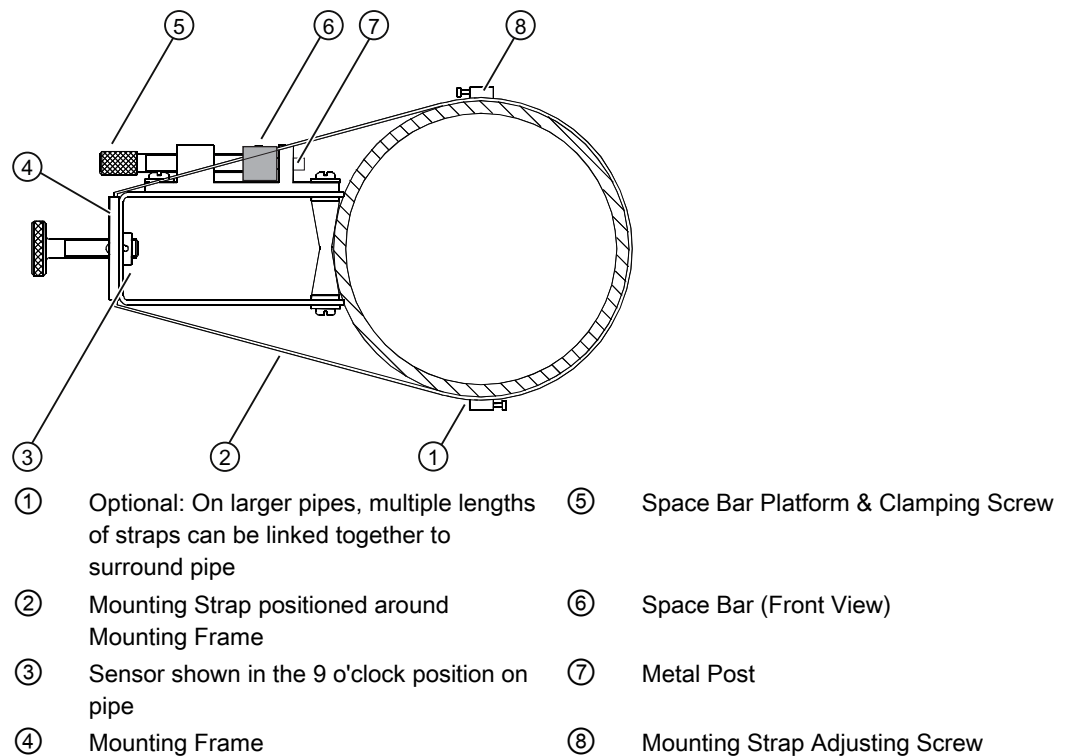


Figure 5-10 Reflect Mount with Mounting Frames and Spacer Bar

Note

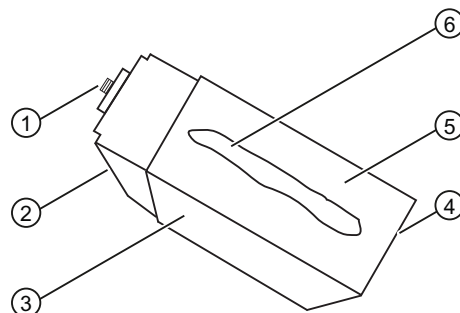
Minimum Ltn 18 mm (0.75 in).

Preparing the Pipe

1. On a flat surface, attach the Spacer Bar to a Mounting Frame so that the Reference Hole on the Spacer Bar fits over the metal post on the platform of the frame. Tighten the clamping screw.
2. Slide the second Mounting Frame onto the other end of the Spacer Bar and align the Number Index Hole with the metal post on the platform. Then tighten the clamping screw. *Ensure that the angled sides of both frames face away from each other.*
3. Wrap a Mounting Strap around the pipe. Make sure to position it so there is easy access to the Mounting Strap Adjusting Screw.
4. At the mounting location, place the Mounting Frame/Spacer Bar Assembly on the pipe so that it rests on the top of the pipe.
5. Engage the end of the Mounting Strap with the Mounting Strap Adjusting Screw.
6. Slide strap under the spring clip of one of the Mounting Frames.
7. Tighten the Mounting Strap Screw enough to take up all of the slack, but not enough to prevent rotation of the assembly. *Repeat procedure for the other Mounting Frame.*
8. Rotate the assembly on the pipe to the final conditioned location, ensuring that it is straight along the pipe axis. (Refer to the sensor orientation diagram)
9. Tighten the mounting straps to seat the assembly firmly on the pipe. Do not over tighten.

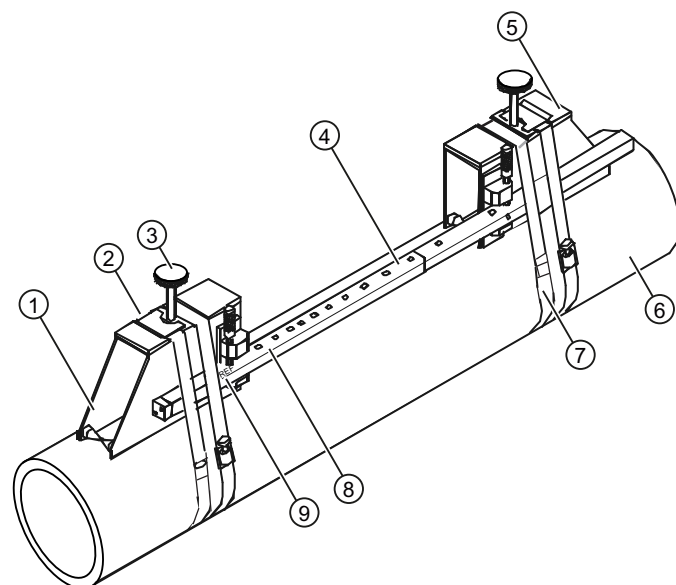
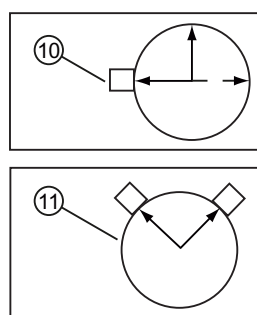
Installing the Sensor

1. Take either sensor and apply a continuous lengthwise 1/8-inch bead of coupling compound across the center of the sensor emitting surface.



- | | |
|---------------|---------------------|
| ① F-Connector | ④ Back End |
| ② Angled Edge | ⑤ Emitting Surface |
| ③ Transducer | ⑥ Coupling Compound |

Figure 5-11 Sensor



- | | |
|--|---|
| ① Front View | ⑥ Pipe |
| ② Spring Clip (Not present on some models) | ⑦ Mounting Strap Note: Optional 2nd Mounting Strap shown. Larger pipes over 30 inches may need an additional support. |
| ③ Sensor Clamping Screw | ⑧ Spacer Bar Platform and Clamping Screw |
| ④ Spacer Bar | ⑨ Spacer Bar Reference Hole |
| ⑤ 1012 Series Mounting Frame | ⑩ Orientation for Single Beam Transducer at 9 o'clock position |
| | ⑪ Orientation for Dual Beam Transducer at 10 & 2 o'clock positions |

Figure 5-12 Sensor Installation

2. Slide sensor into a mounting frame back end first aligning the angled edge of the sensor with the angled edge of the mounting frame. Keep sensor from making contact with the pipe until it butts up against the mounting frame stop. Push sensor down to mate with pipe.
3. Tighten the sensor clamping screws to hold the sensor firmly in place. *Repeat procedure for the other sensor.*
4. If installing a temperature sensor proceed to Mounting Temperature Sensor (Page 72). If not, proceed to Sensor Wiring (Page 74).

5.5.3 Direct Mount

Sensor Installation using Mounting Frames, Spacer Bar and Spacing Guides

The combination of mounting frames, spacer bar and spacing guides is the recommended way to mount Direct Mode sensors. The mounting frame establishes the axial alignment of the sensors and allows you to remove and replace either sensor while preserving their exact mounting location.

For Direct Mode mounting, a spacer bar is used to establish the distance between sensors and a spacing guide to locate the sensors at the nine o'clock and three o'clock positions. Should the distance between sensors be beyond the span of a spacer bar, a measuring tape can be used. The Mylar spacing guide comes in various lengths and widths to accommodate most pipe sizes.

Spacing Guide Sizes
5.08cm x 66.04cm (2" x 26")
5.08cm x 114.3cm (2" x 45")
10.16 cm x 205.7cm (4" x 81")
10.16cm x 393.7cm (4" x 155")
15.2cm x 497.8cm (6" x 196")

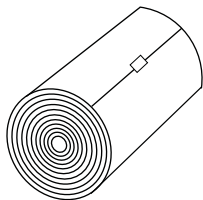
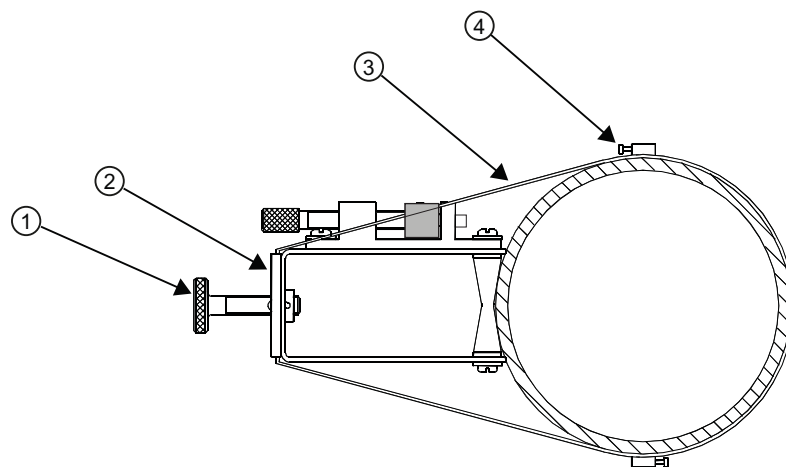


Figure 5-13 Mylar Spacing Guide

1. After receiving the spacing index from the Installation Menu, prepare the pipe surface area where the sensors will be mounted.
2. Degrease the surface and remove any grit, corrosion, rust, loose paint, etc.

3. Make a note of the Number Index displayed in the Pick/Install menu. Check to ensure that you have a matched set of sensors. They both should have the same S/N number but marked with either an "A" or "B" (e.g., 100A and 100B).
4. Temporarily position one of the frames on the pipe where you will be mounting it. Ensure that this is a smooth area without any raised areas (seams, etc.) With a pencil or chalk, mark a 13 mm (1/2") area around the frame. Remove the assembly.
5. Prepare the area you marked by de-greasing surface, if needed, and removing any grit, corrosion, rust, loose paint or surface irregularities with the abrasive material provided
6. Put a mounting strap around the pipe and engage an end into adjusting screw (screw should be pointing up). Position frame in the middle of area you have cleaned and centered on the pipe with its angled end facing away from where the other frame will sit.

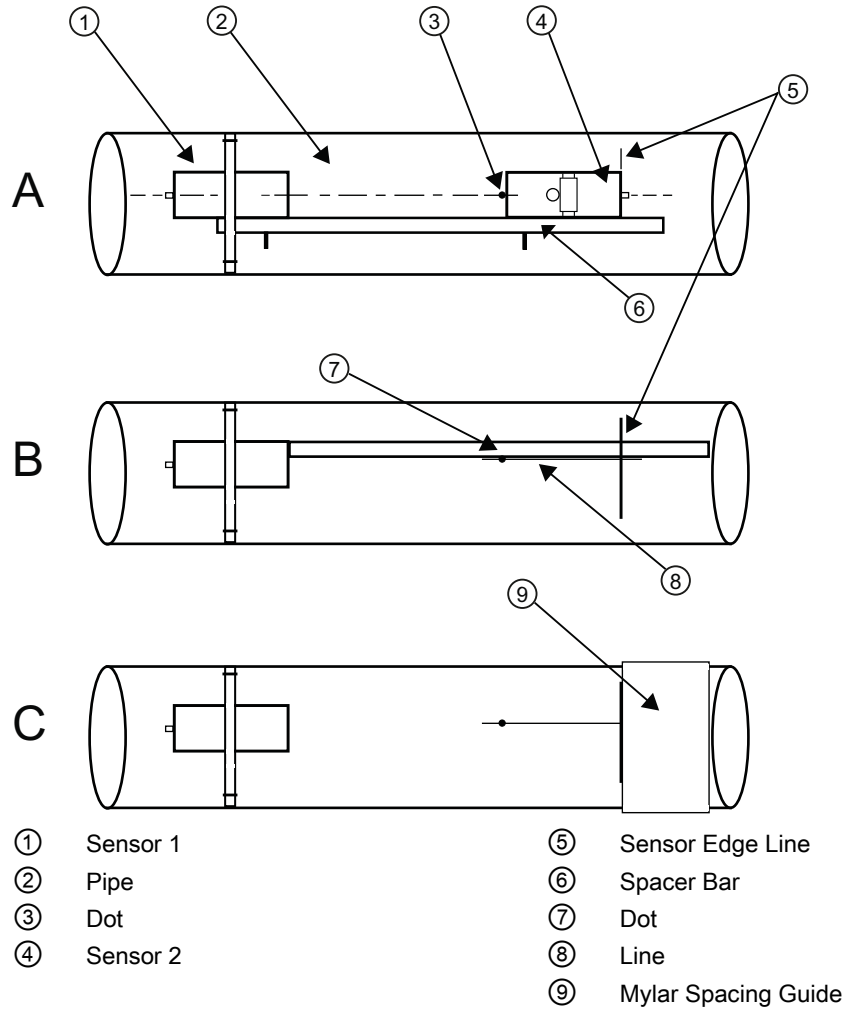


- | | | | |
|---|-----------------------|---|--------------------------------|
| ① | Sensor Clamping Screw | ③ | Mounting Strap |
| ② | Spring Clip | ④ | Mounting Strap Adjusting Screw |

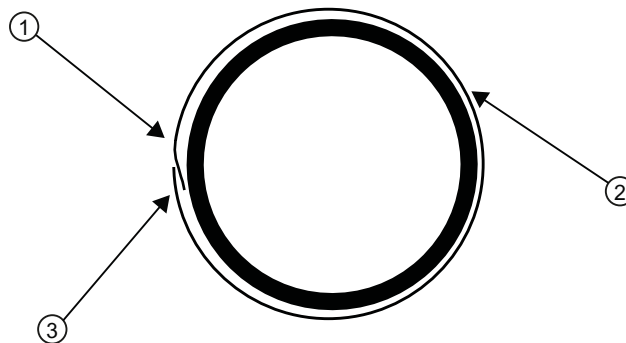
Figure 5-14 Wrap Strap Under Pipe and Attach to Adjusting Screw

7. Slide the mounting strap over it (and under the clip if there is one) and tighten with a screwdriver. While tightening, check to ensure that the center of the tapered roller is centered on the pipe.
8. Attach the second frame to the spacer bar with an index spacer screw into the index hole specified in Step 1. The angle on the frame should be facing away from the direction that the length of the bar is going.

9. Now attach the free end of the spacer bar by inserting an index spacer screw through the REF hole on the spacer bar and then into the hole on the mounted frame. Tighten. Sight to ensure that this frame is lined up in center of pipe and while holding alignment, place a dot (with pencil or chalk) in the center of the tapered roller at the bottom of the frame (see A below). While holding, also mark along the front edge of the frame with pencil or fine chalk line (see B below).



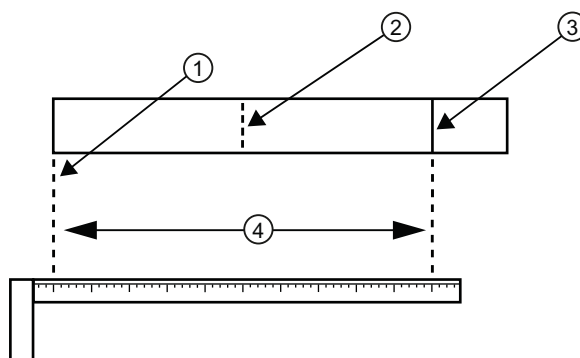
10. Disassemble the spacer bar and the un-mounted frame. Use the bar as a straight edge and, with one edge against the mounted frames tapered roller center and the other crossing the dot you drew, draw a line crossing the dot (see "B" above). Set the bar aside.



- ① Trim material from inner edge if necessary
- ② Mylar Spacing Guide
- ③ 8 cm (3inch) Overlapping Edge

Figure 5-15 Wrapping the Mylar Spacing Guide around the pipe (End View)

11. Wrap the Mylar spacing guide around the pipe so that the left edge is against the sensor edge mark (see "C" above). Arrange so that one end overlaps the other by at least three inches. Trim to fit if necessary, but be sure not to trim at the overlapping end in order to keep it square.
12. Realign left edge of the guide with the sensor edge mark. Line up both vertical edges of the guide and ensuring that it is snug around the pipe, mark along the overlapping edge.
13. Remove Mylar spacing guide and lay it out on a flat surface. Either measure the exact distance half-way between the overlap edge and the mark at the overlap, or fold the guide from the overlap edge to overlap mark and draw a line at the fold or halfway point.

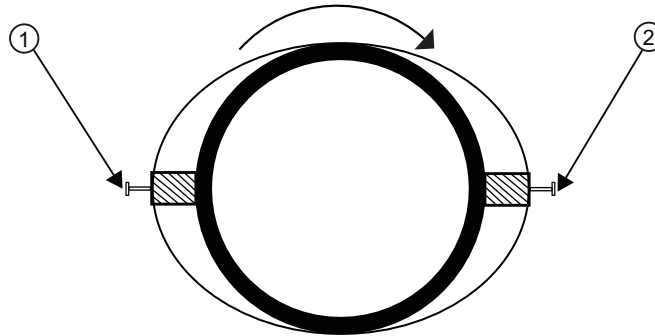


- ① Overlap Edge
- ② Mark (or fold) exactly at half-way point
- ③ Spacing Guide
- ④ Circumference

Figure 5-16 Finding the Halfway Distance

14. Reinstall the spacing guide; its left edge abutting the sensors edge mark on the pipe and the overlapping edge in line with the dot (now a line) on the pipe (see "C"). Tape it in this position on the pipe. Take the second frame and place it against the edge of the guide with its tapered roller centered on the center mark on the guide.

15. Temporarily position the frame (in the 3 o'clock position opposite the mounted frame - see below) where it will be mounted. Ensure that this is a smooth area without any raised spots (seams, etc.). With a pencil or chalk mark a 13 mm (1/2-inch) area around the mounting frames. Remove the frame and the Mylar guide.



- ① 9 o'clock Sensor
 ② 3 o'clock Sensor

Figure 5-17 Aligning the Sensors for Direct Mode operation (End View)

16. Prepare the area you marked by de-greasing the surface, if needed, and removing any grit, corrosion, rust, loose paint or surface irregularities with the abrasive pipe conditioning material provided. Clean the pipe of any debris and abrasive particles.
17. Replace the Mylar guide back in the same position it was in and retape it to the pipe
18. Put a mounting strap around the pipe and engage an end into adjusting screw (screw should be pointing up).
19. Position frame in the middle of area you have cleaned and centered on the pipe with its angled end facing away from where the other frame will sit and aligned with the edge and center marks on the guide. Slide the mounting strap over it (and under the clip if there is one) and tighten with a screwdriver. While tightening, check to ensure that the center of the tapered roller is centered on the pipe.
20. Take either sensor and apply a continuous lengthwise 1/8-inch bead of coupling compound across the center of the sensor emitting surface.
21. Tighten the sensor clamping screws to hold the sensor firmly in place. *Repeat procedure for the other sensor.*
22. Slide sensor into a mounting frame back end first aligning the angled edge of the sensor with the angled edge of the mounting frame. Keep sensor from making contact with the pipe until it butts up against the mounting frame stop. Push sensor down to mate with pipe.
23. Open the transmitter top cover. Using a flat blade screwdriver, remove the Cable Strain Relief bracket.
24. Observing the upstream and downstream orientation, attach the UP and DN cables to the sensors and make snug. Attach the other ends to the UP and DN terminals of the transmitter.
25. Replace the Cable Strain Relief bracket. Close top cover.
26. Proceed to Commissioning (Page 77).

5.5.4 1012T Mounting Tracks

Using 1012T Sensor Mounting Tracks

The 1012TN and 1012TNH Mounting Tracks provide a rigid mounting platform for Series 1011 universal or high precision size A or B sensors. The mounting tracks service pipe sizes up to a maximum of 5.00" (140 mm) outer diameter. Operating temperatures are supported up to 121°C (250°F). The assembly consists of lightweight aluminum track rails with integral sensor clamping screws. Attached index pins enable positive locating of the sensors at fixed spacing locations. Roller-chains and tension screws secure the assembly to the pipe.

The 1012T mounting tracks support both Direct and Reflect mounting modes. The flowmeter recommends the appropriate sensors, mounting track and mounting mode, based on the pipe data entries. Refer to the sensor installation procedures, and if necessary, review how to select and prepare a pipe mounting location.

Installing a 1012T Mounting Track in Reflect Mode

The Sensor Installation procedures show how the automatic selection of sensors, mounting mode and spacing method are established. Examine the figure below, which illustrates a typical [Install Xdcr] menu screen. Note the automatic assignment of mounting track part number, plus the designation of the number index.

Siemens	Dual Path [1]	SITE1
Install Complete?		
Install Path	1	
Transducer Model	1011HP-T1	①
Transducer Size	B3	①
Xdcr Mount Mode	Reflect	①
Spacing Offset	Minimum	
Number Index	6	②
Spacing Method	Track 1012TN	②
Ltn Value (in)	0.581	
Install Complete	No	
Empty Pipe Set	Channel Not Setup	
Zero Flow Adjust	Channel Not Setup	
Install Xdcr		

- ① Sensor type, size and mounting mode selection.
- ② Automatic selection of mounting track part number and number index.

1. Perform all required menu steps up until the point where you respond to the [Install Complete?] prompt.
2. Make note of the Number Index. Check to ensure that you have a matched set of sensors. They both should have the same serial number but marked with either an "A" or "B" (e.g. 100A and 100B).

Note

An index pin will be inserted into the track rail hole designated by the Number Index to position one of the sensors (see ⑪ in figure below).

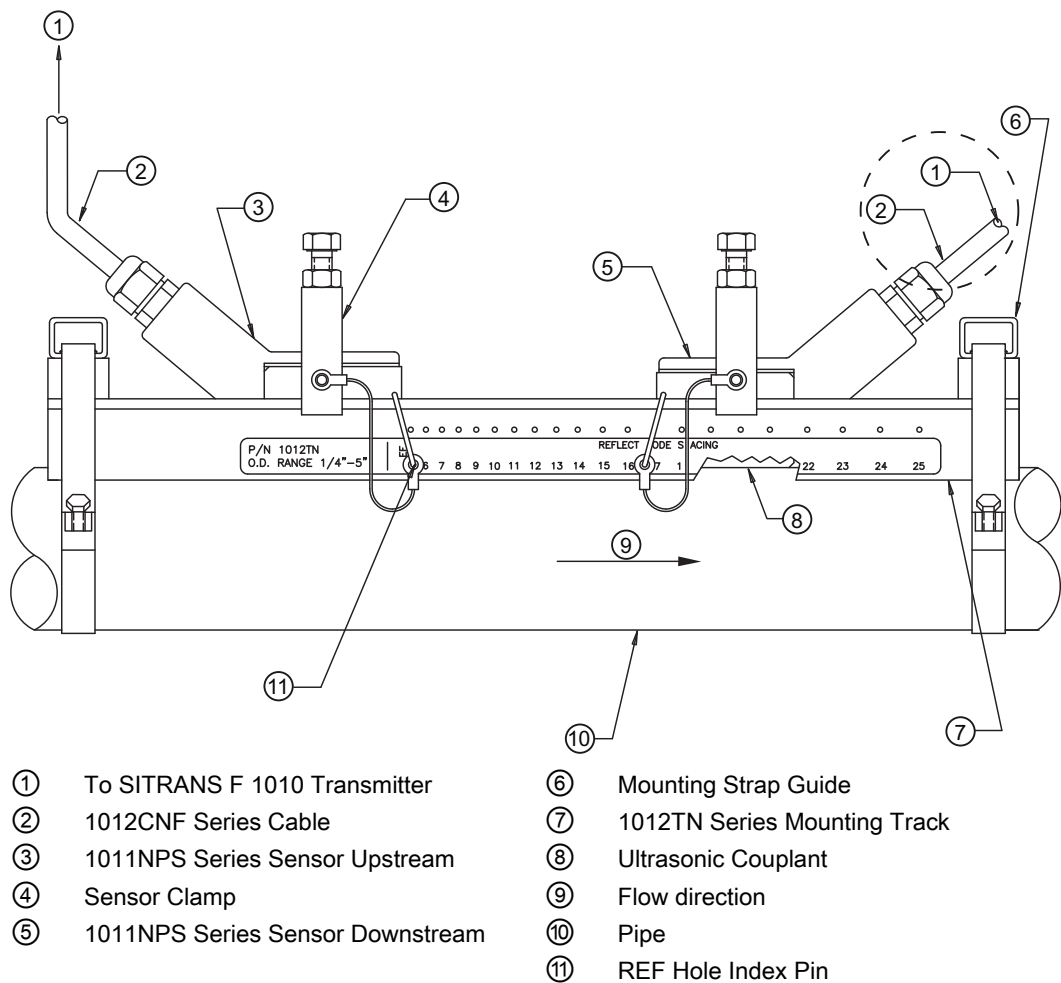


Figure 5-18 Reflect Mount with Model 1012TN Mounting Track (Side View)

3. Place the track rail assembly on the top surface of the pipe at the location where you have determined it would be mounted. Ensure that it is a smooth area without any raised spots or seams.
4. Holding the mounting track assembly in place, loop one of the strap clamps under the pipe, pull it around and maintain tension while slipping a link over the tension screw hook. Tighten the tension screw enough to hold the assembly on the pipe, but still allow rotation. Repeat for the other mounting strap.

5. Rotate the track rail assembly to the intended mounting position on the pipe, then tighten both tension screws just enough to prevent rotation. Do not over tighten.
6. With a pencil or chalk mark a generous area around the perimeter of the track assembly. Loosen and move the assembly away from marked area.
7. Prepare the area you marked by degreasing the surface, if needed, and removing any grit, corrosion, rust, loose paint or surface irregularities with the abrasive pipe conditioning material provided. Clean the pipe of all debris and abrasive particles.
8. Rotate the track into the position that was just cleaned. Insert the index pin into the REF hole.
9. Insert the index pin into the reference hole.
10. Select a sensor and apply a thin band of couplant compound to the sensor's emitting surface.
11. Place the sensor between the track rails, slightly behind the pin and under the clamping screw assembly. Slide it forward until it butts up firmly against the reference pin.
12. Once the sensor is in place secure it with the sensor clamping screw. Do not over tighten.
13. Repeat the procedure for the Number Index sensor making sure to insert an index pin into the correct Number Index hole. Refer to the Model 1012TN Mounting Track (side view) figure above.
14. Observing the upstream and downstream orientation, attach the UP and DN cables to the sensors and make snug. Attach the other ends to the UP and DN terminals of the flowmeter.

Installing a 1012T Mounting Track in Direct Mode

The Sensor Installation procedures show how the automatic selection of sensors, mounting mode and spacing method are established. Examine the figure below, which illustrates a typical [Install Xdcr] menu screen. Note the automatic assignment of model numbers for the sensor and mounting track, plus the designation of the number index.

Siemens	Dual Path [1]	SITE1
Install Complete?		
Install Path	1	
Transducer Model	1011HP-T1	
Transducer Size	B3	
Xdcr Mount Mode	Direct	←
Spacing Offset	Minimum	
Number Index	4	←
Spacing Method	Track 1012TN	←
Ltn Value (in)	0.217	
Install Complete	No	
Empty Pipe Set	Channel Not Setup	
Zero Flow Adjust	Channel Not Setup	
Install Xdcr		

① Automatic selection of mounting track part number , mount mode and number index

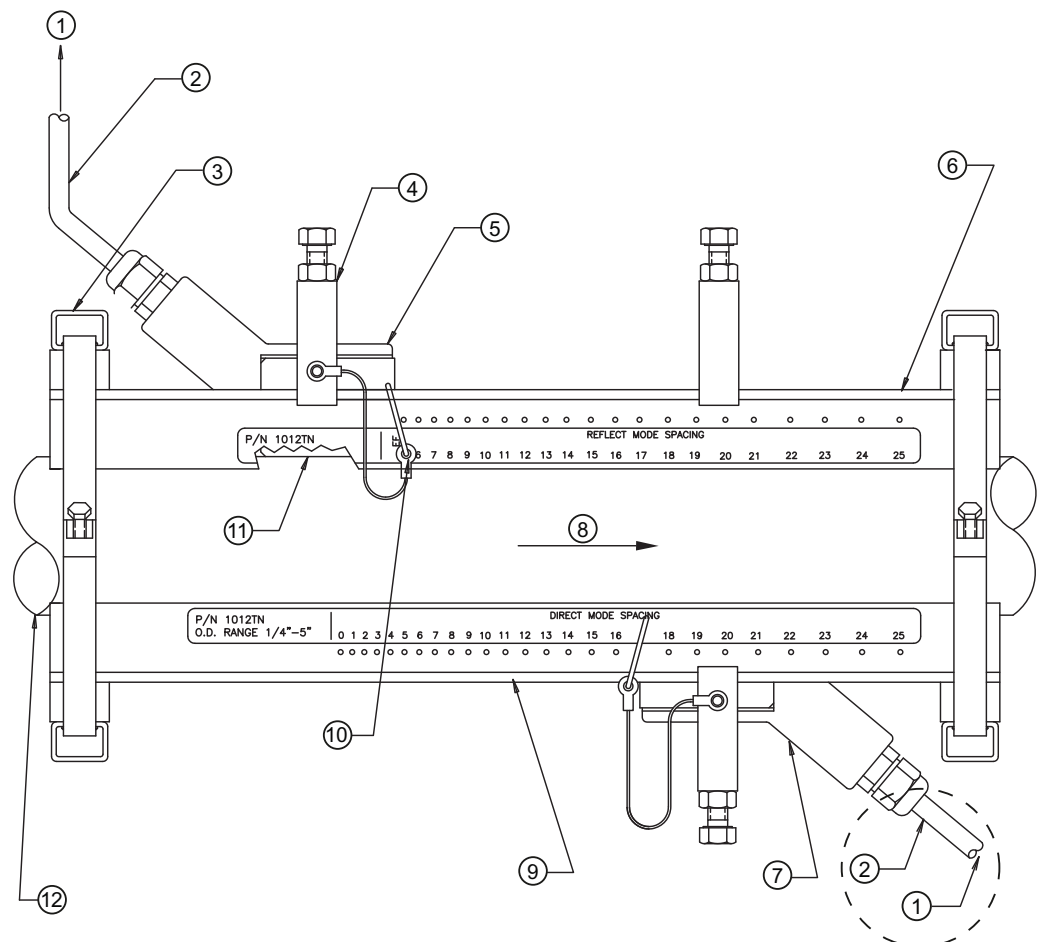
The combination of two Model 1012TN Mounting Tracks and a spacer guide is the recommended way to mount sensors in the Direct Mode. This method ensures that sensors will align exactly 180° from each other and remain spaced the proper distance apart.

The Direct Mount configuration uses a set of two track rail assemblies; one for each sensor, installed 180° apart on the pipe. The set includes:

- Reflect Mode Track Assembly - This track rail includes the Tension Screw and REF hole to position one sensor.
- Direct Mode Track Assembly - This track rail has number index holes for inserting an index pin to position the other sensor.

Note

A pin will be inserted into the hole designated by the Number Index on the Direct Mode track rail to position one of the sensors (see ⑩ in figure below).



- | | |
|----------------------------------|------------------------------------|
| ① To SITRANS F Transmitter | ⑦ 1011NPS Series Sensor Downstream |
| ② 1012CNF Series Cable | ⑧ Flow direction |
| ③ Mounting Strap Guide | ⑨ 1012TN Series Mounting Track |
| ④ Sensor Clamp | ⑩ REF Hole Index Pin |
| ⑤ 1011NPS Series Sensor Upstream | ⑪ Ultrasonic Couplant |
| ⑥ 1012TN Series Mounting Track | ⑫ Pipe |

Figure 5-19 Direct Mount 180° opposed with Mounting Tracks

1. Perform all required menu programming steps up until the point where you respond to the [Install Complete?] prompt.
2. Make a note of the reported Number Index displayed in the [Install Xdcr] menu. Check to ensure that you have a matched set of sensors. They both should have the same serial number but marked with either an "A" or "B" (e.g. 100A and 100B).

Note

Some sensors require a right-angle adapter. This adapter should be installed before placing the sensors in the tracks.

3. Prepare pipe for the track mounts by degreasing the surface, if needed, and removing any grit, corrosion, rust, loose paint or surface irregularities with the abrasive pipe conditioning material provided.
4. If this is a horizontal pipe, place the track rail assembly against the pipe. While holding track, place second track on pipe directly underneath (180°) and hold together in place.
5. Wrap the mounting strap around the pipe and through the strap guide.

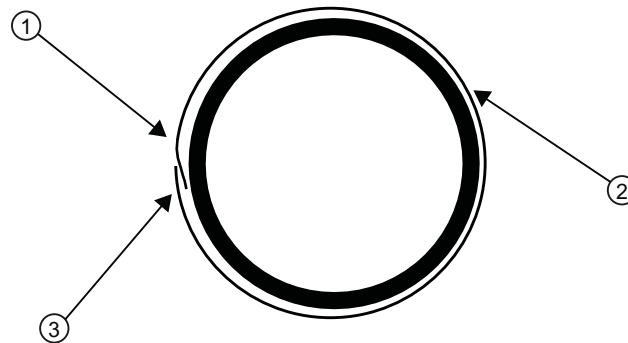
Note

For a vertical pipe installation, use a tie, tape or bungee cord to hold the two tracks in place while mounting.

6. Finger-tighten the chain Tension Screw to secure the strap and tracks to the pipe.

Positioning Track Assemblies

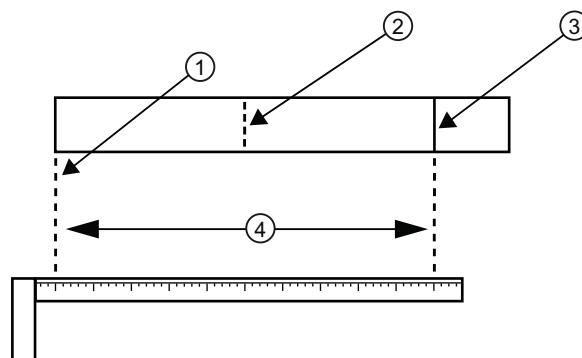
1. Wrap a length of the Mylar spacing guide around the pipe and against the end of the track assemblies. Ensure that the spacer guide edges on both sides align. Arrange so that one end overlaps the other by at least 8 cm (3 inches). Trim to fit if necessary, but in order to keep the end square, be sure not to trim at the overlapping end.



- ① Trim material from inner edge if necessary
- ② Mylar Spacing Guide
- ③ 8 cm (3-inches) Overlapping Edge

Figure 5-20 Wrapping the Mylar Spacing Guide around the pipe (End View)

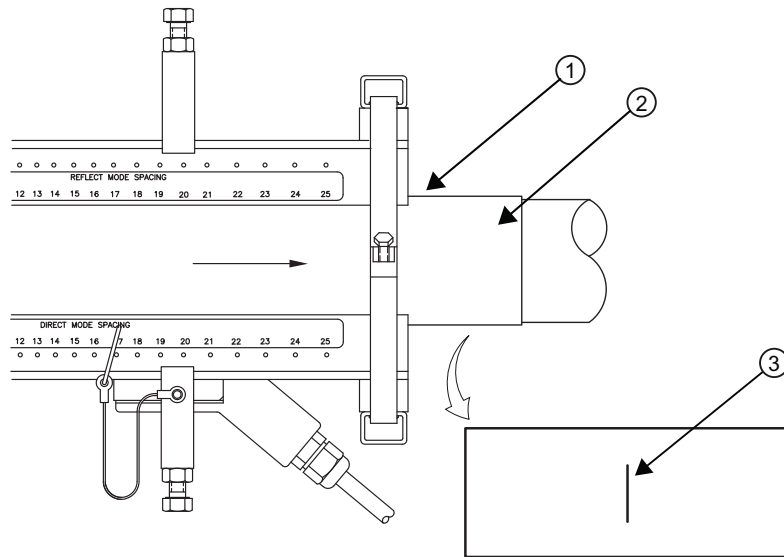
2. Remove the spacer guide. Measure or fold spacer guide to find its halfway distance. Mark a center line and then tape spacer guide to pipe.



- ① Overlap Edge
- ② Mark (or fold) exactly at half-way point
- ③ Mark on Spacing Guide
- ④ Circumference

Figure 5-21 Finding the Halfway Distance

3. Use the edge of the Spacer Guide as a stop for both tracks to keep them parallel. Adjust tracks as necessary.



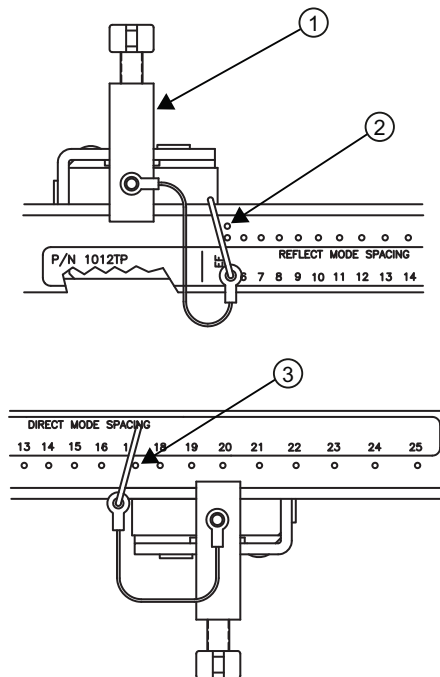
- ① Align tracks with Spacer Guide edge
- ② Mylar Spacer Guide
- ③ Halfway distance of Spacer Guide

Figure 5-22 Track Rail Alignment

4. Loosen the mounting straps enough to allow you to rotate the track assembly until the center of one track aligns with the center line on the Spacer Guide and the center of the other track aligns at the point where the Spacer Guide ends meet. The tracks should now be 180° apart. Tighten both chains but not too tight.

Sensor Installation

1. Insert an index pin into the REF hole of the track marked "Reflect Mode Spacing."
2. Take one of the sensors and insert it between the track rails and to the left of the index pin with the cable connector pointing away from the pin. Move the sensor until the pin stops it. Hold sensor in place. Move sensor clamping screw over the sensor and tighten.



- ① Sensor Clamping Screw
- ② REF hole
- ③ Number Index hole

Figure 5-23 REF and Number Index Pin Locations

3. Insert the other index pin into the correct Number Index hole on the other track marked "Direct Mode Spacing."
4. Insert the second sensor into the track rail with its cable connector pointing away from the pin. Move the sensor until it's stopped by the pin. Move sensor clamping screw over the sensor and tighten.
5. Using a pencil or chalk, mark a generous area around where the sensors contact the pipe.
6. Release the tension on the sensors and remove them.
7. Loosen the mounting straps and rotate the track assembly on the pipe so you can gain access to the areas marked.
8. Prepare the areas you marked by degreasing the surface, if needed, and removing any grit, corrosion, rust, loose paint or surface irregularities with the abrasive pipe conditioning material provided.
9. Rotate the track assemblies into their original position on the pipe. Use the edge of the Mylar guide as a stop for both tracks and keep them parallel. Align each track with the "center line" you previously marked on the Spacing Guide. Tighten tracks securely.

5.5 Sensor Installation

10. This time, before installing each sensor, apply a 3mm (1/8-inch) continuous bead of couplant compound along the center (the long way) of the contact surface of the sensor. Also, keep the sensors lifted slightly from the pipe when installing until the sensor is against the pin; then push down against the pipe.

Note

Remember to install the sensors with the cable connectors facing away from each other.

11. Once the sensors are in place, secure with its clamping screws. Do not over tighten.
12. Observing the upstream and downstream orientation, attach the UP and DN cables to the sensors and make snug. Attach the other ends to the UP and DN terminals of the flowmeter.
13. Proceed to Commissioning (Page 77).

5.5.5 Mounting Temperature Sensors

In order to accurately measure temperature differential in energy flow loops, Siemens Energy flowmeters are designed to work with a pair of matched temperature sensors. These are available in clamp-on style or in insert (Thermowell) style. Refer to the table below. Both styles incorporate 1000 ohm platinum RTD's for high precision.

Table 5- 5 Temperature Sensors

Description	Part Number
Standard clamp-on RTD	7ME39501TA00
Submersible clamp-on RTD (not for FUP1010 or FUE1010)	7ME39501TB00
Standard clamp-on RTD pair for FUE1010 energy system	7ME39501TA10
Insertion style RTD (size 1): 140mm (5.5 in)	7ME39501TJ00
Insertion style RTD (size 2): 216mm (8.5 in)	7ME39501TJ01
Insertion style RTD (size 3): 292mm (11.5 in)	7ME39501TJ02
Insertion style RTD (size 4): 368mm (14.5 in)	7ME39501TJ03
Insertion style RTD pair (size 1) for FUE1010, 140mm (5.5 in)	7ME39501TJ10
Insertion style RTD pair (size 2) for FUE1010, 216mm (8.5 in)	7ME39501TJ11
Insertion style RTD pair (size 3) for FUE1010, 292mm (11.5 in)	7ME39501TJ12
Insertion style RTD pair (size 4) for FUE1010, 368mm (14.5 in)	7ME39501TJ13

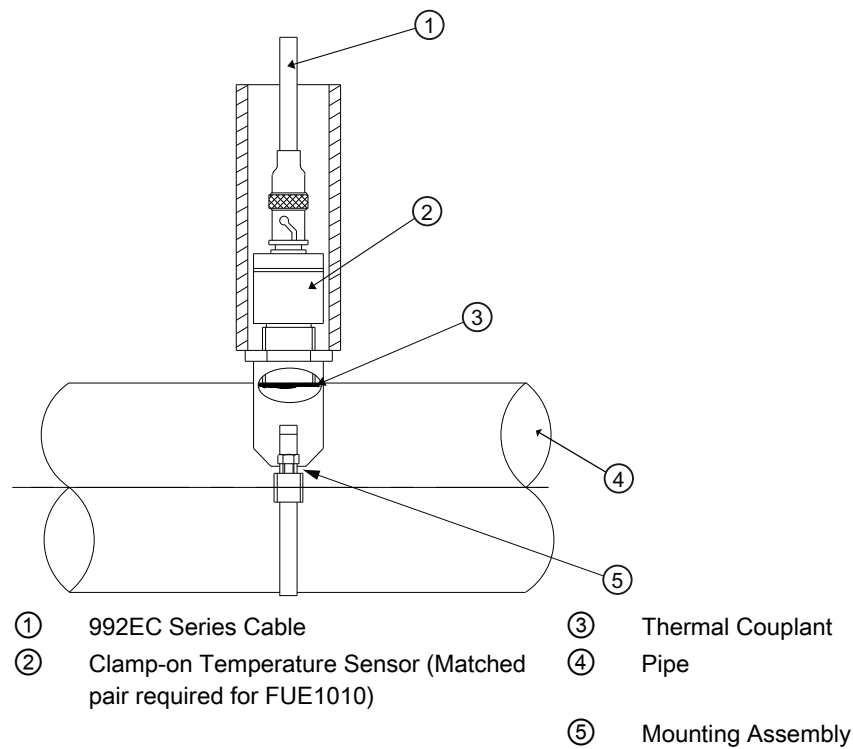


Figure 5-24 Clamp-on Temperature Sensor

Clamp-on style sensors are mounted on the surface of the monitored pipe using series mounting assemblies. Apply a generous quantity of the thermal couplant provided to the tip of the sensor and attach it securely to the cleaned pipe surface with the proper mounting assembly. Temperature measurement anomalies resulting from variations in the ambient conditions can be minimized by insulating the pipe and sensor after installation.

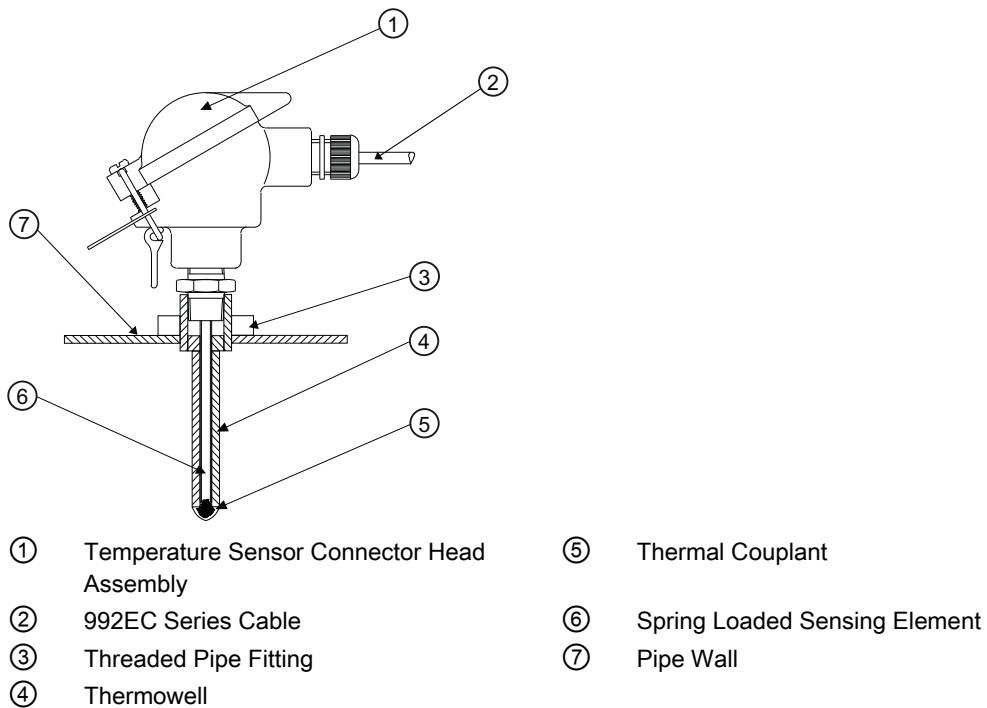


Figure 5-25 Insert Temperature Sensor

Insert sensors are designed to be used in pipes equipped with Thermowells. These are spring-loaded, 1/4" diameter sensors with 1/2" NPT integral connection heads, available in several lengths to accommodate a range of pipe sizes.

Proceed to Commissioning (Page 77).

5.6 Sensor Wiring

Connecting Sensors to the Transmitter

1. Open the flowmeter top cover. Using a flat blade screwdriver, remove the Cable Strain Relief bracket (see figure below).
2. Observing the upstream and downstream orientation, attach the UP (upstream) and DN (downstream) cables to the sensors and make snug. Attach the other ends to the UP and DN terminals of the flowmeter (see figure below).
3. Replace the Cable Strain Relief bracket. Close top cover.
4. Proceed to Commissioning (Page 77).

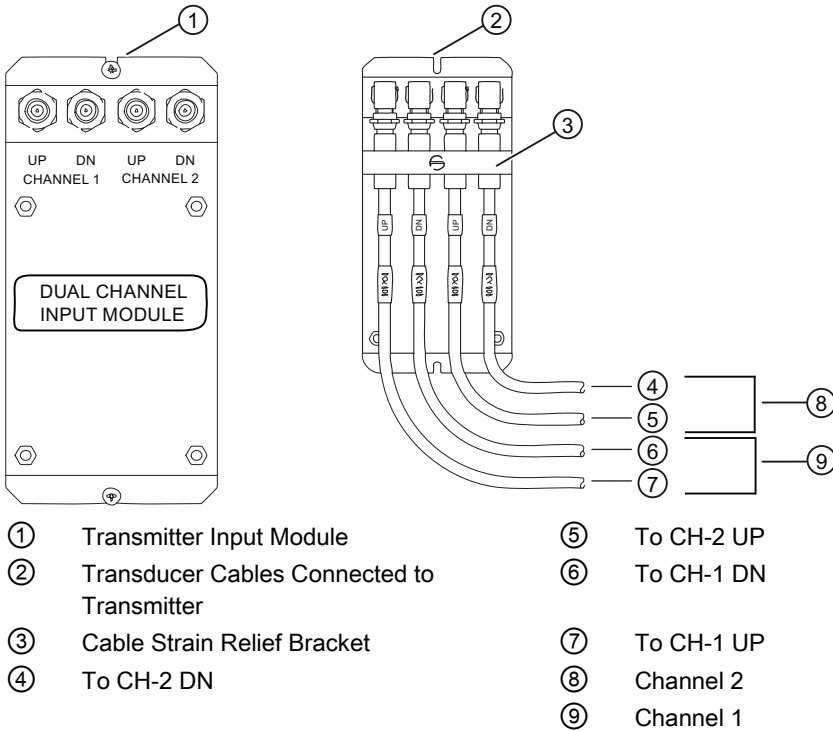


Figure 5-26 Sensor Cable Connections

Commissioning

6.1 General requirements

Before commissioning it must be checked that:

- The device has been installed and connected in accordance with the guidelines provided in chapter 4 "Installing/mounting (Page 33)" and chapter 5 "Connecting (Page 37)"
- Device installed in hazardous location meets the requirements described in "Installation in hazardous location (Page 12)"

6.2 Commissioning

Note

Refer to [Programming the Transmitter] (Page 46) if needed.

1. Scroll down to [Install Xdcr] and press <Right Arrow>.
2. Scroll down to [Install Complete]. Press the <Right Arrow> and select [Install]. Press <ENT>. Flowmeter will go through drives.

Siemens	Dual Path [1]	ABC
Key [Install] after mounting transducers		
Transducer Model	1011HP-T-1	
Transducer Size	D1H	
Xdcr Mount Mode	Reflect	
Spacing Offset	Normal	
Number Index	20	
Spacing Method	Spacer Bar 1012BN	
Ltn Value (in)	4.366	
Install Complete	Yes	
Zero Flow Adjust	Channel Not Setup	
Install Xdcr		

Figure 6-1 Final Setup

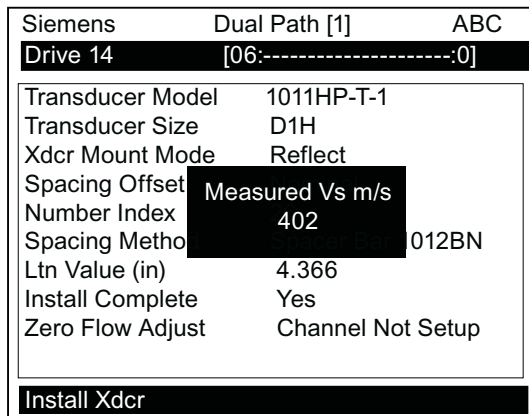
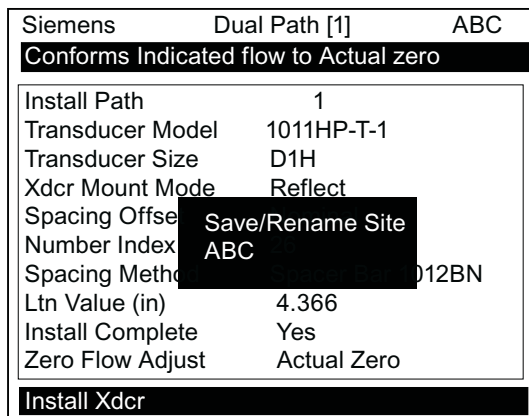
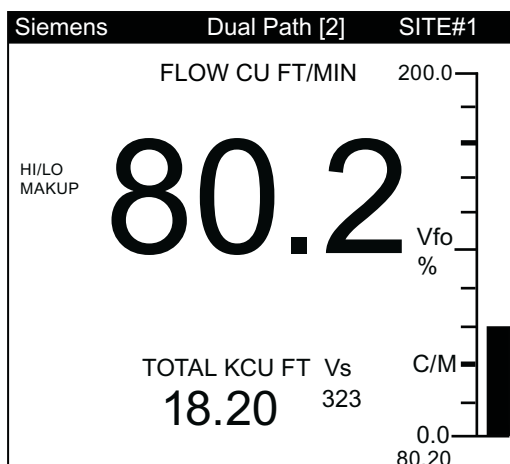


Figure 6-2 Measuring Flow

3. Observe the Measured Vs window and verify a correct sound velocity measurement (if known).
4. Press the <Down Arrow> to accept sound velocity value.
5. Press the <MENU> key.



6. Press the <Right Arrow> and then <ENT> to save the site data.
7. **The flowmeter is now ready to report flow.**



See also

Refer to the I/O Connections and Wiring (Page 167) diagrams for input/output wiring and Span Data manual section for data spanning procedures.

6.3 Installation Menus

FUG1010 Installation Menu Chart

Level A	Level B	Level C	Level D (see manual)	Level E	Level F
Meter Type	Dual Path Flow	Chan/Path Setup	Recall Site Setup	Enter From List	
			Channel Enable	Enter From List	
			Create/Name Site	Enter From List	
			Site Security	On/Off	
			Delete Site	Enter/Clear Site Name	
			Save/Rename Site	Enter From List	
		Pipe Data	Pick Pipe Class	Enter From List	
			Select Pipe Size	Enter From List	
			Pipe OD (in)	Numeric Entry	
			Pipe Material	Enter From List	
			Wall Thickness	Numeric Entry	
			Pipe ID (in)	Numeric Entry	
			CC129Thickness	Numeric Entry	
			Pipe Config	Enter From List	
			Anomaly Diams	Numeric Entry	
			ThermExpCoef 1/F	Numeric Entry	
			Mod of Elast PSI	Numeric Entry	
		Gas Parameters	Base Temperature F	Numeric Entry	
			Base Pres. PSIA	Numeric Entry	
			Spec. Heat Ratio	Numeric Entry	
			Viscosity <cP>	Numeric Entry.	
			Fixed MW g/mole	Numeric Entry	
			Estimated Vs F/S	Numeric Entry	
			Fixed Pres. PSIA	Numeric Entry	
			Z Base	Numeric Entry	
			Z Actual	Numeric Entry	
			AGA8 Comp.	No/Yes	
		Install Xdcr	Install Path	Enter From List	
			Transducer Model	Enter From List	
			Transducer Size	Enter From List	
			Xdcr Mount Mode	Enter From List	
			Spacing Offset	Enter From List	
			Number Index	View Only	
			Spacing Method	View Only	
			Ltn Value	View Only	

Level A	Level B	Level C	Level D (see manual)	Level E	Level F
			Install Complete	No / Install	Select Install
			Zero Flow Adjust	Enter From List	
		Operation Adjust	Damping Control	Time Average / SmartSlew	
			Deadband Control	Numeric Entry	
			Memory/Fault Set	Fault/Memory	
			Memory Delay (s)	N/A	
		Flow Total Units	Flow Vol. Units	Enter From List	
			Std Vol Corr	No/Yes	
			Flow Time Units	Enter From List	
			Flow Disp. Range	Enter From List	
			Flow Disp. Scale	Enter From List	
			Total Vol. Units	Enter From List	
			Std Vol Corr	No/Yes	
			Totalizer Scale	Enter From List	
			Total Resolution	Enter From List	
			Totalizer Mode	Enter From List	
			Batch/Sample Tot	Numeric Entry	
		Span/Set/Cal	Span Data	Enter From List	
			Set Alarm Levels	Enter From List	
			Calib. Flowrate	Intrinsic	
				Kc	
				MultiPoint	
			Calib. Table 1	Index Variable 1	Enter From List
				Calib. Table 1	New Point
				Table Active 1	No/Yes-
				Clear Table 1	No/Yes
			Calib. Table 2	Same as Table 1	
			Calib. Table 3	Same as Table 1	
			Display Setup	Select Data	Enter From List
				Data Display	Enter From List
				Time Base	Enter From List
				StripChart Clear	No/Yes
			Logger Setup	Logger Mode	Enter From List
				Logger Data	Enter From List
				Logger Interval	Enter From List
				Logger Events	Enter From List
				Display Logger	Enter From List
			I/O Data Control	Analog Out Setup	Enter From List
				Relay Setup	Relay 1,2,3,4
				Analog Inp Setup	Enter From List

Commissioning

6.3 Installation Menus

Level A	Level B	Level C	Level D (see manual)	Level E	Level F
			Diagnostic Data	Path Select	1,2, 1 & 2
				Path Enable	No/Yes
				Flow Data	Enter From List
				Application Info	Enter From List
				Gas Data	Enter From List
				Site Setup Data	Enter From List
				Test Facilities	Enter From List
				Print Site Setup	No/Yes
				Site Created:	View Only
Meter Facilities	Preferred Units	English			
		Metric			
	Table Setups	Pipe Table	Create/Edit Pipe	Enter From List	
			Delete Pipe	Enter From List	
		Transducer Type	Enter From List		
	Logger Control	Display Logger	Off/Line Wrap No Line Wrap		
		Output Logger	Yes/No		
		Circular Memory	Yes/No		
		Est LogTime Left	View Only		
		Clear Logger	Yes/No		
	Memory Control	Log Memory Left	Yes/No		
		Memory Map	Yes/No		
		Defragment	Yes/No		
	Analog Out Trim	Trim Io1	Operate / Trim @ 4mA		
		Trim Io2	Operate / Trim @ 4mA		
		Trim Vo1	Operate / Trim @ 2V		
		Trim Vo2	Operate / Trim @ 2V		
		Trim Pgen1	Operate / Trim @ 1Khz		
		Trim Pgen2	Operate / Trim @ 1Khz		
	RTD Calibrate	RTD1	Factory / User Cal		
		RTD2	Factory / User Cal		
	Clock Set	Date (MM.DD.YY)	Numeric Entry		
		Time (HH.MM)	Numeric Entry		
	RS-232 Setup	Baud Rate	Enter From List		

Level A	Level B	Level C	Level D (see manual)	Level E	Level F
		Parity	Enter From List		
		Data Bits	7/8		
		Line Feed	Yes/No		
		Network ID	Numeric Entry		
		RTS Key Time	Enter From List		
	Backlight	Enter From List			
	System Info	Version	View Only		
		Reset Data/Time	View Only	mm.dd.yy.hh.mm.ss	
		Op System P/N	View Only		
		Checksum	View only		
		Code	View Only		
		System Time	View Only	mm.dd.yy.hh.mm.ss	
Language	Enter From List				

Functions

7.1 Gas Parameters Menu

This menu becomes available after picking a flowmeter type and measurement path. We recommend that you edit the Gas Parameters immediately after creating a new Site Setup, however any item in the [Gas Parameters] menu can be altered at any time, even during normal flowmeter operation. The default settings are probably suitable for most applications, however if reliable data can be provided regarding the gas specific heat ratio, gas viscosity or gas compressibility factor, these settings should be modified.

The FUG1010 Gas flowmeter uses the Gas Parameters data to establish the specific gravity and the volume correction factors required for mass flow or standard volume computations.

- The base temperature and base pressure settings are customer provided and are used for standard volume correction.
- The specific heat ratio item is required for the computation of the average gas specific gravity.
- The Viscosity (cP) item is required for proper flow profile compensation.
- The fixed MW (molecular weight) allows you to force the flowmeter to use a specific molecular weight for well-defined gases.
- The fixed Pressure entry allows for a fixed value to be entered when no external pressure (analog input) is available.
- The flowmeter is also capable of providing an AGA8 volume compensation for fixed gas compositions. This is accomplished by creating an offline lookup table that contains the compressibility and density values for a defined range of pressure and temperature. Once completed, the table must be downloaded to the flowmeter. Refer to AGA8 table generation instructions in this section.

The list below shows the defaults and description for all the [Gas Parameters] menu items. Each item in the [Gas Parameters] menu can be edited by the user. Pressing the <Right Arrow> key on any of these menu items will enable numeric entry and allowing the user to override the default values.

Siemens	Dual Path [1]	ABC
Gas Parameters		
Base Temp. F	60.0	
Base Pres. PSIA	=14.700	
Spec. Heat Ratio	1.30	
Viscosity (cP)	0.0100	
Fixed MW g/mole	0.00	
Estimated Vs m/s	350	
Fixed Pres. PSIA	14.700	
Z Base	1.000	
Z Actual	1.000	
AGA8 Comp.	No	
Gas Parameters		

7.1 Gas Parameters Menu

Table 7- 1 Gas Flowmeters Menu Structure and Default Values

Gas Flowmeters	Base Temp	15.5°C (60°F)	Enter reference temperature in C or F.
	Base Pres. PSIA	14.7 PSIA (1.014 BARA)	Enter reference pressure in PSIA or BARA.
	Spec. Heat Ratio	1.3	Enter gas specific heat ratio (constant pressure to constant volume.)
	Viscosity (cP)	0.010 centipoise	Enter absolute gas viscosity in centipoise.
	Fixed MW g/mole	0.0 grams/mole	Enter fixed molecular weight to override automatic computation.
	Estimated Vs m/s	450 m/sec	Enter the nominal sound velocity of the gas if significantly different from this default.
	Fixed Pres. PSIA	14.7 PSIA (1.014 BARA)	Enter fixed operating pressure if external input is not available.
	Z Base	1.000	Enter the compressibility factor for the gas at base conditions.
	Z Actual	1.000	Enter fixed compressibility factor where pressure, temperature and gas composition do not vary significantly.
	AGA8 Comp	YES/NO	If a valid AGA8 table is installed then select [YES] to activate the AGA8 compensation (Std. Vol. Comp from the Flow/Total Units menu must also be selected).

Base Temp and Base Pres. PSIA

The base temperature and base pressure represents the conditions to which the reported volumetric flow rate and volumetric total will be compensated to (standard or normal conditions) as described in the equation below. The required units for data entry are determined by the [Preferred Units] menu cell (English or Metric) selected in the [Meter Facilities] menu. If metric units are selected then the units for temperature and pressure will be degrees Celsius and BARA (absolute) respectively. For English units, temperature and pressure will be in degrees Fahrenheit and PSIA.

$$Q_{base} = Q_{act} \times \frac{P_{act}}{P_{base}} \times \frac{T_{base}}{T_{act}} \times \frac{Z_{base}}{Z_{act}}$$

where:

Q = Volumetric flow rate

P = Pressure (absolute)

T = Temperature (absolute)

Z = Compressibility

base = Base conditions (pressure and temperature)

act = Actual flowing condition (pressure and temperature)

Spec. Heat Ratio

The specific heat ratio refers to the ratio of the gas specific heat at constant pressure to specific heat at constant volume. This ratio (along with the measured gas temperature and sonic velocity) allows the flowmeter to compute (dynamically) the average specific gravity of the gas. The default value of 1.3 is suitable for most gases, but should be modified if this value is known for your specific application.

Viscosity (cP)

The absolute gas viscosity (along with the measured gas density and raw flow velocity) is used by the flowmeter to compute the instantaneous Reynolds number. The Reynolds number is then used to derive the correction factor the required flow profile compensation.

The expected unit for viscosity is "centipoise." The default value of 0.01 is suitable for most gases, but should be modified if this value is known for your specific application.

The Reynolds number is computed as indicated:

$$R_n = 645 \times \frac{\rho \times id \times V_f}{cP}$$

where: ρ = density at flowing conditions (g/cc)

id = spool inside dia (in)

Vf = Flow velocity (ips)

cP = absolute gas viscosity (centipoise)

Fixed MW g/mole

The flowmeter uses the measured gas temperature, sonic velocity and specific heat ratio to compute the average specific gravity of the gas being measured. This feature is useful for identification of the gas as well as for proper reporting of mass flow in cases where the gas composition varies.

In cases where the gas composition does not vary significantly, a fixed value for molecular weight can be entered here. A non-zero value for Fixed MW (grams/mole) will override the automatic computation of specific gravity. Setting Fixed MW back to 0.0 will cause the automatic specific gravity computation to resume.

Estimated Vs

The [Estimated Vs] menu cell allows the numerical entry for the nominal sound velocity of natural gas. Contact your local representative for gases other than natural gas.

Note

Changing the Estimated Vs will require repeating the Transducer Install procedure.

Fixed Temp and Fixed Pres. PSIA

The flowmeter can accept temperature and pressure input from an external direct sensing instrument. If you do not have external temperature or pressure available, then the flowmeter will automatically use the fixed value(s) as the assumed gas temperature and/or pressure. Please note that for proper reporting of volume corrected flow, mass flow or specific gravity, the flowmeter must have reliable temperature and pressure input. However, if the operating temperature and pressure is very constant, then fixed values may be used where higher accuracy is not required.

Note

For flowmeters with on-board RTD temperature capability, the [Fixed Temp] flowmeter will not be present. In this case, a fixed value for temperature can be set by spanning the analog input 4mA setting to the desired temperature value. Providing the analog input channel is not connected to any current source, the valued returned will be the 4 mA temperature value.

The required units for data entry are determined by the [Preferred Units] menu cell (English or Metric) selected in the [Meter Facilities] menu. If [Metric] units are selected then the units for temperature and pressure will be degrees Celsius and BARA (absolute), respectively. For English units, temperature and pressure will be in degrees Fahrenheit and PSIA.

Z Base

The [Z Base] menu cell allows entry for the compressibility factor, at base conditions, for a given gas composition. If using the internal AGA8 compensation, Z Base should be set appropriately for the gas composition.

Z Actual

The [Z Actual] menu cell allows for a fixed entry of the compressibility factor in cases where pressure, temperature and gas composition do not vary significantly. If standard volume compensation is desired then enter the average compressibility factor for the specific gas application.

AGA8

All FUG1010 gas flowmeters include a facility for performing internal volume compensation using an AGA8 lookup table. This volume correction method is suitable and accurate for applications where the gas composition does not vary significantly or where the gas is infrequently sampled (not automatically sampled).

Note

In cases where automatic sampling is performed, a gas flow computer must be used in conjunction with the FUG1010 flowmeter to provide the most accurate volume compensated flow output.

The internal AGA8 lookup table provides the flowmeter with the actual gas density (Kg/m^3) and compressibility factor (Z Actual) for the indicated pressure and temperature (as obtained via the analog input or fixed P/T entry). These values are then used to compute either mass flow rate or standard volume corrected flow rate as indicated in the Flow/Total Units menu.

The table must first be generated externally using a software package which computes the appropriate density and compressibility factors for the specified gas composition.

Note

Siemens recommends using Si-Ware to generate this lookup table.

After the lookup table is generated and appropriately formatted, it can then be downloaded to the flowmeter via the serial data port. At any time during operation a new table may be downloaded to the flowmeter, should a change in gas composition require the calculation of new Z-factors and Density values.

The AGA8 lookup table is essentially a 10 x 10 array or grid containing both Z-factor and Density, with a 10 point temperature and 10 point pressure index. Based on the current temperature and pressure measurement, Z-factor and Density are interpolated to provide accurate volume correction. The table should be configured to cover the full range of operating temperature and pressure; however, if the measured pressure or temperature falls outside the table limits the flowmeter lookup algorithm will extrapolate the Z-factor and Density values accordingly.

If a gas composition was provided to Siemens with the purchase order, then the flowmeter may already be configured for the specified gas composition and would be indicated in the documentation provided with each flowmeter. If a new table or an updated table is required, follow the AGA8 table generation and installation instructions below.

Note

Table values are installed into the flowmeter using a facility providing direct access to many system variables without error handling, therefore, care should be exercised during the formatting of this table prior to downloading to the flowmeter.

When generating an AGA8 lookup table follow these guidelines (refer to Example #1 table below).

- The table values for pressure must be arranged in ascending order and consist of exactly 10 points. The units of entry must be PSIA.
- The table values for temperature must be arranged in ascending order and consist of exactly 10 points. The units of entry must be degrees Kelvin.
- The table values for Density and Z-factor must be entered for each combination of entered temperature and pressure (100 points for each). The units of entry for density must be Kg/m^3 .

AGA8 Table Generation and Installation Instructions

1. Start by first creating the gas composition file within the Si-Ware software application.
2. Next customize the output units by selecting PSI absolute and degrees Kelvin.
3. Now determine the application range for pressure and temperature with sufficient margin to insure that the measured temperature and pressure always falls within the table limits.
4. Compute the temperature increment for 10 points: $T_{incr} = (T_{max} - T_{min}) / 9$, then round off T_{incr} to the next higher integer. Now recomputed $T_{max} = T_{min} + 9 * T_{incr}$.
5. Repeat Step 4 to compute the pressure increment "Pincr," "Pmin" and "Pmax."
6. From the Si-Ware menu select [Perform Range Calculation] and [Varying T & P], then enter the temperature and pressure range and increments from Steps 4 and 5. Verify that there are exactly 10 "temp. points" and 10 "pres. points" indicated.
7. Select [Density] and [Z-factor] from the output data menu, then click on [Compute].
8. From the Si-Ware toolbar select [Table] then [Copy All]. These tables can now be pasted into EXCEL (see Example #1 table below). Select "General" formatting to remove any commas from the data.
9. The final text file must follow the syntax indicated in the example shown on the next page. To accomplish this the data needs to be manipulated within EXCEL and then saved as a comma separated file, then further modification will be necessary (using a text editor) to obtain the final text file format shown in the Example #2 table below.

Note

The data strings must conform to the syntax rules listed in the Syntax Rules table below.

10. Save the final AGA8 text file in an appropriate directory on your PC.
11. Now that the file is properly formatted, it can be downloaded to the flowmeter using HyperTerminal or other communication software. With the RS-232 baud rate set to 9600 or lower, confirm that the flowmeter is properly communicating with the terminal program.

Note

If the flowmeter is actively measuring flow the path must be disabled by either using the flowmeter keypad or HyperTerminal. In HyperTerminal type: MENU. Select the Chan/Path menu and then [Channel Enable]. Select the [No] option.

12. Select the desired default path for download of the AGA8 table. In HyperTerminal type "cv 2" for Dual Path systems. Press <ENT>.
13. Select [Send Text File] from the HyperTerminal menu and proceed to transfer the AGA8 compensation file created and saved in Step 10.
14. Once the table is installed, set the [AGA8 Comp] menu to [Yes] to enable AGA8 compensation. Note that the [Std. Vol Comp] menu must also be set to [Yes] if standard volume flow output is desired.

Table 7- 2 Syntax Rules

<p>Syntax for entry of the pressure and temperature index array is: cv pres_grid[i] pressure_i where i = 0 to 9 cv temp_grid[j] temp_j where j = 0 to 9</p>
<p>Syntax for entry of the density and Z factor values is: cv dens_grid[k] density_k where: k = 0 to 9 cv z_grid[k] zfactor_k where: k = 0 to 9</p>

Note

To simplify the creation of the AGA8 table file, the data can be arranged with comma separators indicating the next item in the array. In this way the "cv" command does not have to be issued for each data point.

For example, the string below loads all temperature points for the entire temperature array from point 0 to point 9 or (0 to 87 deg C).

cv temp_[0] 273.0, 283.0, 293.0, 303.0, 313.0, 323.0, 333.0, 343.0, 353.0, 363.0

Table 7- 3 Example #1 - Density (kg-m/m³) vs. Pressure and Temperature

	100	250	400	550	700	850	1000	1150	1300	1450
273	5.4641	13.7105	22.4055	31.5813	41.2659	51.4778	62.2197	73.4705	85.1762	97.2428
283	5.2928	13.2438	21.5764	30.3107	39.462	49.0368	59.0296	69.4174	80.1557	91.1746
293	5.1324	12.8109	20.8158	29.1586	37.8464	46.8787	56.2454	65.9241	75.8769	86.0497
303	4.9819	12.4082	20.1146	28.107	36.3869	44.9499	53.7836	62.8666	72.1668	81.6406
313	4.8402	12.0322	19.4653	27.1416	35.059	43.2106	51.5835	60.1575	68.9049	77.7902
323	4.7067	11.6801	18.8618	26.251	33.8433	41.6306	49.5998	57.7324	66.0045	74.3861
333	4.5806	11.3497	18.299	25.4258	32.7244	40.186	47.7979	55.5432	63.4009	71.3457
343	4.4612	11.0388	17.7724	24.6582	31.6897	38.8579	46.1506	53.5524	61.045	68.6067
353	4.3481	10.7456	17.2785	23.9418	30.729	37.631	44.6363	51.731	58.8988	66.121
363	4.2408	10.4688	16.8138	23.2712	29.8337	36.4927	43.2375	50.0554	56.9319	63.8507

Functions

7.1 Gas Parameters Menu

Table 7- 4 Z-factor vs. Pressure and Temperature

	100	250	400	550	700	850	1000	1150	1300	1450
273	0.9825	0.9571	0.9318	0.9099	0.8817	0.8575	0.8341	0.8119	0.7913	0.7729
283	0.9842	0.9615	0.9389	0.9166	0.8947	0.8735	0.8531	0.8338	0.816	0.7999
293	0.9858	0.9654	0.9452	0.9254	0.9061	0.8874	0.8696	0.8528	0.8372	0.8232
303	0.9872	0.9689	0.9508	0.9332	0.9161	0.8996	0.8839	0.8692	0.8556	0.8434
313	0.9884	0.972	0.9558	0.9401	0.9249	0.9104	0.8966	0.8837	0.8718	0.861
323	0.9896	0.9747	0.9603	0.9463	0.9328	0.9199	0.9077	0.8964	0.886	0.8766
333	0.9906	0.9772	0.9643	0.9518	0.9398	0.9284	0.9176	0.9077	0.8986	0.8904
343	0.9915	0.9795	0.9679	0.9567	0.946	0.936	0.9265	0.9177	0.9098	0.9026
353	0.9923	0.9815	0.9711	0.9612	0.9517	0.9428	0.9344	0.9268	0.9198	0.9136
363	0.9931	0.9834	0.9741	0.9652	0.9568	0.9489	0.9416	0.9348	0.9288	0.9234

Table 7- 5 Example #2

```

cv temp_grid[0] 273,283,293,303,313,323,333,343,353,363
cv pres_grid[0] 100,250,400,550,700,850,1000,1150,1300,1450
cv dens_grid[0] 5.4641,13.7105,22.4055,31.5813,41.2659,51.4778,62.2197,73.4705,85.1762,97.2428
cv dens_grid[10] 5.2928,13.2438,21.5764,30.3107,39.462,49.0368,59.0296,69.4174,80.1557,91.1746
cv dens_grid[20] 5.1324,12.8109,20.8158,29.1586,37.8464,46.8787,56.2454,65.9241,75.8769,86.0497
cv dens_grid[30] 4.9819,12.4082,20.1146,28.107,36.3869,44.9499,53.7836,62.8666,72.1668,81.6406
cv dens_grid[40] 4.8402,12.0322,19.4653,27.1416,35.059,43.2106,51.5835,60.1575,68.9049,77.7902
cv dens_grid[50] 4.7067,11.6801,18.8618,26.251,33.8433,41.6306,49.5998,57.7324,66.0045,74.3861
cv dens_grid[60] 4.5806,11.3497,18.299,25.4258,32.7244,40.186,47.7979,55.5432,63.4009,71.3457
cv dens_grid[70] 4.4612,11.0388,17.7724,24.6582,31.6897,38.8579,46.1506,53.5524,61.045,68.6067
cv dens_grid[80] 4.3481,10.7456,17.2785,23.9418,30.729,37.631,44.6363,51.731,58.8988,66.121
cv dens_grid[90] 4.2408,10.4686,16.8138,23.2712,29.8337,36.4927,43.2375,50.0554,56.9319,63.8507
cv z_grid[0] 0.9825,0.9571,0.9318,0.9066,0.8817,0.8575,0.8341,0.8119,0.7913,0.7729
cv z_grid[10] 0.9842,0.9615,0.9389,0.9166,0.8947,0.8735,0.8531,0.8338,0.816,0.7999
cv z_grid[20] 0.9858,0.9654,0.9452,0.9254,0.9061,0.8874,0.8696,0.8528,0.8372,0.8232
cv z_grid[30] 0.9872,0.9689,0.9508,0.9332,0.9161,0.8996,0.8839,0.8692,0.8556,0.8434
cv z_grid[40] 0.9884,0.972,0.9558,0.9401,0.9249,0.9104,0.8966,0.8837,0.8718,0.861
cv z_grid[50] 0.9896,0.9747,0.9603,0.9463,0.9328,0.9199,0.9077,0.8964,0.886,0.8766
cv z_grid[60] 0.9906,0.9772,0.9643,0.9518,0.9398,0.9284,0.9176,0.9077,0.8986,0.8904
cv z_grid[70] 0.9915,0.9795,0.9679,0.9567,0.946,0.936,0.9265,0.9177,0.9098,0.9026
cv z_grid[80] 0.9923,0.9815,0.9711,0.9612,0.9517,0.9428,0.9344,0.9268,0.9198,0.9136
cv z_grid[90] 0.9931,0.9834,0.9741,0.9652,0.9568,0.9489,0.9416,0.9348,0.9288,0.9234
    
```

7.2 Gas Data Menu

This menu shows the current Reynolds number used by the flowmeter to implement flow profile compensation, as well as operating pressure and temperature and computed gas properties.

Siemens	Dual Path	ABC
Current Reynolds number		
TEMP 1		0.00 F
TEMP 2		0.00 F
Reynolds #		784
Specific Gravity		1.718 OFF
Base S.G.		
Temperature		102.20 Deg F
Pressure		26.30 PSIA
Volume Corr.		1.65
Viscosity cS		4.756 OFF
Gas Data		

- ① Actively displays pressure and temperature from either analog input, computation or fixed gas parameters menu.

Table 7- 6 Gas Data Menu Items

TEMP 1	Measured temperature from Channel 1 RTD.*
TEMP2	Measured temperature from Channel 2 RTD.
Reynolds Number	The flowmeter corrects the current flow rate in accordance with this Reynolds number. This number is determined from pipe ID, current flow rate and gas kinematic viscosity.
Specific Gravity	Actual specific gravity of gas computed as follows: molecular weight of gas divided by molecular weight of air.
Base S.G.	Specific Gravity measured at base temperature.
Temperature	Measured temperature (analog input or from RTD input).
Pressure	Measured pressure (Analog input or from Gas Parameters menu.)
Volume Corr.	Flow rate/total multiplier used to correct the measured volume to standard volume.
Viscosity	Kinematic viscosity of gas.

* If the analog input for temperature is enabled it will override the internal RTD temperature measurement and TEMP1 will reflect the analog input temperature instead. For Dual Path operation only TEMP1 is used for volume correction.

7.3 Selecting Flow Units

The [Flow/Total Units] menu is available after selecting a meter type and measurement channel. Use the [Flow/Total Units] menu to select volumetric flow units and an associated time base for the flow rate and total outputs. After making your selections, a view-only menu cell shows the resultant scaling. Another menu cell lets you adjust the output resolution by selecting a display range.

Selecting Flow Volume Units

The [Flow Vol. Units] option list allows you to select the rate units the flowmeter uses to report volumetric flow. The flowmeter uses the computed gas specific gravity to convert volumetric flow to mass flow. The default in English Units for gas is [Cubic Feet].

To select a Volumetric or Mass unit:

1. Press the <MENU> key and [Meter Type] will be highlighted.
2. Press the <Right Arrow> to [Dual Path Flow] and then press <ENT>.
3. The [Dual Path Flow] menu will appear with [Chan/Path Setup] menu item highlighted.
4. Scroll down to the [Flow/Total Units] menu and press the <Right Arrow> to select the [Flow Vol. Units] menu.

Siemens	Dual Path [1]	Path 1
Choose Rate and Totalizer Units		
Chan/Path Setup		
Pipe Data		
Application Data		
Install Xdcr		
Operation Adjust		
Flow/Total Units		
Span/Set/Cal		
Display Setup		
Logger Setup		
I/O Data Control		
Diagnostic Data		
Flow/Total Units		

5. Press the <Right Arrow> to select the option list and use the <Up/Down Arrows> to select the desired units.

Siemens	Dual Path [1]	Path 1
Flow Volume Units		
Flow Vol. Units	Cubic Feet	
Std Vol Corr	No	
Flow Time Units	HR	
Flow Disp. Range	Autorange	
Flow Disp. Scale	KCU FT/HR	
Total Vol. Units	Cubic Feet	
Totalizer Scale	KCU FT	
Total Resolution	00000x00	
Totalizer Mode	NETFLOW	
Batch/Sample Tot	0.000	
Flow/Total Units		

6. Press <ENT> to store selection.

Totalizer Modes

The Totalizer function operates in any of the modes listed below:

Table 7- 7 Totalizer Modes

Mode	Flow Direction	Notes
POSFLOW	positive flow	Accumulates flow in positive direction only
NEGFLOW	negative flow	Accumulates flow in reverse direction only
NETFLOW	positive or negative flow	Adds to positive total; subtracts from reverse total

Note

NETFLOW (default) is best for applications where there may be zero flow for long periods. It minimizes false Totalizer register increments due to data scatter. Press the <Down Arrow> to accept the default setting.

Selecting Totalizer modes

1. Press the <MENU> key and [Meter Type] will be highlighted.
2. Press the <Right Arrow> to [Dual Path Flow] and then press <ENT>.
3. The [Dual Path Flow] menu will appear with [Chan/Path Setup] menu item highlighted.
4. Scroll down to the [Totalizer Mode] menu and press the <Right Arrow> to select the Totalizer Mode option list.

Siemens	Dual Path [1]	Path 1
Choose positive, negative or net total		
Flow Vol. Units	Cubic Feet	
Std Vol Corr	No	
Flow Time Units	HR	
Flow Disp. Range	Autorange	
Flow Disp. Scale	KCU FT/HR	
Total Vol. Units	Cubic Feet	
Totalizer Scale	KCU FT	
Total Resolution	NEGFLOW	
Totalizer Mode	>NETFLOW	
Batch/Sample Tot	POSFLOW	
Flow/Total Units		

5. Press the <Up/Down Arrows> to select the desired mode.
6. Press <ENT> to store selection.

Totalizer Mode Controls

From the RS-232 serial port all of the Totalizer commands listed below can be executed using PC keyboard function keys via VT100 terminal key emulation.

Note

Si-Ware or HyperTerminal should be in the Data Display mode when invoking the function keys referenced in the table below. Use the key sequence <Ctrl L> to display the Data Display mode.

Communications Setup

Connect the flowmeter to your PC. Refer to Appendix A for communications setup procedures, if needed.

1. Access Si-Ware or, if using a PC, access HyperTerminal from the PC [Programs] menu, then select [HyperTerminal].
2. In [Connection Description] dialog box, enter a connection name (e.g. FUT1010). Click [OK].
3. In [Phone Number] dialog box, select [Direct to COM 1 (or COM 2)]. Click [OK] to select.
4. In [Properties] dialog box, enter RS-232 parameters. Click [OK].
5. At terminal screen, click [File]. Select [Properties].
6. Select [Settings] tab. At [Emulation] box, select [VT-100].
7. Select [ASCII Setup]. In [ASCII Sending] uncheck boxes. In [ASCII Receiving] check [Append line feeds to incoming line ends.]. Click [OK].
8. At the Terminal screen, press <ENTER> and the Data Display mode appears.
9. If not, to enter the Data Display mode type MENU and then press <Ctrl L>.

Table 7- 8 Totalizer Controls (the "n" in <Fn> = channel number)*

Key	PC #	Command	Description
F1 F2 F3 F4	1	CLRTOT (also clears overflow)	Resetting the Totalizer registers clears all total data accumulated during operation. Note: In Dual Path mode, the Totalizer operates only on the virtual system channel (Ch 3). Therefore in this case, the CLRTOT trigger would be <F3> <1>. Commands that can be invoked from Si-Ware or HyperTerminal: Terminal Command: CLRTOT 1.
F1 F2 F3 F4	2	NOTOT (Totalizer Freeze)	Invoking the NOTOT command disables the Totalizer. Totalization will not resume until you repeat the <Fn> <2> key sequence. When you activate NOTOT, an N precedes the TOTAL symbol (i.e. [NTOTAL]) on the LCD Screen. Commands that can be invoked from Si-Ware or HyperTerminal: Terminal Command: NOTOT 1 = Stop Totalizer Terminal Command: NOTOT 1 = Start Totalizer

F1 F2 F3 F4	3	LAPTOT (Totalizer snapshot)	The LAPTOT command freezes the Totalizer screen display. However, the flowmeter will continue to update its internal registers. The flowmeter will show the current total when you repeat the <F1>< 3> key sequence. When you activate LAPTOT, an L precedes the TOTAL symbol (i.e., [LTOTAL]) on the HyperTerminal screen.
F1 F2 F3 F4	4	CLEAR (Batch/Tot register)	Clears the Batch/Sample Totalizer register. The flowmeter maintains a separate Totalizer register for Batching or Sampling applications but cannot be accessed directly. It is used for relay control only. If you assign the system relay to this function, a momentary (200 mS) relay pulse occurs whenever the BATCHTOT register accumulates a specified liquid quantity. In the [Batch/Sample Tot] menu cell the required total flow volume is entered to activate the relay,. This numeric entry must reflect the selected flow total units. The [Totalizer Scale] menu cell shows the applicable flow total units. The sign of the Batch/Sample Total determines positive or negative accumulation.
F1 F2 F3 F4	5	CLEAR (Makeup Latch)	Clears the Makeup Latch. Refer to the Span Data menu [Set Alarm Levels] and then the [Makeup Latch] On / Off option.

*Use the <F1> key as the "Lead-in command" for 4-Path Totalizer operations.

7.4 Zero Flow Adjust Menu

Zero Flow Compensation Methods

Unlike turbine flowmeters ultrasonic transit-time flowmeters provide active flow measurement right down to zero flow, however, the measurement of the transit-time delta is dependent on the similarity or "match" of the electronics, cables and ultrasonic sensors. Consequently some flow offset (or zero offset) may be present in any installation. To eliminate this residual zero offset Siemens has developed several different methods to insure proper zero flow compensation. The following paragraphs describe each method and when they should be used.

AutoZero

When the 1011HP sensors are mounted in the Reflect Mode configuration the AutoZero routine is automatically invoked at the end of the Initial Makeup. Flow does not have to be stopped to perform AutoZero since only the pipe wall signal is used in determining the zero offset and not the liquid component. The AutoZero routine performs a one-time analysis of the pipe wall component of the ultrasound signal to quantify any residual mismatch in the hardware. Once the AutoZero routine is complete, the system memorizes this measured zero offset and subtracts this value from the flow reading.

Actual Zero

The Actual Zero function simply averages the indicated "zero flow" readings (over a user defined time period) then stores this average value in memory. Under normal operation the indicated flow reading is zero compensated by simply subtracting this memorized value from the uncompensated flow reading. Actual Zero is the most positive method for zeroing the system; however, flow must be stopped with the line blocked (if possible) before invoking this function. If stopping flow is not possible then an alternate zeroing method should be selected.

ReversaMatic

This routine involves swapping the Up and Down sensors on the pipe (while keeping the cables attached) such that the difference in the transit-time change represents the zero offset. The fixed zero offset value is stored in memory in the same manner as described in Actual Zero. This routine would generally be used whenever flow cannot be stopped and the sensors cannot be mounted in the Reflect Mode configuration. Flow must be stable during the entire process.

ZeroMatic

When ZeroMatic is invoked the flowmeter first performs the same analysis as described above in the AutoZero routine. However, after this analysis is complete the flowmeter continues to interrogate the pipe wall signal and update the zero offset value under normal operation, such that the flowmeter dynamically compensates for changing conditions which would normally result in zero drift. ZeroMatic will only operate with the sensors mounted in the Reflect Mode configuration and is recommended for applications which experience large temperature extremes.

Note

Invoking ZeroMatic will clear any existing "fixed" or memorized zero offset. If any zero offset remains after flow is stopped, an Actual Zero can be performed without interrupting ZeroMatic operation. To disable ZeroMatic, invoke it again, but then press <Left Arrow> to abort the installation.

Note

The ZeroClr command only resets the memorized zero offset registers not those set when the AutoZero routine is invoked.

Using Actual Zero

Note

Flow must be stopped with the line blocked (if possible) before invoking this function.

To invoke Actual Zero:

1. Access the [Zero Flow Adjust] option list by pressing <Right Arrow>.
2. Press <ENT>. A pop-up window prompts you to set the current flow rate (in selected rate units) to equal zero (0.000).

Note

If a flow offset is desired (i.e., to test analog outputs) then press <Right Arrow> to enable numeric entry.

3. Press <ENT> to start the Actual Zero process.

When you send the command, the flowmeter analyzes the current flow rate for up to sixty seconds, integrating (averaging) the data for the best zero correlation. During this time, the menu prompt at the top of the display screen shows a timer that counts from zero to sixty. You can allow zero averaging for the entire period, or cancel the process at any time by pressing the <ENT> key. This controls the amount of data the flowmeter averages to obtain a zero level.

Using ReversaMatic

If site conditions do not permit stopping the flow rate at the mounting location, and you do not know the current flow rate, then you can use the ReversaMatic routine to establish the zero flow level. You should perform the ReversaMatic procedure as quickly as possible to ensure that the flow rate remains constant throughout the procedure.

To invoke ReversaMatic:

1. To access the [Zero Flow Adjust] option list press <Right Arrow>.
2. Move the cursor to [ReversaMatic]. Press <ENT> to invoke the routine.
3. The flowmeter begins to measure the positive flow rate. "Positive" flow refers to flow moving from upstream sensor location to the downstream sensor location. Note top prompt line shows: **Reversamatic Action**
4. Upon completion, the flowmeter beeps and the display screen shows: **Reverse Xdcrs / Press <ENT>**
5. Now remove then remount the upstream and downstream sensors in their reversed positions. Mount the Up sensor (without removing its cable) in the Down sensor/cable location. Mount Down sensor with its cable in the Up sensor/cable location. When remounting the sensors, couple them to the pipe properly. Press <ENT> (after re-installing the sensor).
6. The flowmeter measures the negative flow rate briefly, then beeps and repeats the prompt: **Reverse Xdcrs / Press <ENT>**
7. Now remount the sensors for normal operation (in their original orientation). When remounting sensors, couple them to the pipe properly. Press <ENT> (after re-installing the sensors).

This completes the ReversaMatic procedure. The system's zero accuracy will be very close to that obtainable using the Actual Zero method, providing flow remained constant during this procedure.

 **CAUTION**

A caution on the use of upper and lower flow limits (used to prevent flow mis-registration) prior to using the Reversal Zero technique (ReversaMatic): If the negative flow rate that the flowmeter reads in the step during which the sensors are reversed is more negative than the lower flow limit, the meter will re-register positive and the Reversal Zero cycle will thus be corrupted.

Therefore, postpone the installation of upper and lower flow limits until the reversal zero procedure is executed successfully. For pipes that combine large diameters with very high flow velocities, it may be necessary to move the upper and lower flow limits out of the way until the reversal zero is completed. Moreover, pipes of this size frequently have excellent intrinsic zero performance and may not even need zeroing.

ZeroMatic (optional function)

Note

ZeroMatic is used in the Reflect Mode only. Invoking ZeroMatic clears any existing fixed zero offset.

Use this menu cell to select the ZeroMatic option. If conditions permit the use of the Auto Zero function then the ZeroMatic option can be used as well.

To select and enable the ZeroMatic option:

1. In the Install Xdcr menu, press <Up Arrow> to scroll to the [Zero Flow Adjust] menu cell.
2. To access the [Zero Flow Adjust] option list press <Right Arrow>.

Note

If ZeroMatic is not running, the [Actual Zero] menu item will be displayed next to the [Zero Flow Adjust] menu cell.

3. Select the [ZeroMatic] menu cell by pressing <Up/Down Arrow> then press <ENT>.

When the Initial Makeup of ZeroMatic is complete the screen will return to the Pick/Install Xdcr menu and automatically highlight [Operation Adjust], which is the next menu cell.

To disable the ZeroMatic function:

1. Select the [Install Xdcr] menu cell from the Dual Path Flow menu.
2. Scroll down to the [Zero Flow Adjust] menu cell by pressing <Up/Down Arrow>.

Note

The highlighted [ZeroMatic] menu item is the only indication that ZeroMatic is functioning.

3. Invoke the ZeroMatic initial makeup procedure as previously described above.
4. While ZeroMatic initial makeup is running, press <Left Arrow> to abort the process thereby disabling the function.
5. The screen will return to the Dual Path Flow menu and highlight the [Operation Adjust] menu cell.

7.5 Span Data

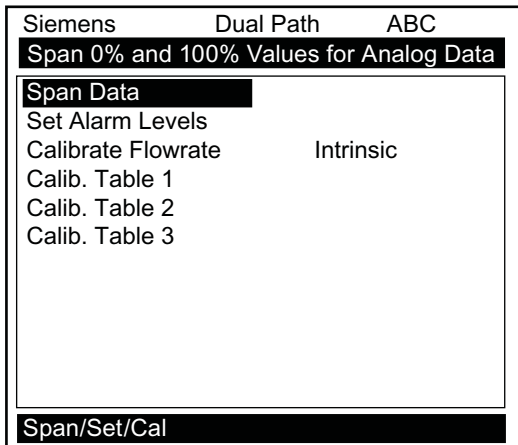
The Span Data menu allows you to set 0% and 100% output limits for volumetric flow (Vfo), absolute flow (Vfab), sonic velocity (Vs) and specific gravity (Vsg). Each menu cell shows appropriate rate units and time base. If you change flow rate units after spanning the system, the computer automatically updates the output data setup to reflect the change. Span limits apply to both the analog outputs and the on-screen strip chart. The flow outputs operate as follows:

<p>Vfo <i>Spanned Volumetric or Mass Flow:</i></p>	<p>The minimum and maximum flow rate entries establish the Vfo span. The Max Flow menu cell sets 100% of span. The Min Flow menu cell sets 0% of span. Use signed numbers for bi-directional spanning. Note that negative (reverse) flow is always lower than positive flow, whatever its absolute magnitude. For example, for a flow measurement range of -30 CF/M to +10 CF/M, the 4 mA span will be -30 CF/M, and the 20 mA span will be +10 CF/M.</p>
<p>Vfab <i>Spanned Absolute Volumetric Flow Rate:</i></p>	<p>Vfab is the absolute magnitude of the volumetric flow rate (Vfo). There are no menu cells provided to span this output. Vfab shares the Vfo span entries. The Vfab minimum span is always zero. The maximum span for Vfab is the largest absolute value of either the min or the max flow rate (Vfo) entries. For example, a span between +10 CF/M and -30 CF/M, spans the Vfab output from 0 CF/M to 30 CF/M.</p>
<p>Vs Spanned Gas Sonic Velocity:</p>	<p>Vs is the sonic velocity in meters-per-second (m/s) of the flowing gas. The min and max Vs entries establish the Vs span. Max Vs (F/S) defines 100% of span. The Min Vs (F/S) defines 0% of span.</p>
<p>Vsg Spanned Gas Specific Gravity:</p>	<p>Vsg is the inferred operating specific gravity of the gas. The min and max Vsg entries establish the Vsg span. Max Vsg defines 100% of span and Min Vsg defines 0% span.</p>

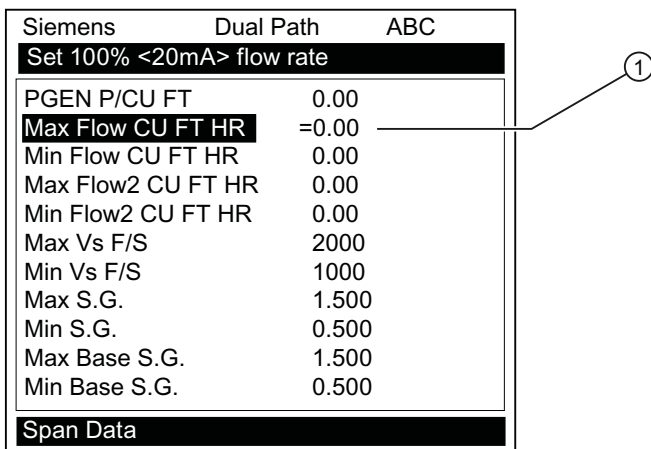
Maximum span values represent:	Minimum span values represent:
100% of span	0% of span
Current output of 20 mA	Current output of 4 mA
Voltage output of 10 Vdc	Voltage output of 0 Vdc
Pulse output of 5000 Hz	Pulse output of 0 Hz

To change the default Span Data settings:

1. At [Meter Type], press <Right Arrow> to [Dual Path Flow] and press <ENT>.
2. At [Chan/Path Setup] press <Right Arrow> to <Clamp-on> and press <ENT>.
3. At [Clamp-on] menu scroll down to [Span/Set/Cal] and press <Right Arrow>.
4. Highlight [Span Data] and press the <Right Arrow>.



5. Highlight [Max Flow] and press <Right Arrow> to. Input 100% flow rate numeric data for 20 mA. Press <ENT> to store data.
6. Scroll down to [Min Flow]. Press <Right Arrow> to input 0% flow rate numeric data for 4 mA. Press <ENT> to store data.



① Input numeric flow data here

PGEN Function

The [PGEN P/Unit Volume] menu cell entry controls a digital output pulse function and is available in all units with 7ME362 and 7ME363 part numbers. It allows the assigning of PGEN digital signal pulses per unit of volume. For example, 1000 output pulses per unit of gas.

Note

The unit of volume is determined by the Volume Units initially selected from the [Total Volume Units] menu cell option list.

Table 7- 9 Input/Output Wiring (TB2) - 7ME39400AL03 Expanded I/O Module

Pin#	Signal	Definition	Description	Function Dual/Quad Path Only
12	PG4	POS [+] Total TTL	0-5000 Hz frequency output , assignable	POS [+] Total TTL
11	PG3	POS [+] Total OC		POS [+] Total OC
10	PG2	NEG [-] Total TTL		NEG [-] Total TTL
9	PG1	NEG [-] Total OC		NEG [-] Total OC
Use reference ground for returns (TB2-2 and TB2-4)				

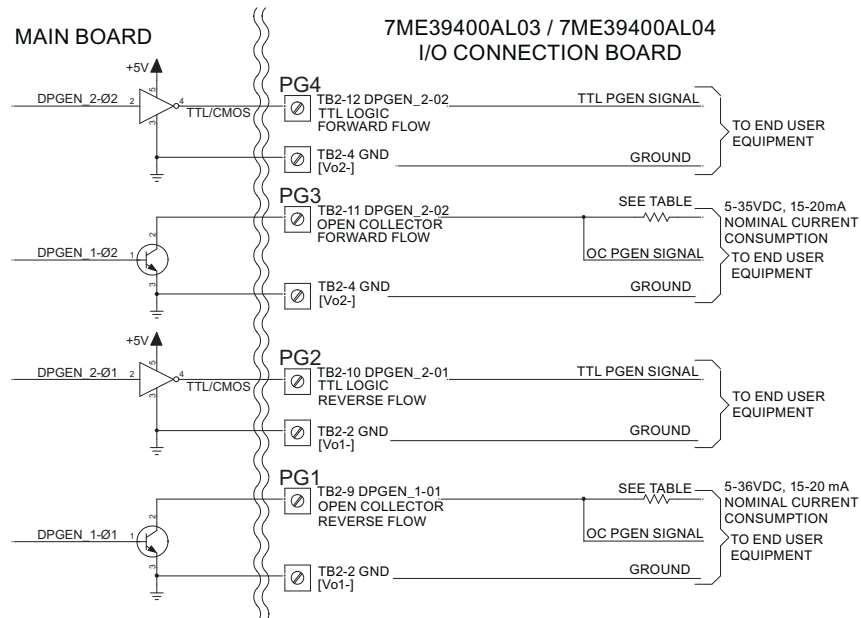


Figure 7-1 7ME39400AL03 Main Board I/O Wiring

Note

TB2-9 and TB2-11 are Open Collector Outputs that require external pull-up resistors for operation. See table for External Supply Voltage and suggested resistor value and ratings. Maximum current into the transistor is 100mA. Maximum Voltage is +36 Vdc.


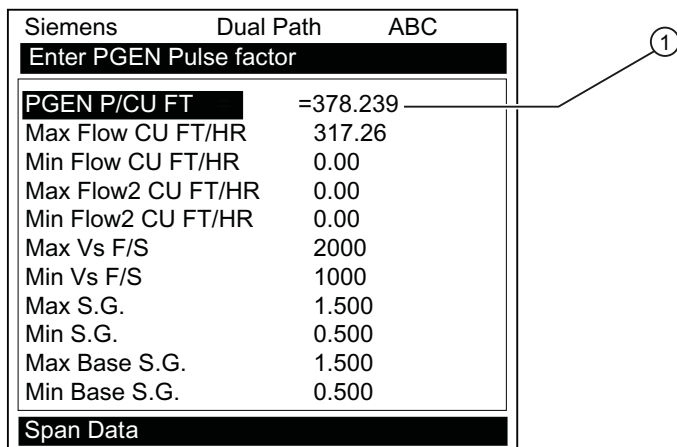
 CAUTION
Negative voltages with respect to ground will permanently damage transistors.

Table 7- 10 Open Collector User Resistor Recommendations

User Supply Voltage (Vdc)	External Resistor (Ohms)	Expected Current Draw (mA)	Recommended Resistor Wattage (Watts)
5	270	18.5	1/2
9	510	17.6	1/2
12	680	17.6	1/2
18	1000	18	3/4
24	1500	16	1
28	1800	15.5	1 1/4
36	2400	15	1 1/4

To change the default PGEN settings:

1. From the [Span Data] menu press <Right Arrow>.
2. Highlight the [PGEN P/Unit Volume] menu cell and press <Right Arrow> to activate the numeric entry.



Siemens Dual Path ABC

Enter PGEN Pulse factor

PGEN P/CU FT =378.239

Max Flow CU FT/HR 317.26

Min Flow CU FT/HR 0.00

Max Flow2 CU FT/HR 0.00

Min Flow2 CU FT/HR 0.00

Max Vs F/S 2000

Min Vs F/S 1000

Max S.G. 1.500

Min S.G. 0.500

Max Base S.G. 1.500

Min Base S.G. 0.500

Span Data

① Input PGEN pulse factor here

3. Use the numeric keys to enter the desired number of PGEN pulses per unit volume.

Note

Ensure that the number entered will provide sufficient resolution while remaining within the 20 Hz to 5000 Hz pulse frequency range. Note that the PGEN output will stop sending pulses at flow rates corresponding to frequencies less than 20 Hz. In this case the PGEN value must then be increased.

4. To store data press <ENT>.

Adjusting the PGEN Output

The default setting for the Digital PGEN output provides a 5000 Hz frequency at an assumed maximum velocity of 100 ft/sec. In certain cases it may be necessary to change this default PGEN value. For example:

- If the PGEN signal cable is very long, then the added cable capacitance may prevent reliable RTU pulse detection at or near 5000 Hz. In this case it may be necessary to decrease the PGEN (Pulses / Unit Volume) setting using the equation below.

$$\text{Pulses / Unit Volume} = \text{MaxFreq} / \text{MaxFlow}$$

Where:

MaxFreq = Maximum desired frequency (Hz)

MaxFlow = Maximum flow rate (Unit Volume / second)

For very low operating flow rates, the pulse frequency may approach the 20 Hz limit of the PGEN output. In this case it may be necessary to increase the PGEN (Pulses / Unit Volume) setting.

$$\text{Pulses / Unit Volume} = \text{MinFreq} / \text{MinFlow}$$

Where:

MinFreq = Minimum desired frequency (Hz). Must be greater than 20 Hz!

MinFlow = Minimum operating flow rate (Unit Volume / second)

Note

If STD VOL is selected then the "unit volume" for PGEN will represent Standard Volume, not actual volume.

Forcing the PGEN Output Frequency

To test the operation of the flowmeter with a Remote Transmitting Unit (RTU), or other pulse counting device, it may be necessary to force the PGEN output frequency, especially when the pipeline is not flowing during flowmeter commissioning. This can be accomplished by setting the AnCal diagnostic value to a flow rate corresponding to the desired frequency output. (Refer to the appropriate paragraph in your manual for operation of the AnCal function.)

7.6 Analog Output Setup

The example below demonstrates how to calculate the AnCal flow rate based on the desired pulse output frequency and the entered PGEN (Pulses / Unit volume) setting:

For PGEN setting = 53 Pulses /CU FT and a desired frequency = 1000 Hz

1. Temporarily change flow rate units to CU FT / SEC (Use same volume units as Totalizer.)
2. Set AnCal = $1000 / 53 = 18.868$ CU FT / SEC
3. 1000 Hz frequency should now be observed on the PGEN output.

7.6 Analog Output Setup

The flowmeter provides current, voltage and pulse-rate analog outputs. The [Analog Out Setup] menu allows you to assign data functions for these signals. The transmitter terminal strip contains the analog output terminals.

Table 7- 11 Analog Outputs

Io (Isolated Current)	4 to 20 mA varies in proportion to an assigned data function.
Vo (DC Voltage)	0 to 10 Vdc varies in proportion to an assigned data function.
Pgen (TTL Logic)	0 to 5000 Hz varies in proportion to an assigned data function.
Digital Pgen	User selective pulses per unit flow.

Table 7- 12 Analog Out Setup Data Categories

Vfo	System spanned volumetric/mass flow rate
Vfo2	Additional spanned volumetric/mass flow rate
Vfab	System spanned and signed absolute flow
Vs	Spanned gas sonic velocity
Valc	Received signal amplitude
Vtrb	Relative degree of gas turbulence
Vsg	Spanned specific gravity
Base S.G.	Spanned S.G. referenced to user temperature
Viscosity	Gas viscosity in centistoke units
lin1, lin2, lin3, lin4	Represents a re-transmit of the analog input signals (e.g. Pressure and Temp inputs can be transmitted on the 4-20mA output).

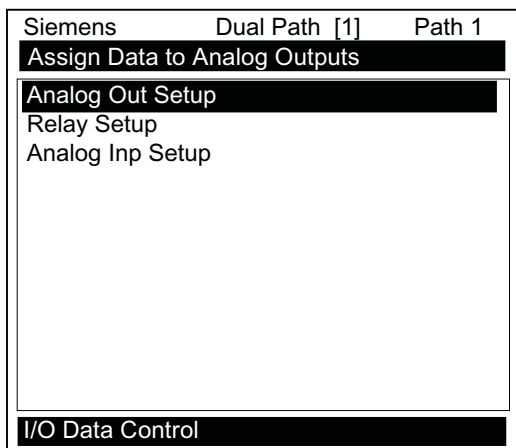
Note

For Multi-Path flowmeters: "1" = Path 1, "2" = Path 2, "3" = Path 3, "4" = Path 4 and "S" represents the system or average channel. These characters appear to the left of the option list parameter.

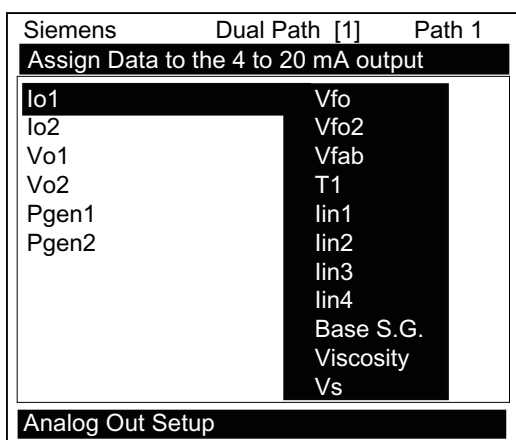
Io Output Functions

Assigning a function to the current output:

1. From the [Chan/Path Setup] menu scroll to [I/O Data Control].
2. Press <Right Arrow> to highlight the [Analog Out Setup] menu.



3. Press <Right Arrow> twice to access the [Io] option list.
4. Move the cursor to the desired data function by pressing <Up/Down Arrow>.



5. To store selection press <ENT>.

Vo Output Functions

The Vo analog output is a 0-10 VDC signal that varies linearly in relation to a selected function.

Assigning a function to the voltage output:

1. From the [Analog Out Setup] menu, press <Right Arrow> to access the [Vo1] option list.
2. Move the cursor to the desired data function by pressing <Up/Down Arrow>.
3. To store selection press <ENT>.

Note

Refer to drawing 1010N-7-7 in Appendix A for Analog output connections.

7.7 Analog Input Setup

The optional Analog Input Setup function assigns an active analog input to a measurement channel/path. The flowmeter provides four DC current input ports for single channel and Dual Path units. The DC current input ranges from a zero level of 4 mA to a full scale of 20 mA. The [Analog Inp Setup] menu cell allows you to enable this port and then span it to any desired scaling.

For example, when using the analog input for pressure the numeric variables might be spanned as follows: 4mA=14.7 PSIA and 20mA=1014.7 PSIA.

Note

The flowmeter expects "absolute" pressure. If the external device reports "gauge pressure" then make sure to span the pressure input so that 4mA represents 1 ATM (14.7 PSIA or 1.014 BARA) and not 0.0.

The various flowmeter models allow you to associate the analog input to active system variables such as specific gravity, viscosity and others (see table below).

Note

Refer to the Installation Drawings or I/O Module markings for the locations of these inputs and wiring procedures.

Table 7- 13 I/O Data Control Menu

I/O Data Control	Analog Inp Setup	lin1	Input	Off Aux PSIA BARA T1 Deg F T1Deg C
			4 mA 20mA	Numeric entry Numeric entry
		lin2 / lin3 / lin4	See In1 option list	

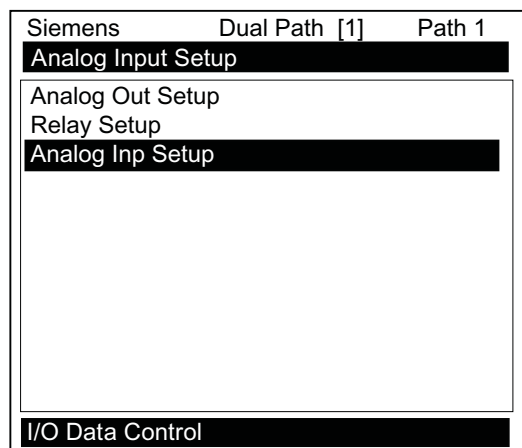
Note

The Aux input is only used as a feed through to the Datalogger.

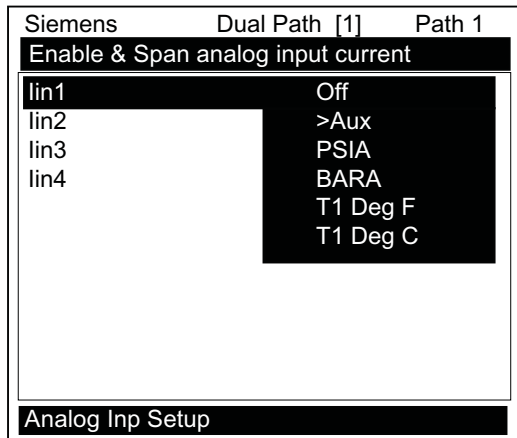
The flowmeter recognizes the first analog input variable that is assigned to any given parameter and ignores any subsequent input with the same assignment. For example, if lin1 and lin2 are both assigned to represent pressure (PSIA), the flowmeter will only use the pressure input from lin1.

Setting the Analog Current Input

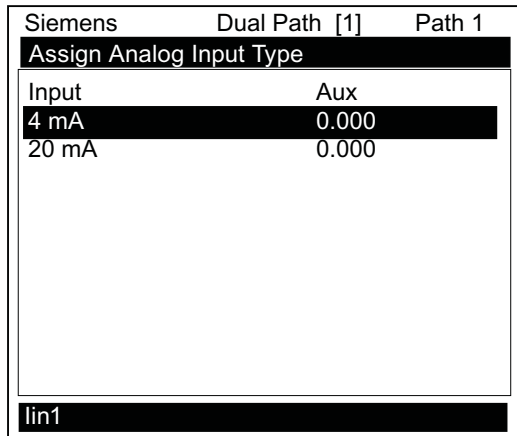
The DC current input port must be enabled first. From the [Analog Inp Setup] menu proceed as follows:



1. Access the [lin1] option list by pressing the <Right Arrow> twice.



2. Move the cursor down to [Aux] by pressing the <Down Arrow> and then press <ENT>. This enables the port to receive an input current. The cursor moves to [4 mA].



3. To enable numeric entry, press the <Right Arrow>. Type a numeric value corresponding to a 4 mA input signal.
4. To store the data press <ENT>. This moves the cursor to [20 mA].
5. To enable numeric entry, press the <Right Arrow>. Type the numeric value corresponding to a 20 mA input signal.
6. To store the data, press <ENT>.

7.8 Analog Output Trim

Introduction

Analog Out Trim function allows you to fine-tune the flowmeter’s analog voltage and current outputs using an ammeter connected to the output under test. In addition, you can use a frequency counter to fine-tune the flowmeter’s pulse rate output.

Note

The current, voltage, and Pgen trimming will be limited by the 12-bit resolution of the flowmeter’s D/A Converter (DAC).

1. From the [Meter Facilities] menu, scroll to the [Analog Out Trim] menu.
2. Press the <Right Arrow> to access the option list.

Siemens	Dual Path [1]	Path 1
Analog Output Trim		
Preferred Units	English	
Table Setups		
Logger Control		
Memory Control		
Analog Out Trim		
RTD Calibrate		
Clock Set	06.25.09	10.52.49
RS-232 Setup	9600 None 8 [0]	
Backlight	On	
System Info		
Meter Facilities		

Table 7- 14 Analog Out Trim Menu Structure

Analog Out Trim	Io1/Io2	Operate Trim@	4mA Indicated mA = x.xx
	Vo1/Vo2	Operate Trim@	2V Indicated V = x.xx
	Pgen1 and Pgen2	Operate Trim @ 1kHz	Indicated Hz = xxx

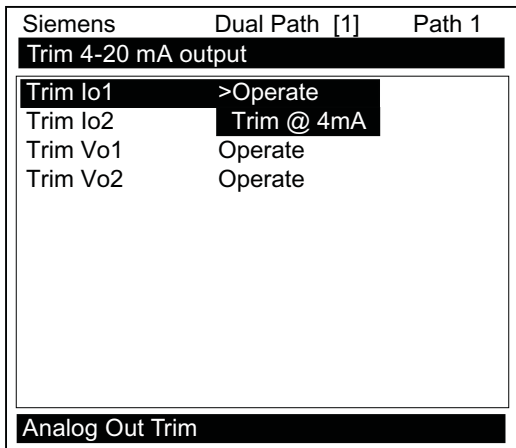
Current Output Trim (Io1 & Io2)

Note

Can be trimmed to within .005 mA of nominal.

To calculate a current output:

1. Set up an ammeter, then connect it to the supply and return terminals of the current output under test.
2. Move the highlight to the port to be tested by pressing the <Up/Down Arrow>. Press the <Right Arrow> and then press the <Down Arrow> to move the cursor to [Trim @ 4mA].



3. Press <ENT>. This triggers a 4.00 mA pop-up window. The ammeter should now be reading 4.00 mA.
4. If the ammeter reading does not match, use the numeric keys to type in the current reading.
5. Press <ENT> to register setting. This adjusts the flowmeter’s DAC (digital-to-analog converter) so that a 4mA output corresponds with 4mA on the ammeter.
6. Re-check the ammeter to make sure that it is now reading 4mA.

Voltage Output Trim (Vo1 & Vo2)

Note

Can be trimmed to within .0025 V of nominal.

To calculate a voltage output:

1. Set up a multimeter to read volts, then connect it to the supply and return terminals of the voltage output under test.
2. Move the highlight to the port to be tested by pressing the <Up/Down Arrow>. Then press the <Right Arrow> and then press <Down Arrow> to move the cursor to [Trim @ 2V].

Siemens	Dual Path [1]	Path 1
Trim 0-10 Volt output		
Trim Io1	Operate	
Trim Io2	Operate	
Trim Vo1	>Operate	
Trim Vo2	Trim @ 2V	
Analog Out Trim		

3. Press <ENT>. This triggers a 2.00 Volts pop-up window. The multimeter should now be reading 2.00 Volts.
4. If the multimeter reading does not match, use the numeric keys to type in the voltage reading.
5. Press <ENT> to register setting. This adjusts the flowmeter's DAC (digital-to-analog converter) so that a 2.00 Volts output corresponds with 2.00 Volts on the multimeter.
6. Re-check the multimeter to make sure that it is now reading 2.00 Volts.

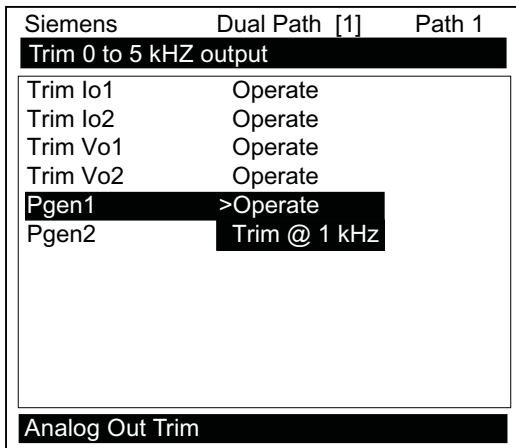
Pgen Output Trim (Pgen1 & Pgen2)

Note

Can be trimmed to within 1.25 Hz of nominal

To calibrate a pulse rate output (Pgen1 or Pgen2):

1. Connect a frequency counter to the supply and return terminals of the pulse rate output under test.
2. Move the highlight to the port to be tested, press the <Right Arrow> and then press the <Down Arrow> to move the cursor to [Trim @1 kHz].



3. Press [ENT]. This triggers a 1 kHz pop-up window. The frequency counter should now read 1 kHz.
4. If the frequency counter reading does not match, use the numeric keys to type in the frequency counter reading.
5. Press [ENT] to register setting. This adjusts the flowmeter's DAC (digital-to analog converter) so that a 1 kHz output corresponds with 1 kHz on the frequency counter.
6. Recheck the frequency counter to make sure that it is now reading 1 kHz.

7.9 Logger Control

Logger Control Menu

The Logger Control menu in the [Meter Facilities] menu provides the Logger controls for the flowmeter measurement channels and paths. It allows the user to select data items/alarm events, a logging interval and a destination for Logger reports. While the Logger Setup menu is measurement channel/path specific, this Logger Control menu provides global control functions. This means that the settings made here apply to all measurement channels/paths, meter types, operating modes, etc. This is possible because the flowmeter stores logged data in a single file.

The [Est LogTime Left] menu view-only menu cell shows an estimate of the hours and minutes of logging time remaining. For convenience sake, the Display Logger command is essentially a duplicate of the menu cell in Logger Setup. It sends Logger data to the graphic screen with or without line wrapping. The Output Logger command sends data to an external device via the RS-232 serial port. The Clear Logger command erases the entire Logger file.

1. From the Meter Facilities menu access the [Logger Control] menu by pressing the <Right Arrow>.
2. Scroll down to [Logger Control]. Press the <Right Arrow> to access the [Logger Control] menu option list.

Siemens	Dual Path [1]	Path 1
Datalogger Control		
Preferred Units	English	
Table Setups		
Logger Control		
Memory Control		
Analog Out Trim		
RTD Calibrate		
Clock Set	06.23.09	12.46.56
RS-232 Setup	38400 Odd [0]	
Backlight	On	
System Info		
Meter Facilities		

Table 7- 15 Logger Control Menu Option List

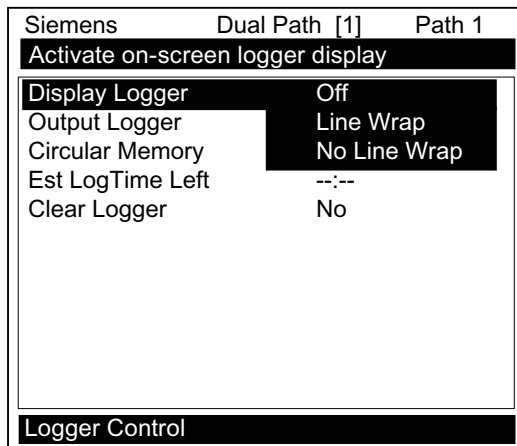
Logger Control	Display Logger	Off Line Wrap No Line Wrap
	Output Logger	No Yes
	Circular Memory (Available for Multi-Path units only)	No Yes
	Est LogTime Left	--:--
	Clear Logger	No Yes

Display Logger

This menu cell allows you to send the Logger contents to the display screen. This command is effective only after a successful install. You can set the report to scroll on the screen with or without line-wrap. Selecting line wrap, forces a line feed after approximately 40 characters. In addition, you have to enable datalogging and then select items in the Logger Setup menu. Note that this command transmits the data from both channels/paths.

To send Logger contents to the display screen:

1. Press <Right Arrow> to access the [Display Logger] option list.



2. Scroll cursor to either [Line Wrap] or [No Line Wrap] by pressing <Up/Down Arrow>.
3. To view Logger contents press <ENT>.
4. To return to [Logger Control] press <MENU>.

Output Logger

This menu cell allows you to send the Logger contents to an external device (usually a computer or printer) via the flowmeter's RS-232 Serial I/O port. This command is effective only after a successful install. In addition, you have to enable datalogging and select data items in the [Logger Setup] menu.

The flowmeter interfaces with most serial printers or personal computers for Logger printouts. You must use the proper cabling between the flowmeter and the external device. In addition, you must configure the RS-232 Setup correctly. You should turn off the Logger function before you transmit an extensive printout. This will avoid contaminating the printout with new Logger data. Logger reports are sequential ASCII text files.

To send Logger contents to the RS-232 Serial Port:

1. Check the flowmeter-to-external device connections and your RS-232 Setup parameters (see RS-232 Setup menu).
2. To access the [Output Logger] option list press <Right Arrow>.
3. Scroll the cursor to [Yes] by pressing <Up/Down Arrow>.

4. To transmit Logger contents to external device via the serial port press <ENT>.
5. To stop printout press <Left Arrow>.

Circular Memory

In its default mode, the Logger collects data until its memory becomes full. At that time the flowmeter suspends datalogging and cannot resume until the Logger memory is cleared (see Clear Logger command). Circular Memory allows the Logger to "write over" its oldest records when memory reaches full capacity. If you enable [Circular Memory], you are assured of always collecting the most recent data. But also remember that you will lose the oldest Logger reports and that further invoking of [Circular Memory] deletes the current contents of the Logger.

To setup and enable Circular Memory:

1. The Logger Mode menu must have the [Memory] menu cell selected.
2. Logger items must be selected (e.g., Site ID, Date, Time, etc.).
3. All active channels/paths in the Channel Setup menu must be disabled. To disable active channels, select the [Channel Enable] menu cell and then [No].
4. In the Logger Control menu, select [Circular Memory].
5. Press <Right Arrow> to access the [Circular Memory] option list.
6. Move the cursor to [Yes] by pressing <Up/Down Arrow>.
7. To store selection press <ENT>.
8. Lastly, re-enable the channels/paths that you disabled earlier to begin logging.

Est LogTime Left

Est LogTime Left is a "view-only" menu cell that shows an estimate of the amount of Logger time remaining in hours and minutes. This menu cell becomes active after you enable datalogging. Selecting [Circular Memory] and/or event-based datalogging (see Logger Setup), blanks the [Est LogTime Left] field and is based on the log interval and data selections made in the Logger Setup.

Clear Logger

If you use the Logger in its default mode, eventually you will use all the memory available for Logger storage. When this occurs, you will not be able to log more data until you free up the memory. The [Clear Logger] command erases ALL stored Logger data. Therefore, you should evaluate the currently stored data, and print any valuable information before using this command.

Note

Saved Sites also consume Logger RAM.

Clearing Logger Memory

1. To access the [Clear Logger] option list press <Right Arrow>.
2. Move the cursor to [Yes] by pressing <Up/Down Arrow>.
3. To clear the memory press <ENT>.

7.10 Operation Adjust Menu Settings

Introduction

The Operation Adjust menu becomes available after picking a meter type and measurement channel. It is recommended that you use it after the sensors are installed and operating to "fine-tune" the meter's output characteristics.

Each application presents different data display and output requirements due to unique pipe and gas conditions. Use the [Operation Adjust] menu to match flowmeter operation to the site. You can set damping controls for the primary flow rate output. You can define a Deadband, (usually a very low flow rate), below which the flow output will be forced to zero. You can also select the flowmeter response to a continuous Fault condition.

Damping Control

The flowmeter provides two different data output filter types, Time Average and SmartSlew. Time Average (recommended) integrates the instantaneous flow rate over a selectable time period. Use the Time Average function when stability in flow reading is essential. A value entered (in seconds) sets the time it takes the flowmeter to respond to a rate change. The default is 10 seconds. Enter any amount of time up to 60 seconds maximum.

SmartSlew performs data scatter damping during steady flow periods while maintaining the ability to respond to changing flow rates. SmartSlew values range from [1 to 9]. Pick a higher number to slow flowmeter response to a rate change.

Setting the Time Average (default):

1. From the [Dual Path Flow] menu scroll to the [Operation Adjust] menu and press <Right Arrow>.
2. At the [Damping Control] menu press the <Right Arrow> and move the cursor down to [Time Average].

3. To enable Time Average entry press <Right Arrow>.

Siemens	Dual Path [1]	Path 1
Select SmartSlew or TimeAvg Damp		
Damping Control		Time Average
Deadband Control		0.00
Memory/Fault Set		Memory
Memory Delay <s>		120
Operation Adjust		

4. Use the numeric keys to type the new Time Average setting.
5. To register the new value press <ENT>.

Setting SmartSlew :

1. From the [Dual Path Flow] menu scroll to the [Operation Adjust] menu and press <Right Arrow>.
2. At the [Damping Control] menu press the <Right Arrow> and move the cursor down to [SmartSlew].
3. To access SmartSlew option list press <Right Arrow>.
4. Scroll the numeric list to the desired choice by pressing <Up/Down Arrow>.
5. To register the new value press <ENT>.

Deadband Control

Use the Deadband Control to instruct the flowmeter to report zero flow if the flow rate falls below a specified level (usually a very low rate). It will prevent the possibility of data scatter (a natural result of digital computation) from causing false Totalizer accumulation during long non-flowing periods. Inspect the actual data scatter during zero flow conditions to find the proper Deadband setting for your application.

To edit Deadband default setting (0.000):

1. From the [Dual Path Flow] menu scroll to the [Operation Adjust] menu and press <Right Arrow>.
2. Scroll to the [Deadband Control] menu
3. Press <Right Arrow> to enable numeric entry.
4. Use the numeric keys to type in the desired rate (using selected flow rate units).
5. To register the new value press <ENT>.

Memory/Fault Set

Certain situations will interrupt data production (e.g., an empty pipe or excessive aeration). Use Memory/Fault Set to select the flowmeter response to such an interruption. The Fault setting (default) will zero the flow rate output and declare an alarm on a flow display screen, Datalogger report and an assigned relay output.

For some applications, occasional temporary Fault conditions may be a normal part of the process and would not require an alarm response. The flowmeter offers a Memory operating mode to support such an application. Memory Mode suspends the flowmeter Fault response by preventing the flow outputs from dropping to zero for the interval specified in the Memory Delay menu cell. During the Memory duration, the flowmeter will maintain the last valid flow reading measured before the onset of the fault condition. The default Memory Delay is 60 seconds. You may select any duration from 3 to 604,800 seconds (one week).

Selecting Memory Mode

1. From the [Dual Path Flow] menu scroll to the [Operation Adjust] menu and press <Right Arrow>.
2. Scroll to the [Memory/Fault Set] and press <Right Arrow> to access option list.
3. Move the cursor down to [Memory] by pressing <Up/Down Arrow>.
4. To make selection press <ENT>.
5. This moves the highlight to [Memory Delay <s>].

Memory Delay (s)

Selecting [Memory Delay <s>] activates the suppressed [Memory Delay] menu cell. It allows you to specify the number of seconds that the flowmeter maintains its last valid flow reading. When the memory delay expires, it triggers the fault alarm response described previously.

Setting Memory Delay

1. To enable numeric entry press <Right Arrow>.
2. Use the number keys to type the delay in seconds.
3. To register the new value press <ENT>.

7.11 Setting Relays

Relay Functions

Use the [Relay Setup] menu to assign a function to channel relays. The flowmeter supports two types of relay outputs, Alarm Relay and Pulse Relay. Alarm Relay outputs operate in "fail-safe" mode. The relay(s) are energized under normal conditions - an alarm condition causes the relay(s) to de-energize until the alarm clears. The Pulse Relay output supports Totalizer and batch relay functions, with an output pulse width of approximately 200 ms; maximum activation rate is 2.5 pulses per sec. If Totalizer pulses exceed this rate, excess pulses are stored in an overflow register. This allows the relay to "catch up" when flow decreases enough.

Note

Using the <F1> key (Totalizer clear command) also clears all channel Totalizers plus the overflow register described in the last paragraph.

Relay 1, 2, 3, and 4 Function Assignments

The flowmeter, depending upon the model, provides four alarm relays. Please refer to the Appendix A for wiring details. Relays respond to any of the alarm conditions or data functions included on the Relay Option List.

Table 7- 16 Relay Option List

Not Used	Not Active
Power Off	Power Off alarm occurs when power fails.
S S.G.	Specific Gravity value relay trip-point.
S Base S.G.	S.G. value relay trip-point at reference temperature.
S High Visc	Kinematic viscosity (centistokes) exceeds High Setpoint.
S Low Visc	Kinematic viscosity (centistokes) falls below Low Setpoint.
S High Temp.	High temperature value relay trip-point.
S Low Temp.	Low temperature value relay trip-point.
S High Flow	Flow rate exceeds high flow set point.
S Low Flow	Flow rate falls below low flow set point.
S Flow Alarm	Flow rate exceeds or falls below flow set points.
S Fault Alarm	Loses receive signal (all paths in fault).
S Spacing	Sensor spacing needs adjusting.
S Turbulence	Turbulence percentage exceeds alarm setpoint.
S Interface	Interface setpoint exceeded.
S Reverse Flow	Flow is in negative direction.
S BatchTot	Batch/Sample total advances.
S Pos Total	Positive total volume advances 1 digit.
S Neg Total	Negative total volume advances 1 digit.

7.11 Setting Relays

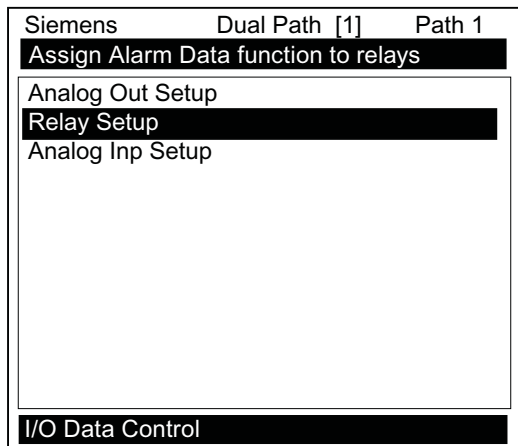
S Fltwarn	Fault warning occurs when 1 or more paths are in fault.
S Soft Fault	Fault condition - Memory mode active.
4 Fault Alarm	Loses receive signal (all paths in fault).
4 Spacing	Sensor spacing needs adjusting.
4 Turbulence	Turbulence percentage exceeds alarm setpoint.
3 Fault Alarm	Loses receive signal (all paths in fault).
3 Spacing	Sensor spacing needs adjusting.
3 Turbulence	Turbulence percentage exceeds alarm setpoint.
2 Fault Alarm	Loses receive signal (all paths in fault).
2 Spacing	Sensor spacing needs adjusting.
2 Turbulence	Turbulence percentage exceeds alarm setpoint.
1 Fault Alarm	Loses receive signal (all paths in fault).
1 Spacing	Sensor spacing needs adjusting.
1 Turbulence	Turbulence percentage exceeds alarm setpoint.

Note

For Multi-Path flowmeters: "1" = Path 1, "2" = Path 2, "3" = Path 3, "4" = Path 4 and "S" represents the system or average channel. These characters appear to the left of the option list parameter.

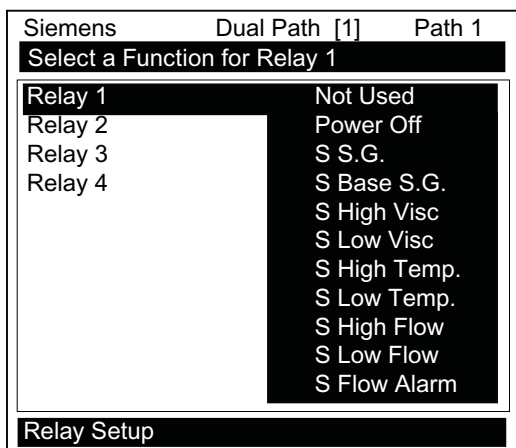
Assigning functions to Relay 1:

1. From the [Dual Path Flow] menu scroll down and highlight [I/O Data Control].
2. Press <Right Arrow> and scroll down to [Relay Setup].



3. To access the [Relay Setup] option list press <Right Arrow>.

4. Move the cursor to the desired Relay assignment by pressing <Up/Down Arrow>.



5. To store selection press <ENT>. Repeat procedure for all other relays.

7.12 Memory Control

Introduction

Memory Control is a reference menu that shows the amount of bytes of data memory left. The data memory capacity depends on the number and complexity of the site setups stored in memory and the size of the current Datalogger file.

The [Memory Control] menu is located in the [Meter Facilities] menu.

Table 7- 17 Memory Control Menu

Log Memory Left→	XXXXXXXX
Memory Map→	No Yes
Defragment→	No Yes

Log Memory Left

This view only menu cell shows the minimum remaining number of characters available for Datalogger and site storage. When the Datalogger is enabled for circular mode, the meter allocates all memory left except for two conventional empty sites required for Datalogger use.

To view the amount of data memory bytes available press <Right Arrow>.

Memory Map

Selecting YES for this item enables a snapshot display of current memory usage. In this display, the asterisk indicates a used block, a space indicates a free block, while a dash character indicates unused filler.

Defragment

Selecting YES for this item consolidates memory data blocks into contiguous storage; collapsing the filler regions. You may be able to use an additional block for site or Datalogger storage as a result. Use this command if you seem to be out of memory even though the [Log Memory Left] item indicates free capacity.

7.13 Resistive Temperature Device (RTD) Calibration

The [RTD Calibrate] menu appears on all SITRANS 1010 models. Use this menu to calibrate Temperature Sensors to an external standard. It is important to note that Siemens RTD temperature sensors are factory-calibrated for high accuracy. We recommend that before deciding to perform the calibration, check the current RTD reading in the [Diagnostics Data / Gas Data] menu. You may find that you do not need to calibrate the sensor. In any case, make sure that the temperature reading stabilizes before proceeding further. The [RTD Calibrate] menu allows you to perform an external calibration, which can be accomplished either by data entry of the current RTD temperature or by a 0°C (32°F) Ice-Bath procedure. You can switch between the intrinsic and external calibration modes at any time.

Note

If you perform an external temperature calibration, you should mark and record the location of each connector and sensor-cable. Once you have re-calibrated the temperature sensors, changing the sensor/connector orientation established during the procedure may void the calibration.

1. From the [Meter Facilities] menu scroll to the [RTD Calibrate] menu.
2. To access the [RTD Calibrate] menu press <Right Arrow>.

Siemens	Dual Path [1]	Path 1
Calibrate Temperature Sensors		
Preferred Units	English	
Table Setups		
Logger Control		
Memory Control		
Analog Out Trim		
RTD Calibrate		
Clock Set	06.25.09	10.52.49
RS-232 Setup	9600	None 8 [0]
Backlight	On	
System Info		
Meter Facilities		

Table 7- 18 RTD Calibrate Menu Structure

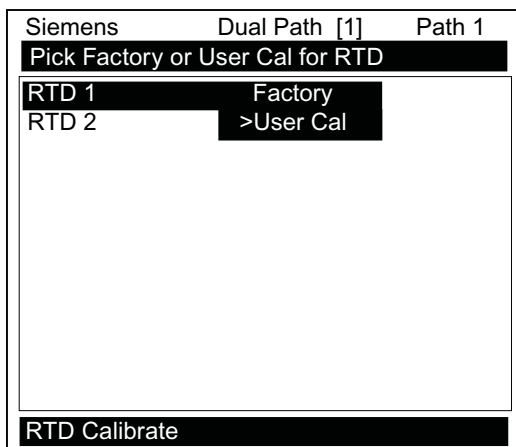
RTD Calibrate	RTD 1→	Factory User Cal
	RTD 2→	Factory User Cal

RTD Calibration by Entry Data

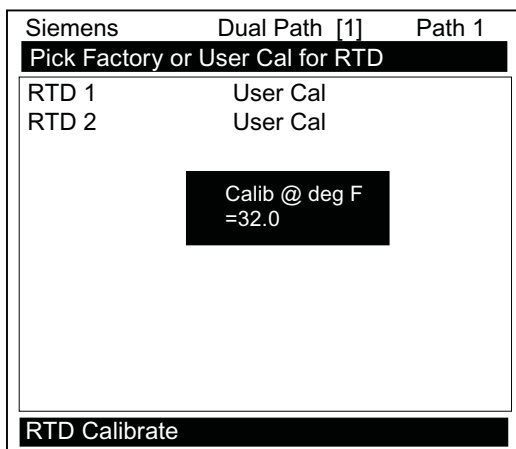
The [RTD Calibrate] menu allows you to adjust the intrinsic RTD reading to match an external reference thermometer by directly entering its reading. Only perform this procedure while the RTD under test is installed and currently measuring temperature.

To enter the current RTD temperature:

1. From the [RTD Calibrate] menu press <Right Arrow> to access the RTD option list.
2. Press <Right Arrow> to highlight the RTD you want to calibrate (RTD 1 or RTD 2).
3. Move the highlight to [Factory] or [User Cal] then press <ENT>.



4. This triggers the pop-up window:



7.13 Resistive Temperature Device (RTD) Calibration

5. To enable numeric entry <Right Arrow>, then type in the reading of the reference thermometer (e.g., 72.0).
6. To recalibrate the RTD sensor <ENT>. To verify the calibrated reading, go to the Dual Path Flow menu [Diagnostic Data/Gas Data] menu to check the current RTD output. Make sure that it coincides with the gas reading of the reference thermometer. Repeat for the other RTD, if necessary.

Note

Factory Calibration provides an additional prompt after a new temperature is entered: [Are you Sure? No Yes]. It is recommended that you use [User Cal] to avoid alteration of preset factory calibration.

Ice Bath RTD Calibration

Use distilled, deionized water and ice mixture at 0°C (32°F) equilibrium for an ice bath. Ensure temperature with a reference thermometer. Siemens can not assume responsibility for the incorrect design, construction or operation of an Ice Bath.

 **CAUTION**

Do not allow an RTD sensor to make direct contact with ice during an ice bath calibration procedure.

To perform a 0°C (32°F) calibration:

1. Immerse RTD sensor in deionized water and ice mixture. Stir the mixture constantly.
2. In the [RTD Calibrate] menu move the highlight by pressing the <Up/down Arrow> to the RTD you want to calibrate (RTD 1 or RTD 2).
3. To access the RTD option list press <Right Arrow>. Move the highlight to [User Cal] then press <ENT>. This triggers the pop-up window.
4. After the RTD sensor reaches equilibrium at 0°C (32°F), press <ENT> to recalibrate the RTD sensor.
5. To verify the calibrated reading, go to Dual Path Flow [Diagnostic Data/Gas Data] menu to check the current RTD output. Make sure that it coincides with the gas reading of the reference thermometer. Repeat for the other RTD, if necessary.

7.14 Reflexor

Reflexor is one of the operating modes available on certain SITRANS F 1010 models. The Reflexor operating mode utilizes Doppler flow detection along with digital signal processing techniques to successfully measure flow under conditions that may not be suitable for transit-time flow measurement. The Reflexor samples the flow stream as it detects Doppler shift. It converts the Doppler shift information by use of Fast Fourier Transform (FFT) and filters the FFT to determine the flow rate. The Reflexor mode will operate with many of the same sensors that are used with transit-time flow measurement along with those which are specifically designed for Doppler flow measurement. Use of any other sensor than shown in these instructions may result in failure to measure or give an incorrect flow rate indication.

Typical Installation

The typical steps to complete the Reflexor installation procedure are as follows:

1. Collect the site data (pipe and liquid data, part numbers, etc.).
2. Choose a mounting location for the flow sensors.
3. Prepare the pipe for sensor's mounting.
4. Access the Installation Menu and create a site.
5. Enter the pipe parameters.
6. Mount flow sensors on pipe and connect to flowmeter.
7. Invoke the sensor installation procedure.
8. Optimize installation through use of the Spectra Display and diagnostic data.

Almost all menu cells will contain default parameters and will not require any additional action. To obtain operation you will only need to access the menu cells for required parameters, such as pipe data. Obtaining accurate flow rate data will take less than five minutes.

Application conditions may require you to mount the sensors using the adjacent mounting method as described and shown in this section.

Selecting a Sensor Set

Maximum sensitivity will be obtained with use of the 191N1S sensor set.

Alternative sensors recommended for use by Reflexor include:

- 1011 Universal size C1, C2 and C3
- 1011 HP-T1 size B1H and A3H
- 1011 HP-T2 size B1H and A3H
- 1011 HP-T3 size B1H and A3H
- 991 Universal size 2 and 3A High and Very High Temperature versions
- 990 (991 Sensor)

The sensor models are also available for submersible and extended temperature applications.

Selecting Sensor Mounting Location

Select a sensor mounting location that has a fully developed flow profile. Do not locate the sensor so that sonic energy enters a region that is not representative of the flow velocities at the measuring location. Use the figure below as a guide to select the proper mounting location.

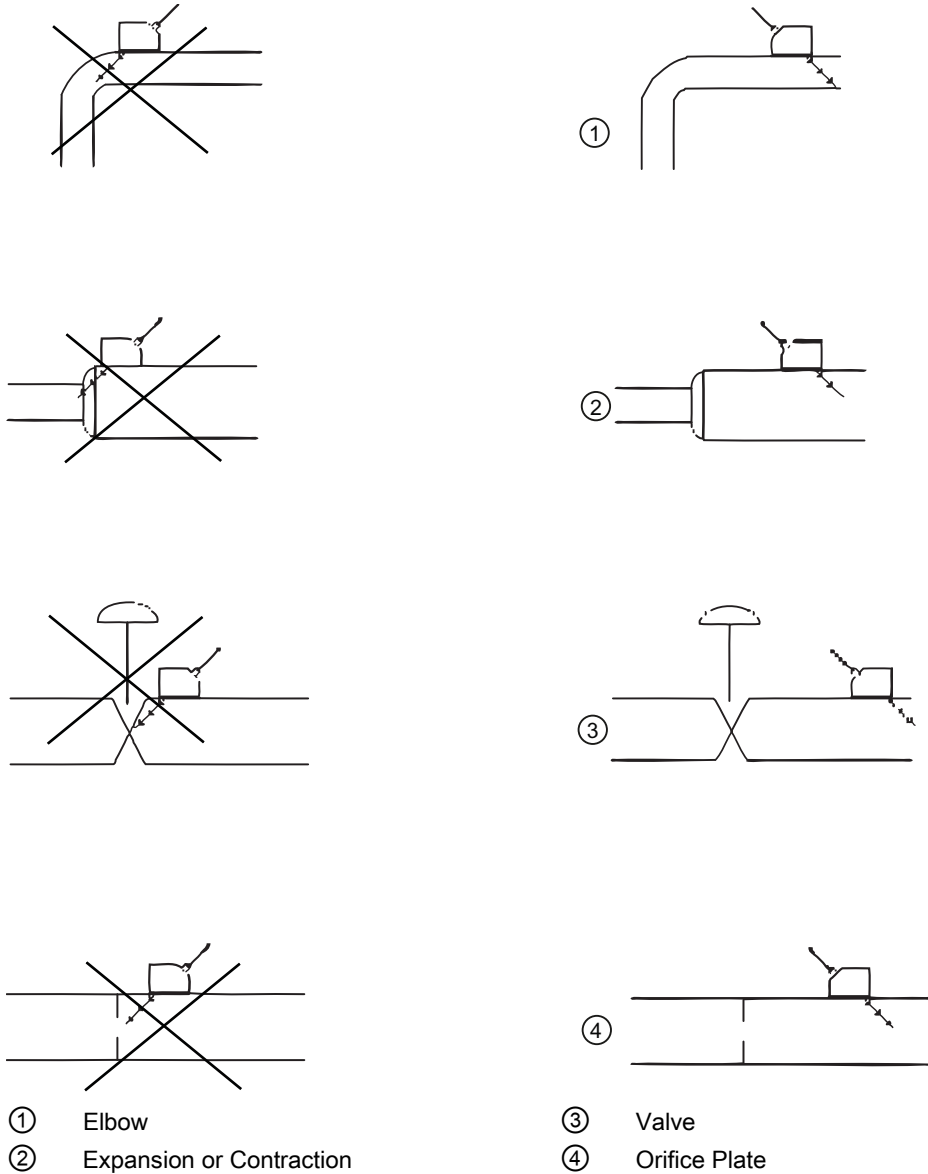


Figure 7-2 Sensor Mounting Examples

Mounting Sensors

Two mounting configurations are available in the Reflexor Mode:

- Adjacent mounting locates the two sensors alongside each other using a single mounting chain or strap.
- In-Line mounting locates the two sensors axially along the pipe using two mounting chains or straps.

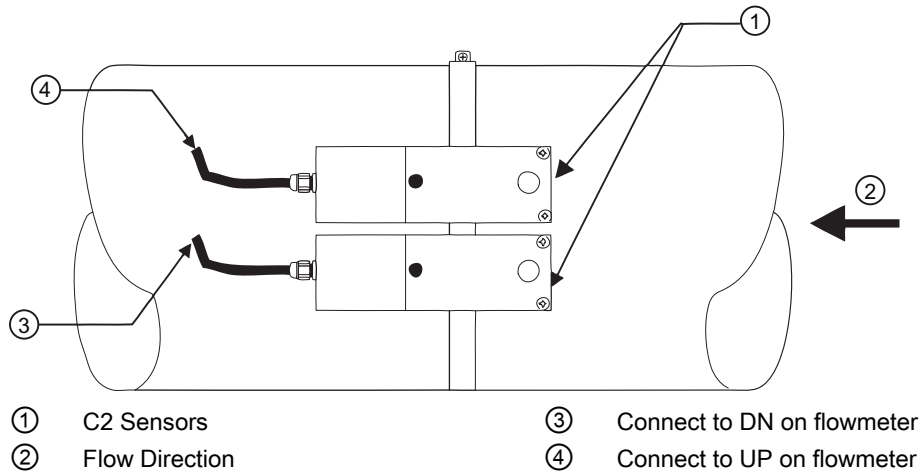


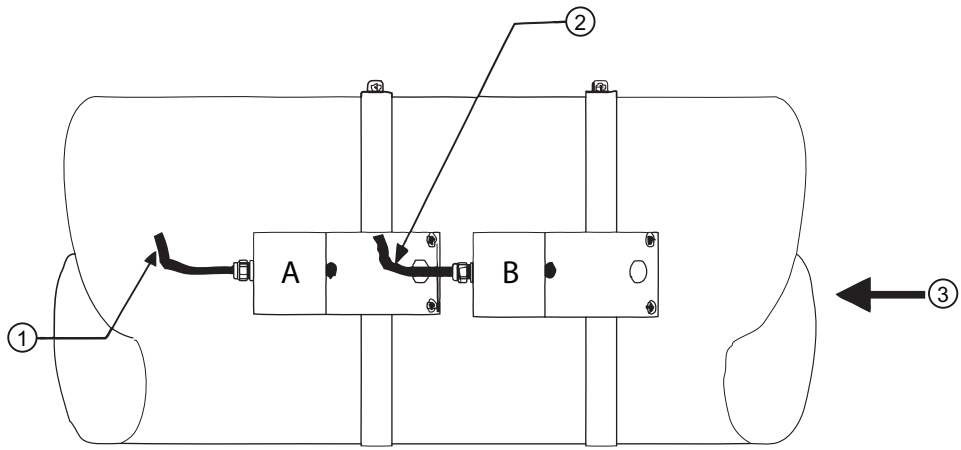
Figure 7-3 Adjacent Sensor Mounting

On inline mounted metal pipes the Receive Sensor is always located downstream of the Transmit Sensor. On plastic pipes the Transmit Sensor is always located downstream of the Receive Sensor.

Table 7- 19 Inline Metal and Plastic Pipe Cable Connections

Sensor	Metal Pipe	Plastic Pipe
C2 Sensor (A)	DN	UP
C2 Sensor (B)	UP	DN

In both cases, the cable entry will be on downstream side. Adjacent mounting will provide the maximum sensitivity to flow. Refer to the appropriate sensor installation drawing for the 191N1S (Installation Drawing 191N1S-7).



- ① Connect to DN on flowmeter for metal pipe (Receive) / Connect to UP on flowmeter for plastic pipe (Transmit)
- ② Connect to UP on flowmeter for metal pipe (Receive) / Connect to DN on flowmeter for plastic pipe (Transmit)
- ③ Flow Direction

Figure 7-4 In-Line Sensor Mounting

Connecting Sensor Cables

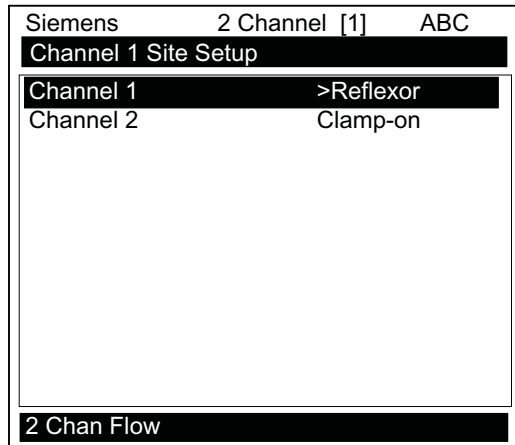
Connect sensor cables between the sensors and the flowmeter. The XMIT (transmit) sensor is connected to the Up cable connection and RCV (receive) sensor is connected to the Down cable connection. The UP/DN orientation is important for the in-line sensor configuration. It is not a factor for the adjacent configuration.

Select Reflexor Operating Mode

Select Meter Type as [Reflexor] for the channel that is to be used as Reflexor. Dual channel units may have either one or both channels used in the Reflexor mode.

Installing Reflexor Operating Mode

1. From the [Meter Type] menu press the <Right Arrow>, select the desired channel setup and press <ENT>.
2. Press the <Right Arrow>, scroll to [Reflexor] and press <ENT>.



3. At the [Channel Setup] menu press the <Right Arrow>.
4. Scroll down to [Create/Name Site] and create a site or use a previous Saved Site setup by highlighting [Recall Site].

Note

If a previous Saved Site is recalled, and the same sensor and location is used, then no other installation steps are required.

5. Press the <Left Arrow> and scroll to [Pipe Data] and enter the required pipe data.

Sensor Selection

1. From [Pipe Data] scroll to the [Install Xdcr] menu and press the <Right Arrow>.
2. At [Transducer Model], press the <Right Arrow> and select the proper group of sensors that match the mounted sensor set. For all 191N, select 190.
3. At [Transducers Size], select the proper size of sensor mounted. For all 191N, select 191.

Note

If the Flow Volume and Time units are not set to the default units of Gallons per Minute, then it is recommended to change those units now by use of the [Flow/Total Units] menu.

4. In the [Install Xdcr] menu, scroll down to [Flow Range], press the <Right Arrow> and select the lowest flow range rate available that is at least **two times higher** than the maximum flow expected at this application.
5. At [Install Complete], for new installations, press the <Right Arrow>, select [Install], and then select [Yes]. Press <ENT>.

Siemens	2 Channel [1]	ABC
Install Completed?		
Transducer Model	1011 Universal	
Transducer Size	C2	
Flow Range GAL/MIN	14.99	
Install Complete	Yes	
Spectra Graph	No	
Install Xdcr		

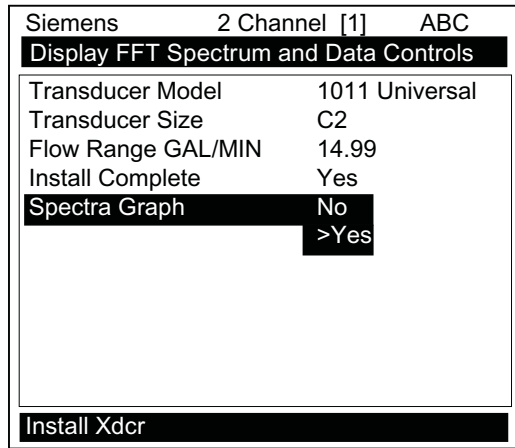
The flowmeter is now operational and the display will show flow by pressing the <MENU> key.

The Spectra Graph

The Spectra Graph provides a powerful tool to determine if the installation has achieved an adequate margin of operation. It also eliminates the possible effects of mechanical vibration and external RFI (Radio Frequency Interference). Mechanical vibration and external RFI can cause other types of Doppler flowmeters to be inaccurate. The Spectra Graph display provides keypad control keys that allow adjustments of application dependent parameters, if required, while observing the results of these adjustments. Application dependent parameters are the Low and High Limit Cursors and the Noise Cursor. In most cases, only the Noise Cursor will be required to be adjusted.

Selecting the Spectra Graph Display

1. In the [Install Xdcr] menu scroll to [Spectra Graph] and press the <Right Arrow>.
2. Press the <Down Arrow> to select [Yes] and press <ENT>.



The Spectra Graph display shows the results of the Fast Fourier Transform (FFT) performed by the flowmeter.

- The horizontal scale represents flow velocity with the higher velocities on the right and lower velocities on the left.
- The vertical axis is relative amplitude or magnitude; each bar shows the relative amplitude for a velocity range.

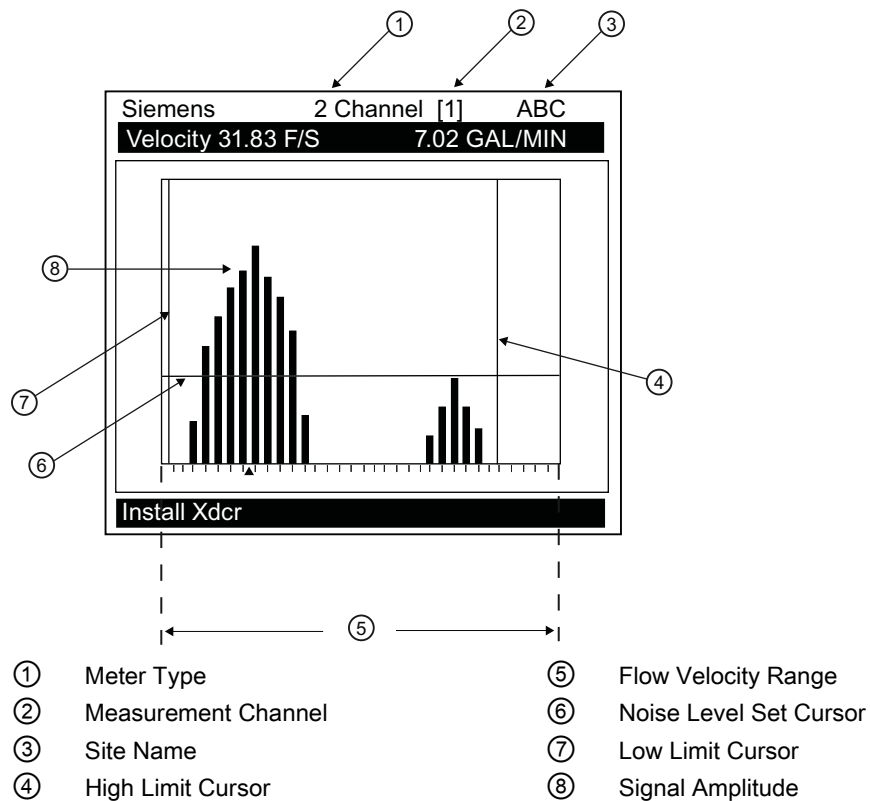


Figure 7-5 Spectra Graph Display Screen

The reported flow rate is the mean value of the included Spectra Graph bars. It is computed by excluding signals that are lower (to the left of) than the Low Limit Cursor or higher (to the right of) than the High Flow Cursor or lower (under) than the Noise Cursor.

Spectra Graph Cursor Use

Table 7- 20 Cursor Definitions

Cursor	Definitions
High Limit Cursor	This cursor appears as a vertical line on the right side of the Spectra Graph. All signals to the right of this line will be excluded from the flow calculation. Use this adjustment if the right side of the Spectra Graph has noise that is larger in amplitude than the signal that is produced by flow. The cursor may be arbitrarily placed at two times the maximum flow expected.
Low Limit Cursor	This cursor appears as a vertical line on the left side of the Spectra Graph. All signals to the left of this line will be excluded from the flow calculation. Use this adjustment if the left side of the Spectra Graph has noise that is larger in amplitude than the signal that is produced by flow. The cursor may be arbitrarily placed at one half the minimum flow expected.
Noise Level Set Cursor	This cursor appears as a horizontal line on the Spectra Graph. All signals below this line will be excluded from the flow calculation. Position the cursor approximately one quarter the height of the FFT peak.

Using Spectra Graph Data and Controls

When the Spectra Graph is first displayed:

- The data shown on the top highlighted line shows Velocity in feet-per-second (F/S) on the left side.
- The volumetric Flow Rate in the current rate units is displayed on the right side.

You can scroll the data shown by pressing the <Up and Down> Arrows.

1. Pressing the <Up Arrow> changes the data in the highlight to [Diagnostic Data] containing, from left to right: (Hz) Doppler shift frequency in Hertz, (mV) Signal Amplitude in millivolts, (FFT Pk) Peak FFT magnitude and (%D) FFT Percent Deviation. Carefully inspect the data for Signal Amplitude and Percent Deviation. Refer to the "Available Adjustments to Spectra Graph" table and the "Reflexor Diagnostic Data" table in this section for details. Press the <Down Arrow> to return to Velocity.
2. Press the <Down Arrow> from Flow Velocity in feet per second (F/S) to advance to the Noise Level Set cursor control. A numeric indication of the Noise Level Cursor position is provided in the highlighted area. Refer to the "Available Adjustments To Spectra Graph" table for details.

3. Adjust the Noise Level cursor, if required, by pressing the <+> key to increase or <-> key to decrease.

Note

A delay in response to all keys will occur. This is due to the longer periodic sampling of the keyboard by the processor while performing FFT's.

4. Press the <Down Arrow> from Noise Level to advance to the High Limit cursor control. The <+> and <-> key are active in this position. Refer to the "Available Adjustments To Spectra Graph" table for details.
5. Press the <Down Arrow> from High Limit to advance to the Low Limit cursor control. The <+> and <-> keys are active in this position. Refer to the "Available Adjustments To Spectra Graph" table for details.
6. Press the <Down Arrow> from Low Limit to advance to the Carrier FX control. The <+> and <-> keys are active in this position.
7. Press the <Down Arrow> from Carrier FX to advance to the Diagnostic Data Display. The <+> and <-> keys are active in this position.
8. To exit the Spectra Graph, press the <Menu> key.
9. To display the Digital Flow Display, press the <Menu> key from any Installation Menu location.

Available Spectra Graph Adjustments

Adjustment	Function	Notes
Noise Level Set	Noise Filter	Set to approximately one quarter the Peak FFT value for typical flow conditions.
High Limit	Low Pass Filter Setting	Set to two times the maximum flow rate.
Low Limit	High Pass Filter	Set to one half minimum flow if noise is present. In most cases, leave at zero.
Carrier Fx	Transmit Frequency Code	Adjust only under guidance of technical support staff.

Reflexor Diagnostic Data

The [Diagnostic Data] menu and the [Application Info] sub menu screen provide one location where all diagnostic data can be viewed.

Note

Adjustments can not be made on the [Application Info] menu screen. Adjustments can only be made on the Spectra Graph.

Table 7- 21 Diagnostic Data

Application Information	Function / Explanation
Low Limit	High Pass Filter Setting
High Limit	Low Pass Filter Setting
Noise Level Set	Noise Filter Setting
Doppler Frequency (Hz)	Average FFT Frequency
% Deviation	The width of Spectra is used to determine beam penetration and calibration. The selection of "Slurry" in Application Data is recommended for flow rate indication accuracy when the % Deviation is less than 25. For % Deviation above 35 the use of "Liquid" is recommended. For applications that continuously have % Deviation between 25 and 35 proper selection of either Liquid or Slurry can be confirmed by comparison to a known flow reference.
Signal Peak-to-Peak mV	Peak-to-Peak demodulation signal amplitude. The acceptable range is between 100 and 3200 mV during typical flow conditions. If less than 100 mV, check transducer type used and mounting configuration. If greater than 3200 mV, try in-line mounting and/or "detune" Carrier Fx.
FFT s/sec	Number of FFTs per second
FFT Peak	Peak FFT Amplitude
Carrier Fx	Transmit Frequency code

Siemens	2 Channel [1]	ABC
Sets low flow limit filter		
Low Limit GAL/MIN	>0.00	
High Limit GAL/MIN	16.75	
Noise Level Set	2	
Doppler Freq	8571	
% Deviation	100.00	
Signal PK-PK mV	27	
FFT s/Sec	28	
FFT Peak	0	
Carrier Fx	27	
Application Info		

Display of "F" at No-Flow conditions

It is normal for the digital display to show an "F" for the no flow condition since the lack of Spectra information during no flow is the same as a fault condition.

Note

Selecting the [Operation Adjust] menu cell [Zero/Fault Set] allows the option of indicating Zero Flow rather than a Fault.

Selecting Liquid Composition

The width of the Spectra wave shape is an indication of the depth of penetration of sonic energy into the flow stream. The % Deviation is a measure of the width of the Spectra and is representative of the penetration of the sonic beam into the liquid.

Select [Slurry] in the [Application Data] menu for better flow rate indication accuracy when the % Deviation is less than 25 with typical flow conditions.

For % Deviations above 35, select [Liquid]. For applications that continuously have % Deviations between 25 and 35, proper selection of either [Liquid] or [Slurry] can be confirmed by comparison to a known flow reference.

Siemens	2 Channel [1]	ABC
Pick Liquid or Slurry Flow Calibration		
Liq Composition	Liquid	
Density S.G.	1.00	
Application Data		

Other Menu Entries

All other flowmeter menu entries will operate and be used in the same manner as the transit time flow measurement mode.

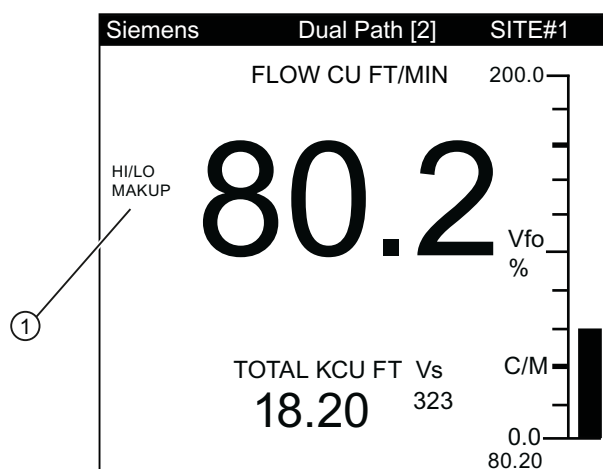
Alarm, error, and system messages

The following alarm codes appear on the main display of the flowmeter.

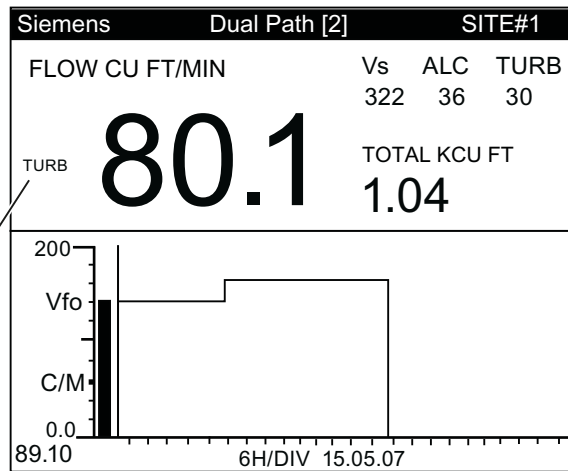
Table 8- 1 Alarm Codes

Letter Codes	Alarm Code	Description
SPACE	Spacing	Sensor spacing may need adjustment
HI/LO	Rate	Flow above High setting or below Low setting
FAULT	Fault	Three continuous seconds without new data update
TURB	Turbulence	Current turbulence percentage exceeds the alarm set point
MEMRY	Memory	Last valid reading for a selected interval during Fault condition
MAKUP	Makeup	In-Process Makeup occurred
EMPTY	Empty	Pipe is empty

The displays shown below indicate where the Alarm Codes appear on the screen. Press <UP> or <DOWN> Arrows to change screen views.



① Alarm Codes



① Alarm Codes

Service and maintenance

9.1 Maintenance

The device is maintenance-free, however, a periodic inspection according pertinent directives and regulations must be carried out.

An inspection can include check of:

- Ambient conditions
- Seal integrity of the process connections, cable entries, and cover screws
- Reliability of power supply, lightning protection, and grounds

9.2 Technical support

If you have any technical questions about the device described in these Operating Instructions and do not find the right answers, you can contact Technical Support:

- Via the Internet using the **Support Request:**
Support request (<http://www.siemens.com/automation/support-request>)
- Via Phone:
 - Europe: +49 (0)911 895 7222
 - America: +1 423 262 5710
 - Asia-Pacific: +86 10 6475 7575

Further information about our technical support is available in the Internet at Technical support (<http://support.automation.siemens.com/WWW/view/en/16604318>)

Service & Support on the Internet

In addition to our documentation, we offer a comprehensive knowledge base online on the Internet at:

Service and support (<http://www.siemens.com/automation/service&support>)

There you will find:

- The latest product information, FAQs, downloads, tips and tricks.
- Our newsletter, providing you with the latest information about your products.
- A Knowledge Manager to find the right documents for you.
- Our bulletin board, where users and specialists share their knowledge worldwide.
- You can find your local contact partner for Industry Automation and Drives Technologies in our partner database.
- Information about field service, repairs, spare parts and lots more under "Services."

Additional Support

Please contact your local Siemens representative and offices if you have additional questions about the device

Find your contact partner at:

Local contact person (<http://www.automation.siemens.com/partner>)

9.3 Return procedures

Enclose the delivery note, the cover note for return delivery together with the declaration of decontamination form on the outside of the package in a well-fastened clear document pouch.

Required forms

- **Delivery Note**
- **Cover Note for Return Delivery** with the following information
Return delivery form (<http://support.automation.siemens.com/WW/view/en/16604370>)
 - product (ordering number)
 - number of devices or spare parts returned
 - reason for the return

- **Declaration of Decontamination**

Decontamination declaration

(http://pia.khe.siemens.com/efiles/feldg/files/Service/declaration_of_decontamination_en.pdf)

With this declaration you certify *that the returned products/spare parts have been carefully cleaned and are free from any residues.*

If the device has been operated together with toxic, caustic, flammable or water-damaging products, clean the device before return by rinsing or neutralizing. Ensure that all cavities are free from dangerous substances. Then, double-check the device to ensure the cleaning is completed.

We shall not service a device or spare part unless the declaration of decontamination confirms proper decontamination of the device or spare part. Shipments without a declaration of decontamination shall be cleaned professionally at your expense before further proceeding.

You can find the forms on the Internet and on the CD delivered with the device.

9.4

Battery disposal



In accordance with EU directive 2006/66/EC, batteries are not to be disposed of using municipal waste disposal services.

Waste industrial batteries are accepted back by Siemens or by the local Siemens representative. Please talk to your local Siemens contact (<http://www.siemens.com/automation/service&support>) or follow the return procedures (Page 142) of Siemens Flow Instruments.

Troubleshooting

10.1 Troubleshooting

The following is list of troubleshooting tips and messages that you may encounter. They include explanations and, in some cases, a recommended action. If a problem seems unsolvable, contact your local Siemens Ultrasonic Flow Representative for expert help at: <http://www.automation.siemens.com/partner>.

Table 10- 1 Troubleshooting Tips

Message	Description
Memory Full!	Response to an attempt to save site data, when data memory is full. Delete an obsolete site or clear Datalogger memory to make room for the new data.
Memory Corrupted!	Memory read error occurred while accessing the active site data.
Chan Not Setup	Response to an attempt to invoke an operation that requires a channel to be enabled. Enable the channel [Channel Setup - Channel Enable - Yes]. Note that a channel cannot be enabled until its transducers are operating.
Clr Active Memory?	Response to pressing the F4 key. Use the F4 function to restore operation if a severe event (e.g., a violent power surge) disrupts system operation.
Clr Saved Data?	[Clr Saved Data?] only appears after answering No to [Clr Active Memory?]. Answering Yes to [Clr Saved Data?] will erase ALL saved data.
<EOT>	Response to a request to output Datalogger data to the printer or the Graphics screen when no Datalogger data exists. Set up the Datalogger.
No Sites - Press <ENT>	Response while trying to recall/delete a site setup when no sites are stored.
Re-space Index	Upon measuring the gas sonic velocity (Vs), the meter recommends re-spacing the transducers to improve performance.

Message	Description
Invalid Setup (use Direct Mode)	<p>During the Initial Makeup the system detects invalid transducer spacing, erroneous liquid pipe parameters, or some other factor that prevents it from completing the Initial Makeup. This may be due to one of the following:</p> <ul style="list-style-type: none"> • An out-of-range data entry. • An invalid condition (e.g., overlapping transducers in Reflect Mode). If selecting Direct Mode does not resolve, review all site setup and transducer installation choices particularly data entered for pipe and gas. • In Reflect Mode the flowmeter detects that the pipe wall signal may infringe upon the gas signal. Use Direct Mode instead. • Press <ENT>, <Up Arrow>, <Down Arrow>, or <Left Arrow> to abort install routine. Continue programming other site data in anticipation of resolving the difficulty later. Call technical support for help if necessary.
Low Signal - Press <ENT>	<p>During the Initial Makeup the flowmeter decides that the level of the receive signal is insufficient for proper operation. Some reasons for low signal are:</p> <ul style="list-style-type: none"> • Invoking [Install completed?] on an empty pipe. • Coupling compound insufficient; not applied or evaporated. • A disconnected or broken transducer cable. • The pipe needs to be conditioned at the mounting location. • Insure that line is sufficiently pressurized. • The Xdcr cables are defective or not connected to the correct channel. <p>If you locate and correct the improper condition immediately, press <ENT> to resume the installation procedure. Otherwise, press the <Left Arrow> to abort the installation and conduct a thorough investigation.</p>
Detection Fault	<p>If it appears that the flowmeter cannot complete an Initial Makeup it means that the pipe and/or gas conditions do not permit a receive signal that meets the flow detection standards. The system will not operate. Attempt to improve operating conditions by reinstalling the transducers at a different spacing offset, or even at a different location on the pipe.</p> <p>Switching from Reflect to Direct Mount may solve the problem. However, operation may not be possible if there is insufficient line pressure or high CO₂ gas content.</p>

Note

If you receive a Detection Fault message, it is strongly recommended that the Technical Service Department (<http://www.automation.siemens.com/partner>) be contacted.

10.2 F4 Reset Procedure

You may encounter an operating problem that blocks access to the Diagnostics Menu, or the flowmeter may operate erratically after exposure to a power transient or some other traumatic event. These cases may require use of the F4-reset sequence to restore operation.

The F4-Reset sequence operates on two levels:

- Clear Active Memory

The first F4-Reset deletes all the data currently in Active Memory, but leaves Datalogger data and all stored Site Setups intact. This is the most desirable method since all you have to do to restore operation is reload a saved Site Setup.

- Clear All Saved Memory

If the first sequence fails then you have to resort to the second level of the F4 sequence, which allows you to clear ALL Saved Memory. **Be aware that this erases all saved Site Setups (including flow calibrated sites), Datalogger Data and user-defined pipe and sensor tables.** This will require you to completely re-install the system and repeat all desired default settings, custom pipe tables, etc. The table below shows the sequence of the [F4] routine:

[Power On/Off + F4]⇒	[Clr Active Memory?]⇒ ↑ ↓	⇒No ⇒Yes
	[Clr Saved Data?]⇒	⇒No ⇒Yes

Clearing only Active Memory

1. Turn off power (if it is currently on). Press <F4> and keep it pressed while you turn on power. The prompt: [Clr Active Memory? No] appears at the top of the screen.
2. Press <Right Arrow> to access F4 Reset option list. Press <Down Arrow> to switch the option list to [Clr Active Memory? Yes]. Press <ENT> to clear all Active Site Data (but not saved Site Setups).
3. To restore operation, press <MENU> to access the installation menu. Create a new site setup or recall a stored site setup.
4. Re-select any Meter Facilities menu items (e.g. RS-232 setup parameters).

Clearing All Saved Data

1. Turn off power (if it is currently on).
2. Press <F4> and keep it pressed while you turn on power. The prompt: [Clr Active Memory? No] appears at the top of the screen. Press the <Down Arrow>. Note that the prompt switches to [Clr Saved Data? No].
3. To access the F4 Reset option list press the <Right Arrow>. Press the <Down Arrow> to switch the option list to [Clr Saved Data? Yes].



CAUTION

Before proceeding further it is essential to understand that this function eliminates ALL data stored in RAM. This means that all saved site setups including the site data of a flow-calibrated site will be erased! In addition, the entire Datalogger file plus any custom factory or user-created pipe or sensor tables will be eliminated. The impact of this is such that we strongly recommend that you consult Technical Services before continuing with this procedure. Be aware that you will have to create a new Site Setup, re-enter all site specific parameters including pipe or sensor tables, plus all desired Meter Facilities menu entries.

4. To clear all Saved Memory press <ENT>.
5. Create a Site Setup before attempting to access other menu items.
6. To restore operation, press <MENU> to access the installation menu. Create a new site setup and complete the installation procedure.
7. Re-select desired Meter Facilities menu items (e.g. RS-232 setup parameters).

10.3 Test Facilities Graph Screen

When operating in the transit time mode the Test Facilities Graph Screen is an exceptional diagnostic tool for troubleshooting problem applications or simply determining Receive signal quality. The primary function of this screen is to display the digitized receive signal waveform with the similar appearance and function of a digital oscilloscope. This screen also allows the user to override some of the flowmeter default settings by permitting adjustment to the measured transit time, the digital averaging and the zero crossover used in the measurement of the up/down transit time difference. The figure shown below is a representation of the diagnostic graph.

Note

The Test Facilities Graph Screen requires significant CPU overhead. The flowmeter should not be left in this mode during normal operation where the Datalogger is the primary output or during calibration work.

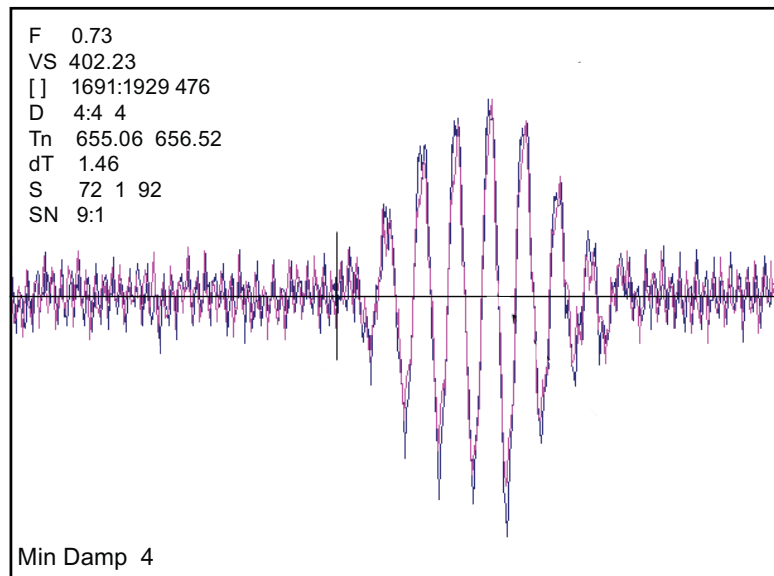


Figure 10-1 Test Facilities Graph Screen

Entering the Diagnostic Graph Screen

Before you can view the Diagnostic Graph Screen the flow channel must first be properly installed and operating in a non-empty condition. If a previously installed channel is in a "Fault" condition, but not reporting "Empty", you can still access the Graph Screen to aid in troubleshooting the cause of the failure to measure flow.

To view the Graph Screen first enter the [Test Facilities] menu, which is a submenu of the main [Diagnostic Data] menu.

1. Pressing the <Up/Down Arrows>, scroll to the [Graph] menu item.
2. Press the <Right Arrow> to enter the [Graph] menu and scroll to highlight the [Yes] item in the option list.
3. Now press the <ENT> key to access the Graph Screen.
4. To exit the Graph Screen and return to the main menu, press the <MENU> key once.

Diagnostic Text Display

The text to the upper left-hand corner of the screen represents diagnostic items which can be individually turned on or off to reduce unnecessary clutter on the screen. This text display can be modified by pressing the <ENT> key and scrolling up or down through the various parameters that appear in the Graph Display menu. Pressing the <ENT> key will select the highlighted parameter (a "+" sign appears next to selected items) and pressing <CLR> will deselect the item. Pressing the <Left Arrow> will return you to the graph screen with the selected parameters appearing at the top left corner of the screen. (The sample graph above is shown with all diagnostics items selected).

Time Base Control

The digitized receive signal can be moved either to the left or right on the screen by pressing the <Left> or <Right> keypad arrows. The direction of the arrow actually represents the direction in which the Receive "window" will move, thereby causing the receive signal to shift in the opposite direction on the screen (e.g., Pressing the <Left Arrow> moves the signal to the right).

The digitized receive signal can be expanded or contracted in the time domain by pressing the <+> or <-> keys on the keypad. This allows you to see the entire contents of the receive window, or zoom in to see greater detail. Pressing the <CLR> key once will automatically center the receive signal on the screen. When expanding the Receive signal small vertical "tick" marks will eventually appear. These marks represent the time at which the receive signal is digitally sampled.

Correlated Plot

During conditions of flow, the actual transit time delta (difference) can be observed in the displayed receive signal waveform when the [Correlated Plot] menu parameter is not selected. To observe this time difference simply depress the <+> key (to see greater signal detail) until the individual up and down receive signals are clearly discernible. To verify that the flowmeter signal processing algorithms are properly correlating the up and down stream receive signals, select the [Correlated Plot] option from the display menu list.

Return to the graph screen and observe the relative position of the up and down waveforms. In a properly correlated receive signal the two images should be nearly superimposed on top of each other, even during high flow conditions. In the unlikely situation where the two images appear to be offset by one or more receive cycles then the flow readings should be considered questionable.

Command Modes

Although the flowmeter signal processing algorithms are capable of accommodating a very wide range of signal conditions, it may be desirable to override these default settings under extremely difficult operating conditions. The following functions are available for this purpose.

Digital Damping Control: (Hot Key 1 and 2)

The meter permits user modification of the digital averaging used by the signal processing routines. In general, the default damping values selected by the flowmeter will provide optimal performance over a wide range of transit time applications. However, in extreme cases of unstable flow, pulsating flow, low signal levels or high electronic noise it may be necessary to override these default settings to permit uninterrupted and reliable flow measurement.

Test Facilities Graph Screen

The Graph Screen includes the capability to access a set of command codes, which enable a user to override a number of default meter settings. The most important parameter is the digital damping control, which can be accessed by pressing number <1> or <2> on the keypad while in the Signal Graph Screen mode.

[MinDamp #] Command

Pressing the <1> key will cause [MinDamp #] to appear on the command line at the lower left-hand corner of the screen. The number listed to the right of the command code represents the exponent in the meter exponential averaging routine, where the larger the number the greater the digital averaging. Pressing the <+> key will increase the damping value. Likewise, pressing the <-> key will decrease the damping value.

To exit this mode, press the <0> key on the keypad.

[MaxDamp #] Command

Pressing the <2> key will bring up the [MaxDamp #] command. The function of this parameter is similar to the [MinDamp #] command described above; however, the two parameters interact in the following manner. The MinDamp value must not exceed the MaxDamp value, therefore increasing the MinDamp value above the previous MaxDamp value will set both parameters to the same value. In most cases, it is preferred that both damping parameters be set to the same value, however, in cases where rapid response to changes in liquid sound velocity for flow rate is required, the two values may be set differently. In this situation the meter will use the MaxDamp value when conditions are stable, but then switch to a faster damping value (limited by MinDamp) when a significant change in sound velocity or flow rate is perceived.

To exit this mode, press the <0> key on the keypad.

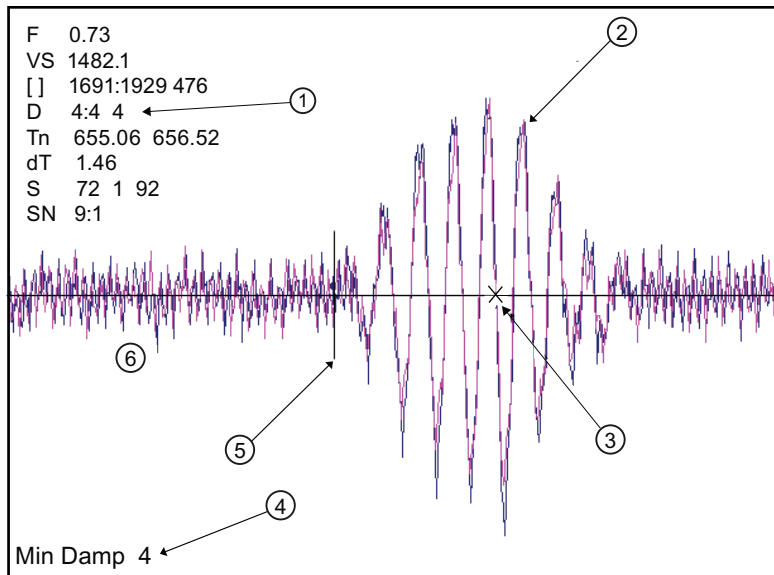
To access the Digital Damping Control using the Test Facilities Graph Screen, proceed as follows:

Note

To use the Test Facilities Graph Screen you must have a working site.

To activate the Test Facilities Graph Screen:

1. In the main menu, scroll to the [Diagnostic Data] menu and select [Test Facilities].
2. Scroll down to [Graph], press the <Right Arrow> and highlight [Yes]. Press <ENT> to select.
3. The Test Facilities Graphic Screen will appear on the meter display as shown below.



- | | |
|----------------------------|----------------------------------|
| ① Damping Factors | ④ Min Damping Factor (Hot Key 1) |
| ② Digitized Receive Signal | ⑤ TN Marker |
| ③ Crossover Marker | ⑥ High Baseline Noise |

Figure 10-2 Setting Digital Damping Factor

Setting the Digital Damping Factor to a value HIGHER than the default value of 4 may be necessary in cases where the signal-to-noise ratio (SN) is found to be unacceptably low (<15:1), but only if the noise is determined to be asynchronous (i.e., not associated with the transmit or flowmeter timing circuitry) as shown in the signal example above, where the baseline noise has a higher frequency than the true liquid signal.

The following application conditions may require a higher Digital Damping Factor:

- Close proximity to pressure control valves which may generate in-band acoustic noise
- High un-dissolved gas solids content in liquid.
- High electronic noise from variable frequency drives or other external equipment.

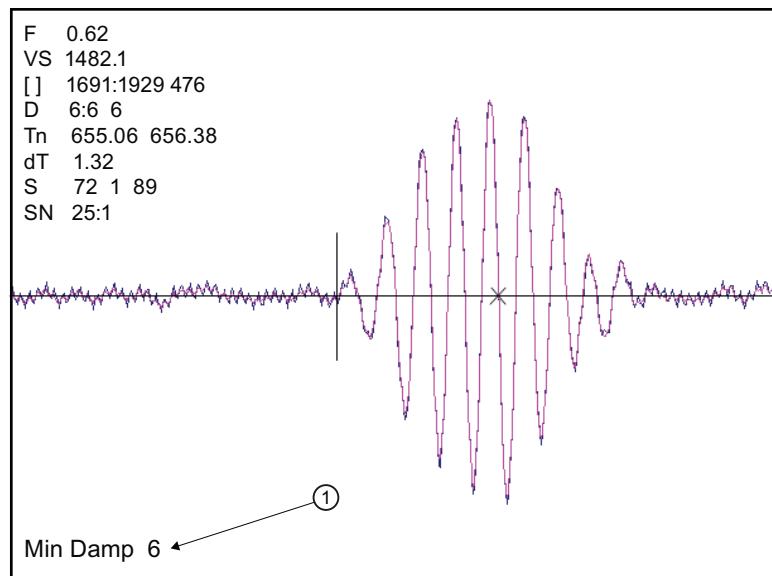
To INCREASE the Digital Damping:

1. Press the <1> key while viewing the Test Facilities Graph Screen as shown above. The damping control [MinDamp #] will appear on the command line at the lower left-hand corner of the screen.

Note

The number listed to the right of the command code on the screen represents the exponent in the exponential averaging routine (digital damping), where the larger the number represents the greater the digital averaging. Setting this exponent higher than 7 is generally not recommended.

2. Pressing the <+> key will increase the MinDamp Factor by one unit for each key press. To exit this mode, press the <0> key on the keypad.



① Increased Damping Factor

Figure 10-3 Setting the MinDamp Factor

The above example shows that increasing the Digital Damping reduces asynchronous noise.

Setting the Digital Damping factor to a value LOWER than the default value of 4 may be justified in cases where pulsating flow is present (such as from a reciprocating pump) or for the purpose of diagnosing transient signal behavior. A pulsating flow condition that generates more than +/- 45 degrees of phase jitter will generally cause signal correlation problems when any digital averaging is used. In this case it may be necessary to completely eliminate the digital averaging by reducing the Digital Damping Factor to 0.

To DECREASE the Digital Damping:

1. Press the <2> key while viewing the Test Facilities Graph Screen. The damping control [MaxDamp #] will appear on the command line at the lower left-hand corner of the screen.
2. Pressing the <-> key will decrease the MaxDamp Factor by one unit for each key press. To exit this mode, press the <0> key on the keypad.

Transit Time Adjustment: (Hot Key 3)

Observe the short vertical marker at the beginning of the receive signal in the Graph Screen above. This line represents the position in time (Tn) where the flowmeter perceives the arrival of the ultrasonic signal. There are actually two Tn markers, one for the upstream arrival time and one for the downstream arrival time. For proper liquid sound velocity measurement these Tn markers should be positioned near the beginning edge of the receive waveform envelope (as shown), however, in cases of poor signal conditions it is possible for this measurement to be off by several receive waveform cycles.

1. To adjust the Tn mark position press the <3> key on the keypad to bring up the [TnSet #] command.
2. Pressing the <+> or <-> keys will cause the Tn marker to move later or earlier, respectively. As you adjust the Tn marker, both Tn and Vs (liquid sound velocity) will change accordingly.
3. To exit this mode, press the <0> key on the keypad.

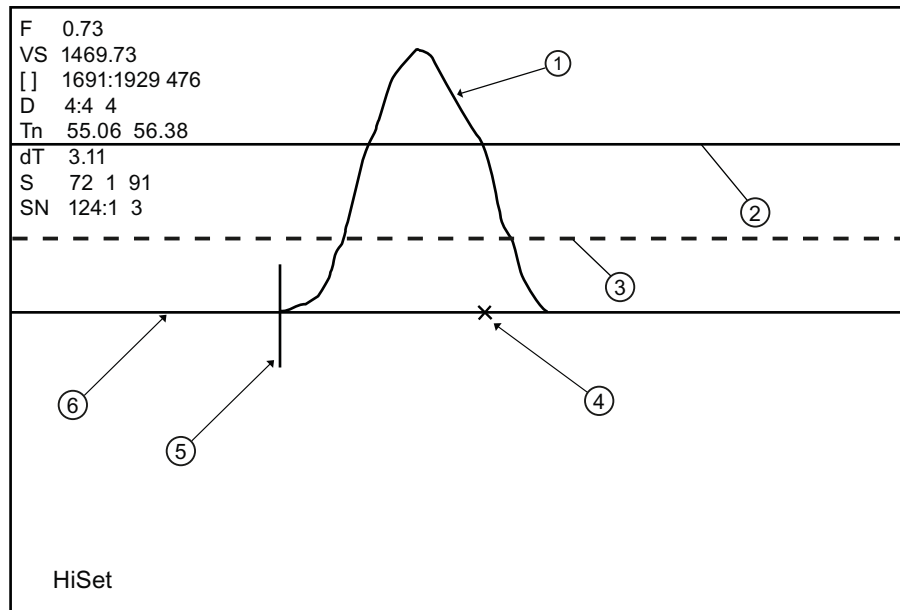
Zero Crossover Adjustment: (Hot Key 4)

Observe the small "X" mark located on the zero crossing line near the middle of the receive signal in the Graph Screen above. This "X" indicates the central crossover which the flowmeter is using to measure the transit-time delta. This crossover will generally be close to the peak of the Receive signal with at least one well formed (non-aberrated) receive cycle on each side of the crossover.

1. If it appears that the placement of this crossover is unsatisfactory then it can be adjusted by pressing the <4> key on the keypad, which will invoke the [ZCO Set #] command. The crossover point can then be moved in either direction on the waveform using the plus <+> or minus <-> keys. The change from the default value (in receive cycles) will appear in the number to the right of the command.
2. To exit this mode, press the <0> key.

Envelope Threshold Adjustment: (Hot Key 5 & 6)

Pressing the <=> key causes the graph to toggle between the default signal waveform screen and the signal envelope screen (see example below). This envelope screen can aid in the diagnosis of Tn errors caused by unusual receive waveform distortion. Signal distortion is sometimes caused by poor sensor selection or poor pipe wall conditions, which may result in an incorrectly measured fluid sound velocity. To improve the automatic measurement of Tn, the envelope threshold limit can be adjusted to exclude portions of the envelope, which may be causing the Tn detection problem.



- | | |
|----------------------------|--------------------|
| ① Envelope Signal | ④ Crossover Marker |
| ② HiSet Envelope Threshold | ⑤ TN Marker |
| ③ LoSet Envelope Threshold | ⑥ Zero Baseline |

Figure 10-4 Envelope Threshold Adjustment

1. If it appears that the default placement of the Tn marker is incorrect or unstable, it can be adjusted by pressing the <5> key on the keypad to invoke the [Hi Set #] command or by pressing the <6> key to invoke the [Low Set #] command (while viewing the envelope screen). A horizontal line representing the envelope threshold level will appear along with a number indicating the percentage level. The High and Low thresholds can then be moved either up or down on the envelope using the <+> or <-> keys. While viewing the Tn marker position, adjust the thresholds so that they are well above the baseline "noise" level but below the first major peak.
2. To exit this mode, press the <0> key.

Signal Masking Function: (Hot Key 7)

Under conditions of extremely low signal amplitude, a noise spike associated with the flowmeter receive signal window may be present on the extreme left side of the graph display. If this spike is large enough it may interfere with the signal detection routines.

1. To eliminate this noise from the signal processing routines, press the <7> key to invoke the [Mask Set #] command, then press the <+> key until the noise is no longer present in the receive waveform.
2. Press <0> to exit this command.

Hold Set Function: (Hot Key 8)

The [Hold Set #] command is used to set the Hold Set number higher if intermittent mis-registration occurs. Press the <8> key on the keypad to invoke this function.

Table 10- 2 Description of Graph Screen Text Display Parameters

Screen Text Parameters	Menu List Item	Description
F	Flow	Measured flow rate in selected flow units.
VS	Vs m/s	Sound Velocity in meters per second.
[]	Display Metrics	Represents the digital sample position of the receive window.
	Correlated plot	Displays the receive waveform in its proper superposition or registration. The true delta time will be displayed by NOT selecting "Correlated Plot".
	Centroid Mark	Indicates with a large vertical marker the peak energy of the receive waveform.
D	Damping	Displays the minimum and maximum digital damping exponent along with the active damping exponent.
Tn	Tn (usec)	Receive signal transit time in microseconds.
dT	DeltaT (nsecs)	Transit time delta (difference) in nanoseconds.
S	Signal Strength	Displays %Valc (amplitude), %Vaer (aeration factor) and numeric ALC.
SN	Signal-to-Noise Ratio	Indicates the signal to noise ratio of the receive signal. Increased damping will increase the S/N ratio as the asynchronous noise reduces.
	Envelope	Percentage change of the signal from Initial Makeup conditions.

Table 10-3 Hot Key Summary

Key	Command Line	Description
<+>		Expands (magnifies) waveform to view more detail.
<->		Contracts waveform to view more of the waveform.
<Left Arrow>		Shifts receive window to the left (waveform to the right).
<Right Arrow>		Shifts receive window to the right (waveform to the left).
<CLR>		Brings waveform to the center of the screen.
<ENT>		Calls up Text Display menu items. <Left Arrow> to return to graph.
<MENU>		Exits the Graph Screen and returns to the main menu.
<1>	MinDamp	Minimum damping exponent control (+ or - to increase or decrease).
<2>	MaxDamp	Maximum damping exponent control (+ or - to increase or decrease).
<3>	TnSet	Transit time adjustment (use + or - to move Tn marker).
<4>	ZCOSet	Zero Crossover adjustment (use + or - to move crossover marker).
<5>	HiSet	Signal envelope threshold level (use + or - to move threshold).
<6>	LoSet	Signal envelope threshold level (use + or - to move threshold).
<7>	MaskSet	Leading edge masking functions (use + or - to alter number of samples masked).
<8>	Hold Set	Set this number higher if intermittent mis-registration occurs.
<0>		Exits the command line.
<=>		Toggle graph between receive waveform and envelope waveform.
<F1> and <.>		Dumps the digitized waveform data over the RS-232 port. You must first leave the Graph Screen mode before invoking this command.

10.4 Site Setup Data

This menu provides data pertaining to sensor characteristics and operation. Some menu items are for technical support interpretation only.

Siemens	Dual Path [1]	ABC
Current transmit drive code		
fx (drive)		30
N (burst length)		5
Ltn		-1.154
Vf max		1577.42
Vs max M/S		2165.41
Vs min M/S		939.62
Empty		30
Samples/Cycle		16
Max Damping		
Min Damping		
HF		0.120
Site Setup Data		

Table 10- 4 Site Setup Menu Items

fx Drive	Current Transmit drive code selected during Initial Makeup. The drive code controls the sonic transmit signal.
N (burst length)	Transmit burst duration selected during Initial Makeup. To change N count press <Right Arrow>. At equal sign enter numeric value (1 to 9 only).
Ltn (mm/in)	Spacing distance between the transducers. It will be in inches or millimeters, depending on default units.
Vf max	The flow velocity (in selected units) corresponding to one whole cycle offset between upstream and downstream receive signals.
Vs max M/S	Maximum Vs for current transducer spacing.
Vs min M/S	Minimum Vs for current transducer spacing.
Empty	Value of Empty Alarm Setting. The meter will declare an empty status if signal strength drops below this value.
Samples/Cycle	Digital sampling rate.
Max Damping	Maximum signal damping. Use to average digital data when an unstable condition occurs.
Min Damping	Minimum signal damping. Use to average digital data when an unstable condition occurs.
HF	Flow registration correction parameter.

[HF] Menu Item

The flowmeter includes a Diagnostics Menu item that permits the entry of a flow registration correction parameter labeled [HF]. This "HF" parameter is the input for a proprietary algorithm that automatically compensates for signal beam blowing, thereby extending the upper flow limit of the flowmeter. The HF parameter should only be adjusted in cases where the user suspects that extreme flow velocity or a large delta-time may be causing signal correlation problems.

Using the [HF] Menu Cell

Two methods for adjusting this parameter are provided via the [HF] menu cell, located within the [Diagnostics] / [Site Setup] submenu. The "Manual" method provides direct entry of this parameter and is primarily intended for the advanced user, whereas the "Automatic" method allows the flowmeter to automatically measure the required correction and install the parameter.

Guidelines for use

- This menu is only accessible for the sensor channels, not the virtual (average flow) channel of the flowmeter (i.e., Diagnostics Path 1 or Path 2, but not Path 1 & 2).
- The flowmeter will inhibit the "Automatic" installation of the [HF] parameter if the flow rate is insufficient (too low) to accurately measure the required correction. If the maximum flow rate for the application is relatively low then this correction is not be required.
- If the flow rate is very high and the flowmeter is reporting erroneous or unstable flow, then the flowmeter may already be having trouble resolving the upstream and downstream signals. In this event, it may be necessary to first lower the flow rate to a moderate level before performing the "Automatic" HF adjustment. Once this is done the flowmeter should be able to properly measure the highest flow rates without problems.
- The limits of the "HF" parameter are +/- 0.7 and any attempt to manually install a larger value will cause the flowmeter to abort the installation of the parameter.

Note

Pressing the <Left Arrow> at any stage prior to accepting the measured value will abort the installation and return to the previous setting.

Accessing the [HF] Function

1. At the [Meter Type] Menu, press the <Right Arrow> and then <ENT> to select the desired Path (e.g., Dual Path Flow).
2. In the [Dual Path Flow] Menu, press the <Down Arrow> and scroll to the [Diagnostic Data] menu cell. Press the <Right Arrow> to select it.
3. In the [Diagnostic Data] Menu, highlight [Path Select] and select the desired sensor path. Press <ENT> to select path.
4. Press the <Down Arrow> and scroll to the [Site Setup Data] menu cell. Press the <Right Arrow> to select it.

Manual Adjustment Procedure

1. In the [Site Setup Data] Menu, press the <Down Arrow> and scroll to the [HF] menu cell. Press the <Right Arrow> and a pop-up [Manual] prompt will appear as shown below.

Note

Press the <Up/Down Arrow> to select [Automatic], if desired.

2. Use the numerical keys to input the desired correction value. Press <ENT> to input value.

Siemens	Dual Path [1]	ABC
fx (drive)		29
N (burst length)		5
Ltn		5.126
Vf max	1577 Adjustment	
Vs max M/S	>Manual	41
Vs min M/S		939.62
Empty		
Samples/Cycle		29
Max Damping		
Min Damping		
HF		>0.000
Site Setup Data		

Siemens	Dual Path [1]	ABC
fx (drive)		29
N (burst length)		5
Ltn		5.126
Vf max	1577 >Manual	
Vs max M/S	= 0.120	41
Vs min M/S		939.62
Empty		
Samples/Cycle		29
Max Damping		
Min Damping		
HF		>0.000
Site Setup Data		

3. The new correction value will appear next to the [HF] menu cell as shown below.

Siemens	Dual Path [1]	ABC
fx (drive)		29
N (burst length)		5
Ltn		5.136
Vf max		
Vs max M/S		
Vs min M/S		1355.00
Empty		
Samples/Cycle		29
Max Damping		
Min Damping		
HF		>0.120

Site Setup Data

Automatic Adjustment Procedure

1. In the [Site Setup Data] Menu, press the <Down Arrow> and scroll to the [HF] menu cell. Press the <Right Arrow> and a pop-up [Manual] prompt will appear.
2. Press the <Up or Down Arrow> to select [Automatic] then press <ENT>.
3. The current measured correction value is displayed (see below).
4. Press <ENT> again to install this correction value which will now appear next to the [HF] menu cell.

Note

The value shown in the [Automatic] pop-up prompt can not be changed and is for user information only.

Siemens	Dual Path [1]	ABC
fx (drive)		29
N (burst length)		5
Ltn		5.126
Vf max	1577 Adjustment	
Vs max M/S	>Automatic	1
Vs min M/S		939.62
Empty		
Samples/Cycle		29
Max Damping		
Min Damping		
HF		>0.000

Site Setup Data

Siemens	Dual Path [1]	ABC
fx (drive)		29
N (burst length)		5
Ltn		5.126
Vf max	1577 >Automatic	
Vs max M/S	= 0.026	
Vs min M/S		939.62
Empty		
Samples/Cycle		29
Max Damping		
Min Damping		
HF		>0.026

Site Setup Data

5. If you decide not to use the [Automatic] selection, press any key other than <ENT> to abort the operation.

10.5 Force Transmit

⚠ CAUTION

The Force Transmit and Force Frequency diagnostic procedures are preconfigured at the factory and should only be implemented by approved Siemens personnel.

This diagnostic software routine allows the user to "force" a transmitting condition that can be used to search for an amplitude level (ALC) when Detection Fault or Low Signal alarms are present. The routine forces the flowmeter to generate constant transmit bursts while reporting current receive signal strength for the user. To initiate the Force Transmit function, refer to the Short Burst detection mode example shown below.

Setting a Force Transmit condition

1. After [Install] command is invoked and while the flowmeter is going through the drive selections press the <ALT> and <MENU> keys simultaneously.

Siemens	Dual Path [1]	ABC
Install Completed?		
Install Path	1	
Transducer Model	1011HP-T1	
Transducer Size	B3	
Xdcr Mount Mode	Direct	
Spacing Offset	Minimum	
Number Index	4	
Spacing Method	Spacer Bar 1012TP	
Ltn Value (in)	0.217	
Install Complete	No	
Empty Pipe Set	Channel Not Setup	
Zero Flow Adjust	Channel Not Setup	
Install Xdcr		

Siemens	Dual Path [1]	ABC
Drive 0		
Install Path	1	
Transducer Model	1011HP-T1	
Transducer Size	B3	
Xdcr Mount Mode	Direct	
Spacing Offset	Minimum	
Number Index	4	
Spacing Method	Spacer Bar 1012TP	
Ltn Value (in)	0.217	
Install Complete	Install	
Empty Pipe Set	Channel Not Setup	
Zero Flow Adjust	Channel Not Setup	
Install Xdcr		

Note

The <ALT> and <MENU> keys must be pressed before the flowmeter scans through all the drives, or the Force Transmit function must be initiated again.

2. A typical menu screen will appear as shown below and indicate the current ALC (e.g., 50). This ALC number indicates the current receive signal strength and can be used for further diagnostic purposes.

Siemens	Dual Path [1]	ABC
ForceN	fx=8	m=7 ALC=50
Install Path	1	
Transducer Model	1011HP-T1	
Transducer Size	B3	
Xdcr Mount Mode	Direct	
Spacing Offset	Minimum	
Number Index	4	
Spacing Method	Spacer Bar 1012TP	
Ltn Value (in)	0.217	
Install Complete	Install	
Empty Pipe Set	Channel Not Setup	
Zero Flow Adjust	Channel Not Setup	
Install Xdcr		

Siemens	Dual Path [1]	ABC
[Redacted]		
Install Path	1	
Transducer Model	1011HP-T1	
Transducer Size	B3	
Xdcr Mount Mode	Direct	
Spacing Offset	Minimum	
Number Index	4	
Spacing Method	Spacer Bar 1012TP	
Ltn Value (in)	0.217	
Install Complete	Install	
Empty Pipe Set	Channel Not Setup	
Zero Flow Adjust	Channel Not Setup	
Install Xdcr		

- To exit Force Transmit, press the <Left Arrow> and a Detection Fault prompt will appear (see above).
- Press the <Left Arrow> again and the meter will return to the [Install Xdcr] menu and highlight the [Empty Pipe Set] menu cell.

Setting a Forced Frequency

- To force a frequency, repeat steps 1 and 2 above, but press <Right Arrow>. The following typical display line will appear: **Drive =0**
- Using numeric keys enter the frequency and press <ENT>.
- To complete the Install process after mounting the transducers press <ENT>.
- If the Force Transmit diagnostic procedure is not used, the normal [Install Complete] function occurs.

Technical data

11.1 Technical Data

Transmitter

- Operating Temperature Range: -18°C to 60°C (0°F to 140°F)
- Storage Temperature Range: -20°C to 93°C (-4°F to 200°F)

Degree of Protection

- Wall mount enclosure: IP65 (NEMA 4X)
- Wall mount explosion proof: IP66 (NEMA 7)

Input

- Flow Range: ± 30 m/s (± 100 ft/s), bidirectional
- Flow sensitivity: 0.0003 m/s (0.001 ft/s), flow rate independent

Accuracy

- Typical accuracy: 1%...2% of actual volume reading (higher accuracy is pipe condition and flow profile dependent)
- Calibratable accuracy: $\pm 0.2\%$ to 0.5% of flow
- Repeatability: $\pm 0.05\%$...0.1% of flow of actual volume reading for 1.5...30 m/s (5...100ft/s) velocities (pipe condition dependent)
- Zero Drift: 0.0003 m/s (0.001 ft/s), with ZeroMatic path active
- Data refresh rate; 5 Hz

Power Supply

- IP65 (NEMA 4X) and IP66 (NEMA 7) Wall Mount - 90 to 240 VAC @50 or 60 Hz 30 VA / 9 to 36 VDC, 12 Watts

Sensor

- Type: Nonintrusive, externally mounted
- Temperature Range: -40°C to +120°C (-40°F to +250°F)
- T1: -40°C to 65°C (-40°F to 150°F); T2: -1.11°C to 104.4°C (30°F to 220°F)

Dimensions

- 236 cm (9.31 in) x 287 cm (11.31 in)
- Net weight: 4.1 kg (9.0 lbs.) maximum

Gas Temperature

- -40°C to +60°C (-40°F to +140°F) (for higher temperatures consult factory)

Gas Types

- Natural Gas
- Processed Gas
- Liquefied Gas

Unit Repair and Excluded Liability

All changes and repairs must be done by qualified personnel, applicable safety regulations must be followed. Please note the following:

- The user is responsible for all changes and repairs made to the device.
- All new components must be provided by Siemens Industry, Inc.
- Restrict repair to faulty components only.
- Do not re-use faulty components.

Appendix

A.1 Certificates

Certificates are posted on the Internet and on the manual collection shipped with the device.

See also

Certificates (<http://www.siemens.com/processinstrumentation/certificates>)

A.2 Ordering

In order to ensure that the ordering data you are using is not outdated, the latest ordering data is always available on the Internet: Catalog process instrumentation (<http://www.siemens.com/processinstrumentation/catalogs>)

See also

Process instrumentation catalog (<http://www.siemens.com/processinstrumentation/catalogs>)

A.3 I/O Connections and Wiring

Terminal Block Wiring - 7ME39400AL01 I/O Module

(Refer to manual drawing 1010N-2-7 sheet 2 of 2)

These connection diagrams apply to the part numbers listed below.

Table A- 1 Connection Diagrams and Part Numbers

1010N-2-7 (Sheet 2 of 2) Drawing	
FUG1010	7ME361* - * A or (Z=J1A) * = standard options

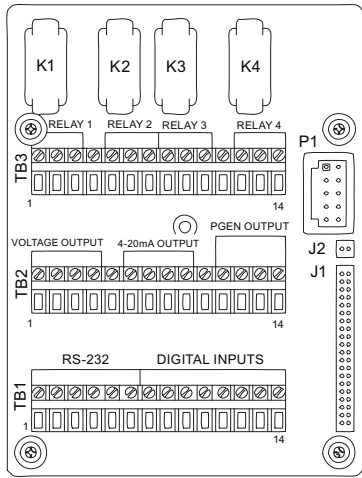
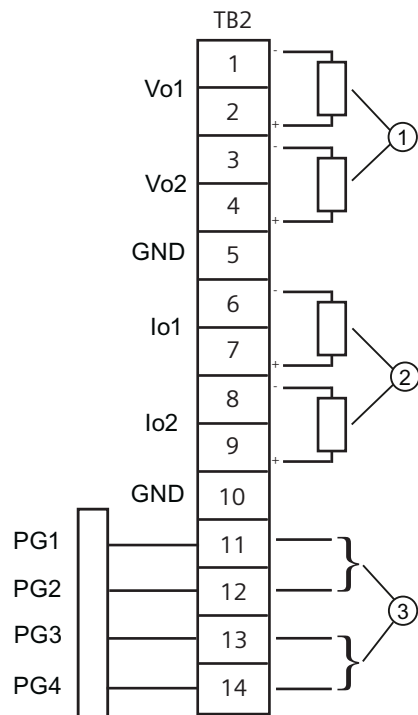


Figure A-1 7ME39400AL01 I/O Module

Table A-2 Input/Output Wiring (TB2) - 7ME3900AL01

Pin#	Signal	Description	Definition	Function
1	Vo1+	Meter process variables are assigned to individual outputs under menu control.	0-10 Volt Analog Output	System outputs assignable and scalable to flow related parameters. CGND is for cable shield terminations.
2	Vo1-		Ref. Ground	
3	Vo2+		0-10 Volt Analog Output	
4	Vo2-		Ref. Ground	
5	CGND		Chassis GND	
6	Io1+		4-20mA Output 1	
7	Io1-		Isolated Return	
8	Io2+		4-20mA Output 2	
9	Io2-		Isolated Return	
10	CGND		Chassis GND	
11	PG1	0 -5000Hz Frequency output; assignable.	Frequency Output 1	NEG [-] Total OC
12	PG2		GND	NEG [-] Total TTL
13	PG3		Frequency Output 2	POS [+] Total OC
14	PG4		GND	POS [+] Total TTL



① 0-10Vdc, Load 10K ohm (min)

② 4-20 mA, Load 1K ohm (max)

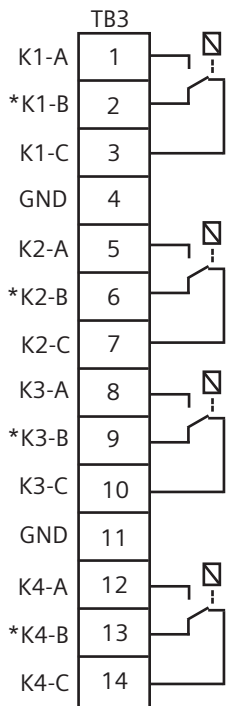
- ③ TB2-11 - NEG [-] Total OC (GND TB2-2)
- TB2-12 - NEG [-] Total TTL (GND TB2-2)
- TB2-13 - POS [+] Total OC (GND TB2-2)
- TB2-14 - POS [+] Total TTL (GND TB2-2)

Appendix

A.3 I/O Connections and Wiring

Table A- 3 Input/Output Wiring (TB3) - 7ME3900AL01 I/O Module

Pin#	Signal	Definition	Description	Function Dual Path Only	Function Quad Path Only
1	K1 A	Relay 1 Normally Open	Relay 1	Alarm or control functions set by CH 3.	Alarm or control functions set by CH5.
2	K1 B	Relay 1 Normally Closed (7ME39400AL00 only)			
3	K1 C	Relay 1 Common			
4	GND	Digital Return (GND)	DGND		
5	K2 A	Relay 2 Normally Open	Relay 2	Alarm or control functions set by CH 3.	Alarm or control functions set by CH5.
6	K2 B	Relay 2 Normally Closed (7ME39400AL00 only)			
7	K2 C	Relay 2 Common			
8	K3 A	Relay 3 Normally Open	Relay 3	Alarm or control functions set by CH 3.	Alarm or control functions set by CH5.
9	K3 B	Relay 3 Normally Closed (7ME39400AL00 only)			
10	K3 C	Relay 3 Common			
11	GND	Digital Return (GND)	DGND		
12	K4 A	Relay 4 Normally Open	Relay 4	Alarm or control functions set by CH 3.	Alarm or control functions set by CH5.
13	K4 B	Relay 4 Normally Closed (7ME39400AL00 only)			
14	K4 C	Relay 4 Common			



Note

Relays are shown in Power OFF position, which is the same as the alarm assertion position.

*7ME39400AL00 Mercury Relay only available with Normally Open.

Terminal Block Wiring - 7ME39400AL04 Expanded I/O Module

(Refer to manual drawing 1010N-7-7 sheet 2 of 2)

These connection diagrams apply to the part numbers listed below.

Table A- 4 Connection Diagrams and Part Numbers

1010N-7-7 (Sheet 2 of 2) Drawing	
FUG1010	7ME361* - * B or (Z=J1D) where: * = standard options

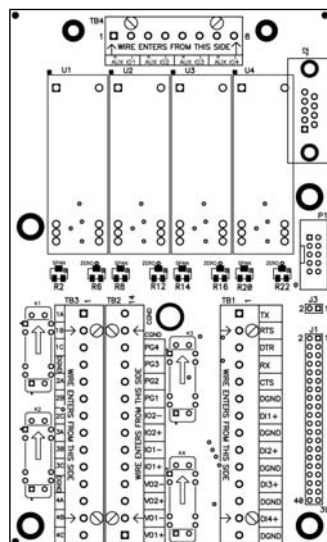
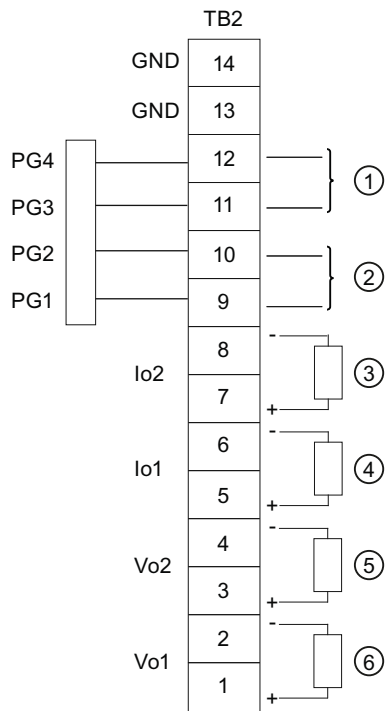


Figure A-2 7ME39400AL04 Expanded I/O Module

Table A- 5 Input/Output Wiring (TB2) - 7ME39400AL04 Expanded I/O Module

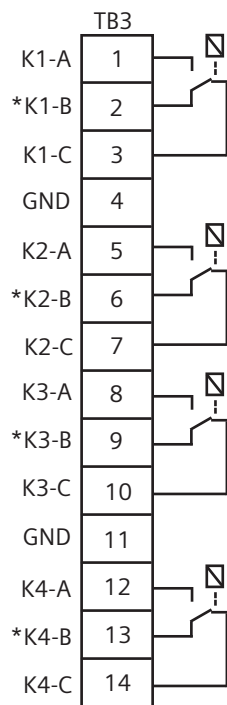
Pin#	Signal	Definition	Description	Function Dual/Quad Path Only
14		Chassis Ground	Chassis Ground	Cable Shield Terminations
13		Chassis Ground	Chassis Ground	Cable Shield Terminations
12	PG4	POS [+] Total TTL	0-5000 Hz frequency output , assignable	POS [+] Total TTL
11	PG3	POS [+] Total OC		POS [+] Total OC
10	PG2	NEG [-] Total TTL		NEG [-] Total TTL
9	PG1	NEG [-] Total OC		NEG [-] Total OC
8	Io2 (-)	Isolated Return	Flowmeter process variables assigned to individual outputs under menu control.	System outputs assignable & scalable to flow related parameters. OC = Open collector
7	Io2 (+)	4-20mA Output 2		
6	Io1 (-)	Isolated Return		
5	Io1 (+)	4-20mA Output 1		
4	Vo2-	Ref. Ground		
3	Vo2+	0-10 Volt Output		
2	Vo1-	Ref. Ground		
1	Vo1+	0-10 Volt Output		



- ① TB2-11 - POS [+] Total OC
TB2-12 - POS [+] Total TTL
- ② TB2-9 - NEG [-] Total OC
TB2-10 - NEG [-] Total TTL
- ③ 4-20 mA Load 1K ohm (max)
- ④ 4-20 mA Load 1K ohm (max)
- ⑤ 0-10V Load 10K ohm (min)
- ⑥ 0-10V Load 10K ohm (min)

Table A- 6 Input/Output Wiring (TB3) - 7ME39400AL04 Expanded I/O Module

Pin#	Signal	Definition	Description	Function Dual Path Only	Function Quad Path Only
1	K1 A	Relay 1 Normally Open	Relay 1	Alarm or control functions set by CH 3.	Alarm or control functions set by CH5.
2	K1 B	Relay 1 Normally Closed (7ME39400AL04 only)			
3	K1 C	Relay 1 Common			
4	GND	Digital Return (GND)	DGND		
5	K2 A	Relay 2 Normally Open	Relay 2	Alarm or control functions set by CH 3.	Alarm or control functions set by CH5.
6	K2 B	Relay 2 Normally Closed (7ME39400AL04 only)			
7	K2 C	Relay 2 Common			
8	K3 A	Relay 3 Normally Open	Relay 3	Alarm or control functions set by CH 3.	Alarm or control functions set by CH5.
9	K3 B	Relay 3 Normally Closed (7ME39400AL04 only)			
10	K3 C	Relay 3 Common			
11	GND	Digital Return (GND)	DGND		
12	K4 A	Relay 4 Normally Open	Relay 4	Alarm or control functions set by CH 3.	Alarm or control functions set by CH5.
13	K4 B	Relay 4 Normally Closed (7ME39400AL04 only)			
14	K4 C	Relay 4 Common			



Note

Relays are shown in Power OFF position, which is the same as the alarm assertion position.

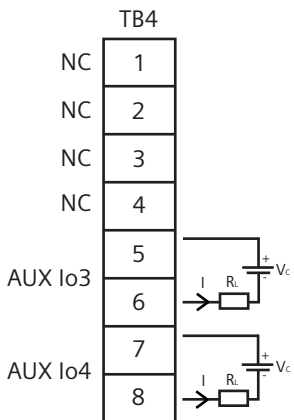
*7ME39400AL03 Mercury Relay only available with Normally Open.

Table A-7 Input/Output Wiring (TB4) - 7ME39400AL04 Expanded I/O Module

Pin#	Signal	Definition	Description
1		No Connection	
2		No Connection	
3		No Connection	
4		No Connection	
5	AUX Io3+	Isolated Loop Power Io3	Connect +30V max. Loop Supply here
6	AUX Io3-	Io3 4-20mA Output	Vo1+ Data Presented as 4-20mA
7	AUX Io4+	Isolated Loop Power Io4	Connect +30V max. Loop Supply here
8	AUX Io4-	Io4 4-20mA Output	Vo2+ Data Presented as 4-20mA

Note

Auxiliary 4-20mA loops are assigned and spanned under menu control of Vo and PGEN outputs.



V_c : 24 Vdc Typical (+15 Vdc to +30 Vdc max) Loop Power
R_L : 1000 ohms (max), Loop wire resistance plus user's input load resistance
$I = 4 - 20 \text{ mA}$

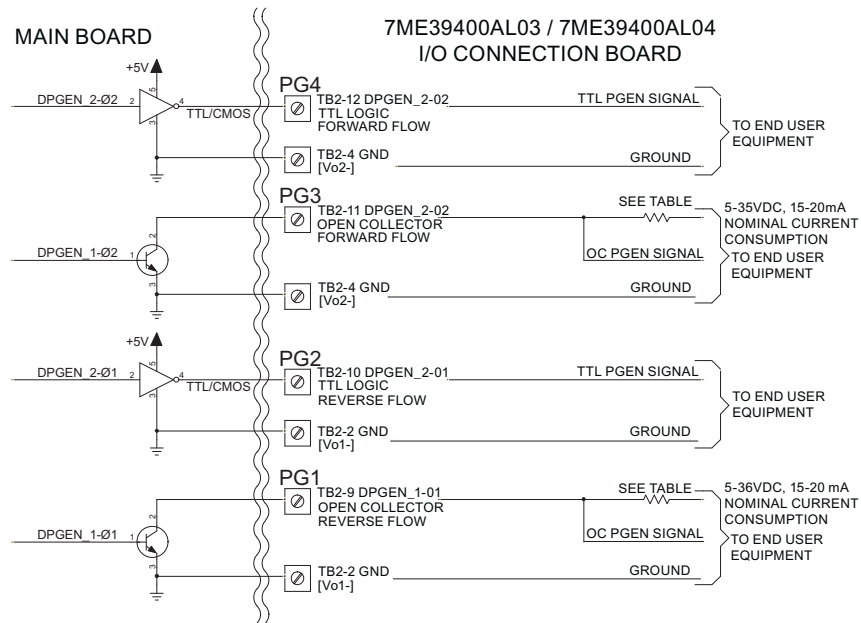


Table A- 8 Open Collector User Resistor Recommendations

User Supply Voltage (Vdc)	External Resistor (Ohms)	Expected Current Draw (mA)	Recommended Resistor Wattage (Watts)
5	270	18.5	1/2
9	510	17.6	1/2
12	680	17.6	1/2
18	1000	18	3/4
24	1500	16	1
28	1800	15.5	1 1/4
36	2400	15	1 1/4

Note

TB2-9 and TB2-11 are Open Collector Outputs that require external pull-up resistors for operation. See table for External Supply Voltage and suggested resistor value and ratings. Maximum current into the transistor is 100mA. Maximum Voltage is +36Vdc.

CAUTION
Negative voltages with respect to ground will permanently damage transistors.

Note

Expanded I/O 7ME39400AL04 TB3 Input/Output wiring is the same as I/O Module 7ME39400AL01 TB3 shown above.

A.4 RS-232 Connection

The hardware and software requirements for programming the SITRANS-F-1010 models require a PC connected to the RS-232 serial port. The serial interface cable includes 9-pin and 25-pin connectors to accommodate both types of IBM-compatible serial ports. A PC communication program such as HyperTerminal (Windows 95/98/NT/2000/XP) serves as the data entry interface. These programs reproduce the menu screens that would appear on the system's graphic screen. Once the serial interface is established you can choose to program a graphic display system using a PC and a communications program. However, note that the serial interface cable is an option.

Note

You can use a DOS-based communications program also. Make sure that your PC is loading the ANSI.SYS driver via your Config.sys file. Set the program's RS-232 parameters to match those of the flowmeter (see HyperTerminal example screen on the following pages).

Note

Many newer Laptop PCs are not equipped with serial ports and only have USB ports. These PCs will require a USB RS-232 adaptor that can be purchased commercially.

The RS-232 Interface Cable

The physical connection between the flowmeter and your PC is accomplished using a serial interface cable, part number: 1015CPC-N. The schematic below shows the configuration of the cable. The wire ends for the flowmeter termination are tinned for easy insertion into TB1 on the flowmeter. Each wire is labeled to identify the correct terminal pin on TB1. In addition, both connectors have their CTS pin shorted to the RTS pin (pins 4 - 5 on 25-pin connector and pins 7 - 8 on 9-pin connector) and this eliminates the need for hardware "handshaking."

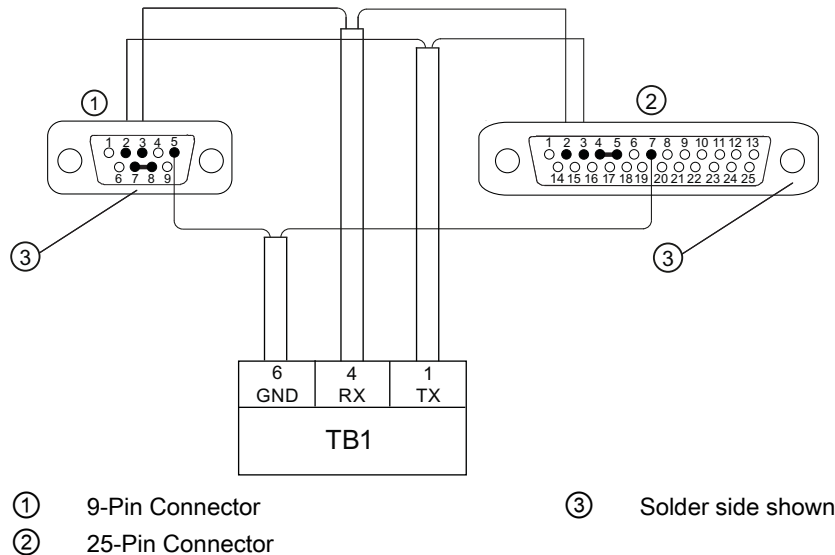


Figure A-3 1015CPC-N Serial Interface Cable

Due to the different SITRANS F 1010 flowmeter configurations, there are 3 types of RS-232 communication cables employed. You can determine which cable is required for your model flowmeter from the table below. Be sure you have the appropriate cable available for use.

For those who would prefer to make the cables themselves, the required parts (except for the RS-232 connector for the FUP1010WP flowmeter types) should be available at most computer or electronics stores. You will find drawings of the terminations for these cables with the reference table below. It provides the signal names, PC termination and SITRANS F 1010 flowmeter termination for each type of flowmeter.

Flowmeter Type	Cable Type	Siemens Part Number	Notes
Weatherproof Portable	DB-9F - Amphenol	CQO:1015CPC-WP	Except Energy Flowmeter
FUE1010/FUP1010	DB-9F - DB-9F	CQO:1015CPC-P	Use for Energy WP
All NEMA 4X	DB-9F - 3 Wire	CQO:1015CPC-N	
NEMA 4X with Expanded I/O Module	DB-9F - DB-9F	CQO:1015CPC-P	For FUS1010 N with A1 option (1010N-7 module)
FUS1010 NEMA 7 Compact	DB-9F - 3 Wire	CQO:1015CPC-N	

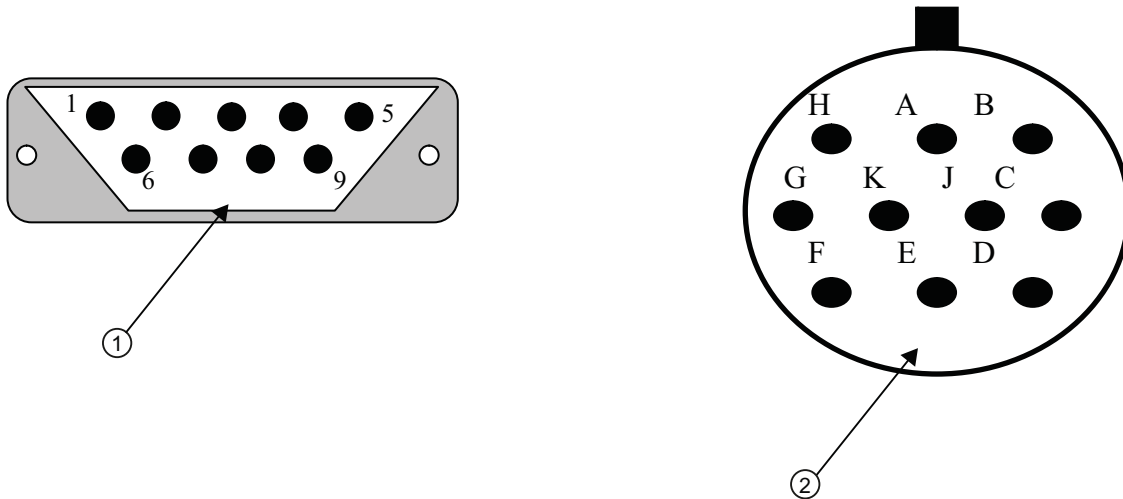
Also, in most computer stores or online, you will be able to find or you may already have a serial "LapLink" cable or "Null Modem" cable. These cables can be used to communicate with the 1010P/DP systems.

If you purchased a 1010W model, you may have received the special connector used for the RS-232 terminal in a packet included with your 1010W. This will enable you to construct the appropriate cable for this flowmeter type.

If you prefer to construct your own cable, the following conventions apply in the table:

- PC: Refers to an IBM compatible, DB-9 serial Com port.
- FUS1010 NEMA 4: Includes all models (N, DN, MN, FUE, EXCEPT those with "A1" option). Termination is made to the 1010N-2 I/O Data Module. Flowmeter end of cable is un-terminated wire.
- FUS1010 NEMA 4 With "A1" Option: Flowmeters that carry "A1" option have 1010N-7 module installed that houses a DB-9 connector for RS-232 communication.
- FUP1010 IP67: Includes all models (P/DP). Termination is made to the RS-232 port DB-9 connector. A DB-9 Female connector is needed to mate with the flowmeter connector.
- FUP1010 WP: Includes all models (WP, WDP except energy meters). Termination is made to the RS-232 port on the connector panel. A special cable terminal is required and can be obtained from Siemens (Part #1015XWP).
- FUS1010X Compact: Includes all models (X, DX). Termination is made to the 1010X-8 I/O module Terminal TB2. Flowmeter end of cable is un-terminated wire.

Signal Name	PC DB-9 Terminal	1010P Terminal	1010WP Terminal	1010N Terminal	1010X Terminal
Ground	Pin 5	Pin 5	Pin E	TB1-pin 6	TB2-pin 16
Tx	Pin 2	Pin 3	Pin C	TB1-pin 1	TB2-pin 11
Rx	Pin 3	Pin 2	Pin B	TB1-pin4	TB2-pin 14



- ① PC DB-9 Connector
1010P/990P Connector
(Wiring Side View)
- ② 1010WP/WDP Connector
(Wiring Side View)

Communicating with SITRANS F 1010 Systems via the RS-232 Interface

The following sections assume that you are familiar with the basics of using Windows 95/98/NT/2000/XP based communications program. All PC computers provide at least one serial port using either a 9-pin or 25-pin D-type connector. The port designation can be either COM 1 or COM 2. Usually, when a computer includes two serial ports, COM 1 will be the 9-pin connector and COM 2 will be the 25-pin connector. However, port designations can vary from manufacturer to manufacturer, so you will have to positively identify the COM port you wish to use for the flowmeter interface. Connect the cable between the flowmeter and your PC using the 25-pin, 9-pin or USB to RS-232 adapter connector, depending upon the port's architecture.

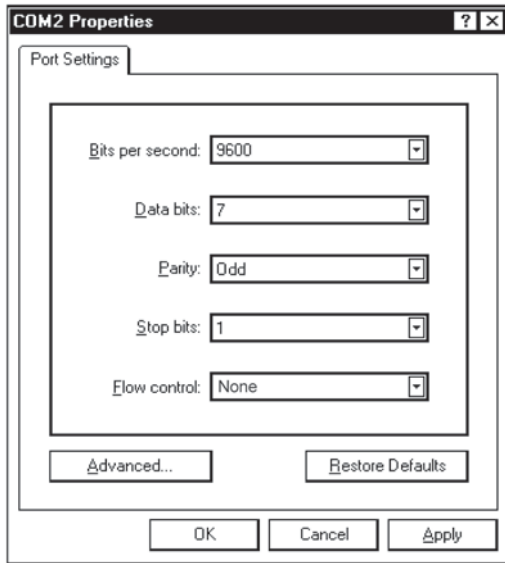
How to use the Windows HyperTerminal Program

Windows provides a communication program called HyperTerminal, which is ideal for interfacing your computer with the flowmeter. The following typical example explains how to set up HyperTerminal.

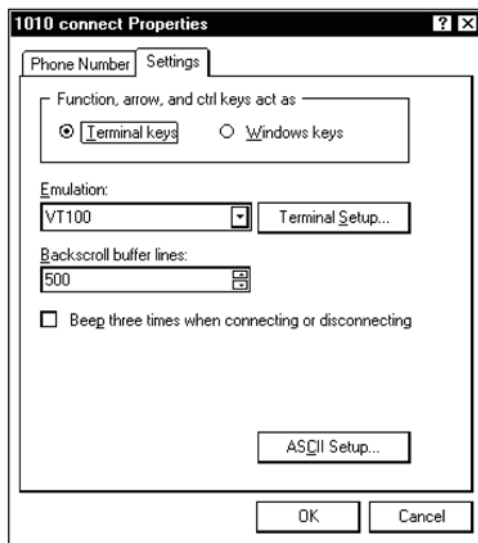
Note

Depending upon the Windows applications being used this setup procedure may vary.

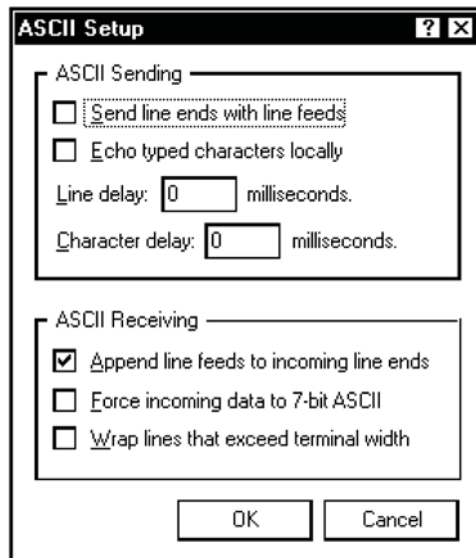
1. From the Windows desktop, left-click on the [START] button.
2. Holding down the left mouse button, move the highlight up to [Programs], then across to [Accessories]. Slide the highlight down to [HyperTerminal], then release the left mouse button.
3. Within the HyperTerminal window, move the mouse pointer down to [Hyperterm.exe] and then double-click the left mouse button.
4. This selects the [Connection Description] dialog box. Enter a name for your connection (e.g., 1010N). You can optionally select an icon for this connection by clicking on one of the icons displayed in the scrolling frame at the bottom of the window. Click [OK].
5. This selects the [Phone Number] dialog box. Move the cursor to the arrow at the right of the [Connect Using] field. Left click on the arrow to expand the field and then move the highlight down to [Direct to Com 1 (or 2)] depending on the port connected to the interface cable. Click [OK] to select the [Com 1 (or 2) Properties] Dialog box. Set up your RS-232 parameters as shown in the example below. Left-click on the [OK] button.



6. You will now see a blank terminal screen. Next left-click [File] on the top menu bar. Drag the highlight down to [Properties] and then left-click.
7. Left-click the [Settings] tab. Expand the [Emulation] box by left-clicking the <Down Arrow> on the right-hand side. Drag the highlight down to [VT-100] and then left-click to select it (as shown below).



8. Next, left-click on the [ASCII Setup] button (see screen above). In the [ASCII Sending] dialog box, make sure that both [send line ends with line feeds] and [Echo Typed characters locally] are UNCHECKED. In the [ASCII Receiving] dialog box, left-click to place a check mark before the [Append line feeds to incoming line ends] dialog. When your screen looks like the example below, left-click the [OK] button.



9. You are now ready to communicate with the 1010 flowmeter. But first, save your settings by moving the mouse cursor to [File], sliding the cursor to [Save], then clicking [OK] on the Save dialog box.

10. The next time you want to use HyperTerminal:

- Click on Start.
- Drag to Programs.
- Drag to Accessories. Drag to HyperTerminal, and click.
- Double-click the icon you selected for the connection.

Note

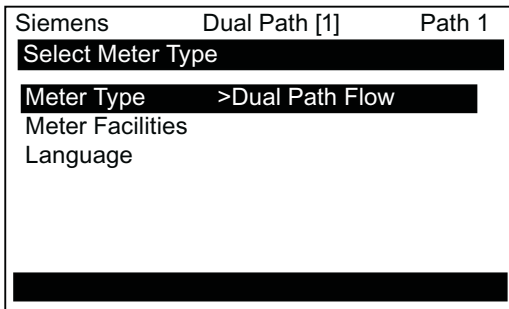
For easier access, create a shortcut to the connect icon from your desktop. Right-click on the icon to open its dialog box. Left-click on [Copy] or [Create a Short Cut] and then move the mouse cursor to a blank area on your desktop. Right-click to open dialog box and then left-click on [Paste] to place a shortcut to the connect icon on your desktop.

Accessing the Installation Menu

Once the parameters are set, HyperTerminal automatically initiates Command mode. You will see a blank screen.

1. Press <ENT> a few times until you see [? For Help] on the screen.
2. Type: ? (question mark) and then press <ENT> to see a list of the available commands.

Use the MENU command (type [Menu] and then press <ENT>) to access the top level of the Installation Menu. You will see a screen similar to the example below.

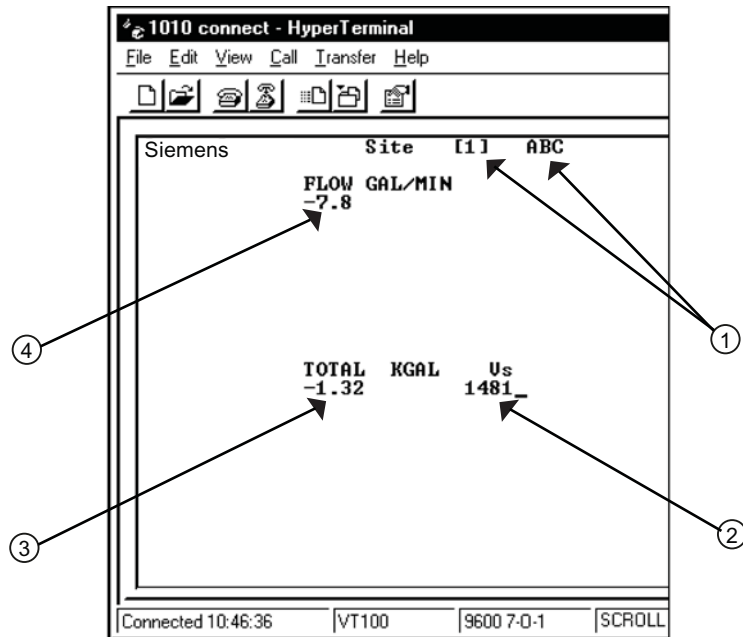


Note

To facilitate connecting through modems, the [Menu] command times out after three minutes of inactivity. To maintain a longer connection type: Menu 1000 and press <ENT>. The optional number is the amount in minutes that the connection will be maintained. Typing [Menu 1000] essentially keeps the interface active until you cancel it.

Data Display Mode

After you complete the installation, you can toggle between Installation Menu mode to Data Display mode. This is the same as using the <MENU> key on the keypad (see manual). The PC keyboard equivalent to the <MENU> key is <CTRL> + <L>. Note that the RS-232 interface does not support graphics. Therefore, when you use HyperTerminal to view the data display screens, you will see the same data in alphanumeric form only (as shown below). You can still use the <Up Arrow> and <Down Arrow> to switch between available display screens.



- ① Current active site setup name. The [1] indicates that the measurement channel is active.
- ② The current measured liquid sonic velocity.
- ③ The flow Total display.
- ④ The current flow reading and flow units.

Navigating through the Installation Menu

After accessing the Installation Menu, you can begin to setup your flowmeter according to the instructions in this manual. The chart below shows the PC keyboard equivalents to the keypad keys while you are in the menu.

SITRANS F 1010 Keypad	PC Keyboard	Description
<Up Arrow>	<Up Arrow>	Move up 1 menu cell (or Flow Display screen)
<Down Arrow>	<Down Arrow>	Move down 1 menu cell (or Flow Display screen)
<Right Arrow>	<Right Arrow>	Move right 1 menu cell (or Flow Display screen)
<Left Arrow>	<Left Arrow>	Move left 1 menu cell (or Flow Display screen)
<MENU>	^L (Ctrl L)	Toggle between Menu and Flow Display
<Datalog>	^D (Ctrl D)	Generate Datalogger report
<CLR>	<Backspace> or 	Deselect list selection
<ALT+Up Arrow>	^U (Ctrl U)	Logger Display Page Advance
<+/-> (chg sign)	(bar, shift + backslash)	Change numeric sign. Can also type (-) key
<ENT>	<Carriage Return>	Enter Key
Digits	Digits	Numerals zero through 9
/	/	Divide by
X	* (upper case 8)	Multiply by
+	+	Plus
-	-	Minus
=	=	Equals
.	.	Decimal Point

Terminal Mode Menu Commands

In addition to Menu, the following commands (followed by the <ENT> key) can be used to control the flowmeter while in Terminal Mode.

Note

The "n" refers to the flowmeter Channel number. For a 2-Channel Arithmetic site (Ch1 + Ch2 or Ch1 – Ch2) the virtual Channel is number 3.

Logger

Invokes the download of all data stored in the Datalogger. Note that the Datalogger data is not erased from the flowmeter memory when it is downloaded. It is recommended to capture this information into a file with a "csv" extension, which can be easily imported into MS EXCEL.

SITE

Invokes a full site download for a single channel or multi-path 1010 flowmeter.

SITE "n"

Invokes a site download for channel "n", where "n" = the Channel # (1, 2, 3, 4, etc.).

DP "n"

Commands the flowmeter to download the digitized receive signal data for Channel or Path "n".

CLRTOT

Clears the Totalizer for a single channel or multi-path 1010 flowmeter.

CLRTOT "n"

Clears the Totalizer for Channel "n" of a multi-channel flowmeter.

Lf on

Turns on the Line Feed at the end of any text string sent by the flowmeter.

Lf off

Turns off the Line Feed at the end of any text string sent by the flowmeter.

?

Provides a list of available Terminal Mode flowmeter commands.

Transferring information from a 1010 Flowmeter to the PC

With HyperTerminal active:

1. Point to [Transfers], and click.
2. Select [Capture Text].
3. Select desired drive path or directory, enter a file name, and click the Start button.
4. Use the following conventions for data file names:
 - For site data or Wave shape data: filename.txt
 - For Datalogger data: filename.csv
5. On PC type the proper command for the data desired (Logger, Site, or DP) and then [Enter].
6. The data should begin streaming on the HyperTerminal screen.

7. Wait for EOT (End Of Transmission) to be displayed.
8. Close the file by pointing to Transfer, drag to Capture Text and click Stop button.

Closing the Terminal or HyperTerminal Program

You may now close the Terminal program. The file(s) you have downloaded are now saved in the location you selected. You may now import the file you have saved into the appropriate program (i.e. MS Word for site data, or MS Excel for Datalogger or wave shape data for graphing or analysis).

The Datalogger contains data that has its fields separated by commas. By using the file extension ".csv" (comma separated values) suggested earlier, the data will import directly into MS Excel without any further modification. For the wave shape data, the fields are separated by spaces, therefore, it is best to save those files as .txt and then use the MS Excel Import Wizard to select "Space Delimiters" for importation of the data.

Site data is downloaded in plain text and can be imported directly into MS Word.

Reset Procedure for Blind Systems

SITRANS F 1010 Blind systems allow you to perform a system reset via the RS-232 interface. The following instructions require the flowmeter to be connected serially to a PC.

Note

Custom RS-232 settings for baud rate, parity and data bits may not be preserved. Therefore, be prepared to set your communications program back to the default (9600, Odd, 7) settings.

To Clear Active Memory using the RS-232 Interface

1. Turn off power (if it is currently on). Turn power on. As soon as you apply power, immediately type the @ character three times. The prompt: **[Clr Active Memory? No]** appears at the top of the screen.
2. Press the <Right Arrow> and then the <Down Arrow> to switch the option list to: **[Clr Active Memory? Yes]** Press <ENT> to clear all Active Site Data (but not saved site setups).
3. To restore operation, press <MENU> to access the Installation Menu. Create a new site setup or recall a stored site setup. Re-select any Meter Facilities items (e.g., RS-232 setup parameters).

To Clear All Saved Data using the RS-232 Interface

CAUTION

Before proceeding further, it is essential to understand that this function eliminates all data stored in RAM. This means that all saved site setups, including the site data of a flow-calibrated site, will be erased! Also, the entire Datalogger file plus any custom factory or user-created pipe or sensor tables will be eliminated. The impact of this is such that we strongly recommend that you consult our technical service department before continuing with this procedure. If you choose to continue, be aware that you will have to create a new site setup, re-enter all site specific parameters including pipe or sensor tables, plus all desired Meter Facilities entries.

1. Turn off power (if it is currently on).
2. Turn the power on. As soon as you apply power, type the @ character three times.

The prompt: **[Clr Active Memory?]** appears at the top of the screen. Press the <Down Arrow>.

Note

Note that the prompt switches to **[Clr Saved Data? No]**.

3. Press the <Right Arrow> and then the <Down Arrow> to switch the option list to: **[Clr Saved Data? Yes]**.
4. Press <ENT> to clear all Saved Site Data, Datalogger Data, user created Pipe Data and Sensor Data.
5. To restore operation, press <MENU> to access the Installation Menu. Create a new site setup or recall a stored site setup. Reselect any Meter Facilities items (e.g., RS-232 setup parameters).

A.5 Flowrate Calibration and Calibration Tables

Flowrate Calibration Methods

SITRANS F 1010 equipment provides three ways to condition the calibration performance of its flowrate output: Intrinsic (factory set), Kc, and Calibration Tables 1 through 3. Access to these calibration options is found in the [Calibrate Flowrate] menu cell and the three [Calib. Table] menu cells of the [Span/Set/Cal] menu.

Intrinsic

When selected, the flowmeter uses no slope adjustment at all. Output data is still zeroed and corrected for Reynolds number, but no slope adjustment is imposed on the flowmeter's flow register.

Some applications may require an output adjustment to match an official external reference. The [Calibrate Flowrate] menu allows you to select a calibration mode. The right-hand column shows the active calibration mode. You can select Intrinsic (factory) and Kc (Slope Correction) Calibration. Selecting either of the external calibration modes will not eliminate the Intrinsic (factory) calibration. You can use this menu cell to switch between Intrinsic and Kc at any time.

Kc Calibration

For most applications, the measured flow range produces a linear meter response. Therefore, the Kc (slope correction) calibration is the preferred method since it only requires a single correction factor for all the flow rates encountered.

Note

Changing the calibration can cause profound changes in flowmeter operating characteristics. Use only the most respected flow standard to obtain a correction factor. The percentage entered must provide an accurate and consistent shift across the entire flow range anticipated for the application.

Kc Factor

To obtain the Kc factor, compare flow total data taken simultaneously from the flowmeter and a reference meter whose accuracy meets the required standard. Allow both meters to accumulate flow total data long enough to average out any differences due to flow fluctuation between the two meter locations. Compare outputs of the two totalizers to determine percentage increase (+) or decrease (-) that is necessary to produce the best average correlation between the flowmeter and the reference standard.

Selecting the Kc Factor

When the [Kc] menu cell is selected, the flowmeter imposes this percentage slope adjustment of its rate output. Output data is zeroed and corrected for the Reynolds number (flow profile compensated), however, a percent change in the rate output is imposed based on the data entered in this cell. The number entered by the user is evaluated into a slope correction factor by dividing it by 100 and algebraically adding it to 1. The resulting factor is used as a multiplier on the rate register of the instrument. Thus an entry of -3% will multiply the rate register by 0.97, for example.

To calculate Kc:

$$Kc = \left[\frac{\text{Actual Rate}}{\text{Indicated Rate}} - 1 \right] \times 100$$

To enter the Kc Factor

1. To enable numeric entry press <Right>.
2. Use the numeric keys to type the required Kc (as calculated above). Note that the Kc value can be negative or positive. Enter the - or + sign first, then type in the calibrated value.
3. To store the data press <ENT>. Note that Kc now appears in the right-hand column of the [Calibrate Flow Rate] menu cell with its new value. Also note that this Kc value can be viewed on the site printout.

Calibration Tables 1 through 3

SITRANS F 1010 instruments offer a unique methodology by which a particular flow response of an instrument may be linearized or optimized by tabulating the results of a series of calibration exercises or collected batch data points. Basically, the flowmeter allows the user to select any of a wide variety of system variables (flowrate, pressure, viscosity, etc.) as a pointer into a table of calibration factors (up to 32). As the system variable is updated, the value of the table's output factors (or positive and negative flow) is re-evaluated and used as a modifier for the current rate register. Note that the flow register is still zeroed and Reynolds number compensated normally and these slope corrections are in addition to these fundamentals.

Note

Kc is still active when this method is being used.

To install a Calibration table:

1. The user selects a system variable that appears to correlate strongly with calibration shifts observed.
2. A table of values is formed comprised of the values that this index could assume over the range of system operation. Remember, the tables created do not extrapolate beyond their end points, they "clip."
3. A calibration factor, a number usually close to 1.00, is entered as a positive and a negative flowrate correction factor (termed PosFlow Corr and NegFlow Corr) for each of the desired index points.

The table may contain up to 32 pairs of these slope correction factors. Note that the Kc factor, unlike these slope correction factors, is entered as a signed percent change in rate, while these factors are simply rate multipliers. As points are entered, the point editor will provide list access to the already entered points plus access to the [New Point] menu cell, used to add a new point. The table may be created in its entirety and then activated by selecting [Yes] in the [Table Active] menu cell. The entire table may be cleared by selecting [Yes] in the [Clear Table] menu cell.

Note

Careless use of the calibration tables can have a detrimental impact on the measurement performance of the flowmeter.

Note

Take precautions before enabling these calibration tables. Although it is unlikely that all three tables would ever be employed in a real installation, three tables are offered for maximum user flexibility. Since the tables can be disabled without being destroyed, 2 or 3 optimization strategies may be tested by this means in order to determine which approach is most effective.

A.6 Setting Thermal Coefficient and Modulus of Elasticity

Introduction

This operating system includes routines that will compensate the measured raw flow rate for dynamic changes in the pipe dimensions, caused by variations in line temperature and pressure supplied to the flowmeter. To account for variations in pipe material, two data entry items (Thermal Expansion Coefficient and Modulus of Elasticity) are provided in the Pipe Data menu screen (see sample menu screen below).

The equation used to automatically compute the change in pipe inside diameter is:

$$d_1 = d_0(1 + \alpha(T_1 - T_0)) * \left(1 + d_0 \frac{(P_1 - P_0)}{E_w}\right)$$

Where:

d_0 = inside diameter of pipe at STP

d_1 = inside diameter of pipe after temperature and pressure change

w = pipe wall thickness

T_0 and P_0 = Standard temperature and pressure

T_1 and P_1 = Operating temperature and pressure

α = Coefficient of Thermal Expansion of Pipe material

E = Modulus of Elasticity of pipe material

Siemens Dual Path [1] ABC	
Pipe Thermal Expansion Factor (1.0e-6)	
Pick Pipe Class	ASA Carb. Steel
Select Pipe Size	8CS40
Pipe OD <in>	8.625
Pipe Material	Steel
Wall Thickness	0.322
Liner Material	None
Linear Thickness	0.000
ThermExp Coef 1/F	0.00
Mod of Elast PSI	0.00
Pipe Data	

① Use this menu cell to change the Modulus Of Elasticity of the pipe wall.

② Use this menu cell to edit the Thermal Expansion Coefficient of the pipe wall.

The default value for each of these new parameters is 0.0. A value of zero effectively disables the pressure and temperature pipe volume compensation routine. When entering a value for the thermal expansion coefficient and modulus of elasticity, keep in mind that the numeric entry already includes an exponent multiplier. For the Thermal Expansion Coefficient the multiplier is 10^{-6} and for the Modulus of Elasticity the multiplier is 10^6 .

Typical values for each parameter are shown below:

Pipe Material	Thermal Expansion	Modulus of Elasticity
Mild Carbon Steel	$6.20 \times 10^{-6} \text{ F}^{-1}$ ($11.16 \times 10^{-6} \text{ C}^{-1}$)	$30 \times 10^6 \text{ psi}$ $2.07 \times 10^6 \text{ bar}$
304 Stainless	$9.60 \times 10^{-6} \text{ F}^{-1}$ ($17.28 \times 10^{-6} \text{ C}^{-1}$)	$28 \times 10^6 \text{ psi}$ $1.93 \times 10^6 \text{ bar}$
316 Stainless	$8.83 \times 10^{-6} \text{ F}^{-1}$ ($15.89 \times 10^{-6} \text{ C}^{-1}$)	$28 \times 10^6 \text{ psi}$ $1.93 \times 10^6 \text{ bar}$

Note

Do not enter exponents of above values.

[ThermExp Coef 1/F]

Use this menu cell to set the Thermal Expansion Coefficient.

Entering the Thermal Expansion Coefficient value:

1. In the [Pipe Data] menu, scroll down to highlight [ThermExp Coef 1/F].
2. To enable numeric entry press <Right Arrow>.
3. Use the number keys to type the Thermal Coefficient value.
4. To register the data press <ENT>.

Mod of Elast PSI

Use this menu cell to set the Modular Elasticity in PSI.

Entering the Modulus of Elasticity value:

1. In the [Pipe Data] menu, scroll down to highlight [Mod of Elast PSI].
2. To enable numeric entry press <Right Arrow>.
3. Use the number keys to type the Modular Elasticity PSI value.
4. To register the data press <ENT>.

Appendix

B.1 Installation/Outline Drawings

The following are the installation and outline drawings for the SITRANS FUG1010 NEMA 4X flowmeter.

1010NS2-7 Rev D - Installation Drawing, 1010 Series Flow Computer, Agency Approved

1010N-7-7 Rev 05 - Installation Wiring, Expanded I/O Module

1010N-2-7 Rev 03 - Installation Wiring, I/O Module

1010N-5S2-7 Rev D - Installation Drawing, Analog Input Module

1010N-5DS2-7 Rev D - Installation Drawing, Analog Input Module

1010N-8MS2-7 Rev B - Installation Wiring, I/O Module

1010-304 Rev 14 - Connection Diagram for Hazardous Area Use, Agency Approved, 1010NS2/1010MNS2 Series Flow Computer

1010WX-S2-7 Rev A - Installation Drawing, 1010 Series Single/Dual Channel Flow Computer, Agency Approved

1010MNS2-7 Rev C - Installation Drawing, 1010 Series Multi-Channel Flow Computer, Agency Approved

1010MWX-S2-7 Rev A - Installation Drawing, 1010 Series Multi-Channel Flow Computer, Agency Approved

1010-443 Rev 05 - Connection Diagram for Hazardous Area Use, Agency Approved, 1010WX-S2 Series Flow Computer

1010NS9-7 Rev A - Installation Drawing, 1010 Series Flow Computer, Agency Approved

1010MNS9-7 Rev A - Installation Drawing, 1010 Series Multi-Channel Flow Computer, Agency Approved

1010-389 Rev 05 - Connection Diagram, Agency Approved for Hazardous Area Use, 1010NS9/1010MNS9 Series Flow Computer

1010-391 Rev C - Connection Diagram, Agency Approved for Zone 2 Connections, 1010NS9 Flow Computer System

1011NS2-7 Rev D - Installation Guide, Connection Diagram Selection, Agency Approved, 1011N Series Transducers

1011NS9-7 Rev C1 - Installation Guide, Connection Diagram Selection, Agency Approved, 1011N Series Transducers

1011NFPS-7 Rev B - Installation Drawing, 1011NPFS Series dedicated Plastic Body Transducer

1011HNS2-7 Rev D - Installation Guide, Connection Diagram Selection, Agency Approved, 1011HN Series Transducers

1011HNS9-7 Rev C1 - Installation Guide, Connection Diagram Selection, Agency Approved, 1011HN Series Transducers

1011HNFS-7 Rev 02 - Installation, 1011HNFS Series Dedicated Plastic Body Transducer

1012F-DB-7 Rev B - Installation Drawing, Dual Path Transducer Set w/Mounting Frames

1012MS-8 Rev F - Installation/Outline, Adjustable Mounting Strap

1012TN-7 Rev A - Installation Drawing, 1010 Series Transducers and Mounting Tracks

1012TNH-7 Rev A - Installation Drawing, 1010 Series Transducer and Mounting Tracks

991TDS2-7 Rev 03 - Installation Drawing, 991TD Temperature Sensor, Submersible, Agency Approved

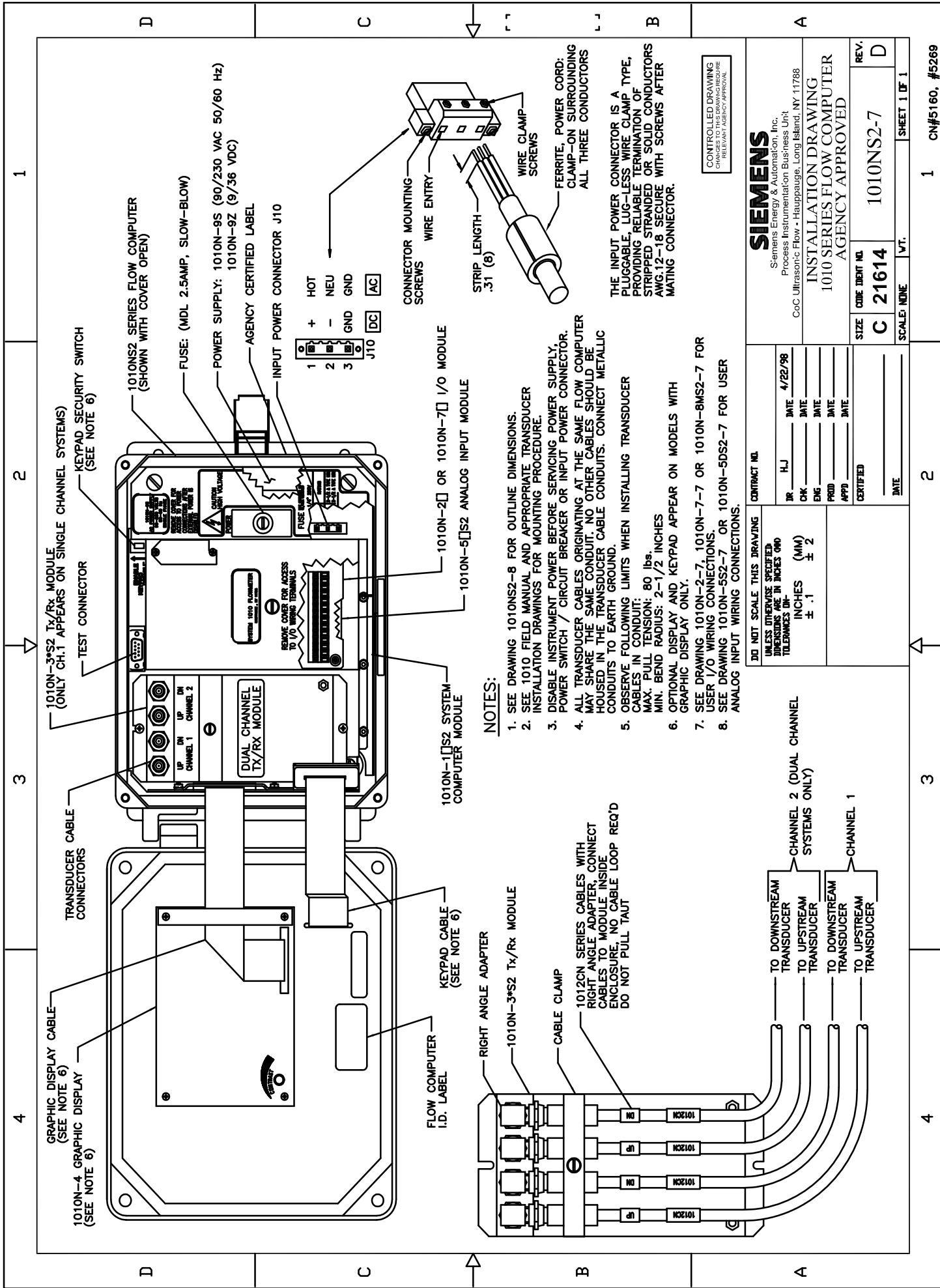
1012WS-8 Rev G- Outline Drawing, Weld Seal Clamp-On Transducer Enclosure

1012WSM-8 Rev D- Installation/Outline, Adjustable Mounting Strap

1012WS-1-7 Rev B- Weld Seal Installation Instructions, Single Enclosure

1012WS-2-7 Rev B- Weld Seal Installation Instructions, Dual Enclosure

CC129-7 Rev A - Installation, CC129 Dry Film Couplant



CONTROLLED DRAWING
CHANGES TO THIS DRAWING REQUIRE
RELEVANT AGENCY APPROVAL

SIEMENS
Siemens Energy & Automation, Inc.
Process Instrumentation Business Unit
CoC, Ultrasonic Flow - Hauppauge, Long Island, NY 11788

INSTALLATION DRAWING
1010 SERIES FLOW COMPUTER
AGENCY APPROVED

SIZE	CODE IDENT NO.	REV.
C	21614	1010NS2-7
SCALE: NONE	VT.	SHEET 1 OF 1

NOTES:

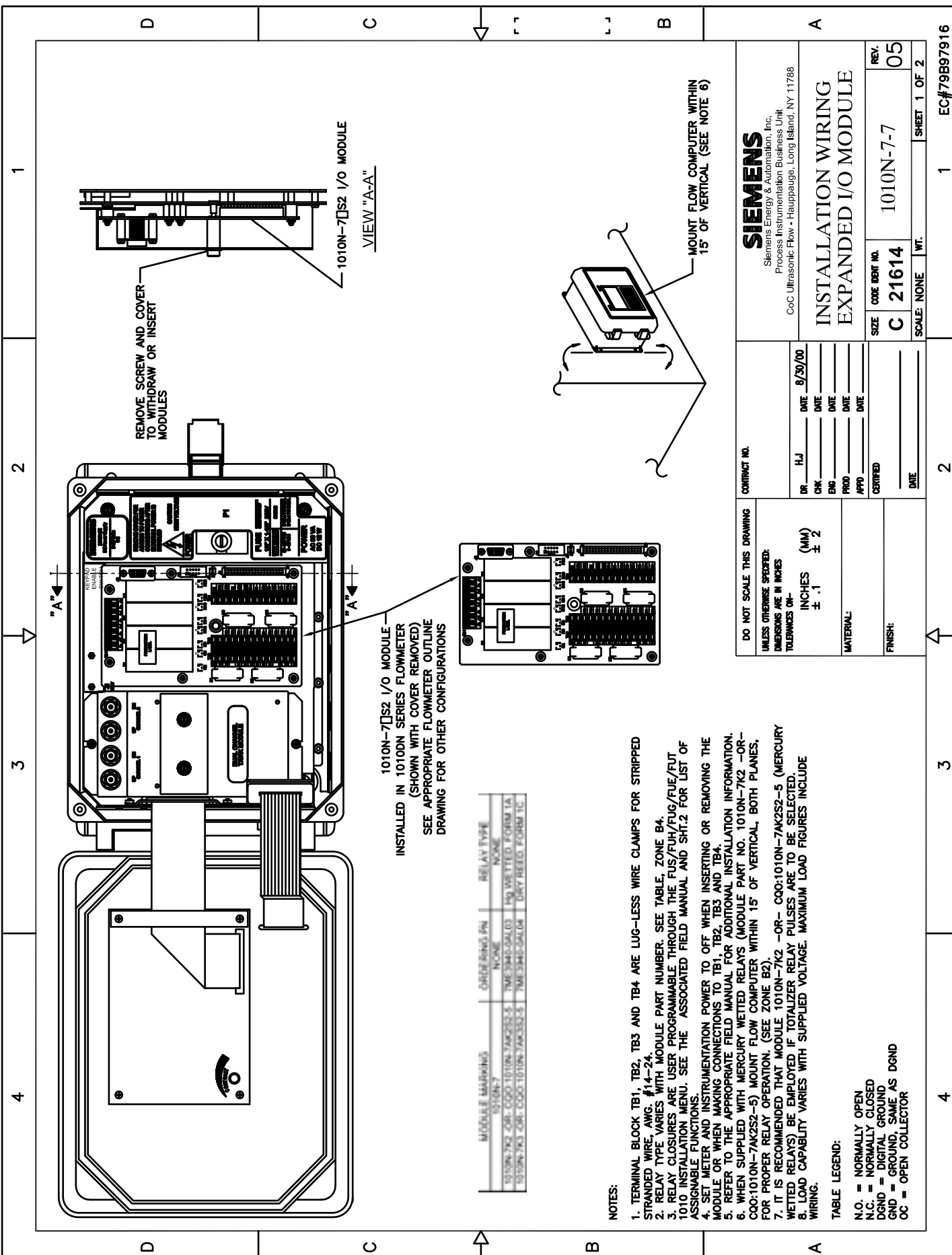
- SEE DRAWING 1010NS2-8 FOR OUTLINE DIMENSIONS.
- SEE 1010 FIELD MANUAL AND APPROPRIATE TRANSDUCER INSTALLATION DRAWINGS FOR MOUNTING PROCEDURE.
- DISABLE INSTRUMENT POWER BEFORE SERVICING POWER SUPPLY, POWER SWITCH / CIRCUIT BREAKER OR INPUT POWER CONNECTOR.
- ALL TRANSDUCER CABLES ORIGINATING AT THE SAME FLOW COMPUTER MAY SHARE THE SAME CONDUIT; NO OTHER CABLES SHOULD BE HOUSED IN THE TRANSDUCER CABLE CONDUITS. CONNECT METALLIC CONDUITS TO EARTH GROUND.
- OBSERVE FOLLOWING LIMITS WHEN INSTALLING TRANSDUCER CABLES IN CONDUIT:
MAX. PULL TENSION: 80 lbs.
MIN. BEND RADIUS: 2-1/2 INCHES
GRAPHIC DISPLAY ONLY.
- OPTIONAL DISPLAY AND KEYPAD APPEAR ON MODELS WITH GRAPHIC DISPLAY ONLY.
- SEE DRAWING 1010N-2-7, 1010N-7-7 OR 1010N-8MS2-7 FOR USER I/O WIRING CONNECTIONS.
- SEE DRAWING 1010N-5S2-7 OR 1010N-5DS2-7 FOR USER ANALOG INPUT WIRING CONNECTIONS.

DO NOT SCALE THIS DRAWING
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES UN-
TOLERANCES IN-

IR	DATE	4/22/98
JK	DATE	
ENG	DATE	
PROD	DATE	
APPD	DATE	
CERTIFIED	DATE	

CHANNEL 2 (DUAL CHANNEL SYSTEMS ONLY)
CHANNEL 1

TO DOWNSTREAM TRANSDUCER
TO UPSTREAM TRANSDUCER
TO DOWNSTREAM TRANSDUCER
TO UPSTREAM TRANSDUCER



REMOVE SCREW AND COVER TO WITHDRAW OR INSERT MODULES

1010N-7[S2] I/O MODULE
VIEW "A-A"

MOUNT FLOW COMPUTER WITHIN 15" OF VERTICAL (SEE NOTE 6)

1010N-7[S2] I/O MODULE
INSTALLED IN 1010DN SERIES FLOWMETER
(SHOWN WITH COVER REMOVED)
SEE APPROPRIATE FLOWMETER OUTLINE DRAWING FOR OTHER CONFIGURATIONS

MODULE MARKING	ORDERING PIN	RELAY TYPE
1010N-7[S2]	NONE	NONE
1010N-7[S2] 1010N-7AK2S2-5	1010N-7AK2S2-5	1010N-7AK2S2-5
1010N-7[S2] 1010N-7AK2S2-5	1010N-7AK2S2-5	1010N-7AK2S2-5

- NOTES:
1. TERMINAL BLOCK TB1, TB2, TB3 AND TB4 ARE LUG-LESS WIRE CLAMPS FOR STRIPPED STRANDED WIRE, AWG. #14-24.
 2. RELAY TYPE VARIES WITH MODULE PART NUMBER. SEE TABLE, ZONE B4.
 3. RELAY CLOSURES ARE USER PROGRAMMABLE THROUGH THE FUS/FUH/FLUG/FUE/FLUT 1010 INSTALLATION MENU. SEE THE ASSOCIATED FIELD MANUAL AND SHT.2 FOR LIST OF ASSIGNABLE FUNCTIONS.
 4. SET METER AND INSTRUMENTATION POWER TO OFF WHEN INSERTING OR REMOVING THE MODULE OR WHEN MAKING CONNECTIONS TO TB1, TB2, TB3 AND TB4.
 5. REFER TO THE APPROPRIATE FIELD MANUAL FOR ADDITIONAL INSTALLATION INFORMATION.
 6. WHEN SUPPLIED WITH MERCURY WETTED RELAYS (MODULE PART NO. 1010N-7K2 -OR- COO:1010N-7AK2S2-5) MOUNT FLOW COMPUTER WITHIN 15" OF VERTICAL, BOTH PLANES, FOR PROPER RELAY OPERATION. (SEE ZONE B2).
 7. IT IS RECOMMENDED THAT MODULE 1010N-7K2 -OR- COO:1010N-7AK2S2-5 (MERCURY WETTED RELAYS) BE EMPLOYED IF TOTALIZER RELAY PULSES ARE TO BE SELECTED.
 8. LOAD CAPABILITY VARIES WITH SUPPLIED VOLTAGE. MAXIMUM LOAD FIGURES INCLUDE WIRING.

TABLE LEGEND:

N.O. = NORMALLY OPEN
 N.C. = NORMALLY CLOSED
 DGND = DIGITAL GROUND
 GND = GROUND, SAME AS DGND
 OC = OPEN COLLECTOR

SIEMENS
 Siemens Energy & Automation, Inc.
 Process Instrumentation Business Unit
 CoC Ultrasonic Flow - Hauppauge, Long Island, NY 11788

**INSTALLATION WIRING
 EXPANDED I/O MODULE**

CONTRACT NO. _____
 DR. HJ _____ DATE 8/30/00
 CHK. _____ DATE _____
 ENG. _____ DATE _____
 PRD. _____ DATE _____
 APPD. _____ DATE _____
 CERTIFIED _____
 DATE _____

DO NOT SCALE THIS DRAWING
 UNLESS OTHERWISE SPECIFIED:
 DIMENSIONS ARE IN INCHES
 TOLERANCES ON:
 INCHES (MM)
 ± .1 (± 2)


MATERIAL: _____
 FINISH: _____

SIZE CODE BENT NO. 1010N-7-7
 REV. 05

SCALE: NONE WT. SHEET 1 OF 2

TERMINAL BLOCK WIRING CONNECTIONS

METER PN'S AND OPERATING SYSTEMS		"7ME350" SITRANS FUE1010 OP SYSTEMS: 5BN01-->5BN04		"7ME360" [FUH1010] SPM03 SDN04		"7ME360" [FUH1010] SPM03 SDN04		"7ME361" [FUG1010] SON05		
METER PN'S AND OPERATING SYSTEMS		7ME353" SITRANS FUS1010 OP SYSTEMS: 5N01-->5N04		7ME361" [FUG1010] SON05		7ME361" [FUG1010] SON05		7ME361" [FUG1010] SON07		
METER PN'S AND OPERATING SYSTEMS		7ME360*2 SITRANS FUE1010 OP SYSTEMS: 5BN01-->5BN02		7ME361" [FUG1010] SON05		7ME361" [FUG1010] SON05		7ME361" [FUG1010] SON07		
a = 0, 2 or 3, indicating enclosure type.										
METER INSTALLATION CONFIGURATION										
TS1	SIGNAL	DEFINITION	DESCRIPTION	SINGLE CHANNEL FUNCTION	DUAL PATH FUNCTION	DUAL PATH ONLY FUNCTION	QUAD PATH ONLY FUNCTION	WIRING	CABLE LENGTH	NOTES
1	TS1	0-10 VOLT OUTPUT	METER PROCESS VARIABLES ARE ASSIGNED TO INDIVIDUAL OUTPUTS; UNDER MENU CONTROL.	SYSTEM OUTPUTS ASSIGNABLE & SCALABLE TO FLOW RELATED PARAMETERS.	SYSTEM OUTPUTS ASSIGNABLE & SCALABLE TO FLOW RELATED PARAMETERS.	SYSTEM OUTPUTS ASSIGNABLE & SCALABLE TO FLOW RELATED PARAMETERS.	SYSTEM OUTPUTS ASSIGNABLE & SCALABLE TO FLOW RELATED PARAMETERS.	SHIELDED CABLE 24 AWG MINIMUM	DEFINED BY EA/TA-232 STANDARD [25000PF MAX ~50 FEET]	
2	Va1+	0-10 VOLT OUTPUT								
3	Va2+	0-10 VOLT OUTPUT								
4	Va2-	REF. GROUND								
5	Is1+	4-20mA OUTPUT 1								
6	Is1-	4-20mA OUTPUT 1								
7	Is2+	4-20mA OUTPUT 2								
8	Is2-	4-20mA OUTPUT 2								
9	PG1	FREQUENCY OUT 1								
10	PG2	FREQUENCY OUT 2								
11	PG3	FREQUENCY OUT 3								
12	PG4	FREQUENCY OUT 4								
13	CON	CHASSIS GROUND								
14	CON	CHASSIS GROUND								
METER INSTALLATION CONFIGURATION										
TS2	SIGNAL	DEFINITION	DESCRIPTION	SINGLE CHANNEL FUNCTION	DUAL PATH FUNCTION	DUAL PATH ONLY FUNCTION	QUAD PATH ONLY FUNCTION	WIRING	CABLE LENGTH	NOTES
1	TS2	0-10 VOLT OUTPUT	METER PROCESS VARIABLES ARE ASSIGNED TO INDIVIDUAL OUTPUTS; UNDER MENU CONTROL.	SYSTEM OUTPUTS ASSIGNABLE & SCALABLE TO FLOW RELATED PARAMETERS.	SYSTEM OUTPUTS ASSIGNABLE & SCALABLE TO FLOW RELATED PARAMETERS.	SYSTEM OUTPUTS ASSIGNABLE & SCALABLE TO FLOW RELATED PARAMETERS.	SYSTEM OUTPUTS ASSIGNABLE & SCALABLE TO FLOW RELATED PARAMETERS.	SHIELDED CABLE 24 AWG MINIMUM	1000 FEET MAXIMUM WITHOUT FACTORY APPROVAL	
2	Va1+	0-10 VOLT OUTPUT								
3	Va2+	0-10 VOLT OUTPUT								
4	Va2-	REF. GROUND								
5	Is1+	4-20mA OUTPUT 1								
6	Is1-	4-20mA OUTPUT 1								
7	Is2+	4-20mA OUTPUT 2								
8	Is2-	4-20mA OUTPUT 2								
9	PG1	FREQUENCY OUT 1								
10	PG2	FREQUENCY OUT 2								
11	PG3	FREQUENCY OUT 3								
12	PG4	FREQUENCY OUT 4								
13	CON	CHASSIS GROUND								
14	CON	CHASSIS GROUND								
METER INSTALLATION CONFIGURATION										
TS3	SIGNAL	DEFINITION	DESCRIPTION	SINGLE CHANNEL FUNCTION	DUAL PATH FUNCTION	DUAL PATH ONLY FUNCTION	QUAD PATH ONLY FUNCTION	WIRING	CABLE LENGTH	NOTES
1	TS3	0-10 VOLT OUTPUT	METER PROCESS VARIABLES ARE ASSIGNED TO INDIVIDUAL OUTPUTS; UNDER MENU CONTROL.	SYSTEM OUTPUTS ASSIGNABLE & SCALABLE TO FLOW RELATED PARAMETERS.	SYSTEM OUTPUTS ASSIGNABLE & SCALABLE TO FLOW RELATED PARAMETERS.	SYSTEM OUTPUTS ASSIGNABLE & SCALABLE TO FLOW RELATED PARAMETERS.	SYSTEM OUTPUTS ASSIGNABLE & SCALABLE TO FLOW RELATED PARAMETERS.	SHIELDED CABLE 24 AWG MINIMUM	1000 FEET MAXIMUM WITHOUT FACTORY APPROVAL	
2	Va1+	0-10 VOLT OUTPUT								
3	Va2+	0-10 VOLT OUTPUT								
4	Va2-	REF. GROUND								
5	Is1+	4-20mA OUTPUT 1								
6	Is1-	4-20mA OUTPUT 1								
7	Is2+	4-20mA OUTPUT 2								
8	Is2-	4-20mA OUTPUT 2								
9	PG1	FREQUENCY OUT 1								
10	PG2	FREQUENCY OUT 2								
11	PG3	FREQUENCY OUT 3								
12	PG4	FREQUENCY OUT 4								
13	CON	CHASSIS GROUND								
14	CON	CHASSIS GROUND								
METER INSTALLATION CONFIGURATION										
TS4	SIGNAL	DEFINITION	DESCRIPTION	SINGLE CHANNEL FUNCTION	DUAL PATH FUNCTION	DUAL PATH ONLY FUNCTION	QUAD PATH ONLY FUNCTION	WIRING	CABLE LENGTH	NOTES
1	TS4	0-10 VOLT OUTPUT	METER PROCESS VARIABLES ARE ASSIGNED TO INDIVIDUAL OUTPUTS; UNDER MENU CONTROL.	SYSTEM OUTPUTS ASSIGNABLE & SCALABLE TO FLOW RELATED PARAMETERS.	SYSTEM OUTPUTS ASSIGNABLE & SCALABLE TO FLOW RELATED PARAMETERS.	SYSTEM OUTPUTS ASSIGNABLE & SCALABLE TO FLOW RELATED PARAMETERS.	SYSTEM OUTPUTS ASSIGNABLE & SCALABLE TO FLOW RELATED PARAMETERS.	SHIELDED CABLE 24 AWG MINIMUM	1000 FEET MAXIMUM WITHOUT FACTORY APPROVAL	
2	Va1+	0-10 VOLT OUTPUT								
3	Va2+	0-10 VOLT OUTPUT								
4	Va2-	REF. GROUND								
5	Is1+	4-20mA OUTPUT 1								
6	Is1-	4-20mA OUTPUT 1								
7	Is2+	4-20mA OUTPUT 2								
8	Is2-	4-20mA OUTPUT 2								
9	PG1	FREQUENCY OUT 1								
10	PG2	FREQUENCY OUT 2								
11	PG3	FREQUENCY OUT 3								
12	PG4	FREQUENCY OUT 4								
13	CON	CHASSIS GROUND								
14	CON	CHASSIS GROUND								



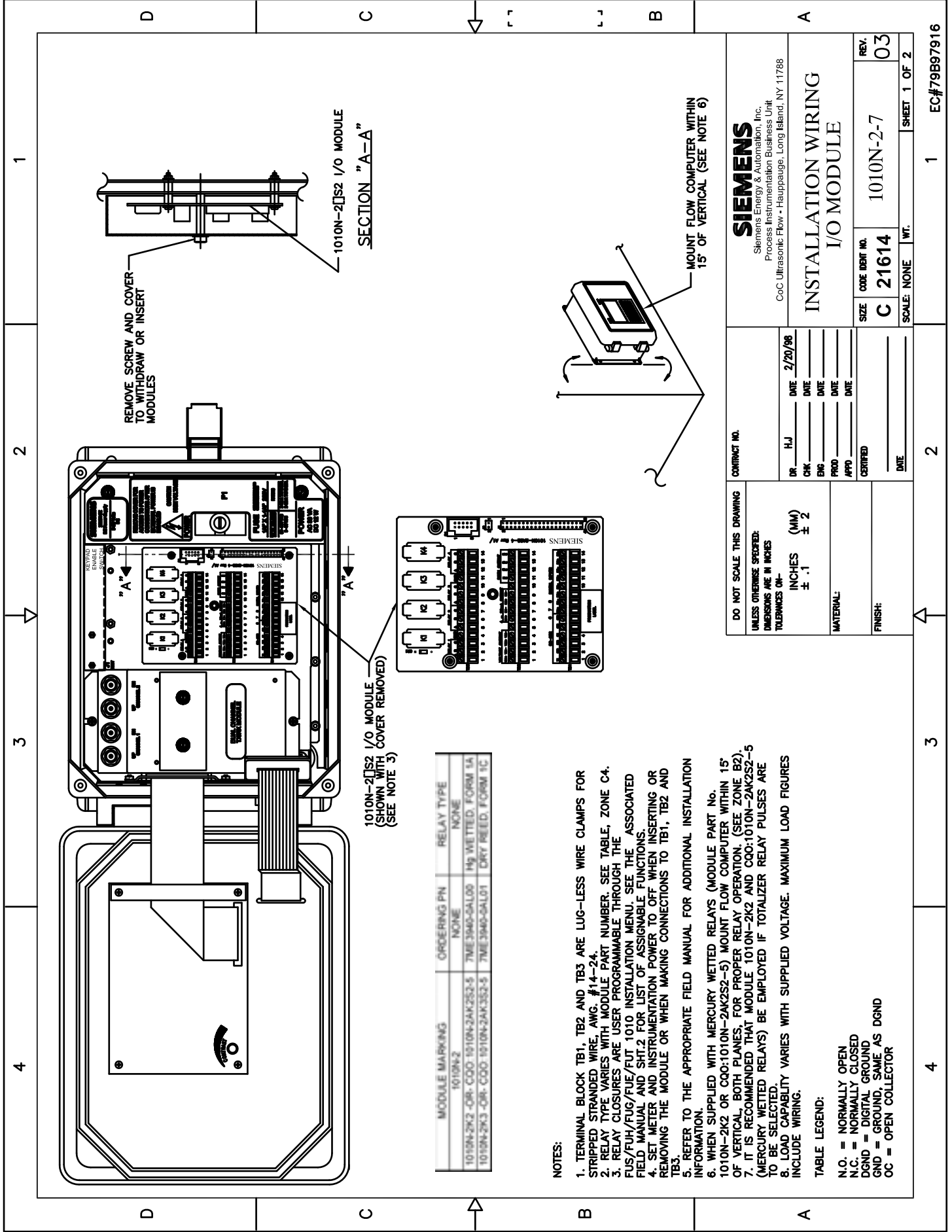
Siemens Energy & Automation, Inc.
Process Instrumentation Business Unit
CoC Ultrasonic Flow - Heurpaugge-Long Island, NY 11788

INSTALLATION WIRING EXPANDED I/O MODULE

DO NOT SCALE THIS DRAWING UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES ON-	CONTRACT NO.
INCHES (MM) ± .1 ± 2	DR _____ DATE 8/30/00
MATERIAL:	CHK _____ DATE _____
FINISH:	ENG _____ DATE _____
	PRD _____ DATE _____
	APPD _____ DATE _____
	CERTIFIED _____
	DATE _____

SIZE	CODE IDENT NO.	WT.
C 21614	1010N-7-7	

REV.	SHEET 2 OF 2
05	



REMOVE SCREW AND COVER TO WITHDRAW OR INSERT MODULES

1010N-2K2 I/O MODULE
SECTION "A-A"

1010N-2K2 I/O MODULE (SHOWN WITH COVER REMOVED) (SEE NOTE 3)

MOUNT FLOW COMPUTER WITHIN 15° OF VERTICAL (SEE NOTE 6)

MODULE MARKING	ORDERING PN	RELAY TYPE
1010N-2	NONE	NONE
1010N-2K2 -DR-	7ME.3940-2A4L00	1½ WETTED, FORM 1A
1010N-2K3 -DR-	7ME.3940-2A4L01	DRY RELED, FORM 1C

- NOTES:**
- TERMINAL BLOCK TB1, TB2 AND TB3 ARE LUG-LESS WIRE CLAMPS FOR STRIPPED STRANDED WIRE, AWG. #14-24.
 - RELAY TYPE VARIES WITH MODULE PART NUMBER. SEE TABLE, ZONE C4.
 - RELAY CLOSURES ARE USER PROGRAMMABLE THROUGH THE FUS/FUH/FUG/FUE/FUT 1010 INSTALLATION MENU. SEE THE ASSOCIATED FIELD MANUAL AND SHT.2 FOR LIST OF ASSIGNABLE FUNCTIONS.
 - SET METER AND INSTRUMENTATION POWER TO OFF WHEN INSERTING OR REMOVING THE MODULE OR WHEN MAKING CONNECTIONS TO TB1, TB2 AND TB3.
 - REFER TO THE APPROPRIATE FIELD MANUAL FOR ADDITIONAL INSTALLATION INFORMATION.
 - WHEN SUPPLIED WITH MERCURY WETTED RELAYS (MODULE PART NO. 1010N-2K2 OR C00:1010N-2AK2S2-5) MOUNT FLOW COMPUTER WITHIN 15° OF VERTICAL, BOTH PLANES, FOR PROPER RELAY OPERATION. (SEE ZONE B2).
 - IT IS RECOMMENDED THAT MODULE 1010N-2K2 AND C00:1010N-2AK2S2-5 (MERCURY WETTED RELAYS) BE EMPLOYED IF TOTALIZER RELAY PULSES ARE TO BE SELECTED.
 - LOAD CAPABILITY VARIES WITH SUPPLIED VOLTAGE. MAXIMUM LOAD FIGURES INCLUDE WIRING.

TABLE LEGEND:

- N.O. = NORMALLY OPEN
- N.C. = NORMALLY CLOSED
- DGND = DIGITAL GROUND
- GND = GROUND, SAME AS DGND
- OC = OPEN COLLECTOR

SIEMENS
Siemens Energy & Automation, Inc.
Process Instrumentation Business Unit
CoC, Ultrasonic Flow - Hauppauge, Long Island, NY 11788

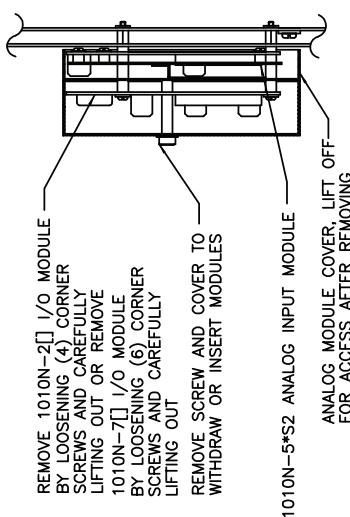
INSTALLATION WIRING I/O MODULE

DO NOT SCALE THIS DRAWING UNLESS OTHERWISE SPECIFIED. DIMENSIONS ARE IN INCHES. TOLERANCES UNLESS OTHERWISE SPECIFIED: INCHES ± .1 (MM) ± .2

MATERIAL: _____
FINISH: _____

CONTRACT NO. _____
DR. HJJ DATE 2/20/98
CHK. _____ DATE _____
ENG. _____ DATE _____
PROD. _____ DATE _____
APPD. _____ DATE _____
CERTIFIED _____
DATE _____

SIZE C 21614 CODE IDENT. NO. 1010N-2-7 REV. 03
SCALE: NONE WT. SHEET 1 OF 2



REMOVE 1010N-2 I/O MODULE BY LOOSENING (4) CORNER SCREWS AND CAREFULLY LIFTING OUT OR REMOVE 1010N-7 I/O MODULE BY LOOSENING (6) CORNER SCREWS AND CAREFULLY LIFTING OUT.
REMOVE SCREW AND COVER TO WITHDRAW OR INSERT MODULES

1010N-5*S2 ANALOG INPUT MODULE
ANALOG MODULE COVER, LIFT OFF FOR ACCESS AFTER REMOVING 1010N-2 I/O MODULE OR 1010N-7 I/O MODULE

TB1 WIRING

PN	COLOR	FUNCTION SEE NOTE 4	DESCRIPTION	WIRING	CABLE LENGTH	NOTES
1	BLACK	RTD CURRENT HIGH	RTD TEMPERATURE MEASUREMENT OF RTD TEMP. REFERENCE CO-1012EC CABLE	AWG.14-24	1000 FT. MAX.	SEE NOTE 3
2	WHITE	RTD VOLTAGE HIGH				WITHOUT FACTORY APPROVAL
3	GREEN	RTD VOLTAGE LOW				
4	RED	RTD CURRENT LOW				
5	BLUE	GROUND				

TB2 WIRING

PN	COLOR	FUNCTION SEE NOTE 4	DESCRIPTION	WIRING	CABLE LENGTH	NOTES
1	BLACK	RTD CURRENT HIGH	RTD TEMPERATURE MEASUREMENT CHANNEL 2, T2 OR SUPPLY TEMP.	AWG.14-24	1000 FT. MAX.	SEE NOTE 3
2	WHITE	RTD VOLTAGE HIGH				WITHOUT FACTORY APPROVAL
3	GREEN	RTD VOLTAGE LOW				
4	RED	RTD CURRENT LOW				
5	BLUE	GROUND				

TB3 WIRING

PN	FUNCTION SEE NOTE 4	USE	DESCRIPTION	BEHAVIOR	LOAD	WIRING	CABLE LENGTH	NOTES
1	AUX.1 IN	ANALOG CURRENT INPUT REFERENCED TO METER GROUND		4 TO 20 mA	2000	AWG.14-24	1000 FT. MAX.	SEE NOTES 3, 5
2	AUX.2 IN	IN2 INPUT						WITHOUT FACTORY APPROVAL
4	AUX.2 COM	IN2 COMMON						

TB4 WIRING

PN	FUNCTION SEE NOTE 4	USE	DESCRIPTION	BEHAVIOR	LOAD	WIRING	CABLE LENGTH	NOTES
1	AUX.3 IN	ANALOG CURRENT INPUT REFERENCED TO METER GROUND		4 TO 20 mA	2000	AWG.14-24	1000 FT. MAX.	SEE NOTES 3, 5
2	AUX.3 COM	IN3 COMMON						WITHOUT FACTORY APPROVAL
3	AUX.4 IN	IN4 INPUT						
4	AUX.4 COM	IN4 COMMON						

ALTERNATE COLOR CODE FOR CERTAIN 1012EC CABLES:
WHITE = ORANGE
GREEN = BROWN

CONTROLLED DRAWING
CHANGES TO THIS DRAWING REQUIRE RELEVANT AGENCY APPROVAL

DO NOT SCALE THIS DRAWING
UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES (MM)
TOLERANCES ON INCHES
± .1
± 2

NOTES:

1. TERMINAL BLOCK TB1, TB2, TB3 AND TB4 ARE LUG-LESS WIRE CLAMP TYPE, PROVIDING RELIABLE CONNECTION TO STRIPPED STRANDED WIRE, AWG. #14-24.
2. SET METER AND INSTRUMENTATION POWER TO OFF WHEN INSERTING OR REMOVING THE MODULE OR WHEN MAKING CONNECTIONS TO TB1, TB2, TB3 AND TB4.
3. REFER TO THE 1010 FIELD MANUAL FOR ADDITIONAL INSTALLATION INFORMATION.
4. USE 1012ECN SERIES CABLES TO CONNECT BETWEEN TEMPERATURE SENSOR INPUT WIRING TERMINALS TB1 AND TB2 AND 991T OR 1011T SERIES TEMPERATURE SENSORS. NOTE SUPPLY AND RETURN TEMPERATURE SENSOR DESIGNATIONS WHEN USED WITH A 1010E SERIES ENERGY FLOW COMPUTER.
5. NET LOAD IS 335 OHMS WHEN SAFETY BARRIERS ARE USED.

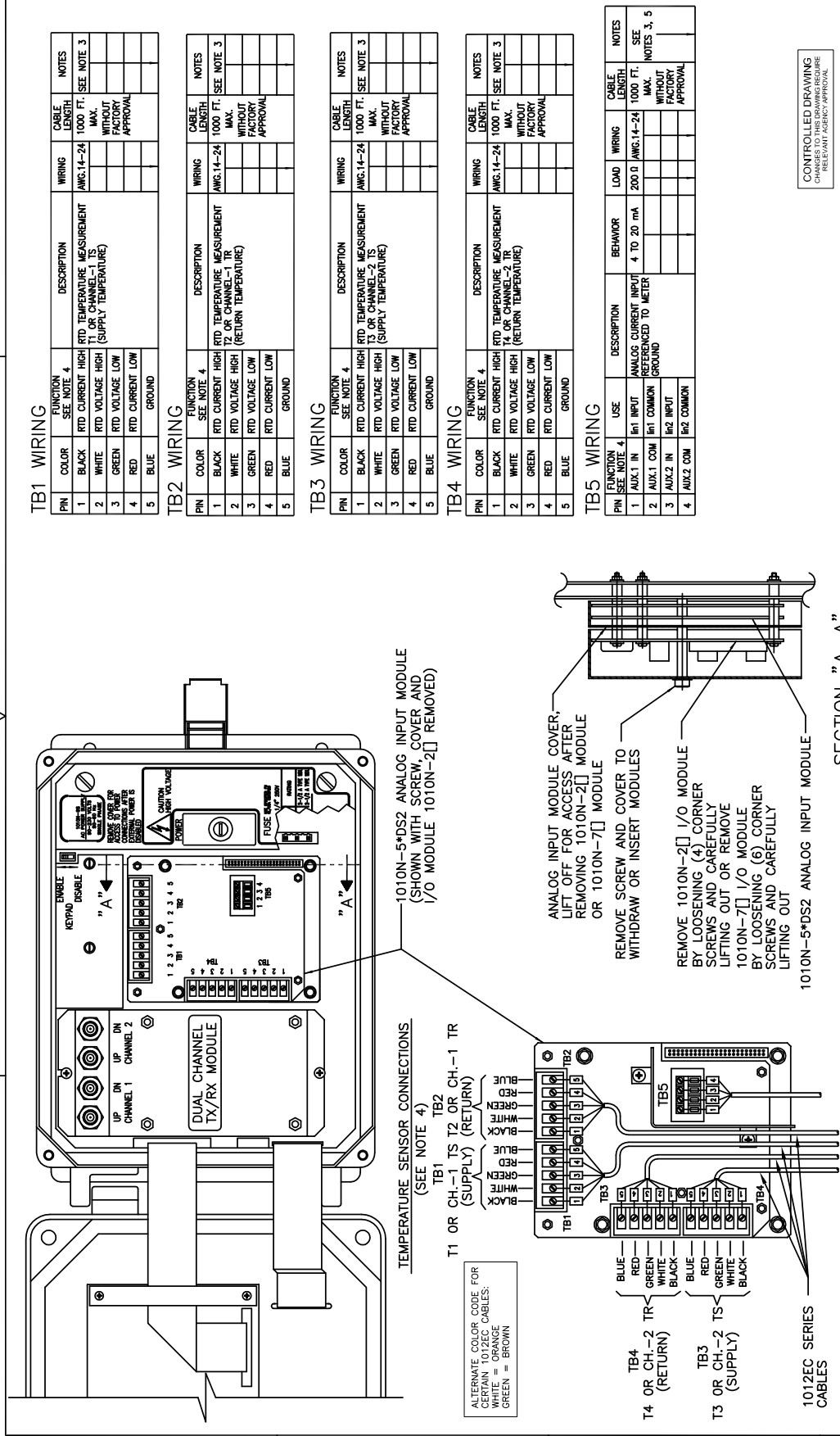
CONTRACT NO.

DR	H/J	DATE	7/18/98
CHK		DATE	
ENG		DATE	
PROD		DATE	
APPD		DATE	
CERTIFIED			
DATE			

SIEMENS
Siemens Energy & Automation, Inc.
Process Instrumentation Business Unit
CoC Ultrasonic Flow - Hauppauge, Long Island, NY 11788

**INSTALLATION DRAWING
ANALOG INPUT MODULE**

SIZE	CODE IDENT NO.	REV.
C	21614	D
SCALE:	NONE	WT.
	1010N-5S2-7	
SHEET	1	OF 1



TB1 WIRING

PIN	COLOR	FUNCTION SEE NOTE 4	DESCRIPTION	WIRING	CABLE LENGTH	NOTES
1	BLACK	RTD CURRENT HIGH	RTD TEMPERATURE MEASUREMENT T1 OR CHANNEL-1 TS	AWG.14-24	1000 FT. MAX.	SEE NOTE 3
2	WHITE	RTD VOLTAGE HIGH				WITHOUT FACTORY APPROVAL
3	GREEN	RTD VOLTAGE LOW				
4	RED	RTD CURRENT LOW				
5	BLUE	GROUND				

TB2 WIRING

PIN	COLOR	FUNCTION SEE NOTE 4	DESCRIPTION	WIRING	CABLE LENGTH	NOTES
1	BLACK	RTD CURRENT HIGH	RTD TEMPERATURE MEASUREMENT T2 OR CHANNEL-2 TS	AWG.14-24	1000 FT. MAX.	SEE NOTE 3
2	WHITE	RTD VOLTAGE HIGH				WITHOUT FACTORY APPROVAL
3	GREEN	RTD VOLTAGE LOW				
4	RED	RTD CURRENT LOW				
5	BLUE	GROUND				

TB3 WIRING

PIN	COLOR	FUNCTION SEE NOTE 4	DESCRIPTION	WIRING	CABLE LENGTH	NOTES
1	BLACK	RTD CURRENT HIGH	RTD TEMPERATURE MEASUREMENT T3 OR CHANNEL-3 TS	AWG.14-24	1000 FT. MAX.	SEE NOTE 3
2	WHITE	RTD VOLTAGE HIGH				WITHOUT FACTORY APPROVAL
3	GREEN	RTD VOLTAGE LOW				
4	RED	RTD CURRENT LOW				
5	BLUE	GROUND				

TB4 WIRING

PIN	COLOR	FUNCTION SEE NOTE 4	DESCRIPTION	WIRING	CABLE LENGTH	NOTES
1	BLACK	RTD CURRENT HIGH	RTD TEMPERATURE MEASUREMENT T4 OR CHANNEL-4 TR	AWG.14-24	1000 FT. MAX.	SEE NOTE 3
2	WHITE	RTD VOLTAGE HIGH				WITHOUT FACTORY APPROVAL
3	GREEN	RTD VOLTAGE LOW				
4	RED	RTD CURRENT LOW				
5	BLUE	GROUND				

TB5 WIRING

PIN	FUNCTION SEE NOTE 4	USE	DESCRIPTION	BEHAVIOR	LOAD	WIRING	CABLE LENGTH	NOTES
1	AUX1 IN	I/O INPUT	ANALOG CURRENT INPUT CONNECTED TO METER	4 TO 20 mA	200 Ω	AWG.14-24	1000 FT. MAX.	SEE NOTES 3, 5
2	AUX1 COM	I/O COMMON						
3	AUX2 IN	I/O INPUT						
4	AUX2 COM	I/O COMMON						

CONTROLLED DRAWING
CHANGES TO THIS DRAWING REQUIRE
RELEVANT USER'S APPROVAL

SIEMENS
Siemens Energy & Automation, Inc.
Process Instrumentation Business Unit
CoC Ultrasonic Flow - Hauppauge, Long Island, NY 11788

INSTALLATION DRAWING
ANALOG INPUT MODULE

CONTRACT NO. _____

DATE: 7/18/98

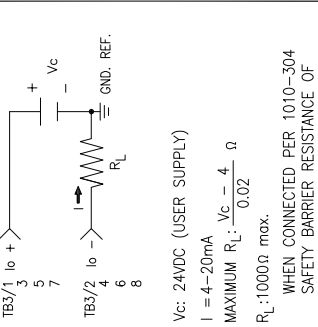
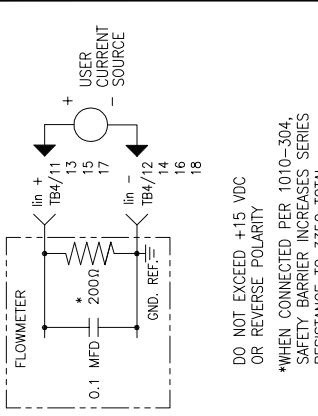
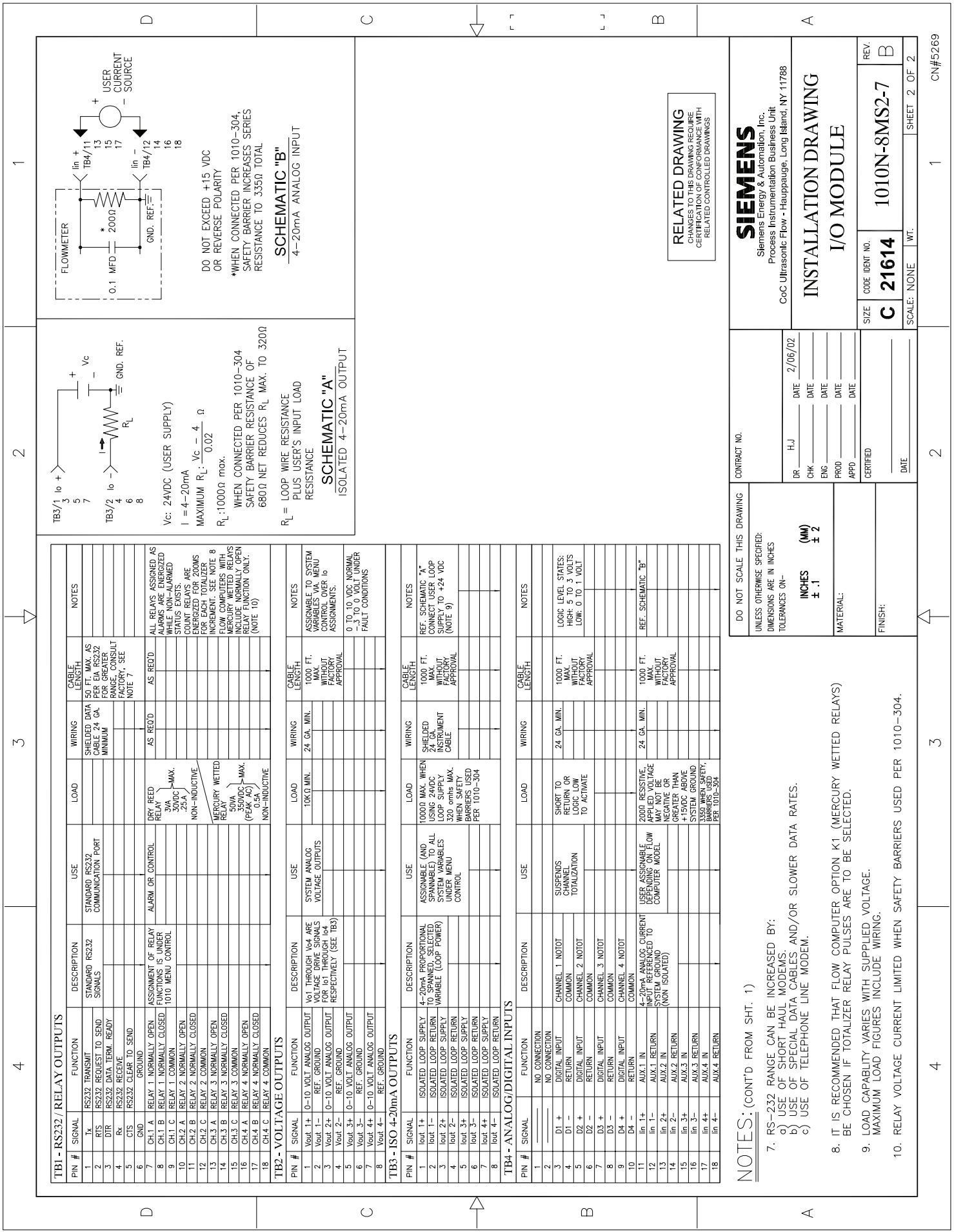
OR: H/J _____
CHK: _____
ENG: _____
PROJ: _____
APP: _____
CERTIFIED: _____
DATE: _____

DO NOT SCALE THIS DRAWING
UNLESS OTHERWISE SPECIFIED.
DIMENSIONS ARE IN INCHES (MM)
TOLERANCES ON:
INCHES ±.1 (MM) ±.2

MATERIAL: _____
FINISH: _____

SIZE: **C 21614** CODE IDENT NO. _____
SCALE: NONE WT. _____
REV. **D** SHEET 1 OF 1

- NOTES:**
1. TERMINAL BLOCK TB1, TB2, TB3, TB4 AND TB5 ARE LUG-LESS WIRE CLAMP TYPE, PROVIDING RELIABLE CONNECTION TO STRIPPED STRANDED WIRE, AWG. #14-24.
 2. SET METER AND INSTRUMENTATION POWER TO OFF WHEN INSERTING OR REMOVING THE MODULE OR WHEN MAKING CONNECTIONS TO TB1, TB2, TB3, TB4 AND TB5.
 3. REFER TO THE 1010 FIELD MANUAL FOR ADDITIONAL INSTALLATION INFORMATION.
 4. USE 1012ECN SERIES CABLES TO CONNECT BETWEEN TEMPERATURE SENSOR INPUT WIRING TERMINALS TB1 THRU TB4 AND 9911T OR 1011T SERIES TEMPERATURE SENSORS. NOTE SUPPLY AND RETURN TEMPERATURE SENSOR DESIGNATIONS WHEN USED WITH A 1010E SERIES ENERGY FLOW COMPUTER.
 5. NET LOAD IS 335 OHMS WHEN SAFETY BARRIERS ARE USED.



DO NOT EXCEED +15 VDC OR REVERSE POLARITY
 *WHEN CONNECTED PER 1010-304, SAFETY BARRIER INCREASES SERIES RESISTANCE TO 335Ω TOTAL

SCHEMATIC "A"
 ISOLATED 4-20mA OUTPUT
 RL = LOOP WIRE RESISTANCE PLUS USER'S INPUT LOAD RESISTANCE

SCHEMATIC "B"
 4-20mA ANALOG INPUT

SCHEMATIC "A"
 ISOLATED 4-20mA OUTPUT

SCHEMATIC "B"
 4-20mA ANALOG INPUT

SCHEMATIC "A"
 ISOLATED 4-20mA OUTPUT

SCHEMATIC "B"
 4-20mA ANALOG INPUT

SCHEMATIC "A"
 ISOLATED 4-20mA OUTPUT

SCHEMATIC "B"
 4-20mA ANALOG INPUT

SCHEMATIC "A"
 ISOLATED 4-20mA OUTPUT

SCHEMATIC "B"
 4-20mA ANALOG INPUT

SCHEMATIC "A"
 ISOLATED 4-20mA OUTPUT

SCHEMATIC "B"
 4-20mA ANALOG INPUT

SCHEMATIC "A"
 ISOLATED 4-20mA OUTPUT

SCHEMATIC "B"
 4-20mA ANALOG INPUT

TB1 - RS232 / RELAY OUTPUTS

PIN #	SIGNAL	FUNCTION	DESCRIPTION	USE	LOAD	WIRING	CABLE LENGTH	NOTES
1	Tx	RS232 TRANSMIT	STANDARD RS232 SIGNALS	STANDARD RS232 COMMUNICATION PORT		SHIELDED CABLE 24 GA MINIMUM	50 FT. MAX. AS PER EIA RS232 FOR GREATER RANGE, CONSULT FACTORY, SEE NOTE 7	
2	Rx	RS232 REQUEST TO SEND						
3	DIR	RS232 DATA TERM. READY						
4	Rx	RS232 RECEIVE						
5	CTS	RS232 CLEAR TO SEND						
6	GND	GROUND						
7	CH1 A	RELAY 1 NORMALLY OPEN	ASSIGNMENT OF RELAY OUTPUTS IN 1010 MENU CONTROL	ALARM OR CONTROL	DRY REED RELAY 3VA 30VDC MAX. 25A NON-INDUCTIVE	AS REQ'D	AS REQ'D	ALL RELAYS ASSIGNED AS SHOWN ARE ENERGIZED WHEN POWER IS APPLIED. STATUS EXISTS. COUNT RELAYS ARE ENERGIZED FOR 200MS FOR EACH TOTALIZER INCREMENT. SEE NOTE 8
8	CH1 B	RELAY 1 NORMALLY CLOSED						
9	CH1 C	RELAY 1 COMMON						
10	CH2 A	RELAY 2 NORMALLY OPEN						
11	CH2 B	RELAY 2 NORMALLY CLOSED						
12	CH2 C	RELAY 2 COMMON						
13	CH3 A	RELAY 3 NORMALLY OPEN						
14	CH3 B	RELAY 3 NORMALLY CLOSED						
15	CH3 C	RELAY 3 COMMON						
16	CH4 A	RELAY 4 NORMALLY OPEN						
17	CH4 B	RELAY 4 NORMALLY CLOSED						
18	CH4 C	RELAY 4 COMMON						

TB2 - VOLTAGE OUTPUTS

PIN #	SIGNAL	FUNCTION	DESCRIPTION	USE	LOAD	WIRING	CABLE LENGTH	NOTES
1	Vout 1+	0-10 VOLT ANALOG OUTPUT	V01 THROUGH V04 ARE VOLTAGE DRIVE SIGNALS FOR I-01 THROUGH I-04 RESPECTIVELY (SEE TB3)	SYSTEM ANALOG VOLTAGE OUTPUTS	10KΩ MIN.	24 GA. MIN.	1000 FT. MAX. WITHOUT FACTORY APPROVAL	ASSIGNABLE TO SYSTEM VARIABLES VIA MENU ASSIGNMENTS.
2	Vout 1-	REF. GROUND						
3	Vout 2+	0-10 VOLT ANALOG OUTPUT						
4	Vout 2-	REF. GROUND						
5	Vout 3+	0-10 VOLT ANALOG OUTPUT						
6	Vout 3-	REF. GROUND						
7	Vout 4+	0-10 VOLT ANALOG OUTPUT						
8	Vout 4-	REF. GROUND						

TB3 - ISO 4-20mA OUTPUTS

PIN #	SIGNAL	FUNCTION	DESCRIPTION	USE	LOAD	WIRING	CABLE LENGTH	NOTES
1	Out 1+	ISOLATED LOOP SUPPLY	4-20mA PROPORTIONAL TO SPANNED, SELECTED VARIABLE (LOOP POWER)	ASSIGNABLE (AND SPANNABLE) TO ALL SYSTEM VARIABLES UNDER MENU CONTROL	1000Ω MAX. WHEN USING 24VDC LOOP SUPPLY 320 ohms MAX. WHEN SAFETY BARRIERS USED PER 1010-304	SHIELDED INSTRUMENT CABLE	1000 FT. MAX. WITHOUT FACTORY APPROVAL	REF. SCHEMATIC "A" CONNECT USER LOOP SUPPLY TO +24 VDC (NOTE 9)
2	Out 1-	ISOLATED LOOP RETURN						
3	Out 2+	ISOLATED LOOP SUPPLY						
4	Out 2-	ISOLATED LOOP RETURN						
5	Out 3+	ISOLATED LOOP SUPPLY						
6	Out 3-	ISOLATED LOOP RETURN						
7	Out 4+	ISOLATED LOOP SUPPLY						
8	Out 4-	ISOLATED LOOP RETURN						

TB4 - ANALOG/DIGITAL INPUTS

PIN #	SIGNAL	FUNCTION	DESCRIPTION	USE	LOAD	WIRING	CABLE LENGTH	NOTES
1		NO CONNECTION						
2		NO CONNECTION						
3	D1 +	DIGITAL INPUT	CHANNEL 1 NOTOT	SUSPENDS CHANNEL TOTALIZATION	SHORT TO RETURN OR LOGIC LOW TO ACTIVATE	24 GA. MIN.	1000 FT. MAX. WITHOUT FACTORY APPROVAL	LOGIC LEVEL STATES: HIGH: 5 TO 3 VOLTS LOW: 0 TO 1 VOLT
4	D1 -	DIGITAL INPUT	CHANNEL 2 NOTOT					
5	D2 +	DIGITAL INPUT	CHANNEL 3 NOTOT					
6	D2 -	DIGITAL INPUT	CHANNEL 4 NOTOT					
7	D3 +	DIGITAL INPUT	CHANNEL 1 NOTOT					
8	D3 -	DIGITAL INPUT	CHANNEL 2 NOTOT					
9	D4 +	DIGITAL INPUT	CHANNEL 3 NOTOT					
10	D4 -	DIGITAL INPUT	CHANNEL 4 NOTOT					
11	In 1+	AUX.1 IN	EXTERNAL ANALOG CURRENT INPUT REFERENCED TO SYSTEM GROUND (NON ISOLATED)	USER ASSIGNABLE DEFERRING ON FLOW COMPUTER MODEL	200Ω RESISTIVE LOAD MAY NOT BE GREATER THAN +15VDC ABOVE SYSTEM GROUND. BARRIERS USED PER 1010-304	24 GA. MIN.	1000 FT. MAX. WITHOUT FACTORY APPROVAL	REF. SCHEMATIC "B"
12	In 1-	AUX.1 RETURN						
13	In 2+	AUX.2 IN						
14	In 2-	AUX.2 RETURN						
15	In 3+	AUX.3 IN						
16	In 3-	AUX.3 RETURN						
17	In 4+	AUX.4 IN						
18	In 4-	AUX.4 RETURN						

NOTES: (CONT'D FROM SHT. 1)

- RS-232 RANGE CAN BE INCREASED BY:
 - USE OF SHORT HAUL MODEMS.
 - USE OF SPECIAL DATA CABLES AND/OR SLOWER DATA RATES.
 - USE OF TELEPHONE LINE MODEM.
- IT IS RECOMMENDED THAT FLOW COMPUTER OPTION K1 (MERCURY WETTED RELAYS) BE CHOSEN IF TOTALIZER RELAY PULSES ARE TO BE SELECTED.
- LOAD CAPABILITY VARIES WITH SUPPLIED VOLTAGE. MAXIMUM LOAD FIGURES INCLUDE WIRING.
- RELAY VOLTAGE CURRENT LIMITED WHEN SAFETY BARRIERS USED PER 1010-304.

DO NOT SCALE THIS DRAWING
 UNLESS OTHERWISE SPECIFIED:
 DIMENSIONS ARE IN INCHES
 TOLERANCES ON-

INCHES
 ± .1
 (MM)
 ± .2

MATERIAL:

FINISH:

CONTRACT NO.

DR: H/J DATE: 2/06/02
 CHK: DATE: _____
 ENG: DATE: _____
 APPD: DATE: _____
 CERTIFIED: _____
 DATE: _____

SIEMENS
 Siemens Energy & Automation, Inc.
 Process Instrumentation Business Unit
 CoC Ultrasonic Flow - Hauppauge, Long Island, NY 11788

INSTALLATION DRAWING
 I/O MODULE

SIZE: CODE IDENT NO. **C 21614**
 SCALE: NONE WT. _____

REV. **B**
 1010N-8MS2-7
 SHEET 2 OF 2

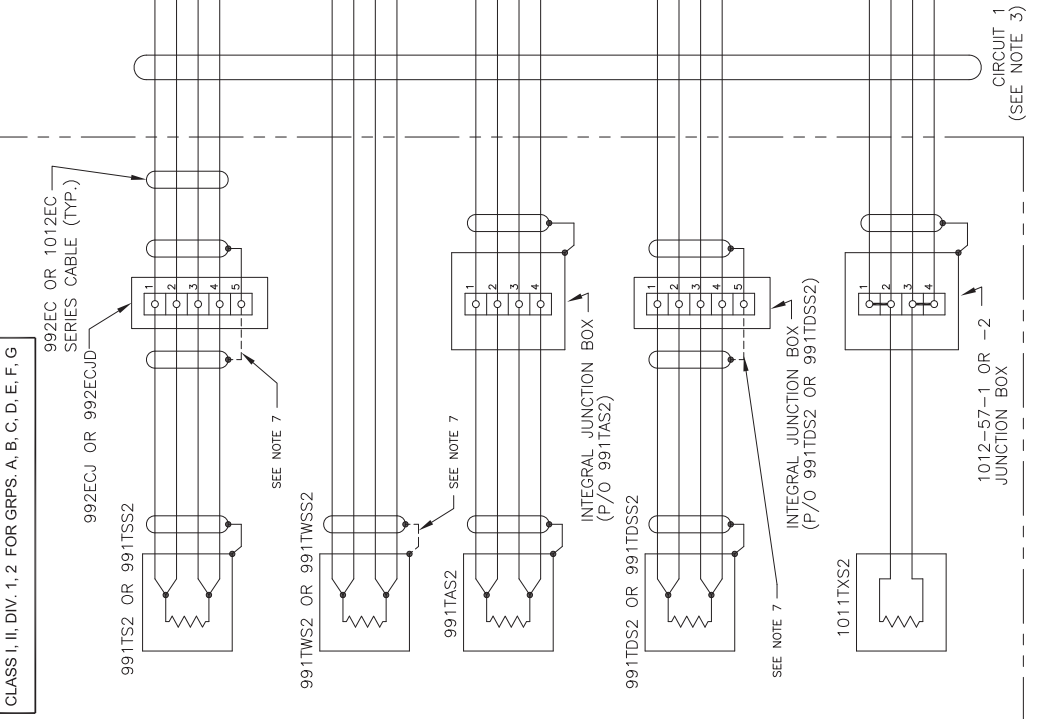
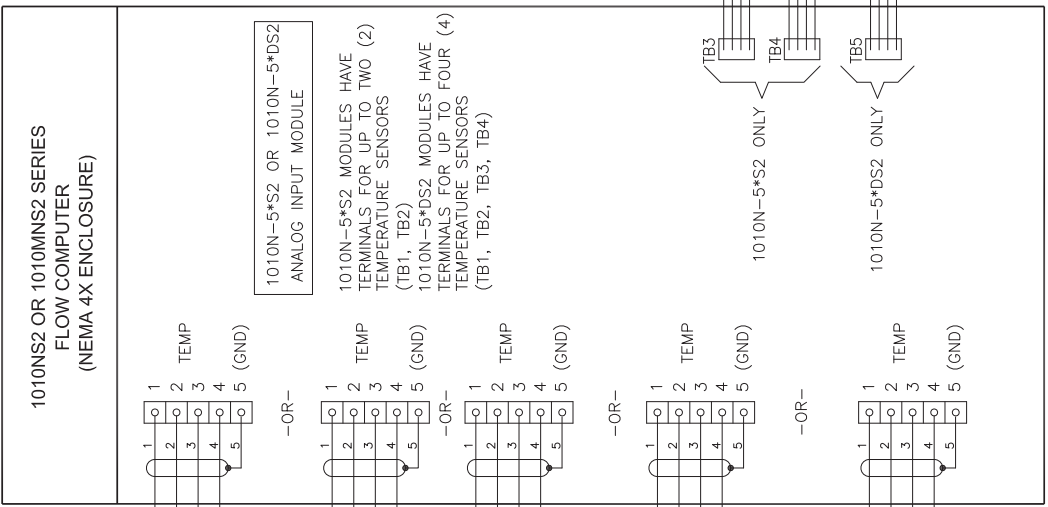
1

CN#5269

4 3 2 1

HAZARDOUS LOCATION
CLASS I, II, DIV. 1, 2 FOR GRFS-A, B, C, D, E, F, G

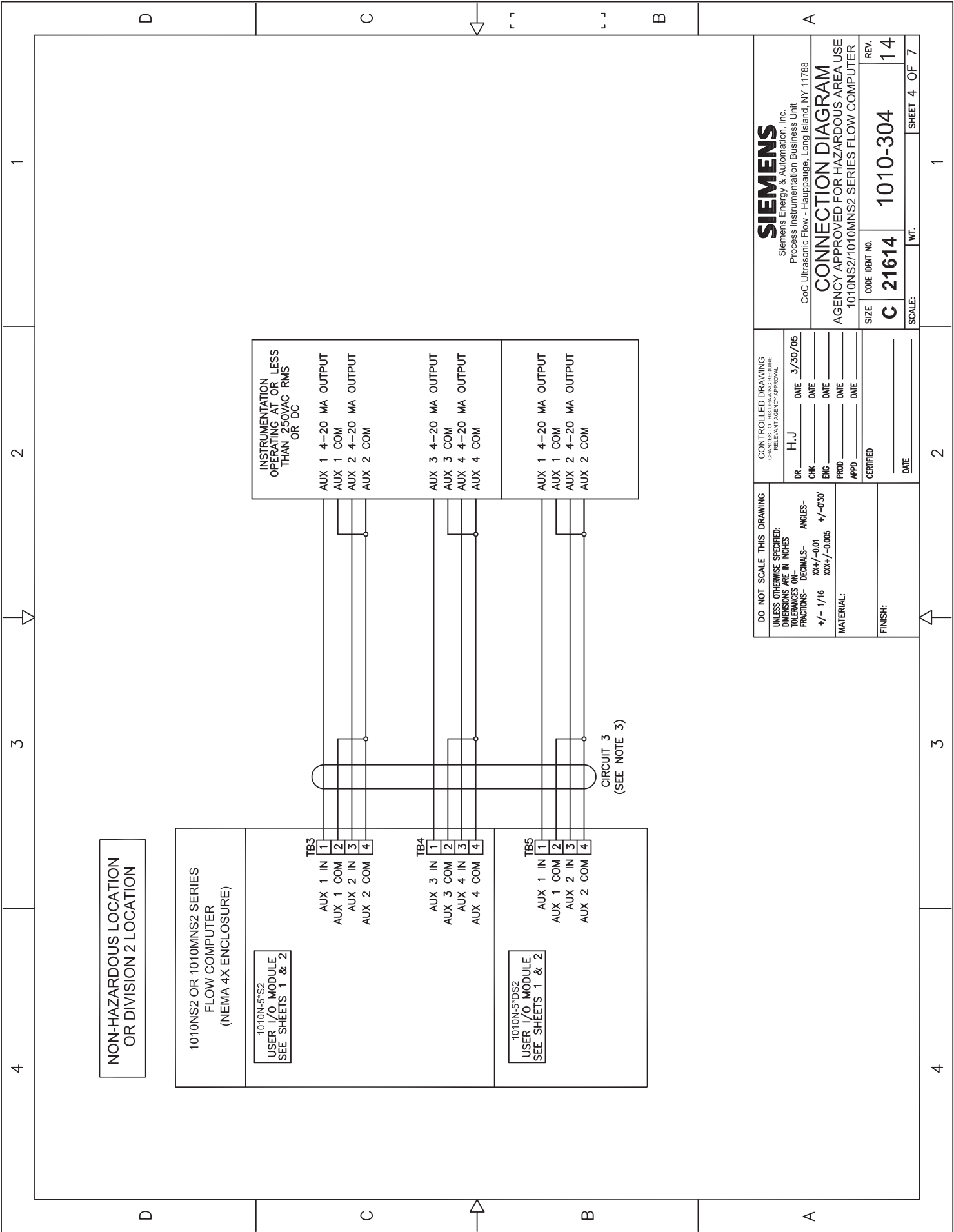
NON-HAZARDOUS LOCATION
OR DIVISION 2 LOCATION



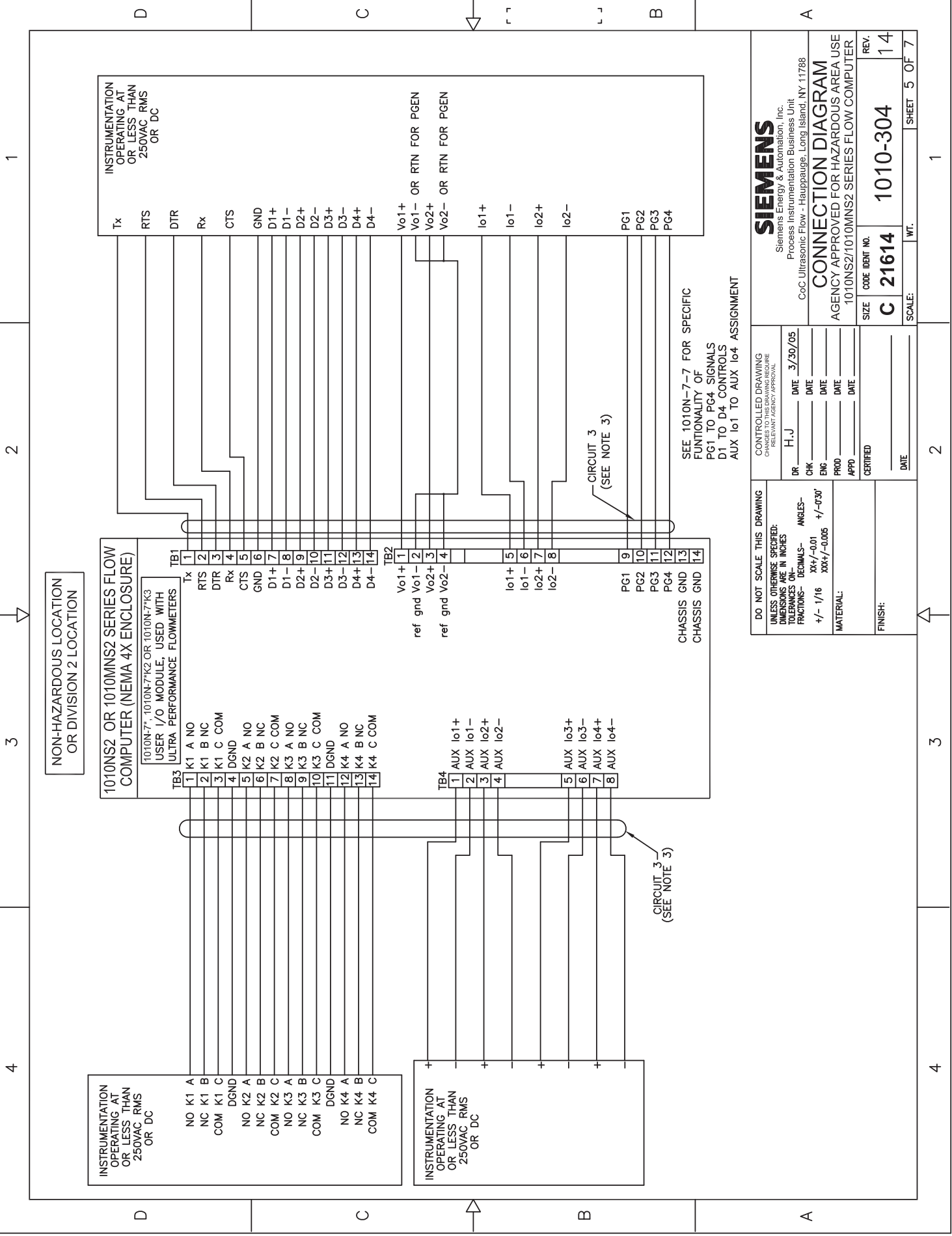
DO NOT SCALE THIS DRAWING UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES FRACTIONS—DECIMALS— ANGLES— +/- 1/16 XX +/- 0.01 +/- 0.30 XXX +/- 0.005		CONTROLLED DRAWING CHANGES TO THIS DRAWING REQUIRE RELEVANT AGENCY APPROVAL	
DR	H, J	DATE	3/30/05
CHK		DATE	
ENG		DATE	
PRD		DATE	
APPD		DATE	
CERTIFIED			
DATE			

<p>OPTIONAL SHIELD CONNECTION</p> <p>NOTES:</p> <p>7. INDICATED SHIELD CONNECTIONS ARE OPTIONAL AND DO NOT AFFECT SAFETY.</p>		<p>SIEMENS</p> <p>Siemens Energy & Automation, Inc. Process Instrumentation Business Unit CoC Ultrasonic Flow - Hauppauge, Long Island, NY 11788</p> <p>CONNECTION DIAGRAM AGENCY APPROVED FOR HAZARDOUS AREA USE 1010NS2/1010MNS2 SERIES FLOW COMPUTER</p>	
SIZE	CODE IDENT NO.	REV.	
C	21614	1010-304	14
SCALE:	NONE	WT.	
			SHEET 2 OF 7

4 3 2 1



DO NOT SCALE THIS DRAWING UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES - DECIMALS - ANGLES - FRACTIONS - DECIMALS - +/- 1/16 XX +/- 0.01 +/- 0.30 XXX +/- 0.005 +/- 0.005	CONTROLLED DRAWING CHANGES TO THIS DRAWING REQUIRE RELEVANT AGENCY APPROVAL		SIEMENS Siemens Energy & Automation, Inc. Process Instrumentation Business Unit CoC Ultrasonic Flow - Hauppauge, Long Island, NY 11788	
	DR H.J. CHK _____ ENG _____ PRD _____ APPD _____ CERTIFIED _____ DATE _____	DATE 3/30/05 DATE _____ DATE _____ DATE _____	CONNECTION DIAGRAM AGENCY APPROVED FOR HAZARDOUS AREA USE 1010NS2/1010MNS2 SERIES FLOW COMPUTER	
MATERIAL: _____ FINISH: _____		SIZE C 21614 CODE IDENT NO. 1010-304	REV. 14	SCALE: _____ WT. _____ SHEET 4 OF 7



NON-HAZARDOUS LOCATION
OR DIVISION 2 LOCATION

1010NS2 OR 1010MNS2 SERIES FLOW
COMPUTER (NEMA 4X ENCLOSURE)

1010N-7*, 1010N-7K2 OR 1010N-7K3
USER I/O MODULE. USED WITH
ULTRA PERFORMANCE FLOWMETERS

INSTRUMENTATION
OPERATING AT
OR LESS THAN
250VAC RMS
OR DC

NO K1 A
NC K1 B
COM K1 C
DGND
NO K2 A
NC K2 B
COM K2 C
NO K3 A
NC K3 B
COM K3 C
DGND
NO K4 A
NC K4 B
COM K4 C

INSTRUMENTATION
OPERATING AT
OR LESS THAN
250VAC RMS
OR DC

Vo1+
Vo1- OR RTN FOR PGEN
Vo2+
Vo2- OR RTN FOR PGEN
lo1+
lo1-
lo2+
lo2-

PG1
PG2
PG3
PG4

DO NOT SCALE THIS DRAWING UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES FRACTIONS- DECIMALS- ANGLES- +/- 1/16 XX/-0.01 +/-0.30 XXX/-0.005		CONTROLLED DRAWING CHANGES TO THIS DRAWING REQUIRE RELEVANT AGENCY APPROVAL	
DR	H.J.	DATE	3/30/05
CHK		DATE	
ENG		DATE	
PROD		DATE	
APPD		DATE	
CERTIFIED			
DATE			
MATERIAL:		SIZE	CODE IDENT NO.
FINISH:		C	21614
		REV.	14
		SCALE:	1010-304
		WT.	SHEET 5 OF 7

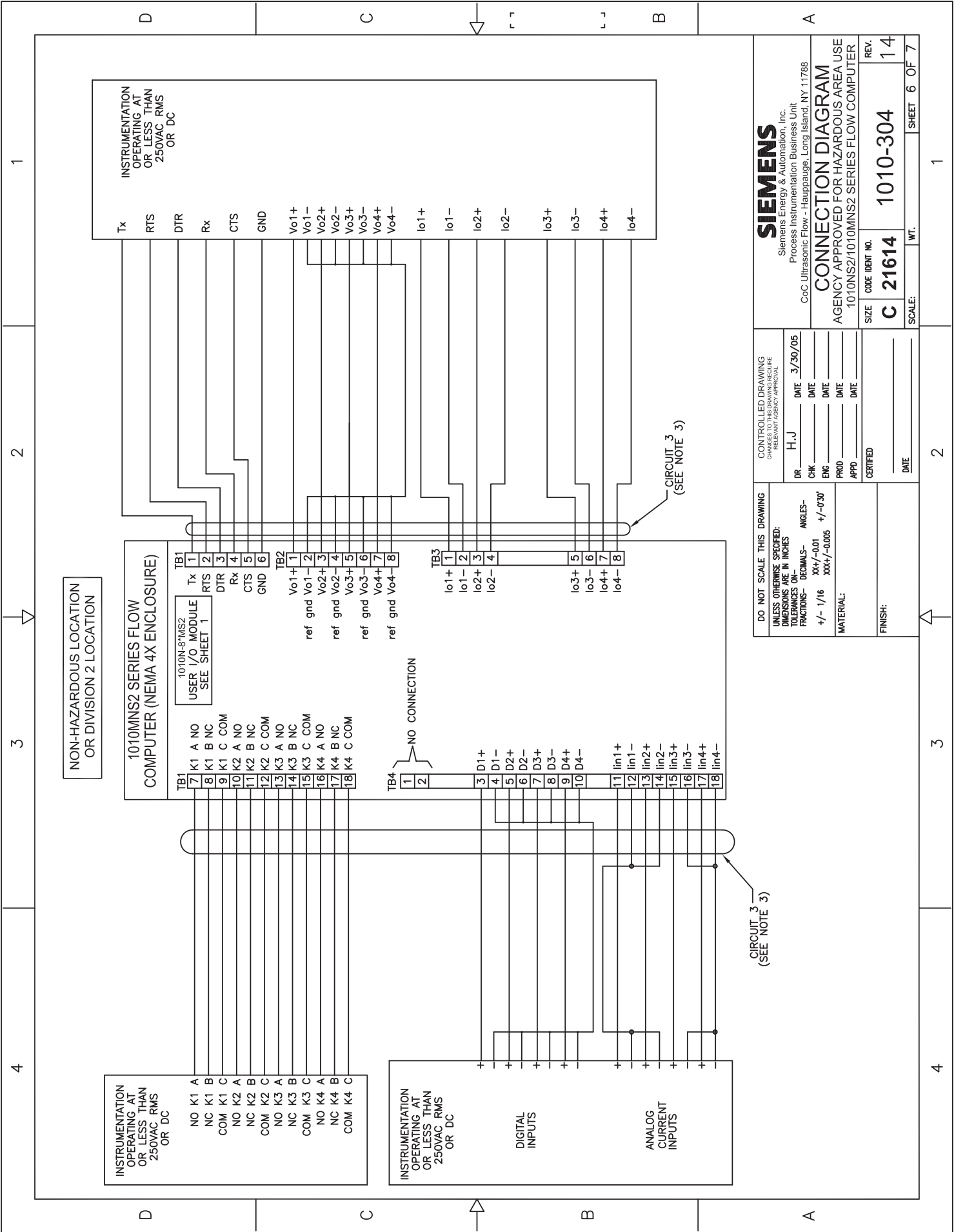
SEE 1010N-7-7 FOR SPECIFIC
FUNCTIONALITY OF
PG1 TO PG4 SIGNALS
D1 TO D4 CONTROLS
AUX lo1 TO AUX lo4 ASSIGNMENT

-CIRCUIT 3
(SEE NOTE 3)

-CIRCUIT 3
(SEE NOTE 3)

SIEMENS
Siemens Energy & Automation, Inc.
Process Instrumentation Business Unit
CoC Ultrasonic Flow - Hauppauge, Long Island, NY 11788

CONNECTION DIAGRAM
AGENCY APPROVED FOR HAZARDOUS AREA USE
1010NS2/1010MNS2 SERIES FLOW COMPUTER



NON-HAZARDOUS LOCATION
OR DIVISION 2 LOCATION

1010MNS2 SERIES FLOW
COMPUTER (NEMA 4X ENCLOSURE)

1010N-8*MNS2
USER I/O MODULE
SEE SHEET 1

INSTRUMENTATION
OPERATING AT
OR LESS THAN
250VAC RMS
OR DC

INSTRUMENTATION
OPERATING AT
OR LESS THAN
250VAC RMS
OR DC

INSTRUMENTATION
OPERATING AT
OR LESS THAN
250VAC RMS
OR DC

DIGITAL
INPUTS

ANALOG
CURRENT
INPUTS

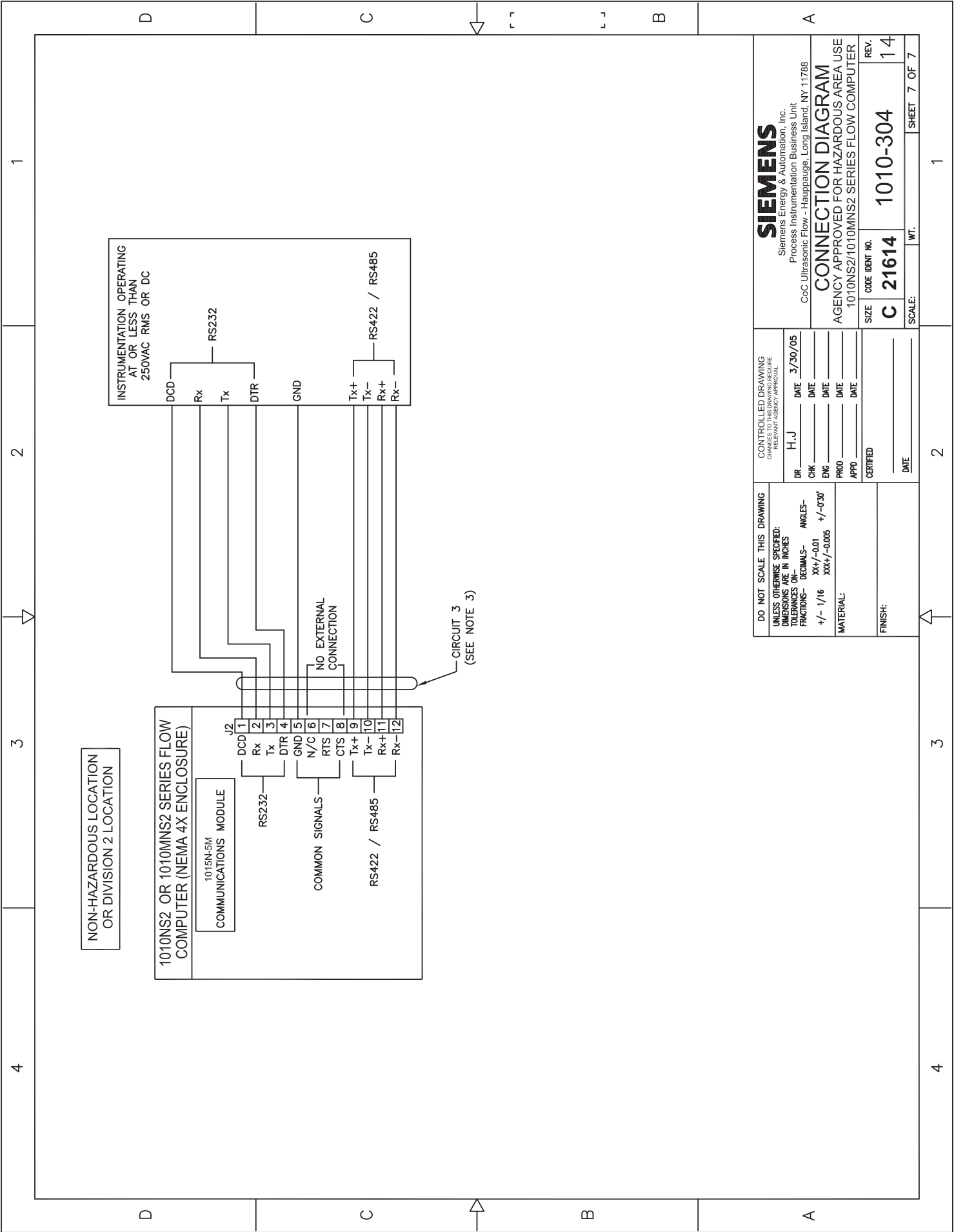
CIRCUIT 3
(SEE NOTE 3)

CIRCUIT 3
(SEE NOTE 3)

DO NOT SCALE THIS DRAWING UNLESS OTHERWISE SPECIFIED: DIMENSIONS IN INCHES TOLERANCES ON FRACTIONS- DECIMALS- ANGLES- +/- 1/16 XXX/-0.01 +/--0.30 MATERIAL: FINISH:	CONTROLLED DRAWING CHANGES TO THIS DRAWING REQUIRE RELEVANT AGENCY APPROVAL	DATE 3/30/05
	DR H.J	DATE
	CHK	DATE
	ENG	DATE
	PROD	DATE
	APPO	DATE
	CERTIFIED	
	DATE	
<p>SIEMENS Siemens Energy & Automation, Inc. Process Instrumentation Business Unit CoC Ultrasonic Flow - Hauppauge, Long Island, NY 11788</p> <p>CONNECTION DIAGRAM AGENCY APPROVED FOR HAZARDOUS AREA USE 1010MNS2/1010MNS2 SERIES FLOW COMPUTER</p>		
SIZE	CODE IDENT NO.	REV.
C 21614	1010-304	14
SCALE:	WT.	SHEET 6 OF 7

4 3 2 1

4 3 2 1



NON-HAZARDOUS LOCATION
OR DIVISION 2 LOCATION

1015N-5M
COMMUNICATIONS MODULE

1010NS2 OR 1010MNS2 SERIES FLOW
COMPUTER (NEMA 4X ENCLOSURE)

J2

DCD	1
Rx	2
Tx	3
DTR	4
GND	5
N/C	6
RTS	7
CTS	8
Tx+	9
Tx-	10
Rx+	11
Rx-	12

RS232

COMMON SIGNALS

RS422 / RS485

INSTRUMENTATION OPERATING
AT OR LESS THAN
250VAC RMS OR DC

RS232

DCD

Rx

Tx

DTR

GND

RS422 / RS485

Tx+

Tx-

Rx+

Rx-

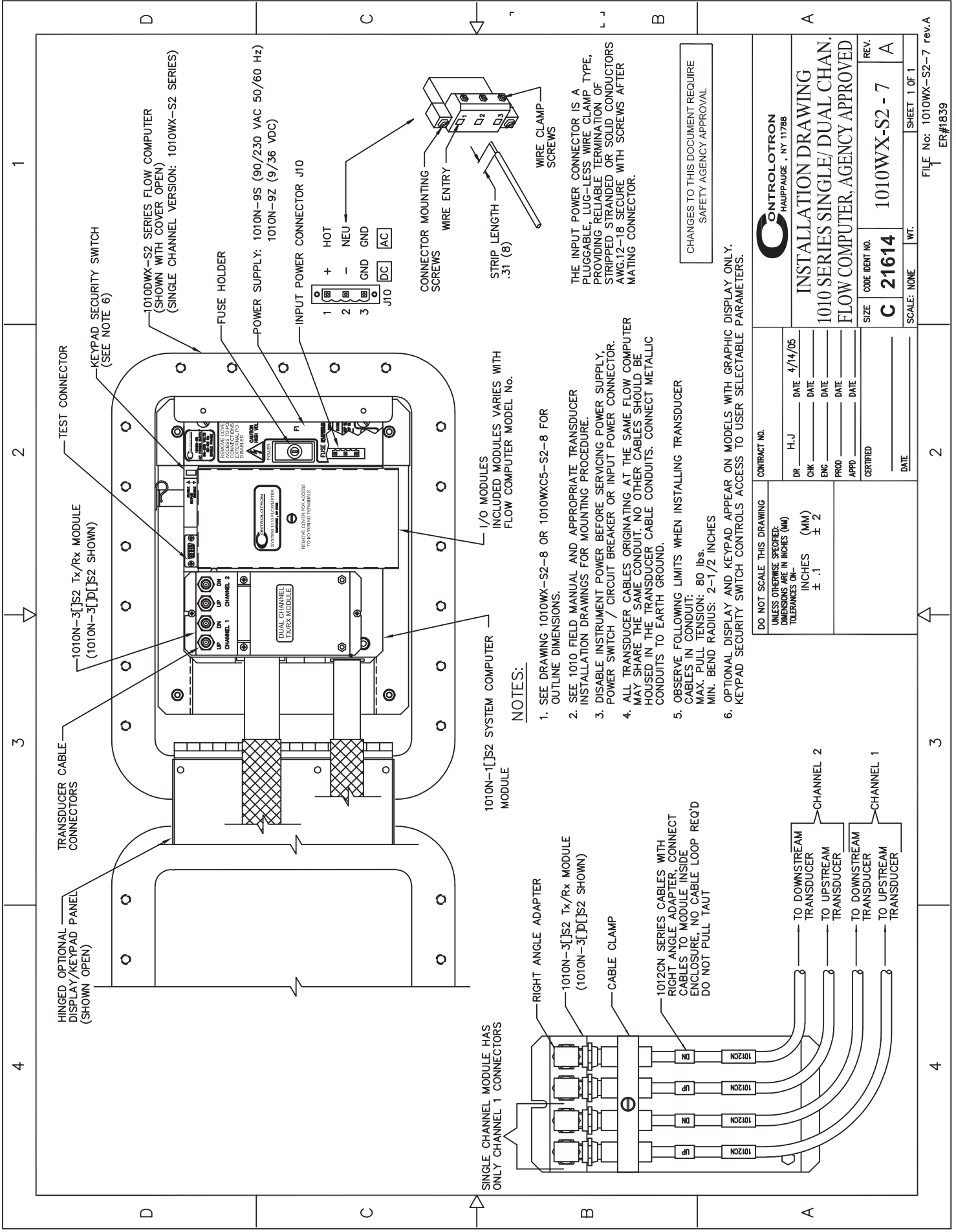
CIRCUIT 3
(SEE NOTE 3)

DO NOT SCALE THIS DRAWING UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES - DECIMALS - ANGLES - FRACTIONS - DECIMALS - ANGLES - +/- 1/16 XX +/- 0.01 +/- 0.30 XXX +/- 0.006	CONTROLLED DRAWING CHANGES TO THIS DRAWING REQUIRE RELEVANT AGENCY APPROVAL		SIEMENS Siemens Energy & Automation, Inc. Process Instrumentation Business Unit CoC Ultrasonic Flow - Hauppauge, Long Island, NY 11788	
	DR: H.J. CHK: _____ ENG: _____ PRD: _____ APPD: _____ CERTIFIED: _____ DATE: _____	DATE: 3/30/05 DATE: _____ DATE: _____ DATE: _____	CONNECTION DIAGRAM AGENCY APPROVED FOR HAZARDOUS AREA USE 1010NS2/1010MNS2 SERIES FLOW COMPUTER	
MATERIAL: _____ FINISH: _____		SIZE: C CODE IDENT NO.: 21614	REV.: 14	SCALE: _____ WT.: _____ SHEET 7 OF 7

4 3 2 1

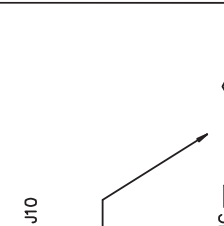
4 3 2 1

D C B A



1010WX-S2 SERIES FLOW COMPUTER
(SHOWN WITH COVER OPEN)
(SINGLE CHANNEL VERSION: 1010WX-S2 SERIES)

POWER SUPPLY: 1010N-9S (90/230 VAC 50/60 Hz)
1010N-9Z (9/36 VDC)



CONNECTOR MOUNTING
SCREWS

WIRE ENTRY

STRIP LENGTH
.31 (6)

WIRE CLAMP
SCREWS

THE INPUT POWER CONNECTOR IS A
PLUGGABLE, LUG-LESS WIRE CLAMP TYPE,
PROVIDING RELIABLE TERMINATION OF
STRIPPED STRANDED OR SOLID CONDUCTORS
AWG.12-18 SECURE WITH SCREWS AFTER
MATING CONNECTOR.

CHANGES TO THIS DOCUMENT REQUIRE
SAFETY AGENCY APPROVAL

1010N-1[Js2] SYSTEM COMPUTER
MODULE

I/O MODULES
INCLUDED MODULES Varies WITH
FLOW COMPUTER MODEL No.

1010N-3[Js2] Tx/Rx MODULE
(1010N-3[D] [Js2] SHOWN)

TEST CONNECTOR

KEYPAD SECURITY SWITCH
(SEE NOTE 6)

FUSE HOLDER

TRANSUDER CABLE
CONNECTORS

HINGED OPTIONAL
DISPLAY/KEYPAD PANEL
(SHOWN OPEN)

NOTES:

1. SEE DRAWING 1010WX-S2-8 OR 1010WXC5-S2-8 FOR
OUTLINE DIMENSIONS.
2. SEE 1010 FIELD MANUAL AND APPROPRIATE TRANSUDER
INSTALLATION DRAWINGS FOR MOUNTING PROCEDURE.
3. DISABLE INSTRUMENT POWER BEFORE SERVICING POWER SUPPLY,
POWER SWITCH / CIRCUIT BREAKER OR INPUT POWER CONNECTOR.
4. ALL TRANSUDER CABLES ORIGINATING AT THE SAME FLOW COMPUTER
HOUSED IN THE SAME CONDUIT. NO OTHER CABLES SHOULD BE
CONDUITS TO EARTH GROUND.
5. OBSERVE FOLLOWING LIMITS WHEN INSTALLING TRANSUDGER
CABLES IN CONDUIT:
MAX. PULL TENSION: 80 lbs
MIN. BEND RADIUS: 2-1/2 INCHES
6. OPTIONAL DISPLAY AND KEYPAD APPEAR ON MODELS WITH GRAPHIC DISPLAY ONLY.
KEYPAD SECURITY SWITCH CONTROLS ACCESS TO USER SELECTABLE PARAMETERS.

DO NOT SCALE THIS DRAWING

CONTRACT NO.

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS IN INCHES (MM)
TOLERANCES ON
INCHES (MM)

± .1
± 2

DR H-J DATE 4/14/05

CHK DATE

ENG DATE

PROD DATE

APPD DATE

CERTIFIED

DATE

RIGHT ANGLE ADAPTER

1010N-3[Js2] Tx/Rx MODULE
(1010N-3[D] [Js2] SHOWN)

CABLE CLAMP

1012CN SERIES CABLES WITH
RIGHT ANGLE ADAPTER, CONNECT
CABLES TO MODULE INSIDE
ENCLOSURE, NO CABLE LOOP REQ'D
DO NOT PULL TAUT

CHANNEL 2

CHANNEL 1

TO DOWNSTREAM
TRANSUDER

TO UPSTREAM
TRANSUDER

TO DOWNSTREAM
TRANSUDER

TO UPSTREAM
TRANSUDER

SINGLE CHANNEL MODULE HAS
ONLY CHANNEL 1 CONNECTORS

CONTROLLOTRON
HAUPPAUGE, NY 11788

INSTALLATION DRAWING
1010 SERIES SINGLE/ DUAL CHAN.
FLOW COMPUTER, AGENCY APPROVED

SIZE CODE IDENT NO. REV.
C 21614 1010WX-S2 - 7 A

SCALE: NONE WT. SHEET 1 OF 1

FILE No: 1010WX-S2-7 rev.A
ER#1839

2

3

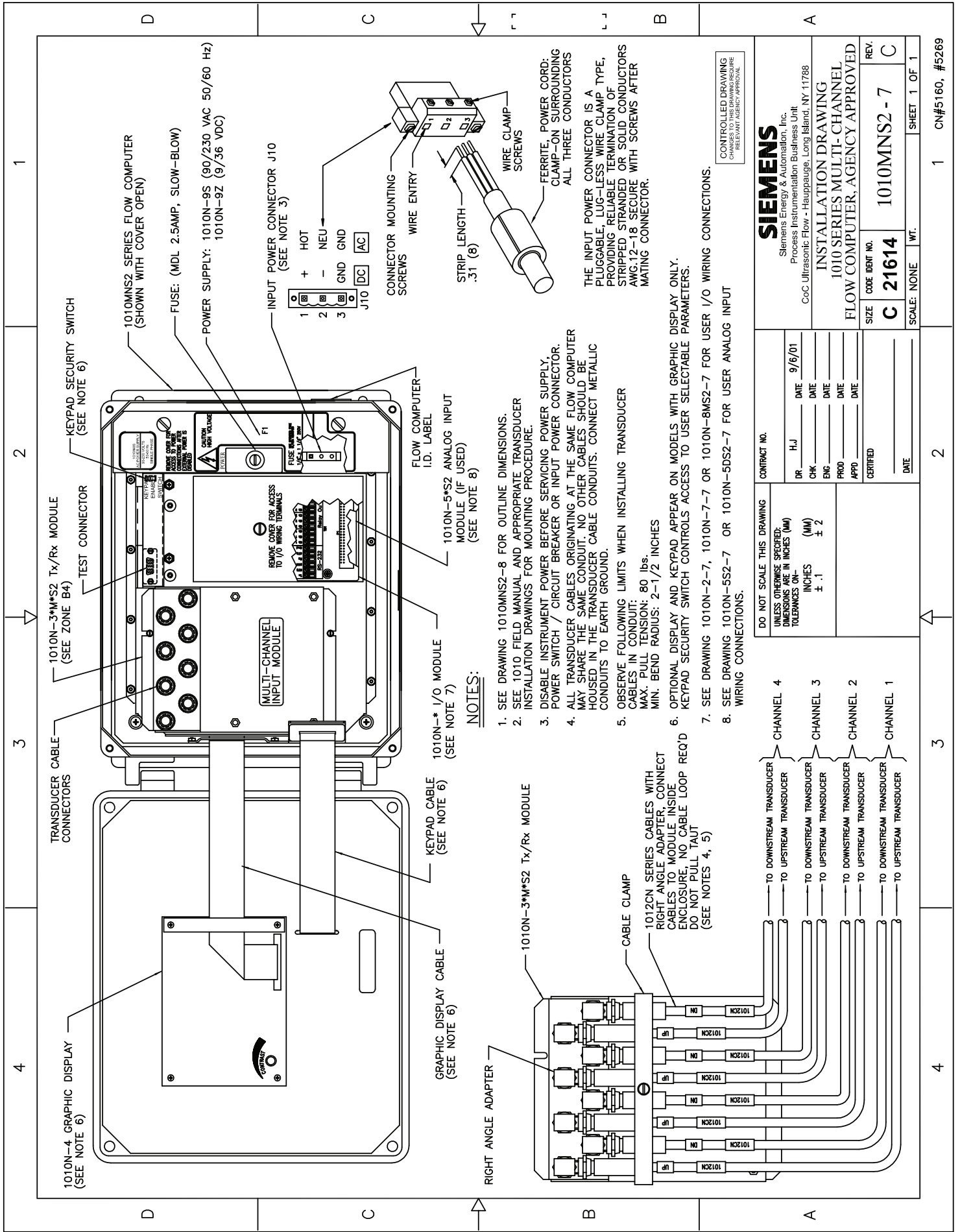
4

1

2

3

4



NOTES:

- SEE DRAWING 1010MNS2-8 FOR OUTLINE DIMENSIONS.
- SEE 1010 FIELD MANUAL AND APPROPRIATE TRANSDUCER INSTALLATION DRAWINGS FOR MOUNTING PROCEDURE.
- DISABLE INSTRUMENT POWER BEFORE SERVICING POWER SUPPLY, POWER SWITCH / CIRCUIT BREAKER OR INPUT POWER CONNECTOR.
- ALL TRANSDUCER CABLES ORIGINATING AT THE SAME FLOW COMPUTER MAY SHARE THE SAME CONDUIT. NO OTHER CABLES SHOULD BE HOUSED IN THE TRANSDUCER CABLE CONDUITS. CONNECT METALLIC CONDUITS TO EARTH GROUND.
- OBSERVE FOLLOWING LIMITS WHEN INSTALLING TRANSDUCER CABLES IN CONDUIT:
MAX. PULL TENSION: 80 lbs.
MIN. BEND RADIUS: 2-1/2 INCHES
- OPTIONAL DISPLAY AND KEYPAD APPEAR ON MODELS WITH GRAPHIC DISPLAY ONLY. KEYPAD SECURITY SWITCH CONTROLS ACCESS TO USER SELECTABLE PARAMETERS.
- SEE DRAWING 1010N-2-7, 1010N-7-7 OR 1010N-8MS2-7 FOR USER I/O WIRING CONNECTIONS.
- SEE DRAWING 1010N-5S2-7 OR 1010N-5DS2-7 FOR USER ANALOG INPUT WIRING CONNECTIONS.

CONTROLLED DRAWING
CHANGES TO THIS DRAWING REQUIRE
RELEVANT AGENCY APPROVAL

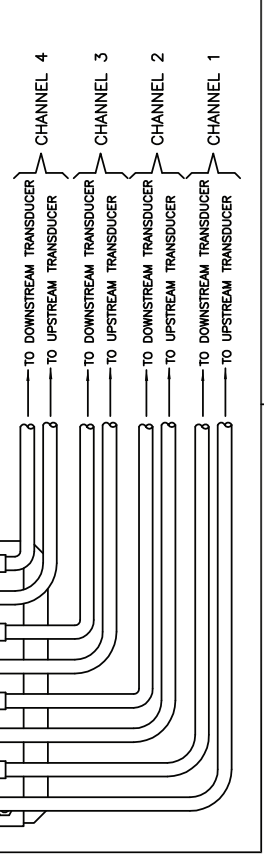
SIEMENS
Siemens Energy & Automation, Inc.
Process Instrumentation Business Unit
CoC Ultrasonic Flow - Hauppauge, Long Island, NY 11788

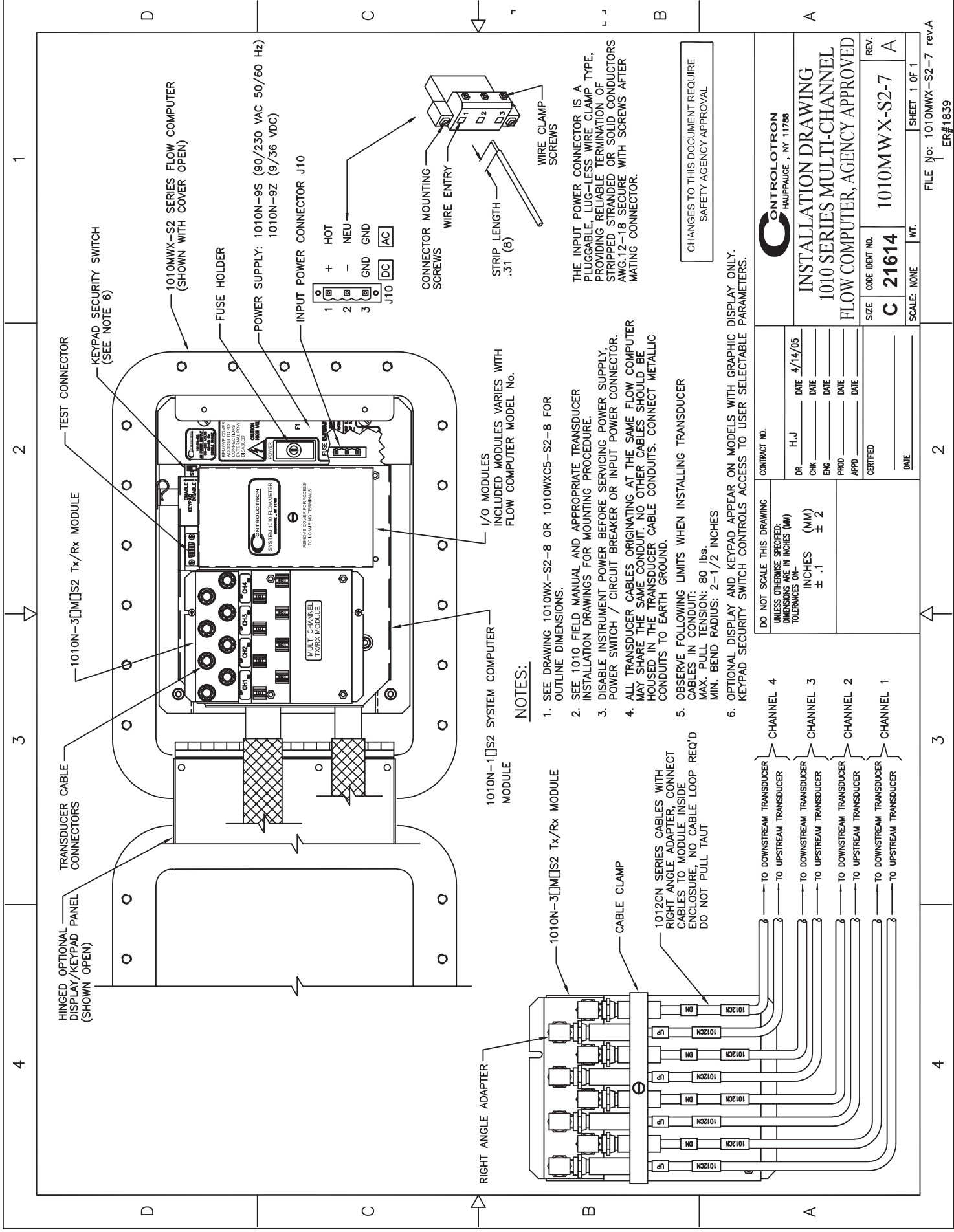
INSTALLATION DRAWING
1010 SERIES MULTI-CHANNEL
FLOW COMPUTER, AGENCY APPROVED

SIZE: **C** CODE IDENT NO. **21614** 1010MNS2-7 REV. **C**

SCALE: NONE WT. SHEET 1 OF 1

DO NOT SCALE THIS DRAWING UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES (IN) TOLERANCES ON—		CONTRACT NO.	
INCHES	± .1	DR	H/J
MILLIMETERS	± .2	CHK	DATE 9/6/01
		ENG	DATE
		PROD	DATE
		APPD	DATE
		CERTIFIED	DATE





HINGED OPTIONAL DISPLAY/KEYPAD PANEL (SHOWN OPEN)

TRANSDUCER CABLE CONNECTORS

1010N-3[M][S2 Tx/Rx MODULE

TEST CONNECTOR

KEYPAD SECURITY SWITCH (SEE NOTE 6)

FUSE HOLDER

1010MWX-S2 SERIES FLOW COMPUTER (SHOWN WITH COVER OPEN)

POWER SUPPLY: 1010N-9S (90/230 VAC 50/60 Hz)
1010N-9Z (9/36 VDC)

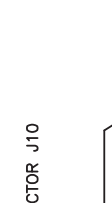
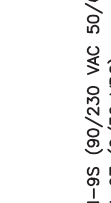
INPUT POWER CONNECTOR J10

CONNECTOR MOUNTING SCREWS

WIRE ENTRY

WIRE CLAMP SCREWS

STRIP LENGTH .31 (8)



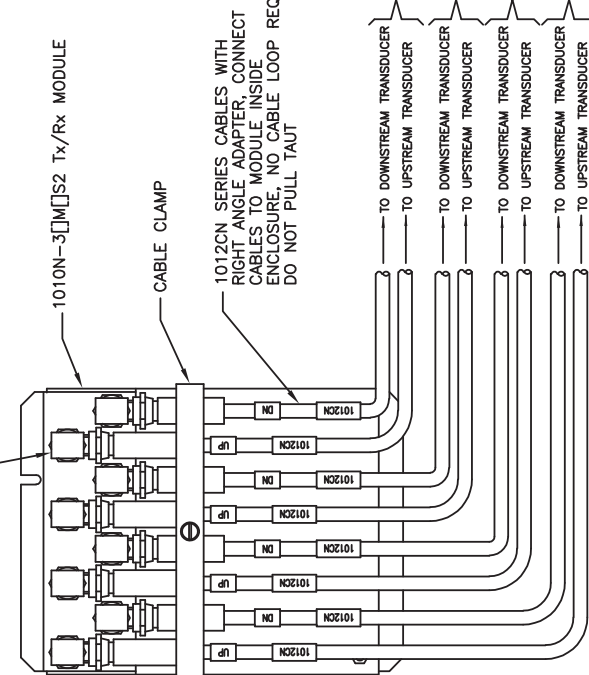
THE INPUT POWER CONNECTOR IS A PLUGGABLE LUG-LESS WIRE CLAMP TYPE, PROVIDING RELIABLE TERMINATION OF STRIPPED STRANDED OR SOLID CONDUCTORS AWG.12-18 SECURE WITH SCREWS AFTER MATING CONNECTOR.

CHANGES TO THIS DOCUMENT REQUIRE SAFETY AGENCY APPROVAL

I/O MODULES INCLUDED MODULES VARIES WITH FLOW COMPUTER MODEL No.

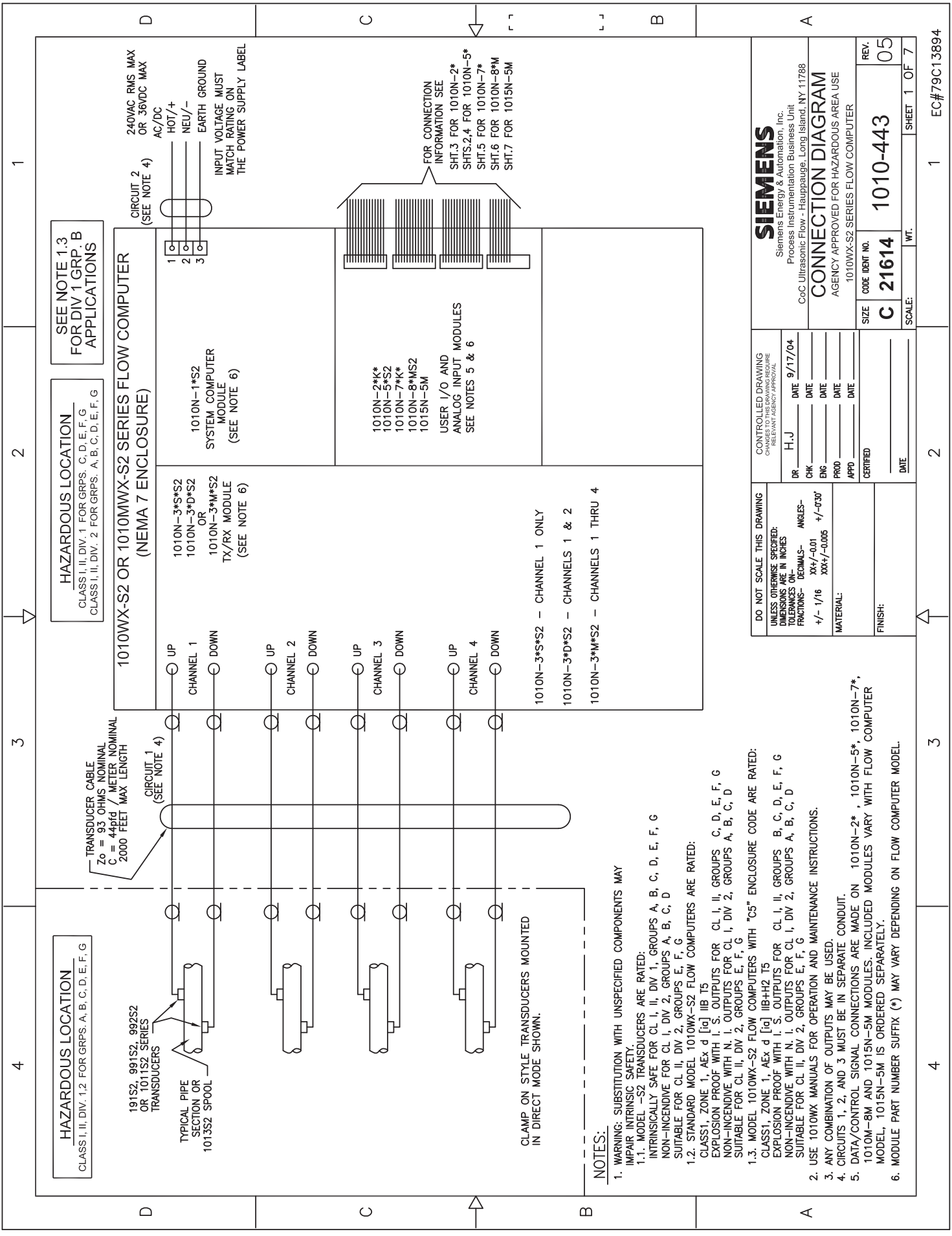
NOTES:

1. SEE DRAWING 1010WX-S2-8 OR 1010WXC5-S2-8 FOR OUTLINE DIMENSIONS.
2. SEE 1010 FIELD MANUAL AND APPROPRIATE TRANSDUCER INSTALLATION DRAWINGS FOR MOUNTING PROCEDURE.
3. DISABLE INSTRUMENT POWER BEFORE SERVICING POWER SUPPLY, POWER SWITCH / CIRCUIT BREAKER OR INPUT POWER CONNECTOR.
4. ALL TRANSDUCER CABLES ORIGINATING AT THE SAME FLOW COMPUTER MAY SHARE THE SAME CONDUIT. NO OTHER CABLES SHOULD BE HOUSED IN THE TRANSDUCER CABLE CONDUITS. CONNECT METALLIC CONDUITS TO EARTH GROUND.
5. OBSERVE FOLLOWING LIMITS WHEN INSTALLING TRANSDUCER CABLES IN CONDUIT:
MAX. PULL TENSION: 80 lbs.
MIN. BEND RADIUS: 2-1/2 INCHES
6. OPTIONAL DISPLAY AND KEYPAD APPEAR ON MODELS WITH GRAPHIC DISPLAY ONLY. KEYPAD SECURITY SWITCH CONTROLS ACCESS TO USER SELECTABLE PARAMETERS.



		HAUPPAUGE, NY 11788	
		INSTALLATION DRAWING 1010 SERIES MULTI-CHANNEL FLOW COMPUTER, AGENCY APPROVED	
SIZE C 21614	CODE IDENT NO. 1010MWX-S2-7	REV. A	SHEET 1 OF 1
SCALE: NONE	WT.	FILE No: 1010MWX-S2-7 rev.A	ER#1839

DO NOT SCALE THIS DRAWING UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES (MM) TOLERANCES ON— INCHES (MM) $\pm .1$ (MM) ± 2	CONTRACT NO. DR. H-J DATE 4/14/05 CHK. DATE ENG. DATE PROD. DATE APPD. DATE CERTIFIED DATE
---	---



SEE NOTE 1.3 FOR DIV 1 GRP. B APPLICATIONS

HAZARDOUS LOCATION
CLASS I, II, DIV. 1 FOR GRPS. C, D, E, F, G
CLASS I, II, DIV. 2 FOR GRPS. A, B, C, D, E, F, G

1010MWX-S2 OR 1010MWX-S2 SERIES FLOW COMPUTER (NEMA 7 ENCLOSURE)

1010N-3*S*S2
1010N-3*D*S2
OR
1010N-3*M*S2
TX/RX MODULE
(SEE NOTE 6)

1010N-1*S2
SYSTEM COMPUTER
MODULE
(SEE NOTE 6)

1010N-2*K*
1010N-5*S2
1010N-7*K*
1010N-8*MS2
1015N-5M
USER I/O AND
ANALOG INPUT MODULES
SEE NOTES 5 & 6

FOR CONNECTION INFORMATION SEE
SHT.3 FOR 1010N-2*
SHT.2,4 FOR 1010N-5*
SHT.5 FOR 1010N-7*
SHT.6 FOR 1010N-8*
SHT.7 FOR 1015N-5M

TRANSUCER CABLE
 $Z_0 = 93 \text{ OHMS NOMINAL}$
 $C = 44 \text{ pfd / METER NOMINAL}$
2000 FEET MAX LENGTH

CIRCUIT 1
(SEE NOTE 4)

191S2, 991S2, 992S2
OR 1011S2 SERIES
TRANSUCERS

TYPICAL PIPE
SECTION OR
1013S2 SPOOL

CLAMP ON STYLE TRANSUCERS MOUNTED
IN DIRECT MODE SHOWN.

NOTES:

- WARNING: SUBSTITUTION WITH UNSPECIFIED COMPONENTS MAY IMPAIR INTRINSIC SAFETY.
 - MODEL -S2 TRANSUCERS ARE RATED:
 - INTRINSICALLY SAFE FOR CL I, II, DIV 1, GROUPS A, B, C, D, E, F, G
 - NON-INCENDIVE FOR CL I, DIV 2, GROUPS A, B, C, D
 - SUITABLE FOR CL II, DIV 2, GROUPS E, F, G
 - STANDARD MODEL 1010MWX-S2 FLOW COMPUTERS ARE RATED:
 - CLASS 1, ZONE 1, AEX d [ic] IIB T5
 - EXPLOSION PROOF WITH I. S. OUTPUTS FOR CL I, II, GROUPS C, D, E, F, G
 - NON-INCENDIVE WITH N. I. OUTPUTS FOR CL I, DIV 2, GROUPS A, B, C, D
 - SUITABLE FOR CL II, DIV 2, GROUPS E, F, G
 - MODEL 1010MWX-S2 FLOW COMPUTERS WITH "CS" ENCLOSURE CODE ARE RATED:
 - CLASS 1, ZONE 1, AEX d [ic] IIB+H2 T5
 - EXPLOSION PROOF WITH I. S. OUTPUTS FOR CL I, II, GROUPS B, C, D, E, F, G
 - NON-INCENDIVE WITH N. I. OUTPUTS FOR CL I, DIV 2, GROUPS A, B, C, D
 - SUITABLE FOR CL II, DIV 2, GROUPS E, F, G
- USE 1010WX MANUALS FOR OPERATION AND MAINTENANCE INSTRUCTIONS.
- ANY COMBINATION OF OUTPUTS MAY BE USED.
- CIRCUITS 1, 2, AND 3 MUST BE IN SEPARATE CONDUIT.
- DATA/CONTROL SIGNAL CONNECTIONS ARE MADE ON 1010N-2*, 1010N-5*, 1010N-7*, 1010M-8M AND 1015N-5M MODULES. INCLUDED MODULES VARY WITH FLOW COMPUTER MODEL. 1015N-5M IS ORDERED SEPARATELY.
- MODULE PART NUMBER SUFFIX (*) MAY VARY DEPENDING ON FLOW COMPUTER MODEL.

240VAC RMS MAX
OR 36VDC MAX
AC/DC
HOT/+
NEU/-
EARTH GROUND
INPUT VOLTAGE MUST
MATCH RATING ON
THE POWER SUPPLY LABEL

CIRCUIT 2
(SEE NOTE 4)

<p>SIEMENS Siemens Energy & Automation, Inc. Process Instrumentation Business Unit CoC Ultrasonic Flow - Hauppauge, Long Island, NY 11788</p>	
<p>CONNECTION DIAGRAM AGENCY APPROVED FOR HAZARDOUS AREA USE 1010MWX-S2 SERIES FLOW COMPUTER</p>	
<p>DO NOT SCALE THIS DRAWING UNLESS OTHERWISE SPECIFIED: DIMENSIONS - IN INCHES TOLERANCES - ANGLES - FRACTIONS - DECIMALS - +/- .001 XX/-0.01 +/- .005 XX/-0.005 +/- .030*</p>	<p>CONTROLLED DRAWING CHANGES TO THIS DRAWING REQUIRE RELEVANT AGENCY APPROVAL</p>
<p>DR H, J DATE 9/17/04</p>	<p>CHK _____ DATE _____</p>
<p>ENG _____ DATE _____</p>	<p>PRD _____ DATE _____</p>
<p>APPD _____ DATE _____</p>	<p>CERTIFIED _____ DATE _____</p>
<p>SIZE C 21614</p>	<p>CODE IDENT NO. 1010-443</p>
<p>SCALE: _____</p>	<p>WT. _____</p>
<p>SHEET 1 OF 7</p>	<p>REV. 05</p>

1

2

3

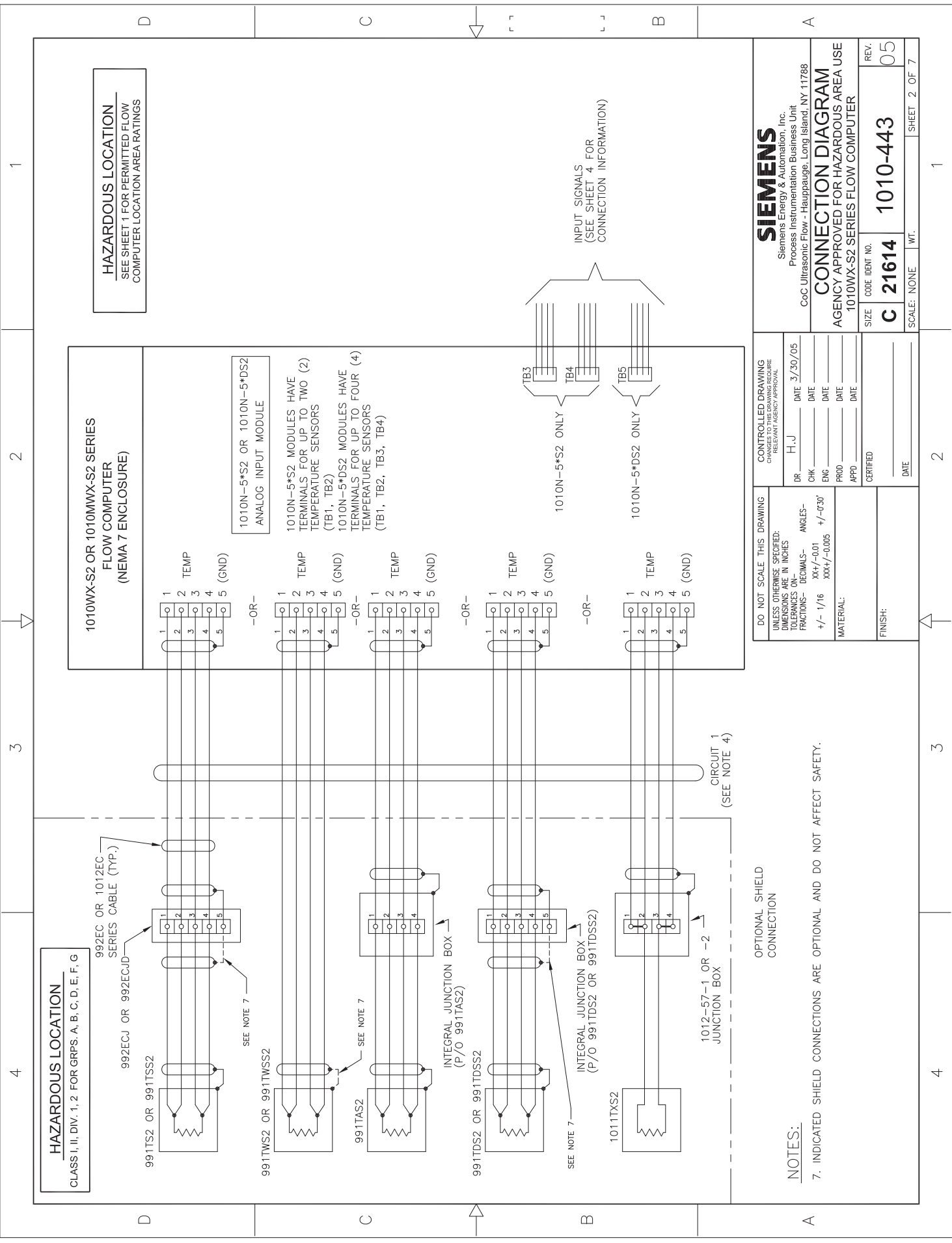
4

1

2

3

4



HAZARDOUS LOCATION
SEE SHEET 1 FOR PERMITTED FLOW
COMPUTER LOCATION AREA RATINGS

**1010WX-S2 OR 1010MWX-S2 SERIES
FLOW COMPUTER
(NEMA 7 ENCLOSURE)**

1010N-5*S2 OR 1010N-5*DS2
ANALOG INPUT MODULE

1010N-5*S2 MODULES HAVE
TERMINALS FOR UP TO TWO (2)
TEMPERATURE SENSORS
(TB1, TB2)

1010N-5*DS2 MODULES HAVE
TERMINALS FOR UP TO FOUR (4)
TEMPERATURE SENSORS
(TB1, TB2, TB3, TB4)

INPUT SIGNALS
(SEE SHEET 4 FOR
CONNECTION INFORMATION)

1010N-5*S2 ONLY

1010N-5*DS2 ONLY

HAZARDOUS LOCATION
CLASS I, II, DIV. 1, 2 FOR GRPS. A, B, C, D, E, F, G

992EC OR 1012EC
SERIES CABLE (TYP.)

992ECJ OR 992ECJD

991TS2 OR 991TSS2

991TWS2 OR 991TWS2

991TAS2

INTEGRAL JUNCTION BOX
(P/O 991TAS2)

991TDS2 OR 991TDS2

INTEGRAL JUNCTION BOX
(P/O 991TDS2 OR 991TDS2)

1011TXS2

1012-57-1 OR -2
JUNCTION BOX

OPTIONAL SHIELD
CONNECTION

NOTES:

7. INDICATED SHIELD CONNECTIONS ARE OPTIONAL AND DO NOT AFFECT SAFETY.

CONTROLLED DRAWING
CHANGES TO THIS DRAWING REQUIRE
DESIGN/PURCHASER APPROVAL

DR	H, J	DATE	3/30/05
CHK		DATE	
ENG		DATE	
PRD		DATE	
APPD		DATE	
CERTIFIED			
DATE			

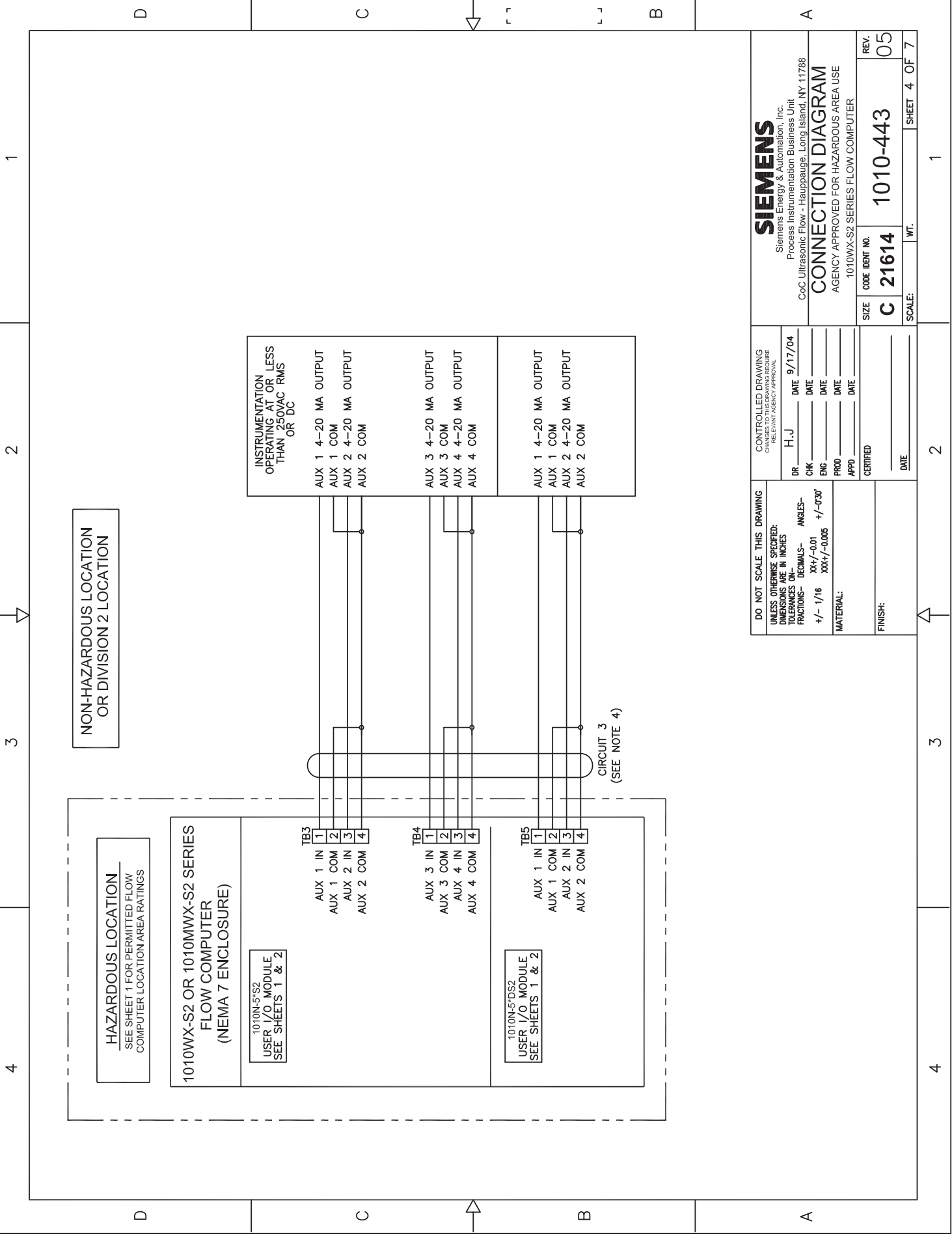
DO NOT SCALE THIS DRAWING
UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES ON— ANGLES—
FRACTIONS— DECIMALS—

+	-	XX+	-0.01	+	-	0°30'
		XXX+	-0.005			
MATERIAL:						
FINISH:						

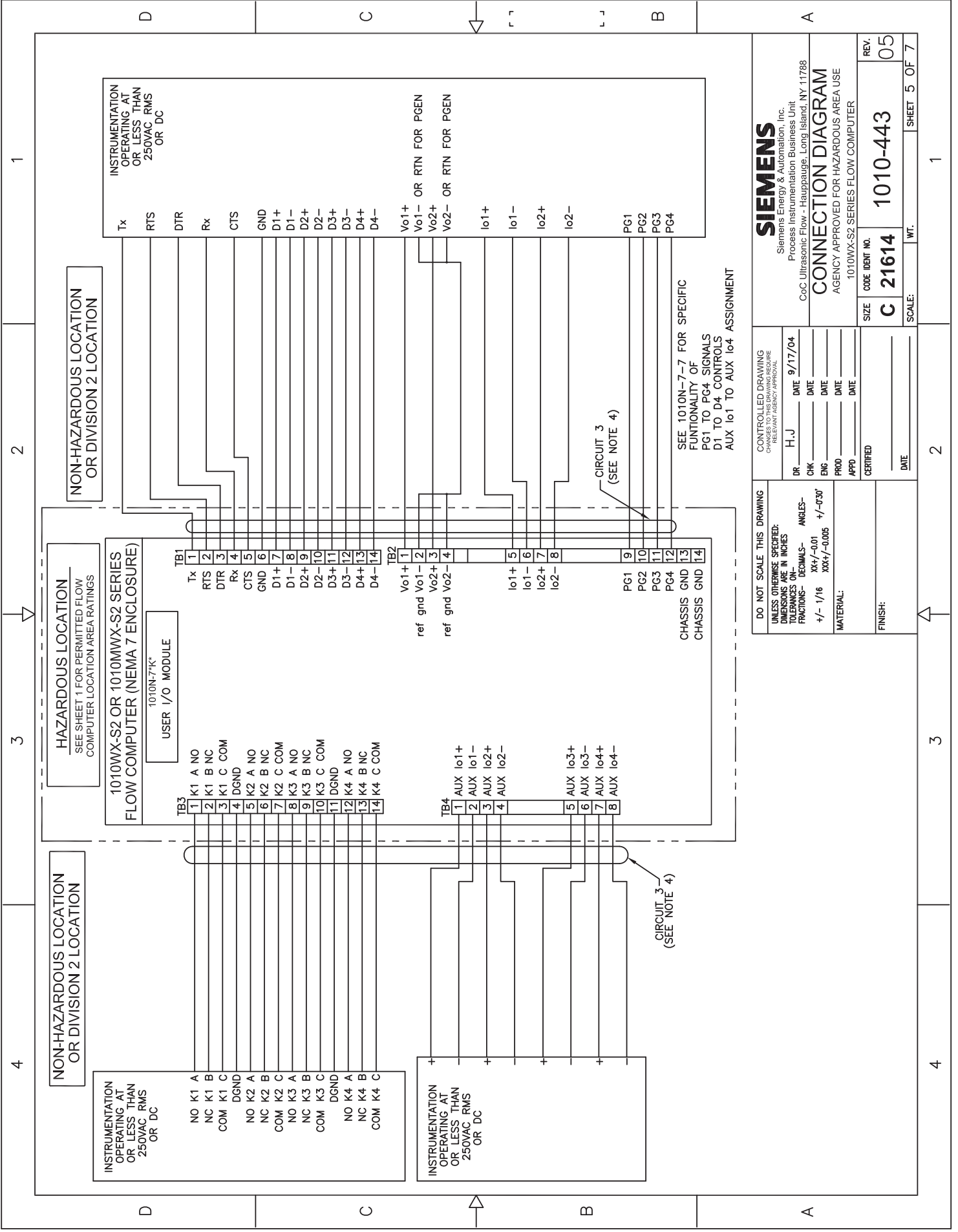
SIEMENS
Siemens Energy & Automation, Inc.
Process Instrumentation Business Unit
CoC Ultrasonic Flow - Hauppauge, Long Island, NY 11788

CONNECTION DIAGRAM
AGENCY APPROVED FOR HAZARDOUS AREA USE
1010WX-S2 SERIES FLOW COMPUTER

SIZE	CODE IDENT NO.	REV.
C 21614	1010-443	05
SCALE: NONE	WT.	SHEET 2 OF 7



<p style="text-align: center;">SIEMENS Siemens Energy & Automation, Inc. Process Instrumentation Business Unit CoC Ultrasonic Flow - Hauppauge, Long Island, NY 11788</p>	<p style="text-align: center;">CONTROLLED DRAWING CHANGES TO THIS DRAWING REQUIRE RELEVANT AGENCY APPROVAL</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%;">DR</td> <td style="width: 25%;">H.J.</td> <td style="width: 25%;">DATE</td> <td style="width: 25%;">9/17/04</td> </tr> <tr> <td>CHK</td> <td></td> <td>DATE</td> <td></td> </tr> <tr> <td>ENG</td> <td></td> <td>DATE</td> <td></td> </tr> <tr> <td>PRD</td> <td></td> <td>DATE</td> <td></td> </tr> <tr> <td>APPD</td> <td></td> <td>DATE</td> <td></td> </tr> <tr> <td>CERTIFIED</td> <td></td> <td></td> <td></td> </tr> <tr> <td>DATE</td> <td></td> <td></td> <td></td> </tr> </table>	DR	H.J.	DATE	9/17/04	CHK		DATE		ENG		DATE		PRD		DATE		APPD		DATE		CERTIFIED				DATE				<p style="text-align: center;">CONNECTION DIAGRAM AGENCY APPROVED FOR HAZARDOUS AREA USE 1010WX-S2 SERIES FLOW COMPUTER</p>	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%;">SIZE</td> <td style="width: 25%;">CODE IDENT NO.</td> <td style="width: 25%;">REV.</td> <td style="width: 25%;">SHEET</td> </tr> <tr> <td>C</td> <td>21614</td> <td>1010-443</td> <td>4 OF 7</td> </tr> <tr> <td colspan="2">SCALE:</td> <td>WT.</td> <td></td> </tr> </table>	SIZE	CODE IDENT NO.	REV.	SHEET	C	21614	1010-443	4 OF 7	SCALE:		WT.	
DR	H.J.	DATE	9/17/04																																								
CHK		DATE																																									
ENG		DATE																																									
PRD		DATE																																									
APPD		DATE																																									
CERTIFIED																																											
DATE																																											
SIZE	CODE IDENT NO.	REV.	SHEET																																								
C	21614	1010-443	4 OF 7																																								
SCALE:		WT.																																									
<p>DO NOT SCALE THIS DRAWING UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES FRACTIONS - DECIMALS - ANGLES - +/- 1/16 XX +/- .001 +/- 0°30' XXX +/- .0005</p> <p>MATERIAL:</p> <p>FINISH:</p>																																											



HAZARDOUS LOCATION
SEE SHEET 1 FOR PERMITTED FLOW
COMPUTER LOCATION AREA RATINGS

**1010WX-S2 OR 1010MWX-S2 SERIES
FLOW COMPUTER (NEMA 7 ENCLOSURE)**

**1010N-7*K*
USER I/O MODULE**

- | TB3 | |
|-----|----------|
| 1 | K1 A NO |
| 2 | K1 B NC |
| 3 | K1 C COM |
| 4 | DGND |
| 5 | K2 A NO |
| 6 | K2 B NC |
| 7 | K2 C COM |
| 8 | K3 A NO |
| 9 | K3 B NC |
| 10 | K3 C COM |
| 11 | DGND |
| 12 | K4 A NO |
| 13 | K4 B NC |
| 14 | K4 C COM |
-
- | TB4 | |
|-----|----------|
| 1 | AUX lo1+ |
| 2 | AUX lo1- |
| 3 | AUX lo2+ |
| 4 | AUX lo2- |
| 5 | AUX lo3+ |
| 6 | AUX lo3- |
| 7 | AUX lo4+ |
| 8 | AUX lo4- |

- | TB1 | |
|-----|-----|
| 1 | Tx |
| 2 | RTS |
| 3 | DTR |
| 4 | Rx |
| 5 | CTS |
| 6 | GND |
| 7 | D1+ |
| 8 | D1- |
| 9 | D2+ |
| 10 | D2- |
| 11 | D3+ |
| 12 | D3- |
| 13 | D4+ |
| 14 | D4- |
-
- | TB2 | |
|-----|-------------|
| 1 | Vo1+ |
| 2 | Vo1- |
| 3 | Vo2+ |
| 4 | Vo2- |
| 5 | lo1+ |
| 6 | lo1- |
| 7 | lo2+ |
| 8 | lo2- |
| 9 | PG1 |
| 10 | PG2 |
| 11 | PG3 |
| 12 | PG4 |
| 13 | CHASSIS GND |
| 14 | CHASSIS GND |

- | INSTRUMENTATION
OPERATING AT
OR LESS THAN
250VAC RMS
OR DC | |
|--|-----------------|
| Tx | OR RTN FOR PGEN |
| RTS | OR RTN FOR PGEN |
| DTR | |
| Rx | |
| CTS | |
| GND | |
| D1+ | |
| D1- | |
| D2+ | |
| D2- | |
| D3+ | |
| D3- | |
| D4+ | |
| D4- | |
| Vo1+ | |
| Vo1- | |
| Vo2+ | |
| Vo2- | |
| lo1+ | |
| lo1- | |
| lo2+ | |
| lo2- | |
| PG1 | |
| PG2 | |
| PG3 | |
| PG4 | |

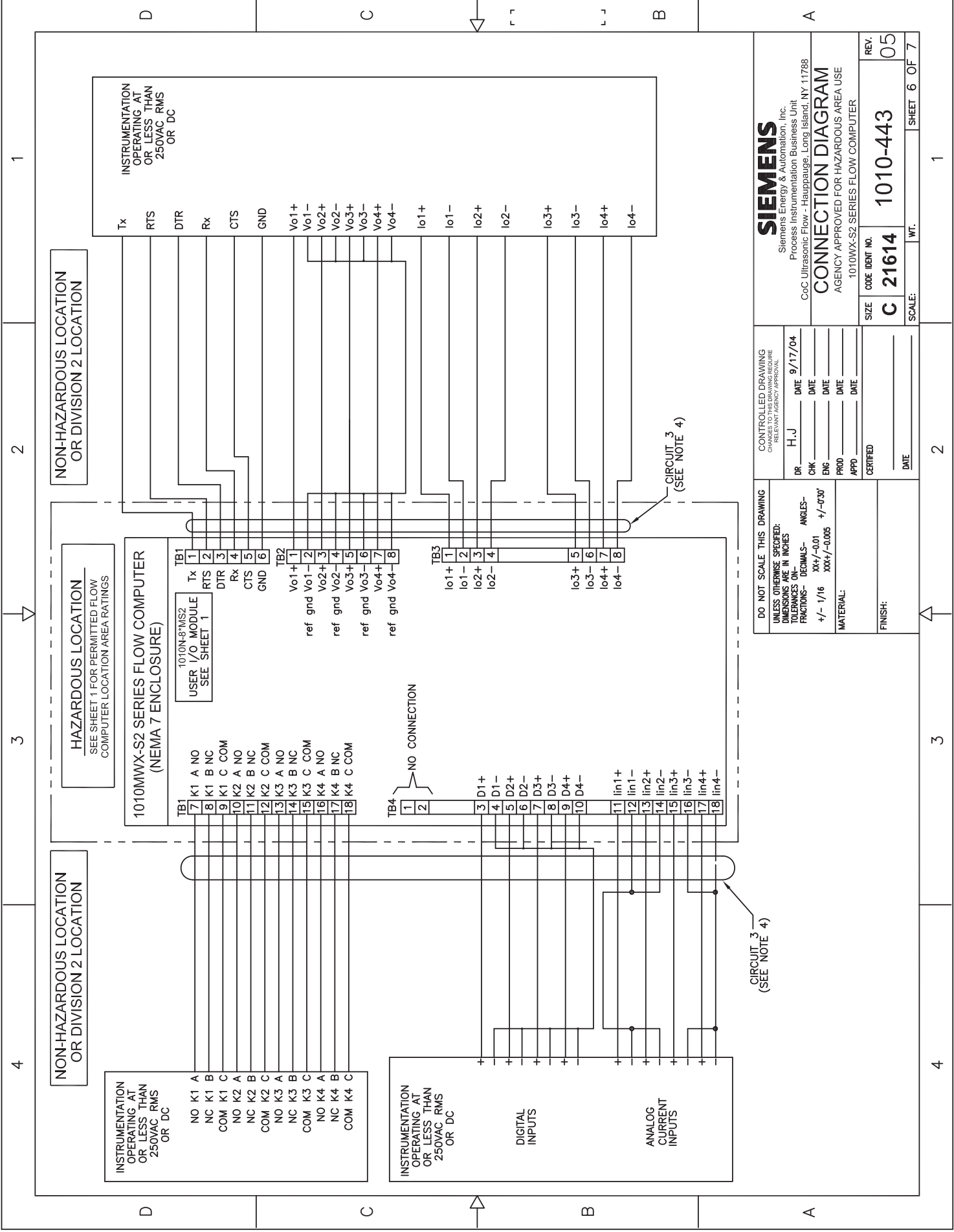
**NON-HAZARDOUS LOCATION
OR DIVISION 2 LOCATION**

**CIRCUIT 3
(SEE NOTE 4)**

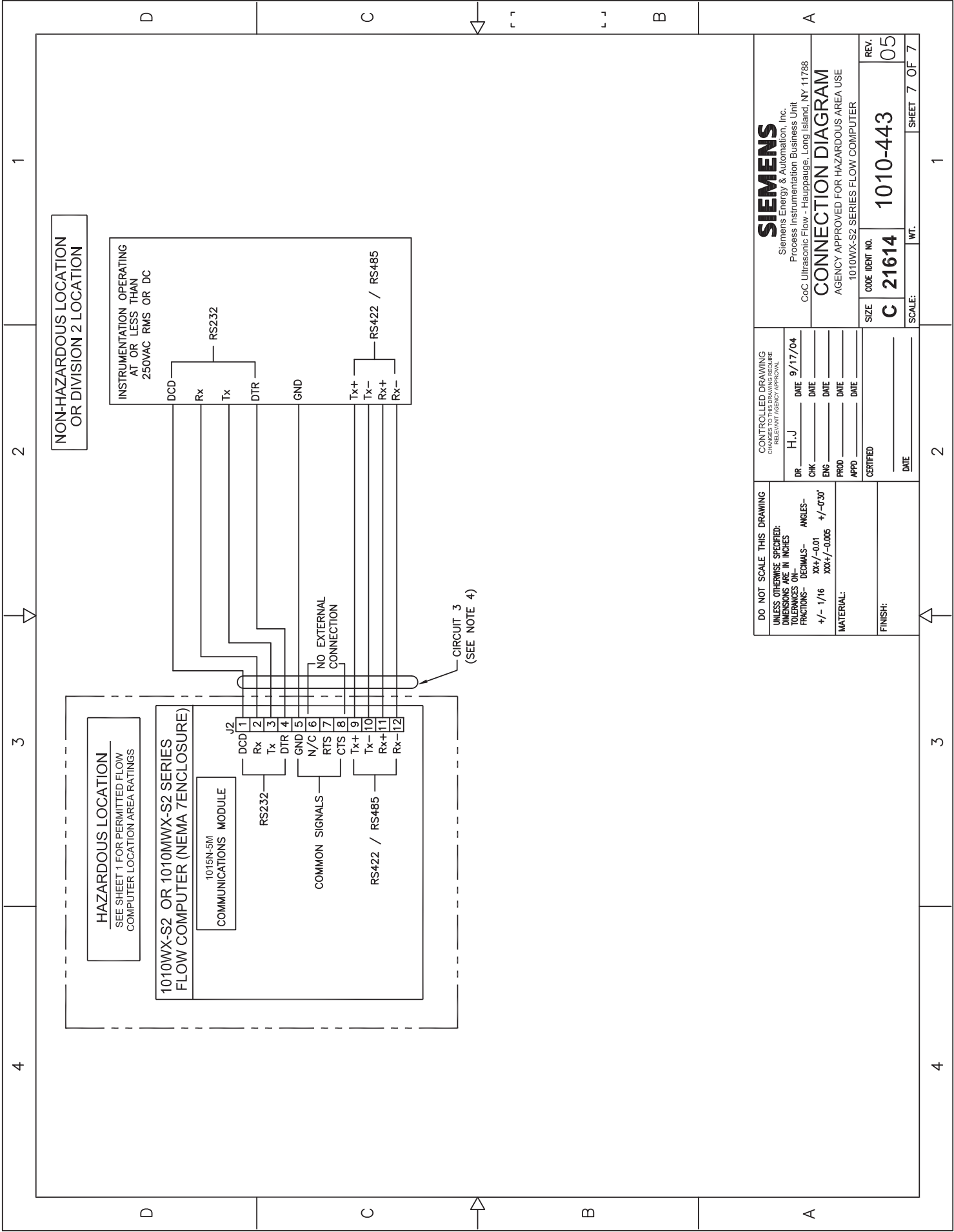
**SEE 1010N-7-7 FOR SPECIFIC
FUNCTIONALITY OF
PG1 TO PG4 SIGNALS
D1 TO D4 CONTROLS
AUX lo1 TO AUX lo4 ASSIGNMENT**

**CIRCUIT 3
(SEE NOTE 4)**

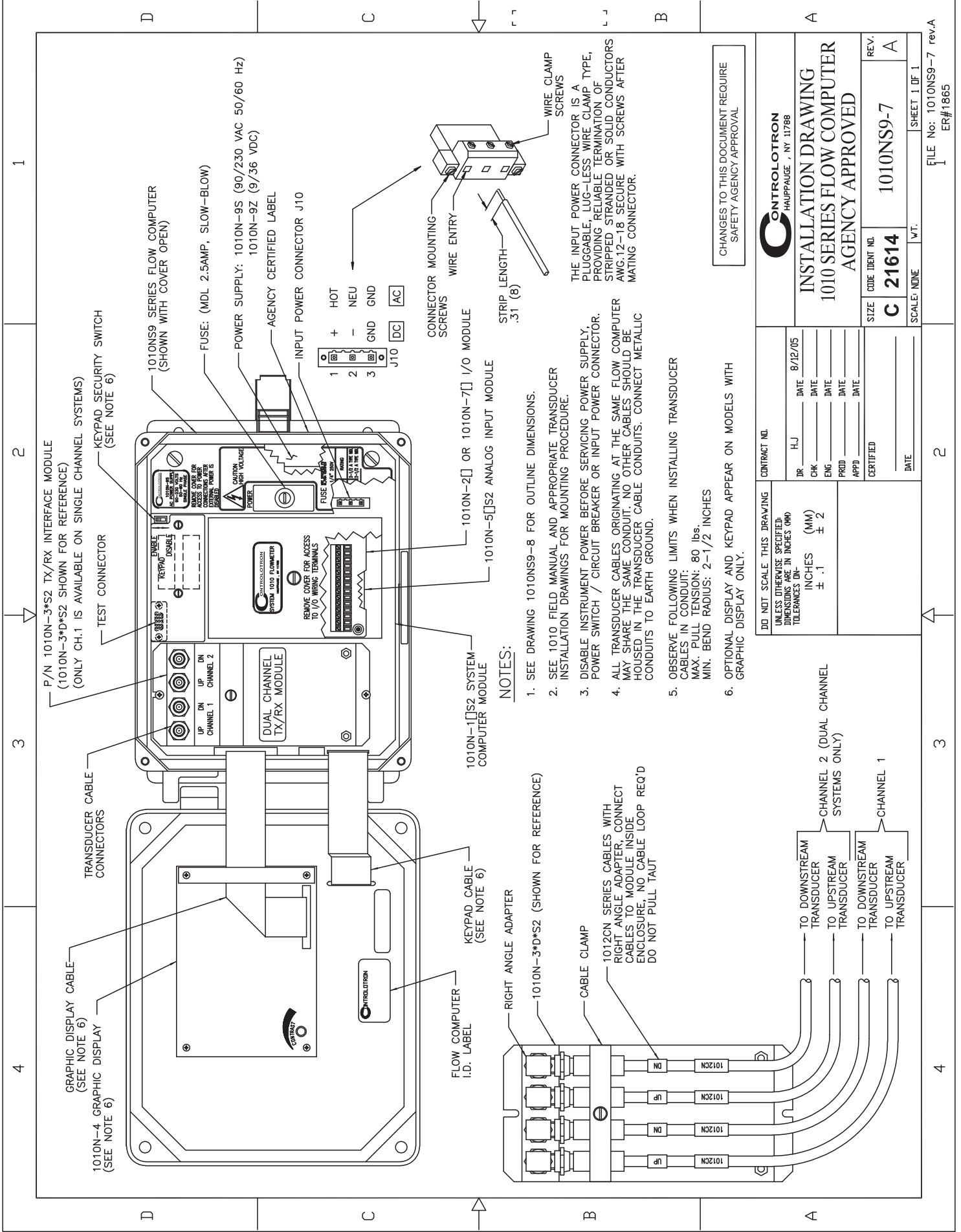
DO NOT SCALE THIS DRAWING UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES- DECIMALS- ANGLES- FRACTIONS- DECIMALS- +/- 1/16 XX +/- .001 +/- .030 XXX +/- .0005 +/- .005 MATERIAL: FINISH:	CONTROLLED DRAWING CHANGES TO THIS DRAWING REQUIRE RELEVANT AGENCY APPROVAL DR: H.J. DATE: 9/17/04 CHK: DATE: DATE: ENG: DATE: DATE: PRD: DATE: DATE: APP: DATE: DATE: CERTIFIED: DATE:	SIEMENS Siemens Energy & Automation, Inc. Process Instrumentation Business Unit CoC Ultrasonic Flow - Hauppauge, Long Island, NY 11788 CONNECTION DIAGRAM AGENCY APPROVED FOR HAZARDOUS AREA USE 1010WX-S2 SERIES FLOW COMPUTER	SIZE: C CODE IDENT NO.: 21614 REV.: 05 SCALE: WT. SHEET 5 OF 7
	HAZARDOUS LOCATION NON-HAZARDOUS LOCATION NON-HAZARDOUS LOCATION OR DIVISION 2 LOCATION	1 2 3 4	1 2 3 4



SIEMENS Siemens Energy & Automation, Inc. Process Instrumentation Business Unit CoC Ultrasonic Flow - Hauppauge, Long Island, NY 11788		CONNECTION DIAGRAM AGENCY APPROVED FOR HAZARDOUS AREA USE 1010MWX-S2 SERIES FLOW COMPUTER	
CONTROLLED DRAWING CHANGES TO THIS DRAWING REQUIRE RELEVANT AGENCY APPROVAL	DR: H.J. DATE: 9/17/04	SIZE: C CODE IDENT NO.: 21614	REV.: 05 SHEET 6 OF 7
DO NOT SCALE THIS DRAWING UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES FRACTIONS- DECIMALS- ANGLES- +/- 1/16 XX/-0.01 +/--0.30 XXX/-0.005	DATE: _____ DATE: _____ DATE: _____ DATE: _____	MATERIAL: _____ FINISH: _____	SCALE: _____ WT: _____



DO NOT SCALE THIS DRAWING UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES - DECIMALS - ANGLES - FRACTIONS - DECIMALS - +/- 1/16 XX +/- 0.01 +/- 0.30 XXX +/- 0.005	CONTROLLED DRAWING CHANGES TO THIS DRAWING REQUIRE RELEVANT AGENCY APPROVAL		SIEMENS Siemens Energy & Automation, Inc. Process Instrumentation Business Unit CoC Ultrasonic Flow - Hauppauge, Long Island, NY 11788
	DR: H.J. DATE: 9/17/04 CHK: _____ DATE: _____ ENG: _____ DATE: _____ PRD: _____ DATE: _____ APPD: _____ DATE: _____ CERTIFIED: _____ DATE: _____	CONNECTION DIAGRAM AGENCY APPROVED FOR HAZARDOUS AREA USE 1010WX-S2 SERIES FLOW COMPUTER	
MATERIAL:	SIZE: C	CODE IDENT NO.: 21614	REV.: 05
FINISH:	SCALE:	WT.	SHEET 7 OF 7

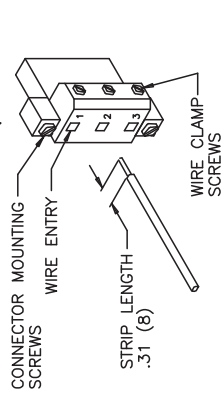
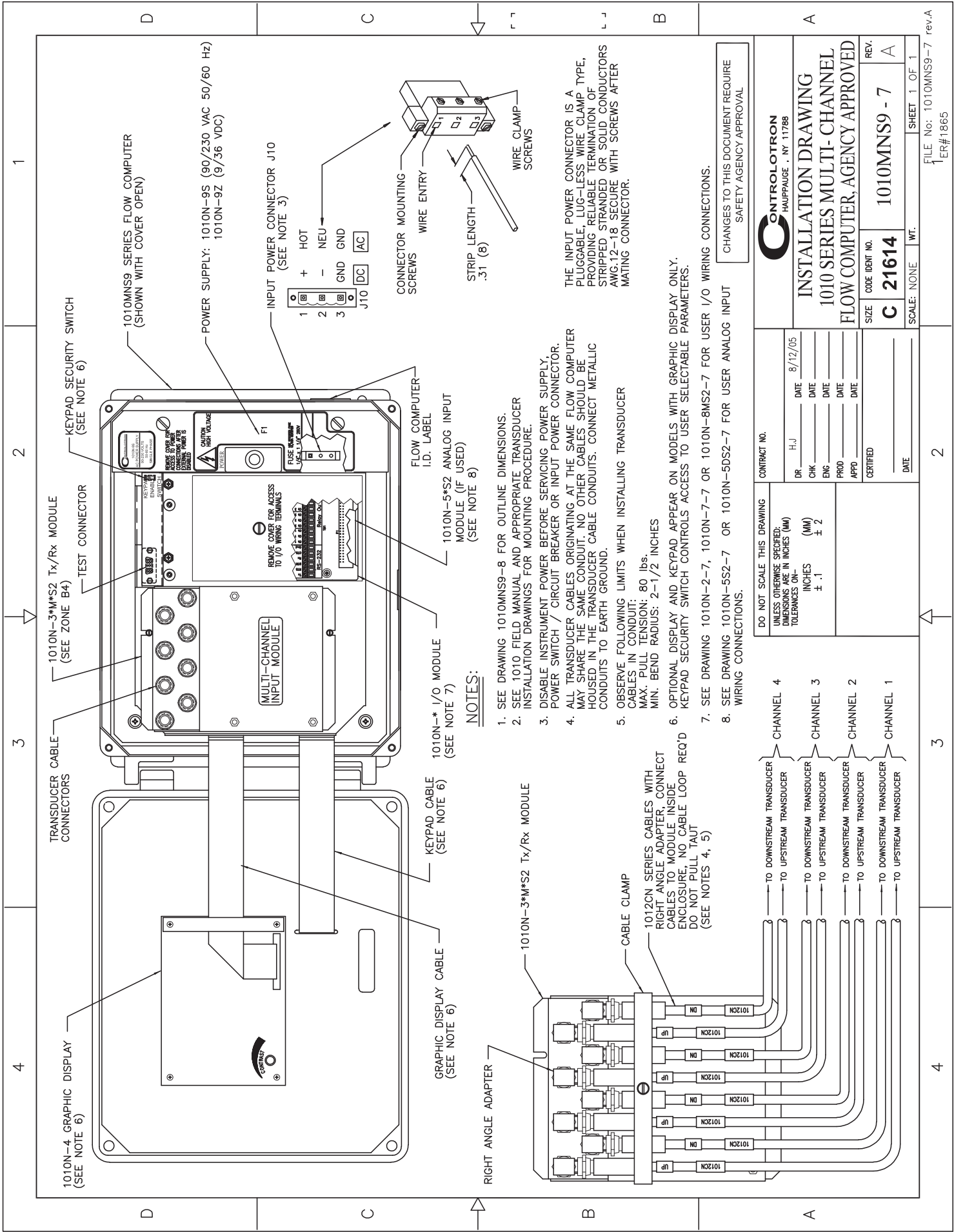


NOTES:

- SEE DRAWING 1010NS9-8 FOR OUTLINE DIMENSIONS.
- SEE 1010 FIELD MANUAL AND APPROPRIATE TRANSDUCER INSTALLATION DRAWINGS FOR MOUNTING PROCEDURE.
- DISABLE INSTRUMENT POWER BEFORE SERVICING POWER SUPPLY, POWER SWITCH / CIRCUIT BREAKER OR INPUT POWER CONNECTOR.
- ALL TRANSDUCER CABLES ORIGINATING AT THE SAME FLOW COMPUTER MAY SHARE THE SAME CONDUIT. NO OTHER CABLES SHOULD BE HOUSED IN THE TRANSDUCER CABLE CONDUITS. CONNECT METALLIC CONDUITS TO EARTH GROUND.
- OBSERVE FOLLOWING LIMITS WHEN INSTALLING TRANSDUCER CABLES IN CONDUIT:
MAX. PULL TENSION: 80 lbs.
MIN. BEND RADIUS: 2-1/2 INCHES
- OPTIONAL DISPLAY AND KEYPAD APPEAR ON MODELS WITH GRAPHIC DISPLAY ONLY.

CHANGES TO THIS DOCUMENT REQUIRE SAFETY AGENCY APPROVAL

INSTALLATION DRAWING 1010 SERIES FLOW COMPUTER AGENCY APPROVED	
DO NOT SCALE THIS DRAWING UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES (MM) TOLERANCES UNLESS OTHERWISE SPECIFIED: INCHES ± .1 MM ± .2	CONTRACT NO. DR H-J DATE 8/12/05 CHK ENG DATE PRD APP DATE CERTIFIED DATE
SIZE CODE IDENT NO. C 21614 1010NS9-7	REV. A SCALE: NONE W.T. SHEET 1 OF 1



THE INPUT POWER CONNECTOR IS A PLUGGABLE, LUG-LESS WIRE CLAMP TYPE, PROVIDING RELIABLE TERMINATION OF STRIPPED STRANDED OR SOLID CONDUCTORS AWG.12-18 SECURE WITH SCREWS AFTER MATING CONNECTOR.

NOTES:

- SEE DRAWING 1010MNS9-8 FOR OUTLINE DIMENSIONS.
- SEE 1010 FIELD MANUAL AND APPROPRIATE TRANSDUCER INSTALLATION DRAWINGS FOR MOUNTING PROCEDURE.
- DISABLE INSTRUMENT POWER BEFORE SERVICING POWER SUPPLY, POWER SWITCH / CIRCUIT BREAKER OR INPUT POWER CONNECTOR.
- ALL TRANSDUCER CABLES ORIGINATING AT THE SAME FLOW COMPUTER MAY SHARE THE SAME CONDUIT. NO OTHER CABLES SHOULD BE HOUSED IN THE TRANSDUCER CABLE CONDUITS. CONNECT METALLIC CONDUITS TO EARTH GROUND.
- OBSERVE FOLLOWING LIMITS WHEN INSTALLING TRANSDUCER CABLES IN CONDUIT:
MAX. PULL TENSION: 80 lbs.
MIN. BEND RADIUS: 2-1/2 INCHES
- OPTIONAL DISPLAY AND KEYPAD APPEAR ON MODELS WITH GRAPHIC DISPLAY ONLY. KEYPAD SECURITY SWITCH CONTROLS ACCESS TO USER SELECTABLE PARAMETERS.
- SEE DRAWING 1010N-2-7, 1010N-7-7 OR 1010N-8MS2-7 FOR USER I/O WIRING CONNECTIONS.
- SEE DRAWING 1010N-5S2-7 OR 1010N-5DS2-7 FOR USER ANALOG INPUT WIRING CONNECTIONS.

CHANGES TO THIS DOCUMENT REQUIRE SAFETY AGENCY APPROVAL

CONTROLTRON
HAUPPAUGE, NY 11788

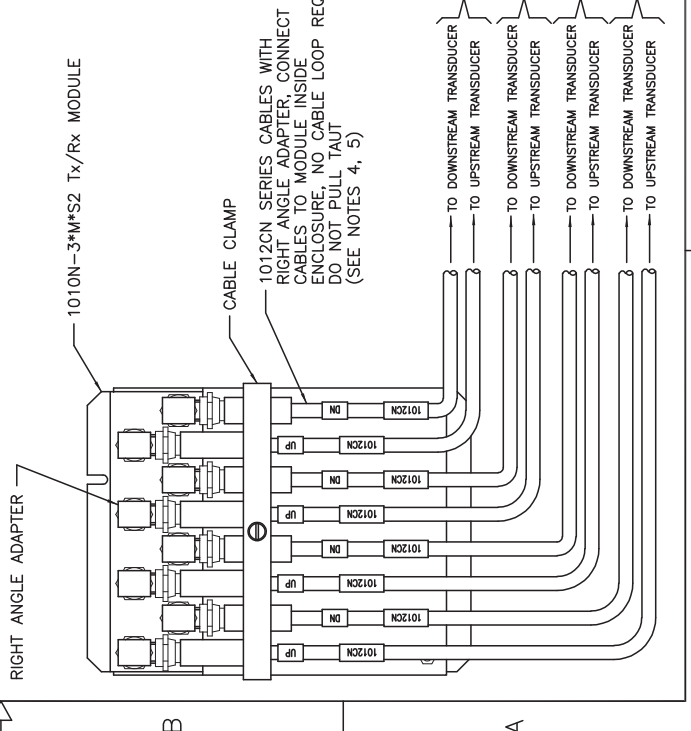
INSTALLATION DRAWING
1010 SERIES MULTI-CHANNEL
FLOW COMPUTER, AGENCY APPROVED

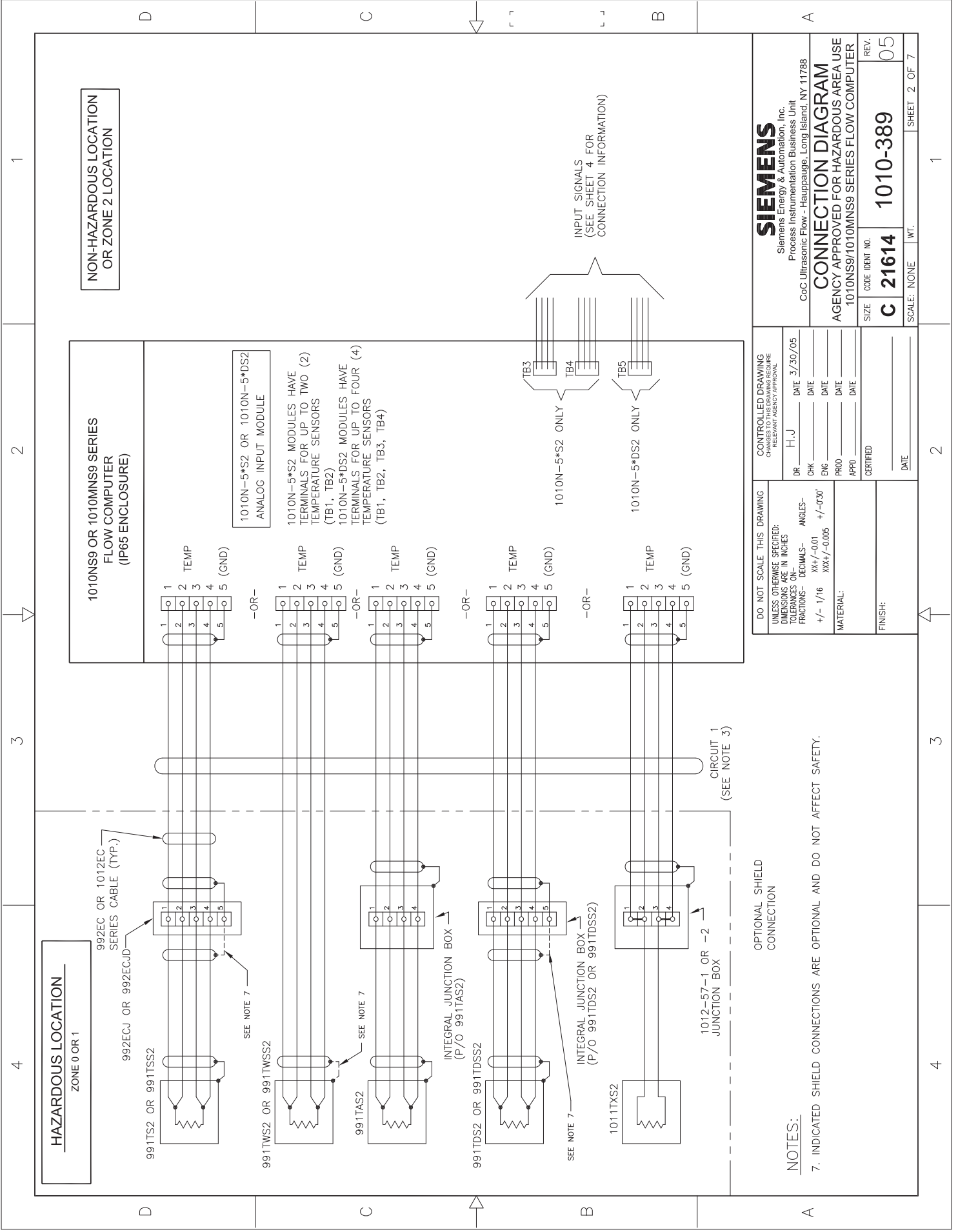
REV. **A**

SIZE **C** CODE IDENT NO. **21614** 1010MNS9 - 7

SCALE: NONE WT. SHEET 1 OF 1

DO NOT SCALE THIS DRAWING		CONTRACT NO.	
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES (MM) TOLERANCES ON INCHES ± .1 (MM) ± .2		DATE 8/12/05	
DR	HJ	CHK	DATE
ENG	DATE	PRD	DATE
APPD	DATE	CERTIFIED	DATE





NON-HAZARDOUS LOCATION
OR ZONE 2 LOCATION

1010NS9 OR 1010MNS9 SERIES
FLOW COMPUTER
(IP65 ENCLOSURE)

1010N-5*S2 OR 1010N-5*DS2
ANALOG INPUT MODULE

1010N-5*S2 MODULES HAVE
TERMINALS FOR UP TO TWO (2)
TEMPERATURE SENSORS
(TB1, TB2)

1010N-5*DS2 MODULES HAVE
TERMINALS FOR UP TO FOUR (4)
TEMPERATURE SENSORS
(TB1, TB2, TB3, TB4)

INPUT SIGNALS
(SEE SHEET 4 FOR
CONNECTION INFORMATION)

1010N-5*S2 ONLY

1010N-5*DS2 ONLY

SIEMENS Siemens Energy & Automation, Inc. Process Instrumentation Business Unit CoC Ultrasonic Flow - Hauptpatung, Long Island, NY 11788		CONNECTION DIAGRAM AGENCY APPROVED FOR HAZARDOUS AREA USE 1010NS9/1010MNS9 SERIES FLOW COMPUTER	SIZE: C CODE IDENT NO.: 21614 REV.: 05
DO NOT SCALE THIS DRAWING UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES ON- FRACTIONS- DECIMALS- ANGLES- +/- 1/16 XX+/-0.01 +/-0.30 XXX+/-0.005		CONTROLLED DRAWING CHANGES TO THIS DRAWING REQUIRE RELEVANT AGENCY APPROVAL	SCALE: NONE WT. SHEET 2 OF 7
DR: H, J CHK: _____ ENG: _____ APPD: _____ CERTIFIED: _____	DATE: 3/30/05 DATE: _____ DATE: _____ DATE: _____	DATE: _____ DATE: _____ DATE: _____	DATE: _____

NOTES:
7. INDICATED SHIELD CONNECTIONS ARE OPTIONAL AND DO NOT AFFECT SAFETY.

OPTIONAL SHIELD
CONNECTION

CIRCUIT 1
(SEE NOTE 3)

1012-57-1 OR -2
JUNCTION BOX

INTEGRAL JUNCTION BOX
(P/O 991TDS2 OR 991TDS2)

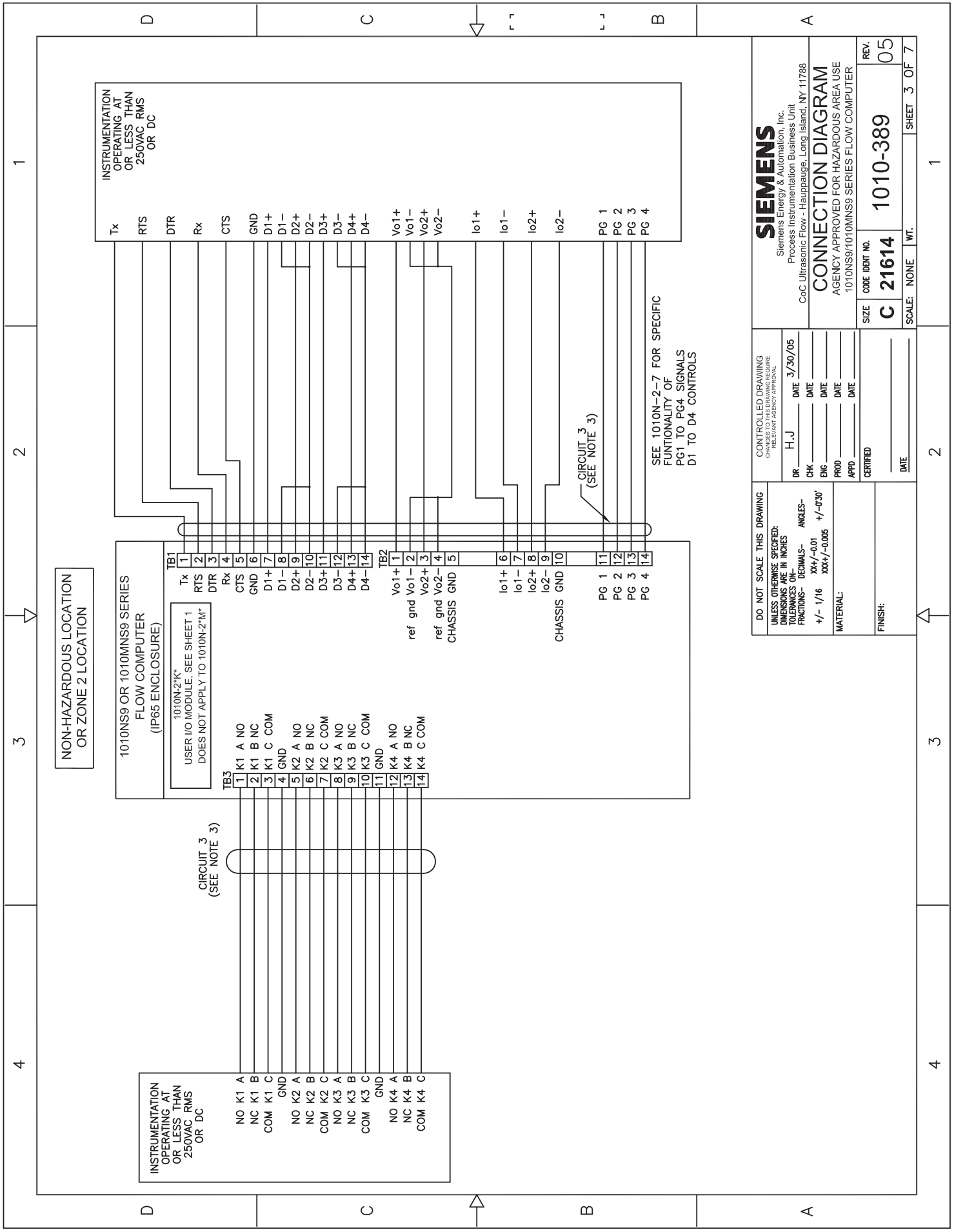
INTEGRAL JUNCTION BOX
(P/O 991TAS2)

991TWS2 OR 991TWS2

991TSS2 OR 991TSS2

992ECJ OR 992ECJ
SERIES CABLE (TYP.)

HAZARDOUS LOCATION
ZONE 0 OR 1



NON-HAZARDOUS LOCATION
OR ZONE 2 LOCATION

1010NS9 OR 1010MNS9 SERIES
FLOW COMPUTER
(IP65 ENCLOSURE)

TB1
1 Tx
2 RTS
3 DTR
4 Rx
5 CTS
6 GND
7 D1+
8 D1-
9 D2+
10 D2-
11 D3+
12 D3-
13 D4+
14 D4-
TB2
1 Vo1+
2 Vo1-
3 Vo2+
4 Vo2-
5 CHASSIS GND
6 lo1+
7 lo1-
8 lo2+
9 lo2-
10 CHASSIS GND
11 PG 1
12 PG 2
13 PG 3
14 PG 4

1010N-2"K"
USER I/O MODULE - SEE SHEET 1
DOES NOT APPLY TO 1010N-2"K"

TB3
1 K1 A NO
2 K1 B NC
3 K1 C COM
4 GND
5 K2 A NO
6 K2 B NC
7 K2 C COM
8 K3 A NO
9 K3 B NC
10 K3 C COM
11 GND
12 K4 A NO
13 K4 B NC
14 K4 C COM

INSTRUMENTATION
OPERATING AT
OR LESS THAN
250VAC RMS
OR DC

Tx
RTS
DTR
Rx
CTS
GND
D1+
D1-
D2+
D2-
D3+
D3-
D4+
D4-
Vo1+
Vo1-
Vo2+
Vo2-
lo1+
lo1-
lo2+
lo2-
PG 1
PG 2
PG 3
PG 4

INSTRUMENTATION
OPERATING AT
OR LESS THAN
250VAC RMS
OR DC

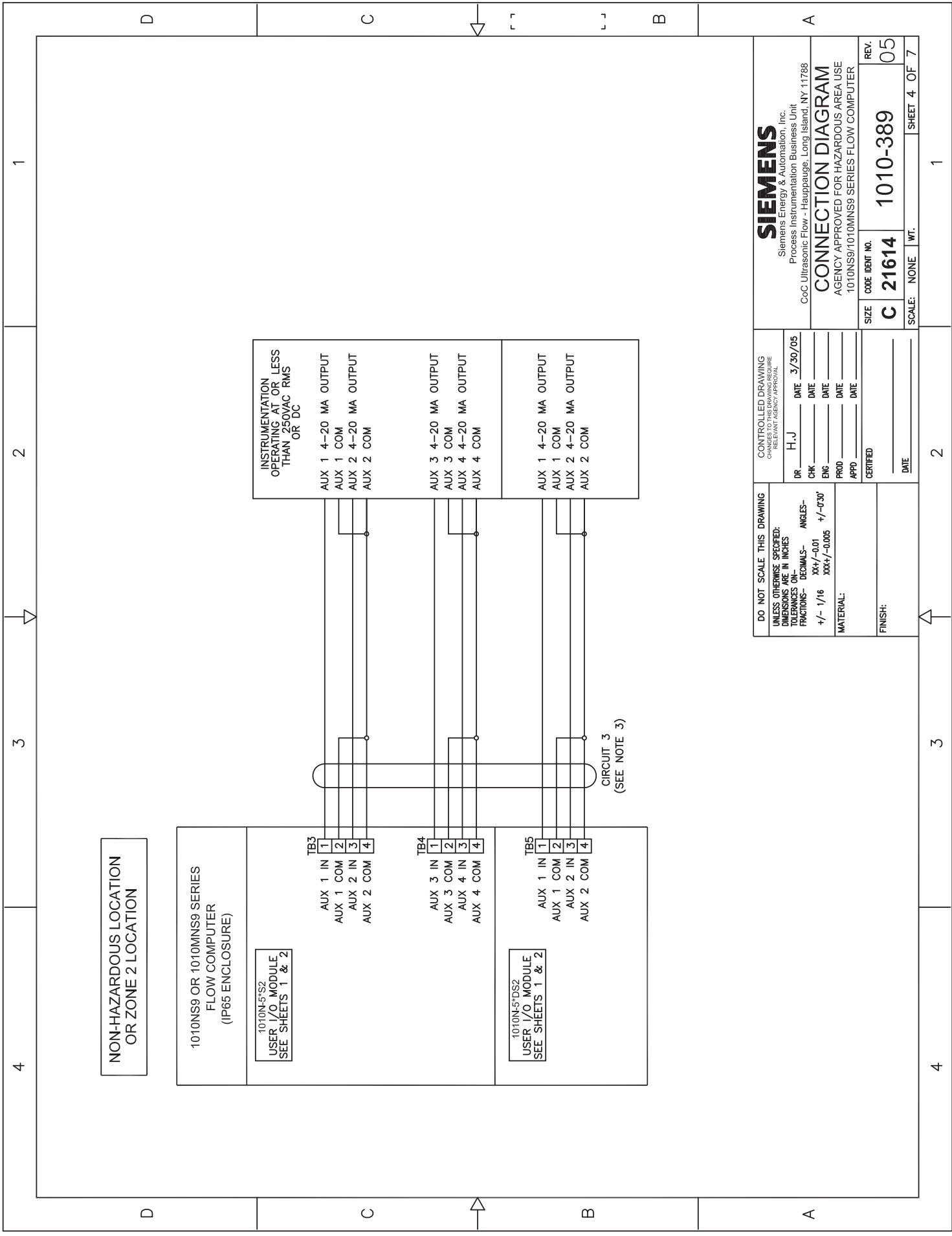
NO K1 A
NC K1 B
COM K1 C
GND
NO K2 A
NC K2 B
COM K2 C
NO K3 A
NC K3 B
COM K3 C
GND
NO K4 A
NC K4 B
COM K4 C

CIRCUIT 3
(SEE NOTE 3)

CIRCUIT 3
(SEE NOTE 3)

SEE 1010N-2-7 FOR SPECIFIC
FUNCTIONALITY OF
PG1 TO PG4 SIGNALS
D1 TO D4 CONTROLS

SIEMENS Siemens Energy & Automation, Inc. Process Instrumentation Business Unit CoC, Ultrasonic Flow - Hauppauge, Long Island, NY 11788	CONTROLLED DRAWING CHANGES TO THIS DRAWING REQUIRE RELEVANT AGENCY APPROVAL		DR H, J CHK _____ ENG _____ PROD _____ APPD _____ CERTIFIED _____ DATE _____	DATE 3/30/05 DATE _____ DATE _____ DATE _____ DATE _____
	DO NOT SCALE THIS DRAWING UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES ON- FRACTIONS- DECIMALS- ANGLES- +/- 1/16 XX+/-0.01 +/-0.30 XXX+/-0.005			
CONNECTION DIAGRAM AGENCY APPROVED FOR HAZARDOUS AREA USE 1010NS9/1010MNS9 SERIES FLOW COMPUTER		SIZE C 21614 CODE IDENT NO. 1010-389 SCALE: NONE WT. _____ SHEET 3 OF 7		REV. 05



NON-HAZARDOUS LOCATION
OR ZONE 2 LOCATION

1010NS9 OR 1010MINS9 SERIES
FLOW COMPUTER
(IP65 ENCLOSURE)

1010N-5*52
USER I/O MODULE
SEE SHEETS 1 & 2

TB3
AUX 1 IN
AUX 1 COM
AUX 2 IN
AUX 2 COM

TB4
AUX 3 IN
AUX 3 COM
AUX 4 IN
AUX 4 COM

TB5
AUX 1 IN
AUX 1 COM
AUX 2 IN
AUX 2 COM

INSTRUMENTATION
OPERATING AT OR LESS
THAN 250VAC RMS
OR DC

AUX 1 4-20 MA OUTPUT
AUX 1 COM
AUX 2 4-20 MA OUTPUT
AUX 2 COM

AUX 3 4-20 MA OUTPUT
AUX 3 COM
AUX 4 4-20 MA OUTPUT
AUX 4 COM

AUX 1 4-20 MA OUTPUT
AUX 1 COM
AUX 2 4-20 MA OUTPUT
AUX 2 COM

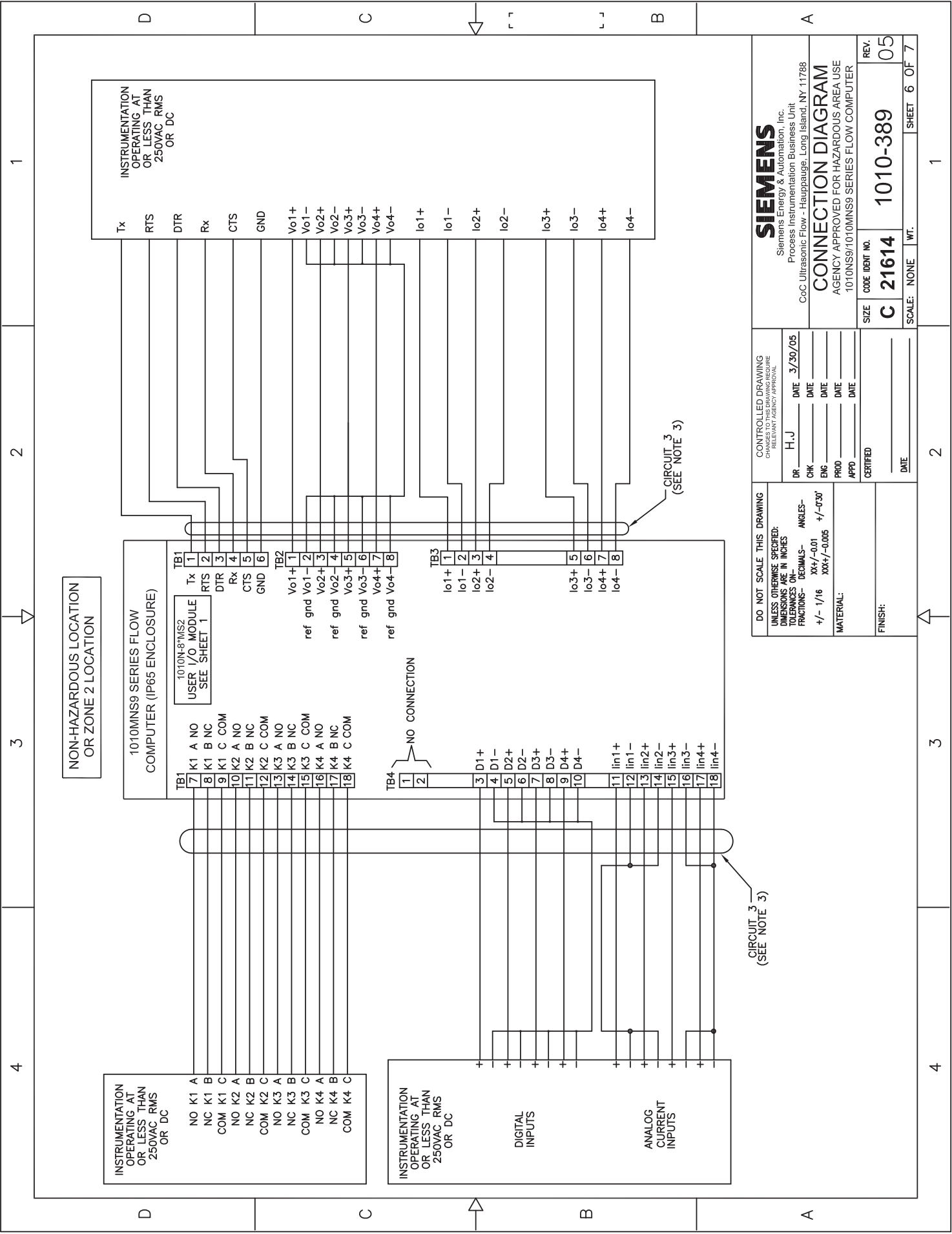
CIRCUIT 3
(SEE NOTE 3)

DO NOT SCALE THIS DRAWING UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES ON— FRACTIONS— DECIMALS— ANGLES— +/- 1/16 XX+/-0.01 +/-0.30° XXX+/-0.005		CONTROLLED DRAWING CHECKED BY: _____ DATE: 3/30/05 DESIGNED BY: _____ DATE: _____ DRAWN BY: _____ DATE: _____ APP'D BY: _____ DATE: _____ CERTIFIED: _____ DATE: _____	
AGENCY APPROVED FOR HAZARDOUS AREA USE 1010NS9/1010MINS9 SERIES FLOW COMPUTER		CONNECTION DIAGRAM	REV. 05
SIZE C	CODE IDENT NO. 21614	1010-389	SHEET 4 OF 7
SCALE: NONE		WT.	

SIEMENS
Siemens Energy & Automation, Inc.
Process Instrumentation Business Unit
CoC Ultrasonic Flow - Hauppauge, Long Island, NY 11788

CONNECTION DIAGRAM
AGENCY APPROVED FOR HAZARDOUS AREA USE
1010NS9/1010MINS9 SERIES FLOW COMPUTER

SIZE C
CODE IDENT NO. 21614
1010-389
REV. 05
SCALE: NONE
WT.
SHEET 4 OF 7



SIEMENS Siemens Energy & Automation, Inc. Process Instrumentation Business Unit CoC Ultrasonic Flow - Hauppauge, Long Island, NY 11788		CONNECTION DIAGRAM AGENCY APPROVED FOR HAZARDOUS AREA USE 1010N(S9)/1010MNS9 SERIES FLOW COMPUTER	
CONTROLLED DRAWING CHANGES TO THIS DRAWING REQUIRE RELEVANT AGENCY APPROVAL		DATE: 3/30/05 DR: H.J. CHK: _____ ENG: _____ PRD: _____ APPD: _____ CERTIFIED: _____ DATE: _____	
DO NOT SCALE THIS DRAWING UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES FRACTIONS- DECIMALS- ANGLES- +/- 1/16 XX +/- 0.01 +/- 0.30 XXX +/- 0.005 +/- 0.005		MATERIAL: _____ FINISH: _____	
SIZE: C	CODE IDENT NO.: 21614	REV.: 05	SHEET 6 OF 7

1

2

3

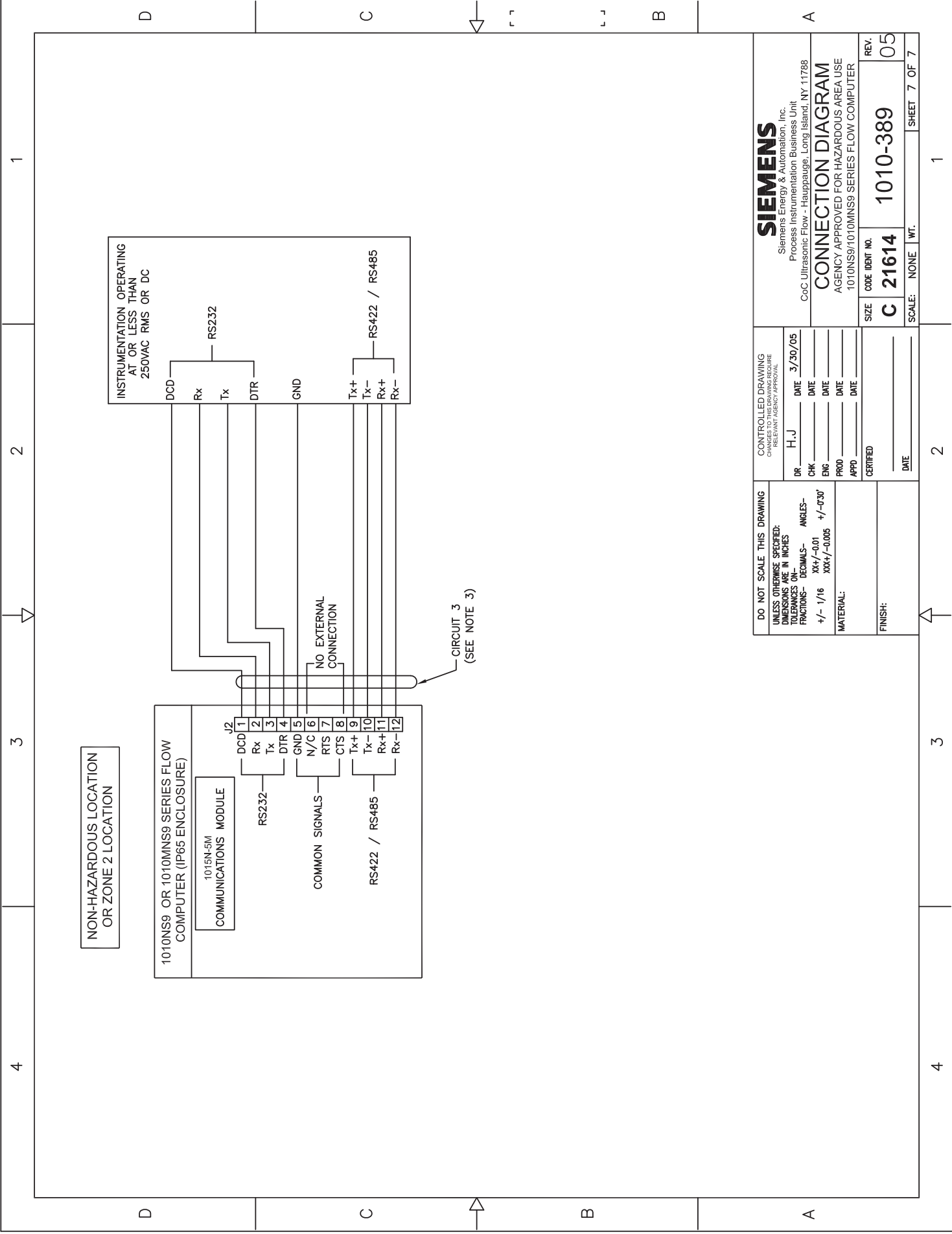
4

1

2

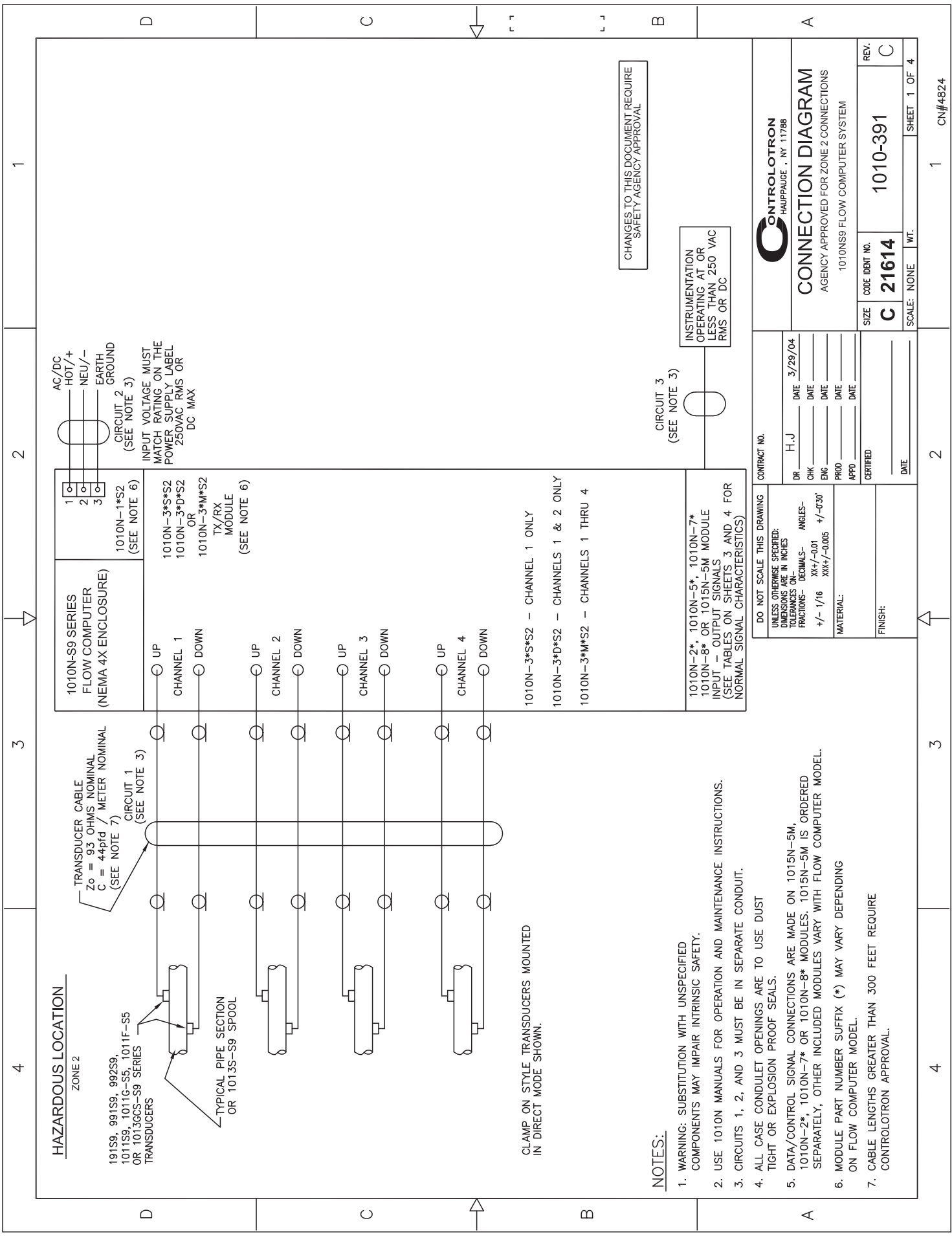
3

4



DO NOT SCALE THIS DRAWING UNLESS OTHERWISE SPECIFIED: DIMENSIONS IN INCHES TOLERANCES ON FRACTIONS- DECIMALS- ANGLES- XX +/- 0.01 XX +/- 0.005 +/- 0.30		CONTROLLED DRAWING CHANGES TO THIS DRAWING REQUIRE RELEVANT AGENCY APPROVAL	
DR	H.J.	DATE	3/30/05
CHK		DATE	
ENG		DATE	
PRD		DATE	
APPD		DATE	
CERTIFIED			
FINISH:			
MATERIAL:			

SIEMENS Siemens Energy & Automation, Inc. Process Instrumentation Business Unit CoC Ultrasonic Flow - Hauppauge, Long Island, NY 11788		CONNECTION DIAGRAM AGENCY APPROVED FOR HAZARDOUS AREA USE 1010NS9/1010MNS9 SERIES FLOW COMPUTER	
SIZE	CODE IDENT NO.	REV.	
C	21614	1010-389	05
SCALE:	NONE	WT.	
			SHEET 7 OF 7



HAZARDOUS LOCATION

ZONE 2

191S9, 991S9, 992S9,
1011S9, 1011G-S5, 1011F-S5
OR 1013GCS-S9 SERIES
TRANSDUCERS

TYPICAL PIPE SECTION
OR 1013S-S9 SPOOL

TRANSDUCER CABLE
 $Z_o = 93$ OHMS NOMINAL
 $C = 44$ pfd / METER NOMINAL
(SEE NOTE 7)

CIRCUIT 1
(SEE NOTE 3)

1010N-S9 SERIES
FLOW COMPUTER
(NEMA 4X ENCLOSURE)

1010N-1*S2
(SEE NOTE 6)

1010N-3*S*S2
OR
1010N-3*D*S2
TX/RX
MODULE
(SEE NOTE 6)

UP

CHANNEL 1

DOWN

UP

CHANNEL 2

DOWN

UP

CHANNEL 3

DOWN

UP

CHANNEL 4

DOWN

1010N-3*S*S2 - CHANNEL 1 ONLY

1010N-3*D*S2 - CHANNELS 1 & 2 ONLY

1010N-3*M*S2 - CHANNELS 1 THRU 4

1010N-2*, 1010N-5*, 1010N-7*
1010N-8* OR 1015N-5M MODULE
INPUT - OUTPUT SIGNALS
(SEE TABLES ON SHEETS 3 AND 4 FOR
NORMAL SIGNAL CHARACTERISTICS)

CHANGES TO THIS DOCUMENT REQUIRE
SAFETY AGENCY APPROVAL

CIRCUIT 3
(SEE NOTE 3)

INSTRUMENTATION
OPERATING AT OR
LESS THAN 250 VAC
RMS OR DC

NOTES:

1. WARNING: SUBSTITUTION WITH UNSPECIFIED COMPONENTS MAY IMPAIR INTRINSIC SAFETY.
2. USE 1010N MANUALS FOR OPERATION AND MAINTENANCE INSTRUCTIONS.
3. CIRCUITS 1, 2, AND 3 MUST BE IN SEPARATE CONDUIT.
4. ALL CASE CONDULET OPENINGS ARE TO USE DUST TIGHT OR EXPLOSION PROOF SEALS.
5. DATA/CONTROL SIGNAL CONNECTIONS ARE MADE ON 1015N-5M, 1010N-2*, 1010N-7* OR 1010N-8* MODULES. 1015N-5M IS ORDERED SEPARATELY, OTHER INCLUDED MODULES VARY WITH FLOW COMPUTER MODEL.
6. MODULE PART NUMBER SUFFIX (*) MAY VARY DEPENDING ON FLOW COMPUTER MODEL.
7. CABLE LENGTHS GREATER THAN 300 FEET REQUIRE CONTROLTRON APPROVAL.

CONTRACT NO.

DR	H, J	DATE	3/29/04
CHK		DATE	
ENG		DATE	
PRD		DATE	
APPD		DATE	
CERTIFIED		DATE	
DATE			

DO NOT SCALE THIS DRAWING
UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
FRACTIONS - DECIMALS - ANGLES -
TOLERANCES - DECIMALS - ANGLES -
+/- 1/16 XX +/- .001 +/- .030
XXX +/- .005

MATERIAL:

FINISH:



CONNECTION DIAGRAM

AGENCY APPROVED FOR ZONE 2 CONNECTIONS
1010NS9 FLOW COMPUTER SYSTEM

SIZE	CODE IDENT NO.	REV.
C	21614	C
SCALE: NONE	WT.	SHEET 1 OF 4

NORMAL SIGNAL CHARACTERISTICS
(SEE NOTES 5 & 6)

MODULE	LOCATION	FUNCTION	NORMAL VOLTAGE	CURRENT
1010N+2, 1010N+2K2 OR 1010N+2K3	TB1-1	Tx	to ±12 Vdc	4 mA
	TB1-2	RTS	to ±12 Vdc	4 mA
	TB1-3	DTR	to ±12 Vdc	4 mA
	TB1-4	Rx	to ±12 Vdc	4 mA
	TB1-5	CTS	to ±12 Vdc	4 mA
	TB1-6	GND	0 Vdc	20 mA
	TB1-7	D1+	0 to 5 Vdc	5 mA
	TB1-8	D1-	0 Vdc	5 mA
	TB1-9	D2+	0 to 5 Vdc	5 mA
	TB1-10	D2-	0 Vdc	5 mA
	TB1-11	D3+	0 to 5 Vdc	5 mA
	TB1-12	D3-	0 Vdc	5 mA
	TB1-13	D4+	0 to 5 Vdc	5 mA
	TB1-14	D4-	0 Vdc	5 mA
1010N+5DS2	TB2-1	Vo1+	0 - 10 Vdc	1 mA
	TB2-2	Vo2+	0 - 10 Vdc	1 mA
	TB2-3	Vo2-	0 Vdc	1 mA
	TB2-4	Vo3+	0 - 10 Vdc	1 mA
	TB2-5	Vo3-	0 Vdc	1 mA
	TB2-6	Vo4+	0 - 10 Vdc	1 mA
	TB2-7	Vo4-	0 Vdc	1 mA
	TB2-8	Vo4+	0 Vdc	1 mA
	TB2-9	Vo4-	0 Vdc	1 mA
	TB2-10	NO CONNECTION		
	TB2-11	PGEN 1+	0 to 5 Vdc	4 mA
	TB2-12	PGEN 1-	0 Vdc	4 mA
	TB2-13	PGEN 2+	0 to 5 Vdc	4 mA
	TB2-14	PGEN 2-	0 Vdc	4 mA
1010N+5DS2	TB3-1	K1 NO	0 - 50 Vdc	250 mA
	TB3-2	K1 NC	0 - 50 Vdc	250 mA
	TB3-3	K1 COM	0 - 50 Vdc	250 mA
	TB3-4	NO CONNECTION		
	TB3-5	K2 NO	0 - 50 Vdc	250 mA
	TB3-6	K2 NC	0 - 50 Vdc	250 mA
	TB3-7	K2 COM	0 - 50 Vdc	250 mA
	TB3-8	K3 NO	0 - 50 Vdc	250 mA
	TB3-9	K3 NC	0 - 50 Vdc	250 mA
	TB3-10	K3 COM	0 - 50 Vdc	250 mA
	TB3-11	NO CONNECTION		
	TB3-12	K4 NO	0 - 50 Vdc	250 mA
	TB3-13	K4 NC	0 - 50 Vdc	250 mA
	TB3-14	K4 COM	0 - 50 Vdc	250 mA

NORMAL SIGNAL CHARACTERISTICS
(SEE NOTE 6)

MODULE	LOCATION	FUNCTION	NORMAL VOLTAGE	CURRENT
1010N+5S2	TB3-1	1 in 1	15 Vdc Max	4 - 20 mA
	TB3-2	1 in 1 COMMON		4 - 20 mA
	TB3-3	1 in 2	15 Vdc Max	4 - 20 mA
	TB3-4	1 in 2 COMMON		4 - 20 mA
	TB4-1	1 in 3	15 Vdc Max	4 - 20 mA
	TB4-2	1 in 3 COMMON		4 - 20 mA
	TB4-3	1 in 4	15 Vdc Max	4 - 20 mA
	TB4-4	1 in 4 COMMON		4 - 20 mA
	TB5-1	1 in 1	15 Vdc Max	4 - 20 mA
	TB5-2	1 in 1 COMMON		4 - 20 mA
1010N+5DS2	TB5-3	1 in 2	15 Vdc Max	4 - 20 mA
	TB5-4	1 in 2 COMMON		4 - 20 mA

NORMAL SIGNAL CHARACTERISTICS
(SEE NOTES 5 & 6)

MODULE	LOCATION	FUNCTION	NORMAL VOLTAGE	CURRENT
1010N+8MS2	TB1-1	Tx	to ±12 Vdc	4 mA
	TB1-2	RTS	to ±12 Vdc	4 mA
	TB1-3	DTR	to ±12 Vdc	4 mA
	TB1-4	Rx	to ±12 Vdc	4 mA
	TB1-5	CTS	to ±12 Vdc	4 mA
	TB1-6	GND	0 Vdc	20 mA
	TB1-7	K1 NO	0 - 50 Vdc	250 mA
	TB1-8	K1 NC	0 - 50 Vdc	250 mA
	TB1-9	K1 COM	0 - 50 Vdc	250 mA
	TB1-10	K2 NO	0 - 50 Vdc	250 mA
	TB1-11	K2 NC	0 - 50 Vdc	250 mA
	TB1-12	K2 COM	0 - 50 Vdc	250 mA
	TB1-13	K3 NO	0 - 50 Vdc	250 mA
	TB1-14	K3 NC	0 - 50 Vdc	250 mA
	TB1-15	K3 COM	0 - 50 Vdc	250 mA
	TB1-16	K4 NO	0 - 50 Vdc	250 mA
	TB1-17	K4 NC	0 - 50 Vdc	250 mA
	TB1-18	K4 COM	0 - 50 Vdc	250 mA
	TB2-1	Vo1+	0 - 10 Vdc	1 mA
	TB2-2	Vo1-	0 Vdc	1 mA
	TB2-3	Vo2+	0 - 10 Vdc	1 mA
	TB2-4	Vo2-	0 Vdc	1 mA
	TB2-5	Vo3+	0 - 10 Vdc	1 mA
	TB2-6	Vo3-	0 Vdc	1 mA
	TB2-7	Vo4+	0 - 10 Vdc	1 mA
	TB2-8	Vo4-	0 Vdc	1 mA
	TB3-1	lo1+	33 Vdc	4 - 20 mA
	TB3-2	lo1-	0 - 33 Vdc	4 - 20 mA
	TB3-3	lo2+	33 Vdc	4 - 20 mA
	TB3-4	lo2-	0 - 33 Vdc	4 - 20 mA
	TB3-5	lo3+	33 Vdc	4 - 20 mA
	TB3-6	lo3-	0 - 33 Vdc	4 - 20 mA
	TB3-7	lo4+	33 Vdc	4 - 20 mA
	TB3-8	lo4-	0 - 33 Vdc	4 - 20 mA
TB4-1	NO CONNECTION			
TB4-2	NO CONNECTION			
TB4-3	D1+	0 to 5 Vdc	5 mA	
TB4-4	D1-	0 Vdc	5 mA	
TB4-5	D2+	0 to 5 Vdc	5 mA	
TB4-6	D2-	0 Vdc	5 mA	
TB4-7	D3+	0 to 5 Vdc	5 mA	
TB4-8	D3-	0 Vdc	5 mA	
TB4-9	D4+	0 to 5 Vdc	5 mA	
TB4-10	D4-	0 Vdc	5 mA	
TB4-11	lin1+	0 - 15 Vdc	4 - 20 mA	
TB4-12	lin1-	0 Vdc	4 - 20 mA	
TB4-13	lin2+	0 - 15 Vdc	4 - 20 mA	
TB4-14	lin2-	0 Vdc	4 - 20 mA	
TB4-15	lin3+	0 - 15 Vdc	4 - 20 mA	
TB4-16	lin3-	0 Vdc	4 - 20 mA	
TB4-17	lin4+	0 - 15 Vdc	4 - 20 mA	
TB4-18	lin4-	0 Vdc	4 - 20 mA	

CHANGES TO THIS DOCUMENT REQUIRE
SAFETY AGENCY APPROVAL

DO NOT SCALE THIS DRAWING
UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
FRACTIONS- DECIMALS- ANGLES-
+/- 1/16 XX/-0.01 +/-0.30
XX4/-0.005

CONTRACT NO. _____
DR. H.J. DATE 3/29/04
CHK _____ DATE _____
ENG _____ DATE _____
PRD _____ DATE _____
APPD _____ DATE _____
CERTIFIED _____
DATE _____

FINISH: _____

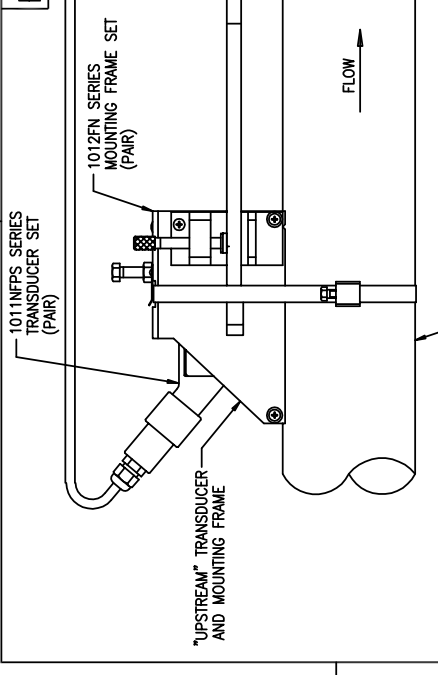
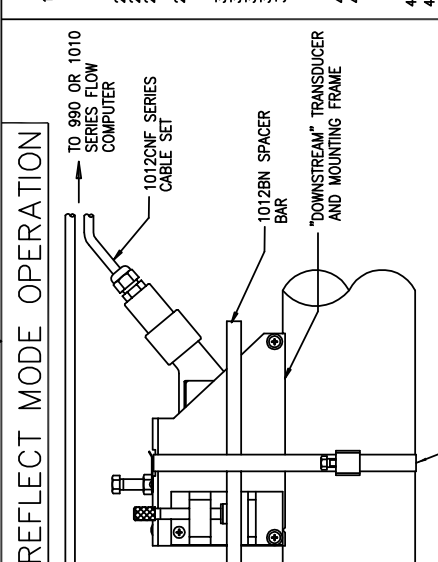
CONTROLTRON
HAUPPAUGE, NY 11788

CONNECTION DIAGRAM
AGENCY APPROVED FOR ZONE 2 CONNECTIONS
1010NS9 FLOW COMPUTER SYSTEM

SIZE: **C** CODE IDENT NO. **21614** 1010-391 REV. **C**
SCALE: NONE WT. SHEET 3 OF 4

INSTALLATION NOTES - SEE DRAWING REFERENCE **A**

- USING THE INSTALLATION MENU AND THE PROCEDURE OUTLINED IN THE FLOW COMPUTER FIELD MANUAL, CONFIRM THAT YOU HAVE THE APPROPRIATE TRANSDUCERS AND SPACER BAR (IF USED) FOR REFLECT MODE OPERATION ON THE CHOSEN PIPE.
- SELECT MOUNTING LOCATION:
 - CHOOSE LOCATION WHICH REMAINS FULL AT ZERO FLOW
 - WHERE POSSIBLE LOCATE TRANSDUCERS TO PIPE DIAMETERS OR MORE FROM BEND TO ENSURE FULLY DEVELOPED AND STABLE FLOW PROFILE.
 - ON HORIZONTAL PIPE, SELECT HORIZONTAL PLANE, IF POSSIBLE TO AVOID SEDIMENT BLOCKAGE OF ULTRASONIC BEAM.
- PREPARE PIPE FOR TRANSDUCER MOUNTING:
 - REMOVE GRIT, CORROSION, COATING OR HEAVY PAINT
 - CLEAN AND DEGREASE SURFACE
 - DO NOT MOUNT OVER FROST.
 - CONDITION PIPE SURFACE:
 - LOCATE THE PIPE SURFACE TO ACCEPT THE TRANSDUCERS. USE THE ABRASIVE PAD PROVIDED.
- INSTALLATION WITH MOUNTING FRAMES
 - CONSULT THE 1010 FIELD MANUAL AND USE THE INSTALLATION MENU TO SELECT THE APPROPRIATE INDEX HOLE OR SPACING (LTN) FOR YOUR APPLICATION.
 - IF SPACER BAR IS USED:
 - CLAMP ONE MOUNTING FRAME AT THE UN-NUMBERED REFERENCE POSITION OF THE SPACER BAR. BE SURE THE INDEX PIN AND SPACER BAR INDEX SCREW ENGAGE THE HOLE IN THE SPACER BAR.
 - CLAMP THE SECOND MOUNTING FRAME TO THE SPACER BAR IN THE SAME MANNER AT THE INDEX HOLE INDICATED DURING STEP 4.1.
 - HOLD THE MOUNTING FRAME/SPACER BAR ASSEMBLY ON THE PIPE AT THE SELECTED LOCATION AND TEMPORARILY SECURE IT TO THE PIPE USING STRAPS FROM THE 1012MS STRAP MOUNTING KIT. GO TO 4.4.
 - IF MOUNTING FRAMES ARE SPACED BY MEASURING "L"IN":
 - TEMPORARILY SECURE ONE OF THE MOUNTING FRAMES TO THE PIPE USING STRAPS FROM THE 1012MS STRAP MOUNTING KIT.
 - MEASURE ALONG THE PIPE AND TEMPORARILY SECURE THE SECOND MOUNTING FRAME TO THE PIPE SO THAT SPACING "L"IN" DETERMINED IN STEP 4.1 IS MEASURED BETWEEN THE SPACING MARKS ON THE MOUNTING FRAMES.
 - IF THE PIPE SURFACE IS CLEAN AND SMOOTH, PROCEED TO TRANSDUCER INSTALLATION ON SHIT.3. IF PIPE SURFACE NEEDS CONDITIONING; MARK THE MOUNTING FRAME POSITION CAREFULLY; LOOSEN STRAPS AND MOVE THE MOUNTING FRAMES ASIDE. LOCALLY SMOOTH THE PIPE SURFACE IN THE MARKED AREAS USING THE ABRASIVE PAD SUPPLIED. SHIFT THE MOUNTING FRAMES BACK INTO THEIR APPROPRIATE LOCATIONS AND TIGHTEN THE MOUNTING STRAPS SECURELY.



REFLECT MODE OPERATION

TO 980 OR 1010 SERIES FLOW COMPUTER

1012CNF SERIES CABLE SET

1012BN SPACER BAR

"DOWNSTREAM" TRANSDUCER AND MOUNTING FRAME

1012MS SERIES MOUNTING STRAP KIT

1012FN SERIES MOUNTING FRAME SET (PAIR)

1011NFPS SERIES TRANSDUCER SET (PAIR)

CUSTOMER'S PIPE

FLOW

SECURING MOUNTING FRAMES TO THE PIPE SURFACE

HOLD THE MOUNTING FRAME/SPACER BAR ASSEMBLY AGAINST THE PIPE AT THE SELECTED MOUNTING LOCATION. MARK THE APPROXIMATE OUTLINE OF THE MOUNTING FRAMES ON THE PIPE SURFACE. USING THE ABRASIVE PAD SUPPLIED, SMOOTH THE PIPE SURFACE IN THE MARKED AREAS. SECURE THE MOUNTING FRAMES TO THE PIPE USING THE MOUNTING STRAP KIT (1012MS). SEE DRAWING 1012MS-8.

ABRADE TO SMOOTH FINISH, TWO PLACES

4.4

4.2

4.3

PREFERRED MOUNTING PLANE

HORIZONTAL

2.3

MOUNT TRANSDUCERS/MOUNTING FRAMES IN HORIZONTAL PLANE TO PREVENT BLOCKING OF ULTRASONIC BEAM BY AIR OR SEDIMENT.

USING THE SPACER BAR TO SET TRANSDUCER MOUNTING FRAME SPACING

USING THE INSTALLATION MENU, AS OUTLINED IN THE FLOW COMPUTER FIELD MANUAL, DETERMINE THE SPACING INDEX NUMBER FOR THE SELECTED APPLICATION.

USE THE SPACER BAR INDEX SCREW TO SECURE THE SPACER BAR TO ONE OF THE MOUNTING FRAMES AT THE UN-NUMBERED REFERENCE POSITION.

SPACER BAR INDEX SCREW

UN-NUMBERED REFERENCE POSITION

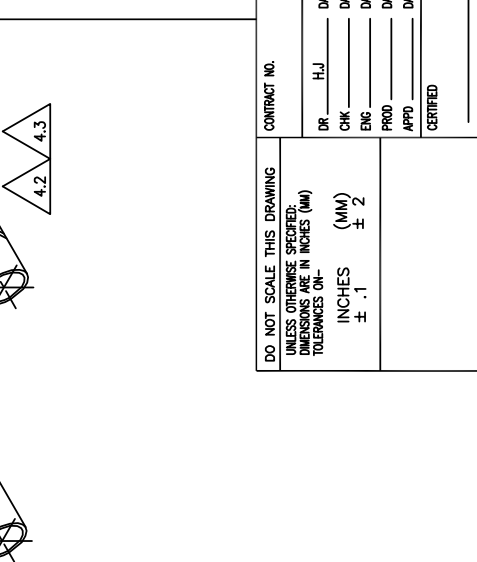
NUMBERED INDEX POSITIONS

SPACER BAR

4.2

SEE SHEET 4 FOR MOUNTING FRAMES INSTALLATION WITHOUT MOUNTING FRAMES

** SEE SHEET 3 FOR INSTRUCTIONS TO COMPLETE TRANSDUCER INSTALLATION.



SECURE THE SECOND MOUNTING FRAME TO THE SPACER BAR AT THE NUMBERED INDEX POSITION DETERMINED FROM THE INSTALLATION MENU.

CONTROLTRON
HAUPPAUGE, NY 11788

INSTALLATION, 1011NFPS SERIES DEDICATED PLASTIC BODY TRANSDUCER

CONTRACT NO. _____

DR. H.J. _____ DATE 7/7/99

CHK. _____ DATE _____

ENG. _____ DATE _____

PROD. _____ DATE _____

APPD. _____ DATE _____

CERTIFIED _____

DATE _____

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES (MM)

INCHES (MM)

± .1 (± 2)

SIZE CODE IDENT NO. **C 21614**

REV. **B**

SCALE: NONE WT. _____

SHEET 1 OF 4

R14: 1011NFPS-7 rev.B

CN4333

DO NOT SCALE THIS DRAWING

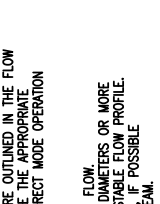
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES (MM)

INCHES (MM)

± .1 (± 2)

SEE SHEET 4 FOR MOUNTING FRAMES INSTALLATION WITHOUT MOUNTING FRAMES

PREFERRED MOUNTING PLANE




2.3 HORIZONTAL

2.3 MOUNT TRANSducers/MOUNTING FRAMES IN HORIZONTAL PLANE TO PREVENT BLOCKING OF ULTRASONIC BEAM BY AIR OR SEDIMENT.

USING THE SPACER BAR TO SET TRANSDUCER MOUNTING FRAME SPACING

USING THE INSTALLATION MENU, AS OUTLINED IN THE FLOW COMPUTER FIELD MANUAL, DETERMINE THE SPACING INDEX NUMBER FOR THE SELECTED APPLICATION. USE THE SPACER BAR INDEX SCREW TO SECURE THE SPACER BAR TO ONE OF THE MOUNTING FRAMES AT THE UN-NUMBERED REFERENCE POSITION.



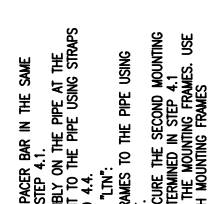
4.2 SPACER BAR INDEX SCREW

4.2 UN-NUMBERED REFERENCE POSITION

4.2 NUMBERED INDEX POSITIONS

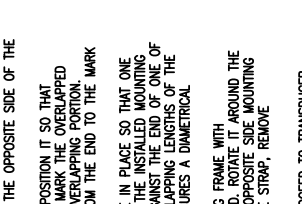
4.2 SPACER BAR

SECURE THE SECOND MOUNTING FRAME TO THE SPACER BAR AT THE NUMBERED INDEX POSITION DETERMINED FROM THE INSTALLATION MENU.



4.4 SECURE THE SECOND MOUNTING FRAME TO THE SPACER BAR AT THE NUMBERED INDEX POSITION DETERMINED FROM THE INSTALLATION MENU.

WRAP MOUNTING GUIDE AROUND PIPE AND MARK AT OVERLAPPING EDGE. UNWRAP GUIDE, MEASURE DISTANCE "L" FROM EDGE TO MARK, MARK AGAIN AT 1/2 "L". RE-INSTALL THE MOUNTING GUIDE, TAPE IN PLACE WITH BOTH MARKS VISIBLE. ALIGN ONE MARK WITH THE CENTER LINE OF THE MOUNTING FRAMES.



4.4.1 MARK

4.4.1 PIPE

4.4.1 GUIDE

4.4.1 MARK

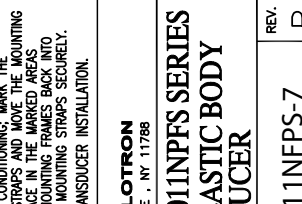
4.4.2 MARK

4.4.2 PIPE

4.4.2 GUIDE

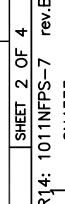
4.4.2 MARK

IF NECESSARY, USE THE ABRASIVE PAD SUPPLIED TO PRODUCE A SMOOTH FINISH ON THE PIPE AT THE TRANSDUCER MOUNTING POSITIONS.



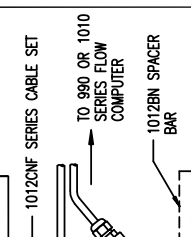
4.5 IF NECESSARY, USE THE ABRASIVE PAD SUPPLIED TO PRODUCE A SMOOTH FINISH ON THE PIPE AT THE TRANSDUCER MOUNTING POSITIONS.

ALIGN OVERLAPPING EDGES



4.4.3 ALIGN OVERLAPPING EDGES

DIRECT MODE OPERATION



3 1011NFPS SERIES TRANSDUCER SET (PAIR)

3 1017FN SERIES MOUNTING FRAME SET (PAIR)

3 TO 990 OR 1010 SERIES FLOW COMPUTER

3 1012BN SPACER BAR

3 CUSTOMER'S PIPE

3 MOUNTING GUIDE

3 1012MS SERIES MOUNTING STRAP KIT

3 "UPSTREAM" TRANSDUCER AND MOUNTING FRAME

3 "DOWNSTREAM" TRANSDUCER AND MOUNTING FRAME

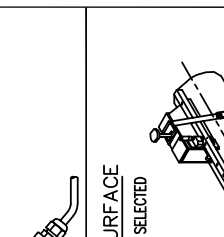
3 FLOW

INSTALLATION NOTES - SEE DRAWING REFERENCE A

1. USING THE INSTALLATION MENU AND THE PROCEDURE OUTLINED IN THE FLOW COMPUTER FIELD MANUAL, CONFIRM THAT YOU HAVE THE APPROPRIATE TRANSDUCERS AND SPACER BAR (IF USED) FOR DIRECT MODE OPERATION ON THE CHOSEN PIPE.
2. SELECT MOUNTING LOCATION;
 - 2.1 CHOOSE LOCATION WHICH REMAINS FULL AT ZERO FLOW.
 - 2.2 WHERE POSSIBLE LOCATE TRANSDUCERS TO PIPE DIAMETERS OR MORE FROM BEND TO ENSURE FULLY DEVELOPED AND STABLE FLOW PROFILE.
 - 2.3 ON HORIZONTAL PIPE, SELECT HORIZONTAL PLANE, IF POSSIBLE TO AVOID SEDIMENT BLOCKAGE OF ULTRASONIC BEAM.
3. PREPARE PIPE FOR TRANSDUCER MOUNTING
 - 3.1 REMOVE GRIT, CORROSION, COATING OR HEAVY PAINT
 - 3.2 CLEAN AND DEGREASE SURFACE
 - 3.3 DO NOT MOUNT OVER FROST.
 - 3.4 CONDITION PIPE SURFACE.
 - 3.4.1 LOCALLY SMOOTH THE PIPE SURFACE TO ACCEPT THE TRANSDUCERS. USE THE ABRASIVE PAD PROVIDED.
4. INSTALLATION WITH MOUNTING FRAMES
 - 4.1 CONSULT THE 1010 FIELD MANUAL AND USE THE INSTALLATION MENU TO SELECT THE APPROPRIATE INDEX HOLE OR SPACING (LTN) FOR YOUR APPLICATION.
 - 4.2 IF SPACER BAR IS USED:
 - 4.2.1 CLAMP ONE MOUNTING FRAME AT THE UN-NUMBERED REFERENCE POSITION OF THE SPACER BAR. BE SURE THE INDEX PIN AND SPACER BAR INDEX SCREW ENGAGE THE HOLE IN THE SPACER BAR.
 - 4.2.2 CLAMP THE SECOND MOUNTING FRAME TO THE SPACER BAR IN THE SAME MANNER AT THE INDEX HOLE INDICATED DURING STEP 4.1.
 - 4.2.3 HOLD THE MOUNTING FRAME/SPACER BAR ASSEMBLY ON THE PIPE AT THE SELECTED LOCATION AND TEMPORARILY SECURE IT TO THE PIPE USING STRAPS FROM THE 1012MS STRAP MOUNTING KIT. GO TO 4.4.
 - 4.3 IF MOUNTING FRAMES ARE SPACED BY MEASURING "LTN":
 - 4.3.1 TEMPORARILY SECURE ONE OF THE MOUNTING FRAMES TO THE PIPE USING STRAPS FROM THE 1012MS STRAP MOUNTING KIT.
 - 4.3.2 MEASURE ALONG THE PIPE AND TEMPORARILY SECURE THE SECOND MOUNTING FRAME TO THE PIPE SO THAT SPACING "LTN" DETERMINED IN STEP 4.1 IS MEASURED BETWEEN THE SPACING MARKS ON THE MOUNTING FRAMES. USE STRAIGHT EDGE OR OTHER MEANS TO ALIGN BOTH MOUNTING FRAMES WITH PIPE AXIS.
 - 4.4 USE THE MOUNTING GUIDE INCLUDED WITH THE 1012MS STRAP MOUNTING KIT TO TRANSFER ONE OF THE MOUNTING FRAMES TO THE OPPOSITE SIDE OF THE PIPE.
 - 4.4.1 WRAP THE MOUNTING GUIDE AROUND THE PIPE. POSITION IT SO THAT THE OVERLAPPING LENGTHS ARE EDGE-ALIGNED. MARK THE OVERLAPPED PORTION OF THE GUIDE AT THE EDGE OF THE OVERLAPPING PORTION. REMOVE THE GUIDE. MEASURE THE DISTANCE FROM THE END TO THE MARK AND MARK AGAIN HALFWAY BETWEEN.
 - 4.4.2 RE-POSITION THE GUIDE ON THE PIPE AND TAPE IN PLACE SO THAT ONE OF THE MARKS INDICATES THE CENTERLINE OF THE INSTALLED MOUNTING FRAMES AND THE MOUNTING GUIDE EDGE IS AGAINST THE END OF ONE OF THE MOUNTING FRAMES. MAKE SURE THE OVERLAPPING LENGTHS OF THE MOUNTING GUIDE ARE EDGE-ALIGNED. THIS ASSURES A DIAMETRICAL TRANSFER OF THE MOUNTING FRAME POSITION.
 - 4.4.3 LOOSEN THE MOUNTING STRAP ON THE MOUNTING FRAME WITH WHICH THE MOUNTING GUIDE HAS BEEN ALIGNED. ROTATE IT AROUND THE PIPE SURFACE UNTIL IT IS CENTERED ON THE OPPOSITE SIDE MOUNTING GUIDE MARK MADE IN STEP 4.4.1. TIGHTEN THE STRAP. REMOVE THE MOUNTING GUIDE.
 - 4.5 IF THE PIPE SURFACE IS CLEAN AND SMOOTH, PROCEED TO TRANSDUCER INSTALLATION. IF THE PIPE SURFACE REQUIRES FINISHING, MARK THE MOUNTING FRAME POSITION, UNWRAP THE ABRASIVE PAD STRIPS, AND USE THE MOUNTING FRAMES AS A GUIDE TO SMOOTH THE PIPE SURFACE IN THE MARKED AREAS. USE THE ABRASIVE PAD SUPPLIED. SHIFT THE MOUNTING FRAMES BACK INTO THEIR APPROPRIATE LOCATIONS AND TIGHTEN THE MOUNTING STRAPS SECURELY. ** SEE SHEET 3 FOR INSTRUCTIONS TO COMPLETE TRANSDUCER INSTALLATION.

SECURING MOUNTING FRAMES TO THE PIPE SURFACE

HOLD THE MOUNTING FRAME/SPACER BAR ASSEMBLY AGAINST THE PIPE AT THE SELECTED MOUNTING LOCATION OR POSITION USING LTN, TEMPORARILY STRAP IN PLACE.

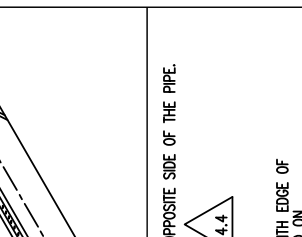


4.2 HOLD THE MOUNTING FRAME/SPACER BAR ASSEMBLY AGAINST THE PIPE AT THE SELECTED MOUNTING LOCATION OR POSITION USING LTN, TEMPORARILY STRAP IN PLACE.

4.3 HOLD THE MOUNTING FRAME/SPACER BAR ASSEMBLY AGAINST THE PIPE AT THE SELECTED MOUNTING LOCATION OR POSITION USING LTN, TEMPORARILY STRAP IN PLACE.

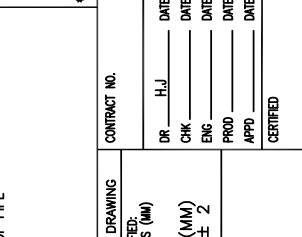
4.4 USE THE MOUNTING GUIDE TO TRANSFER ONE OF THE MOUNTING FRAMES TO THE OPPOSITE SIDE OF THE PIPE.

USE THE MOUNTING GUIDE TO TRANSFER ONE OF THE MOUNTING FRAMES TO THE OPPOSITE SIDE OF THE PIPE.



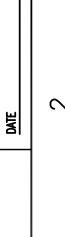
4.4 USE THE MOUNTING GUIDE TO TRANSFER ONE OF THE MOUNTING FRAMES TO THE OPPOSITE SIDE OF THE PIPE.

IF NECESSARY, USE THE ABRASIVE PAD SUPPLIED TO PRODUCE A SMOOTH FINISH ON THE PIPE AT THE TRANSDUCER MOUNTING POSITIONS.



4.5 IF NECESSARY, USE THE ABRASIVE PAD SUPPLIED TO PRODUCE A SMOOTH FINISH ON THE PIPE AT THE TRANSDUCER MOUNTING POSITIONS.

ALIGN OVERLAPPING EDGES



4.4.3 ALIGN OVERLAPPING EDGES

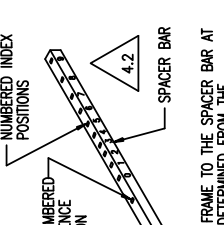
INSTALLATION NOTES - SEE DRAWING REFERENCE A

1. USING THE INSTALLATION MENU AND THE PROCEDURE OUTLINED IN THE FLOW COMPUTER FIELD MANUAL, CONFIRM THAT YOU HAVE THE APPROPRIATE TRANSDUCERS AND SPACER BAR (IF USED) FOR DIRECT MODE OPERATION ON THE CHOSEN PIPE.
2. SELECT MOUNTING LOCATION;
 - 2.1 CHOOSE LOCATION WHICH REMAINS FULL AT ZERO FLOW.
 - 2.2 WHERE POSSIBLE LOCATE TRANSDUCERS TO PIPE DIAMETERS OR MORE FROM BEND TO ENSURE FULLY DEVELOPED AND STABLE FLOW PROFILE.
 - 2.3 ON HORIZONTAL PIPE, SELECT HORIZONTAL PLANE, IF POSSIBLE TO AVOID SEDIMENT BLOCKAGE OF ULTRASONIC BEAM.
3. PREPARE PIPE FOR TRANSDUCER MOUNTING
 - 3.1 REMOVE GRIT, CORROSION, COATING OR HEAVY PAINT
 - 3.2 CLEAN AND DEGREASE SURFACE
 - 3.3 DO NOT MOUNT OVER FROST.
 - 3.4 CONDITION PIPE SURFACE.
 - 3.4.1 LOCALLY SMOOTH THE PIPE SURFACE TO ACCEPT THE TRANSDUCERS. USE THE ABRASIVE PAD PROVIDED.
4. INSTALLATION WITH MOUNTING FRAMES
 - 4.1 CONSULT THE 1010 FIELD MANUAL AND USE THE INSTALLATION MENU TO SELECT THE APPROPRIATE INDEX HOLE OR SPACING (LTN) FOR YOUR APPLICATION.
 - 4.2 IF SPACER BAR IS USED:
 - 4.2.1 CLAMP ONE MOUNTING FRAME AT THE UN-NUMBERED REFERENCE POSITION OF THE SPACER BAR. BE SURE THE INDEX PIN AND SPACER BAR INDEX SCREW ENGAGE THE HOLE IN THE SPACER BAR.
 - 4.2.2 CLAMP THE SECOND MOUNTING FRAME TO THE SPACER BAR IN THE SAME MANNER AT THE INDEX HOLE INDICATED DURING STEP 4.1.
 - 4.2.3 HOLD THE MOUNTING FRAME/SPACER BAR ASSEMBLY ON THE PIPE AT THE SELECTED LOCATION AND TEMPORARILY SECURE IT TO THE PIPE USING STRAPS FROM THE 1012MS STRAP MOUNTING KIT. GO TO 4.4.
 - 4.3 IF MOUNTING FRAMES ARE SPACED BY MEASURING "LTN":
 - 4.3.1 TEMPORARILY SECURE ONE OF THE MOUNTING FRAMES TO THE PIPE USING STRAPS FROM THE 1012MS STRAP MOUNTING KIT.
 - 4.3.2 MEASURE ALONG THE PIPE AND TEMPORARILY SECURE THE SECOND MOUNTING FRAME TO THE PIPE SO THAT SPACING "LTN" DETERMINED IN STEP 4.1 IS MEASURED BETWEEN THE SPACING MARKS ON THE MOUNTING FRAMES. USE STRAIGHT EDGE OR OTHER MEANS TO ALIGN BOTH MOUNTING FRAMES WITH PIPE AXIS.
 - 4.4 USE THE MOUNTING GUIDE INCLUDED WITH THE 1012MS STRAP MOUNTING KIT TO TRANSFER ONE OF THE MOUNTING FRAMES TO THE OPPOSITE SIDE OF THE PIPE.
 - 4.4.1 WRAP THE MOUNTING GUIDE AROUND THE PIPE. POSITION IT SO THAT THE OVERLAPPING LENGTHS ARE EDGE-ALIGNED. MARK THE OVERLAPPED PORTION OF THE GUIDE AT THE EDGE OF THE OVERLAPPING PORTION. REMOVE THE GUIDE. MEASURE THE DISTANCE FROM THE END TO THE MARK AND MARK AGAIN HALFWAY BETWEEN.
 - 4.4.2 RE-POSITION THE GUIDE ON THE PIPE AND TAPE IN PLACE SO THAT ONE OF THE MARKS INDICATES THE CENTERLINE OF THE INSTALLED MOUNTING FRAMES AND THE MOUNTING GUIDE EDGE IS AGAINST THE END OF ONE OF THE MOUNTING FRAMES. MAKE SURE THE OVERLAPPING LENGTHS OF THE MOUNTING GUIDE ARE EDGE-ALIGNED. THIS ASSURES A DIAMETRICAL TRANSFER OF THE MOUNTING FRAME POSITION.
 - 4.4.3 LOOSEN THE MOUNTING STRAP ON THE MOUNTING FRAME WITH WHICH THE MOUNTING GUIDE HAS BEEN ALIGNED. ROTATE IT AROUND THE PIPE SURFACE UNTIL IT IS CENTERED ON THE OPPOSITE SIDE MOUNTING GUIDE MARK MADE IN STEP 4.4.1. TIGHTEN THE STRAP. REMOVE THE MOUNTING GUIDE.
 - 4.5 IF THE PIPE SURFACE IS CLEAN AND SMOOTH, PROCEED TO TRANSDUCER INSTALLATION. IF THE PIPE SURFACE REQUIRES FINISHING, MARK THE MOUNTING FRAME POSITION, UNWRAP THE ABRASIVE PAD STRIPS, AND USE THE MOUNTING FRAMES AS A GUIDE TO SMOOTH THE PIPE SURFACE IN THE MARKED AREAS. USE THE ABRASIVE PAD SUPPLIED. SHIFT THE MOUNTING FRAMES BACK INTO THEIR APPROPRIATE LOCATIONS AND TIGHTEN THE MOUNTING STRAPS SECURELY. ** SEE SHEET 3 FOR INSTRUCTIONS TO COMPLETE TRANSDUCER INSTALLATION.

INSTALLATION NOTES - SEE DRAWING REFERENCE A

1. USING THE INSTALLATION MENU AND THE PROCEDURE OUTLINED IN THE FLOW COMPUTER FIELD MANUAL, CONFIRM THAT YOU HAVE THE APPROPRIATE TRANSDUCERS AND SPACER BAR (IF USED) FOR DIRECT MODE OPERATION ON THE CHOSEN PIPE.
2. SELECT MOUNTING LOCATION;
 - 2.1 CHOOSE LOCATION WHICH REMAINS FULL AT ZERO FLOW.
 - 2.2 WHERE POSSIBLE LOCATE TRANSDUCERS TO PIPE DIAMETERS OR MORE FROM BEND TO ENSURE FULLY DEVELOPED AND STABLE FLOW PROFILE.
 - 2.3 ON HORIZONTAL PIPE, SELECT HORIZONTAL PLANE, IF POSSIBLE TO AVOID SEDIMENT BLOCKAGE OF ULTRASONIC BEAM.
3. PREPARE PIPE FOR TRANSDUCER MOUNTING
 - 3.1 REMOVE GRIT, CORROSION, COATING OR HEAVY PAINT
 - 3.2 CLEAN AND DEGREASE SURFACE
 - 3.3 DO NOT MOUNT OVER FROST.
 - 3.4 CONDITION PIPE SURFACE.
 - 3.4.1 LOCALLY SMOOTH THE PIPE SURFACE TO ACCEPT THE TRANSDUCERS. USE THE ABRASIVE PAD PROVIDED.
4. INSTALLATION WITH MOUNTING FRAMES
 - 4.1 CONSULT THE 1010 FIELD MANUAL AND USE THE INSTALLATION MENU TO SELECT THE APPROPRIATE INDEX HOLE OR SPACING (LTN) FOR YOUR APPLICATION.
 - 4.2 IF SPACER BAR IS USED:
 - 4.2.1 CLAMP ONE MOUNTING FRAME AT THE UN-NUMBERED REFERENCE POSITION OF THE SPACER BAR. BE SURE THE INDEX PIN AND SPACER BAR INDEX SCREW ENGAGE THE HOLE IN THE SPACER BAR.
 - 4.2.2 CLAMP THE SECOND MOUNTING FRAME TO THE SPACER BAR IN THE SAME MANNER AT THE INDEX HOLE INDICATED DURING STEP 4.1.
 - 4.2.3 HOLD THE MOUNTING FRAME/SPACER BAR ASSEMBLY ON THE PIPE AT THE SELECTED LOCATION AND TEMPORARILY SECURE IT TO THE PIPE USING STRAPS FROM THE 1012MS STRAP MOUNTING KIT. GO TO 4.4.
 - 4.3 IF MOUNTING FRAMES ARE SPACED BY MEASURING "LTN":
 - 4.3.1 TEMPORARILY SECURE ONE OF THE MOUNTING FRAMES TO THE PIPE USING STRAPS FROM THE 1012MS STRAP MOUNTING KIT.
 - 4.3.2 MEASURE ALONG THE PIPE AND TEMPORARILY SECURE THE SECOND MOUNTING FRAME TO THE PIPE SO THAT SPACING "LTN" DETERMINED IN STEP 4.1 IS MEASURED BETWEEN THE SPACING MARKS ON THE MOUNTING FRAMES. USE STRAIGHT EDGE OR OTHER MEANS TO ALIGN BOTH MOUNTING FRAMES WITH PIPE AXIS.
 - 4.4 USE THE MOUNTING GUIDE INCLUDED WITH THE 1012MS STRAP MOUNTING KIT TO TRANSFER ONE OF THE MOUNTING FRAMES TO THE OPPOSITE SIDE OF THE PIPE.
 - 4.4.1 WRAP THE MOUNTING GUIDE AROUND THE PIPE. POSITION IT SO THAT THE OVERLAPPING LENGTHS ARE EDGE-ALIGNED. MARK THE OVERLAPPED PORTION OF THE GUIDE AT THE EDGE OF THE OVERLAPPING PORTION. REMOVE THE GUIDE. MEASURE THE DISTANCE FROM THE END TO THE MARK AND MARK AGAIN HALFWAY BETWEEN.
 - 4.4.2 RE-POSITION THE GUIDE ON THE PIPE AND TAPE IN PLACE SO THAT ONE OF THE MARKS INDICATES THE CENTERLINE OF THE INSTALLED MOUNTING FRAMES AND THE MOUNTING GUIDE EDGE IS AGAINST THE END OF ONE OF THE MOUNTING FRAMES. MAKE SURE THE OVERLAPPING LENGTHS OF THE MOUNTING GUIDE ARE EDGE-ALIGNED. THIS ASSURES A DIAMETRICAL TRANSFER OF THE MOUNTING FRAME POSITION.
 - 4.4.3 LOOSEN THE MOUNTING STRAP ON THE MOUNTING FRAME WITH WHICH THE MOUNTING GUIDE HAS BEEN ALIGNED. ROTATE IT AROUND THE PIPE SURFACE UNTIL IT IS CENTERED ON THE OPPOSITE SIDE MOUNTING GUIDE MARK MADE IN STEP 4.4.1. TIGHTEN THE STRAP. REMOVE THE MOUNTING GUIDE.
 - 4.5 IF THE PIPE SURFACE IS CLEAN AND SMOOTH, PROCEED TO TRANSDUCER INSTALLATION. IF THE PIPE SURFACE REQUIRES FINISHING, MARK THE MOUNTING FRAME POSITION, UNWRAP THE ABRASIVE PAD STRIPS, AND USE THE MOUNTING FRAMES AS A GUIDE TO SMOOTH THE PIPE SURFACE IN THE MARKED AREAS. USE THE ABRASIVE PAD SUPPLIED. SHIFT THE MOUNTING FRAMES BACK INTO THEIR APPROPRIATE LOCATIONS AND TIGHTEN THE MOUNTING STRAPS SECURELY. ** SEE SHEET 3 FOR INSTRUCTIONS TO COMPLETE TRANSDUCER INSTALLATION.

WRAP MOUNTING GUIDE AROUND PIPE AND MARK AT OVERLAPPING EDGE. UNWRAP GUIDE, MEASURE DISTANCE "L" FROM EDGE TO MARK, MARK AGAIN AT 1/2 "L". RE-INSTALL THE MOUNTING GUIDE, TAPE IN PLACE WITH BOTH MARKS VISIBLE. ALIGN ONE MARK WITH THE CENTER LINE OF THE MOUNTING FRAMES.



4.4.1 MARK

4.4.1 PIPE

4.4.1 GUIDE

4.4.1 MARK

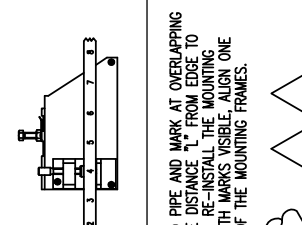
4.4.2 MARK

4.4.2 PIPE

4.4.2 GUIDE

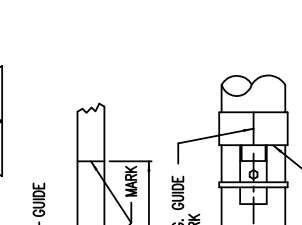
4.4.2 MARK

IF NECESSARY, USE THE ABRASIVE PAD SUPPLIED TO PRODUCE A SMOOTH FINISH ON THE PIPE AT THE TRANSDUCER MOUNTING POSITIONS.



4.5 IF NECESSARY, USE THE ABRASIVE PAD SUPPLIED TO PRODUCE A SMOOTH FINISH ON THE PIPE AT THE TRANSDUCER MOUNTING POSITIONS.

ALIGN OVERLAPPING EDGES



4.4.3 ALIGN OVERLAPPING EDGES

4 3 2 1

MATING 1012CNF SERIES TRANSDUCER CABLES WITH 1011NFPS SERIES TRANSDUCERS

- REMOVE PROTECTIVE CAPS.
- SEE APPROPRIATE CABLE ASSEMBLY DRAWING FOR 'F' CONNECTOR, NPT ADAPTER AND GLAND ASSEMBLY DETAIL.
- MATE 'F' CONNECTORS, CABLES TO TRANSDUCER.
- FOR BEST WEATHER SEAL, WRAP TEFLON PIPE TAPE (NOT SUPPLIED) AROUND MALE NPT THREADS ON TRANSDUCER HOUSING.
- SCREW NPT ADAPTER TO TRANSDUCER HOUSING (HAND TIGHT IS SUFFICIENT).
- TIGHTEN GLAND BODY WITH NPT ADAPTER AND SECURE CABLE BY TIGHTENING GLAND TOP NUT. (HAND TIGHT IS SUFFICIENT).

INSTALLATION NOTES - CONT'D FROM SHT. 1 OR SHT. 2

- MAKE CABLE CONNECTIONS AT FLOW COMPUTER IN ACCORDANCE WITH APPROPRIATE FLOW COMPUTER INSTALLATION DRAWING AND 1010 FIELD MANUAL.
- SEE DRAWINGS 1012FN-8 AND 1011NFPS-8 FOR MOUNTING FRAME AND TRANSDUCER OUTLINE DIMENSIONS.

INSTALLING TRANSDUCERS IN MOUNTING FRAMES

APPLY A THIN BAND OF COUPLANT TO THE EMITTING SURFACE OF THE TRANSDUCERS. SLIP THE TRANSDUCERS INTO THE MOUNTING FRAMES, SEATING THEM SQUARELY ON THE PIPE SURFACE. PUSH FORWARD INTO THE FRAMES AGAINST THE FRONT SPACER, TIGHTEN THE TRANSDUCER CLAMPING SCREW, FIRMLY SEATING THE TRANSDUCERS ON THE PIPE SURFACE. SECURE THE CLAMPING SCREW WITH THE LOCKNUT.

**SEE DRAWING 1012TP-7 FOR INSTALLATION USING 1012TP SERIES MOUNTING TRACKS.

USE OF FLEXIBLE CONDUIT WITH TRANSDUCERS

THE TRANSDUCER WIRING HOUSING HAS INTEGRAL 1/2" N.P.T. THREADS TO ACCEPT A CONDUIT COUPLING IF FLEXIBLE CONDUIT IS USED. MAKE CONNECTION AS SHOWN, THEN PASS COUPLING AND CONDUIT OVER THE CABLE, SECURE TO THE TRANSDUCER WIRING HOUSING.

DO NOT SCALE THIS DRAWING UNLESS OTHERWISE SPECIFIED. DIMENSIONS ARE IN INCHES (MM) TOLERANCES ON-

INCHES ± .1 (MM) ± 2

CONTRACT NO.

DR	HJJ	DATE	7/17/99
CHK		DATE	
ENG		DATE	
PRD		DATE	
APPD		DATE	
CERTIFIED			
DATE			

CONTROLTRON
HAUPPAGE, NY 11788

INSTALLATION, 1011NFPS SERIES DEDICATED PLASTIC BODY TRANSDUCER

SIZE	CODE IDENT NO.	REV.
C	21614	1011NFPS-7
SCALE: NONE	WT.	SHEET 3 OF 4

R14: 1011NFPS-7 rev.B
CN4333

INSTALLATION OF TRANSDUCERS WITHOUT MOUNTING FRAMES

THE SAME GENERAL NOTES AND PROCEDURES APPLY WHEN INSTALLING TRANSDUCERS WITHOUT THE BENEFIT OF MOUNTING FRAMES. APPLY THE FOLLOWING ALTERNATES TO THE INSTALLATION NOTES ON SHEETS 1 & 2.

- 4.2 IF SPACER BAR IS USED:
 alt.4.2.1 SECURE ONE TRANSDUCER AT THE UN-NUMBERED REFERENCE POSITION OF THE SPACER BAR BY ENGAGING ONE OF THE SCREWS STORED IN THE SPACER BAR CAP WITH THE THREADED INSERT IN THE SIDE OF THE TRANSDUCER BLOCK.
 alt.4.2.2 SECURE THE SECOND TRANSDUCER TO THE SPACER BAR IN THE SAME MANNER AT THE INDEX HOLE INDICATED DURING STEP 4.1.
 alt.4.2.3 HOLD TRANSDUCER/SPACER BAR ASSEMBLY ON THE PIPE AT THE SELECTED LOCATION AND TEMPORARILY SECURE IT TO THE PIPE USING STRAPS FROM THE 1012MS STRAP MOUNTING KIT.
- 4.3 IF TRANSDUCERS ARE SPACED BY MEASURING "LN":
 alt.4.3.1 TEMPORARILY SECURE ONE OF THE TRANSDUCERS TO THE PIPE USING STRAPS FROM THE 1012MS STRAP MOUNTING KIT.
 alt.4.3.2 MEASURE ALONG THE PIPE AND TEMPORARILY SECURE THE SECOND TRANSDUCER TO THE PIPE SO THAT SPACING "LN" DETERMINED IN STEP 4.1 IS MEASURED BETWEEN THE SPACING MARKS ON THE FRONT FACES OF THE TRANSDUCERS. USE A STRAIGHT EDGE OR OTHER MEANS TO ALIGN BOTH TRANSDUCERS WITH THE PIPE AXIS.

FOR REFLECT MODE INSTALLATION GO TO STEP alt.4.5 FOR DIRECT MODE INSTALLATION CONTINUE WITH alt.4.4.

alt.4.4 USE THE MOUNTING GUIDE INCLUDED WITH THE 1012MS STRAP MOUNTING KIT TO TRANSFER ONE OF THE TRANSDUCERS TO THE OPPOSITE SIDE OF THE PIPE. (SEE SHEET 2, ZONE A4)

alt.4.4.1 WRAP THE MOUNTING GUIDE AROUND THE PIPE POSITION IT SO THAT THE OVERLAPPING LENGTHS ARE EDGE-ALIGNED. MARK THE OVERLAPPED PORTION OF THE GUIDE AT THE EDGE OF THE OVERLAPPING PORTION. REMOVE THE GUIDE. MEASURE THE DISTANCE FROM THE END TO THE MARK AND MARK AGAIN HALFWAY BETWEEN.

alt.4.4.2 RE-POSITION THE GUIDE ON THE PIPE AND TAPE IN PLACE SO THAT ONE OF THE MARKS INDICATES THE CENTERLINE OF THE INSTALLED TRANSDUCER AND THE MOUNTING GUIDE EDGE IS AGAINST THE END OF ONE OF THE TRANSDUCERS. MAKE SURE THE OVERLAPPING LENGTHS OF THE MOUNTING GUIDE ARE EDGE-ALIGNED. THIS ASSURES A DYMETRICAL TRANSFER OF THE TRANSDUCER POSITION.

alt.4.4.3 LOOSEN THE MOUNTING STRAP ON THE TRANSDUCER WITH WHICH THE MOUNTING GUIDE HAS BEEN ALIGNED. ROTATE IT AROUND THE PIPE SURFACE UNTIL IT IS CENTERED ON THE OPPOSITE SIDE MOUNTING GUIDE MARK. MAKE IN STEP alt.4.4.1. TIGHTEN THE STRAP. REMOVE THE MOUNTING GUIDE.

alt.4.5 WITH THE TRANSDUCERS TEMPORARILY STRAPPED IN PLACE, MARK THE PIPE SURFACE AT THE TRANSDUCER PERIMETER. REMOVE THE TRANSDUCERS FROM THE PIPE. IF THE PIPE SURFACE IS CLEAN AND SMOOTH, PROCEED TO STEP alt.4.6. IF THE PIPE SURFACE NEEDS CONDITIONING, LOCALLY SMOOTH THE SURFACE IN THE MARKED AREAS USING THE ABRASIVE PAD SUPPLIED. DO NOT OBSCURE THE MARKED TRANSDUCER LOCATIONS.

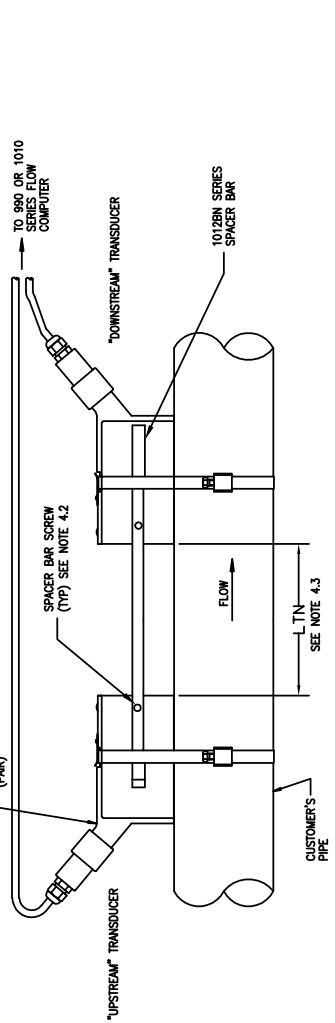
alt.4.6 APPLY A THIN BAND OF COUPLANT TO THE EMITTING SURFACE OF BOTH TRANSDUCERS. CAREFULLY REPLACE THE TRANSDUCERS ON THE PIPE, REPEATING THE PROCEDURE ABOVE, IF REQUIRED, TO ASSURE ACCURATE POSITIONING.

CONTINUE WITH INSTALLATION NOTE 5 AND CABLE CONNECTING INSTRUCTIONS ON SHEET 3.

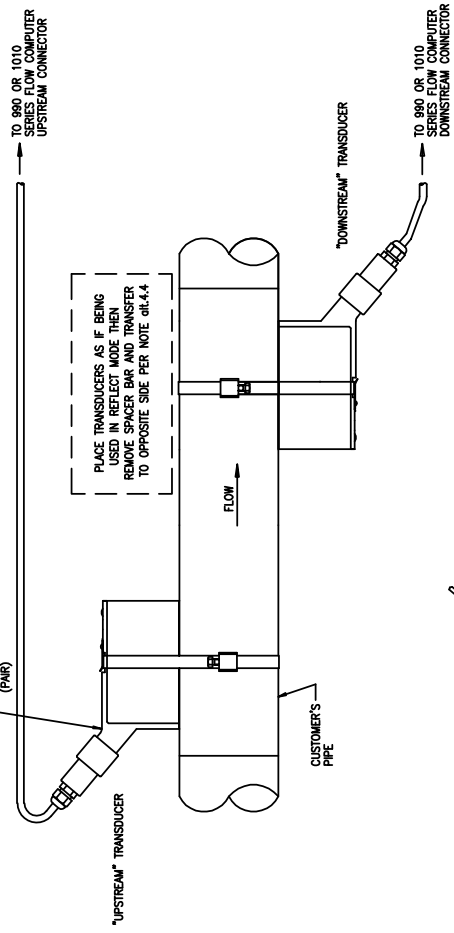
CONTROLTRON HAUPPAUSE, NY 11788	
INSTALLATION, 1011NFPFS SERIES DEDICATED PLASTIC BODY TRANSDUCER	
SIZE	REV. B
CODE IDENT NO. C 21614	1011NFPFS-7
SCALE: NONE	WT.
SHEET 4 OF 4	

DO NOT SCALE THIS DRAWING UNLESS OTHERWISE SPECIFIED. DIMENSIONS ARE IN INCHES (MM) TOLERANCES ON:	
INCHES ± .1	(MM) ± 2
CONTRACT NO.	DATE
DR: HJJ	DATE: 7/17/98
CHK:	DATE:
ENG:	DATE:
PROD:	DATE:
APPD:	DATE:
CERTIFIED:	DATE:

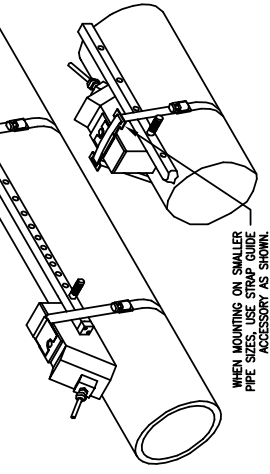
REFLECT MODE OPERATION

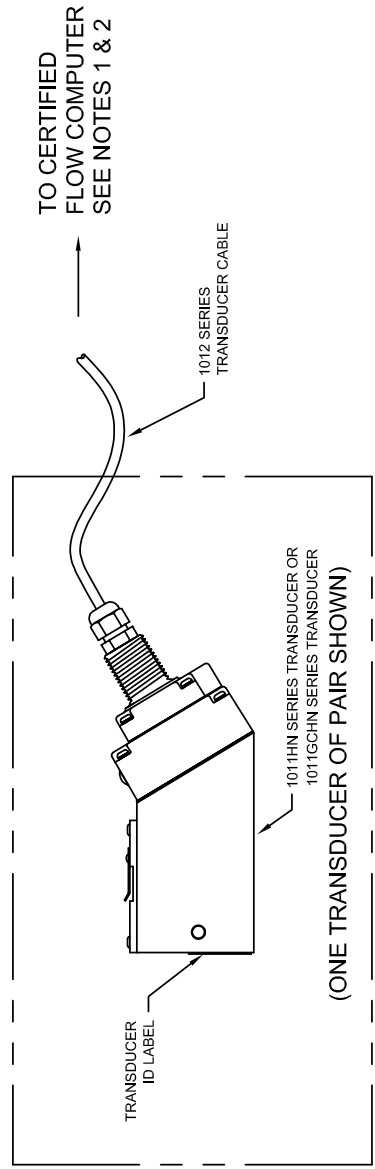


DIRECT MODE OPERATION



AUXILIARY VIEW





1. INSTALL ONE OF THE FOLLOWING TRANSDUCERS

- P/N 1011HN(MODEL CODES)-(SIZE)-S2
- P/N 1011GCHN(MODEL CODES)-(SIZE)-S2

IN ACCORDANCE WITH THE FOLLOWING DRAWINGS:

- a. FOR USE WITH 994 SERIES AGENCY APPROVED FLOW COMPUTERS-INTRINSICALLY SAFE FOR CLASS I, II, DIVISION 1, GROUPS A - G, PER DRAWING 990-104 OR 990-105 NON-INCENDIVE FOR CLASS I, DIVISION 2, GROUPS A - D, SUITABLE FOR CLASS II, DIVISION 2, GPS F, G PER DRAWING 990-110 OR 990-111.
- b. FOR USE WITH 1010 SERIES AGENCY APPROVED FLOW COMPUTERS-INTRINSICALLY SAFE FOR CLASS I, II, DIVISION 1, GROUPS A - G, PER DRAWING 1010-304, 1010-341 OR 1010-443 NON-INCENDIVE FOR CLASS I, DIVISION 2, GROUPS A - D, SUITABLE FOR CLASS II, DIVISION 2, GPS E, F, G PER DRAWING 1010-304, 1010-339, 1010-342 OR 1010-443.

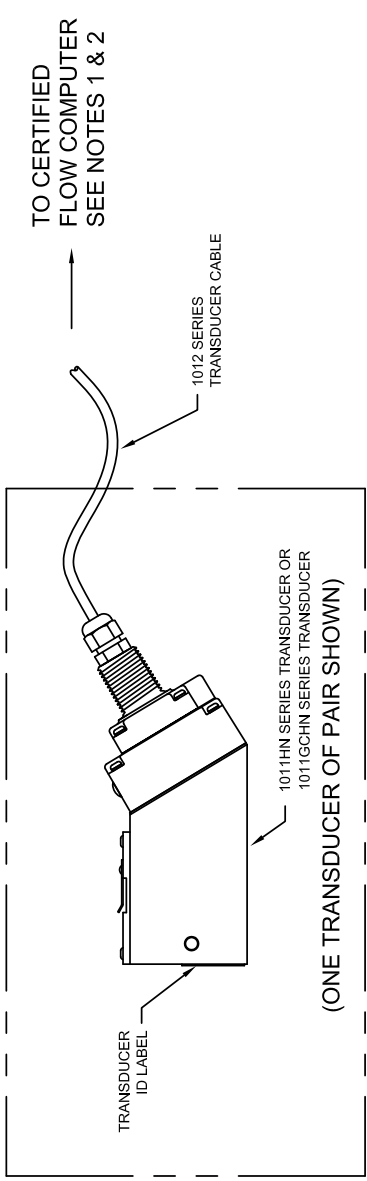
2. SEE DRAWING 1011HNS-7 OR 1011HNS-8 AND APPROPRIATE FLOW COMPUTER FIELD MANUAL FOR ADDITIONAL INSTALLATION INSTRUCTIONS.

3. SEE DRAWING 1011HNS-8 OR 1011HNS-8 FOR OUTLINE INSTALLATION DIMENSIONS.

4. WARNING: SUBSTITUTION WITH UNSPECIFIED COMPONENTS MAY IMPAIR INTRINSIC SAFETY.

CHANGES TO THIS DOCUMENT
REQUIRE SAFETY AGENCY APPROVAL

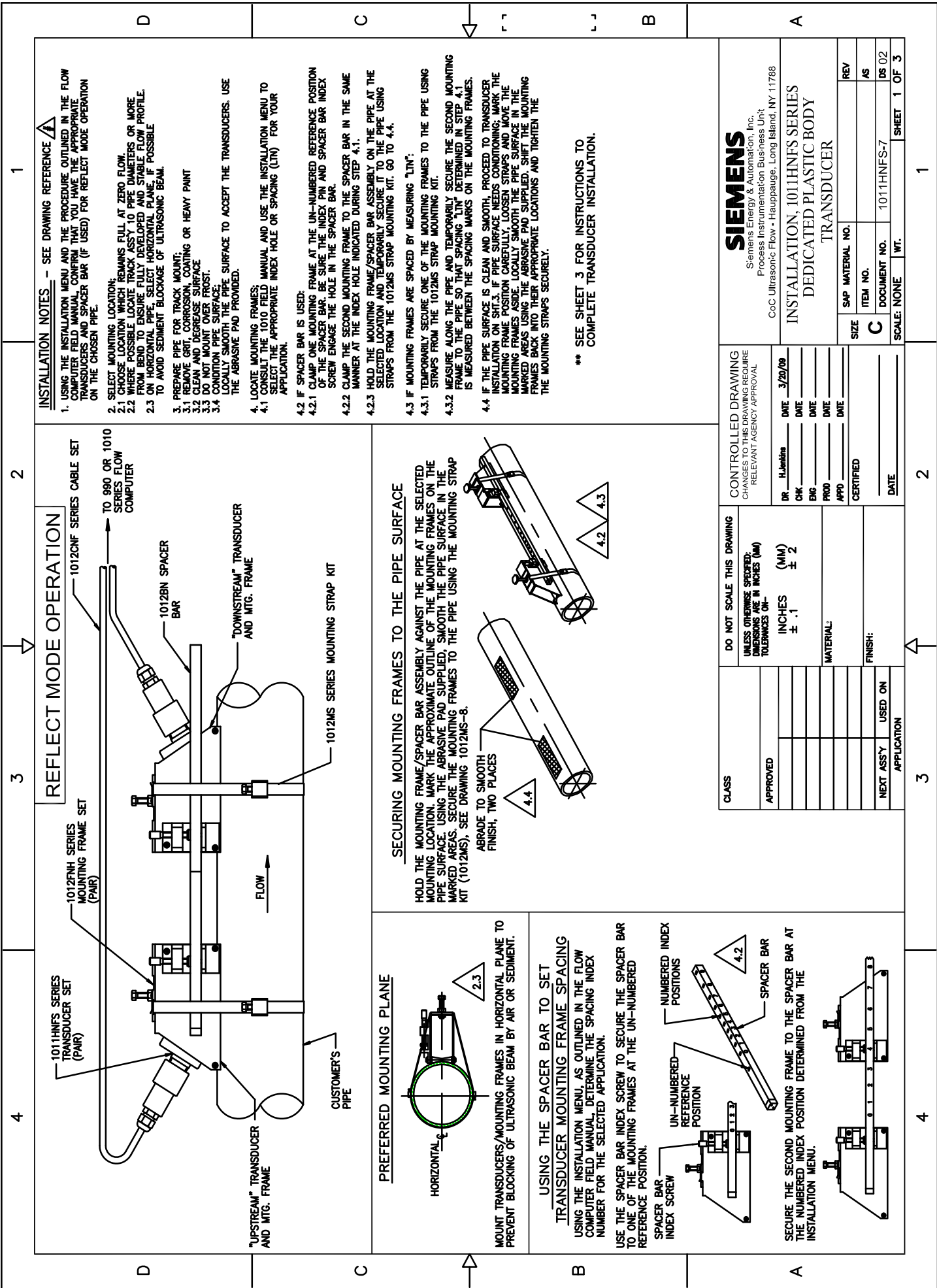
DO NOT SCALE THIS DRAWING UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES (MM) TOLERANCES ON— INCHES (MM) +/- .01 +/- .2	CONTRACT NO. DR H..J DATE 11/04/04 CHK DATE ENG DATE PROD DATE APPD DATE CERTIFIED		SIEMENS Siemens Energy & Automation, Inc. Process Instrumentation Business Unit CoC Ultrasonic Flow - Hauptbaug Long Island, NY 11788 INSTALLATION GUIDE CONNECTION DIAGRAM SELECTION AGENCY APPROVED 1011HN SERIES TRANSDUCERS	SIZE CODE IDENT NO. REV. A 21614 1011HNS2-7 D
	DATE DATE			SCALE: WT. SHEET 1 of 1



1. INSTALL ONE OF THE FOLLOWING TRANSDUCERS
 P/N 1011HN(MODEL CODES)-(SIZE)-S9
 P/N 1011GCHN(MODEL CODES)-(SIZE)-S9
 IN ACCORDANCE WITH THE FOLLOWING DRAWINGS:
 - a. FOR USE WITH 1010 SERIES AGENCY APPROVED FLOW COMPUTERS-
 INTRINSICALLY SAFE EEx ia IIC T5 PER DRAWING 1010-389, 1010-422. OR 1010-464.
 - b. NON-INCENDIVE FOR ZONE 2 PER DRAWING 1010-389, 1010-391, 1010-423 OR 1010-464.
2. SEE DRAWING 1011HNS-7 OR 1011HNFS-7 AND APPROPRIATE FLOW COMPUTER FIELD MANUAL FOR ADDITIONAL INSTALLATION INSTRUCTIONS.
3. SEE DRAWING 1011HNS-8 OR 1011HNFS-8 FOR OUTLINE INSTALLATION DIMENSIONS.
4. WARNING: SUBSTITUTION WITH UNSPECIFIED COMPONENTS MAY IMPAIR INTRINSIC SAFETY.

CHANGES TO THIS DOCUMENT
 REQUIRE SAFETY AGENCY APPROVAL

DO NOT SCALE THIS DRAWING UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES (MM) TOLERANCES ON- INCHES +/- .01 (MM) +/- .2		CONTRACT NO. DR CHEV. DATE 5/16/01 CHK DATE ENG DATE PRD DATE APPD DATE CERTIFIED DATE		CONTROLTRON HAUPPAUGE, NY 11788 INSTALLATION GUIDE, CONNECTION DIAGRAM SELECTION AGENCY APPROVED 1011HN SERIES TRANSDUCERS	
SIZE CODE IDENT. NO. A 21614		1011HNS9-7		REV. C1	
SCALE:		WT.		SHEET 1 of 1	



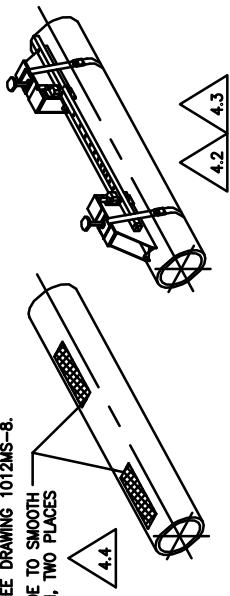
REFLECT MODE OPERATION

INSTALLATION NOTES - SEE DRAWING REFERENCE **A**

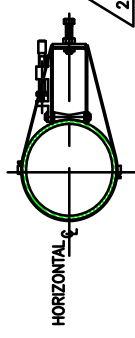
- USING THE INSTALLATION MENU AND THE PROCEDURE OUTLINED IN THE FLOW COMPUTER FIELD MANUAL, CONFIRM THAT YOU HAVE THE APPROPRIATE TRANSDUCERS AND SPACER BAR (IF USED) FOR REFLECT MODE OPERATION ON THE CHOSEN PIPE.
- SELECT MOUNTING LOCATION;
 - CHOOSE LOCATION WHICH REMAINS FULL AT ZERO FLOW.
 - WHERE POSSIBLE LOCATE TRACK ASSY TO PIPE DIAMETERS OR MORE FROM BEND TO ENSURE FULLY DEVELOPED AND STABLE FLOW PROFILE.
 - ON HORIZONTAL PIPE, SELECT HORIZONTAL PLANE. IF POSSIBLE TO AVOID SEDIMENT BLOCKAGE OF ULTRASONIC BEAM.
- PREPARE PIPE FOR TRACK MOUNT;
 - REMOVE GRIT, CORROSION, COATING OR HEAVY PAINT
 - CLEAN AND DEGREASE SURFACE
 - DO NOT MOUNT OVER FROST.
 - CONDITION PIPE SURFACE.
 - LOCALLY SMOOTH THE PIPE SURFACE TO ACCEPT THE TRANSDUCERS. USE THE ABRASIVE PAD PROVIDED.
- LOCATE MOUNTING FRAMES;
 - CONSULT THE 1010 FIELD MANUAL AND USE THE INSTALLATION MENU TO SELECT THE APPROPRIATE INDEX HOLE OR SPACING (LIN) FOR YOUR APPLICATION.
- IF SPACER BAR IS USED:
 - CLAMP ONE MOUNTING FRAME AT THE UN-NUMBERED REFERENCE POSITION OF THE SPACER BAR. BE SURE THE INDEX PIN AND SPACER BAR INDEX SCREW ENGAGE THE HOLE IN THE SPACER BAR.
 - CLAMP THE SECOND MOUNTING FRAME TO THE SPACER BAR IN THE SAME MANNER AT THE INDEX HOLE INDICATED DURING STEP 4.1.
 - HOLD THE MOUNTING FRAME/SPACER BAR ASSEMBLY ON THE PIPE AT THE SELECTED LOCATION AND TEMPORARILY SECURE IT TO THE PIPE USING STRAPS FROM THE 1012MS STRAP MOUNTING KIT. GO TO 4.4.
- IF MOUNTING FRAMES ARE SPACED BY MEASURING "LIN":
 - TEMPORARILY SECURE ONE OF THE MOUNTING FRAMES TO THE PIPE USING STRAPS FROM THE 1012MS STRAP MOUNTING KIT.
 - MEASURE ALONG THE PIPE AND TEMPORARILY SECURE THE SECOND MOUNTING FRAME TO THE PIPE SO THAT SPACING "LIN" DETERMINED IN STEP 4.1 IS MEASURED BETWEEN THE SPACING MARKS ON THE MOUNTING FRAMES.
 - IF THE PIPE SURFACE IS CLEAN AND SMOOTH, PROCEED TO TRANSDUCER INSTALLATION ON SHT.3. IF PIPE SURFACE NEEDS CONDITIONING; MARK THE MOUNTING FRAME POSITION CAREFULLY, LOOSEN STRAPS AND MOVE THE MOUNTING FRAMES ASIDE. LOCALLY SMOOTH THE PIPE SURFACE IN THE MARKED AREAS USING THE ABRASIVE PAD SUPPLIED. SHIFT THE MOUNTING FRAMES BACK INTO THEIR APPROPRIATE LOCATIONS AND TIGHTEN THE MOUNTING STRAPS SECURELY.

SECURING MOUNTING FRAMES TO THE PIPE SURFACE

HOLD THE MOUNTING FRAME/SPACER BAR ASSEMBLY AGAINST THE PIPE AT THE SELECTED MOUNTING LOCATION. MARK THE APPROXIMATE OUTLINE OF THE MOUNTING FRAMES ON THE PIPE SURFACE. USING THE ABRASIVE PAD SUPPLIED, SMOOTH THE PIPE SURFACE IN THE MARKED AREAS. SECURE THE MOUNTING FRAMES TO THE PIPE USING THE MOUNTING STRAP KIT (1012MS). SEE DRAWING 1012MS-8.



PREFERRED MOUNTING PLANE

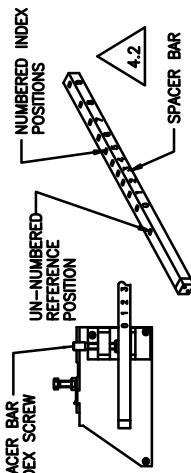


MOUNT TRANSDUCERS/MOUNTING FRAMES IN HORIZONTAL PLANE TO PREVENT BLOCKING OF ULTRASONIC BEAM BY AIR OR SEDIMENT.

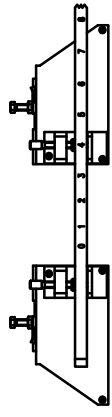
USING THE SPACER BAR TO SET TRANSDUCER MOUNTING FRAME SPACING

USING THE INSTALLATION MENU, AS OUTLINED IN THE FLOW COMPUTER FIELD MANUAL, DETERMINE THE SPACING INDEX NUMBER FOR THE SELECTED APPLICATION.

USE THE SPACER BAR INDEX SCREW TO SECURE THE SPACER BAR TO ONE OF THE MOUNTING FRAMES AT THE UN-NUMBERED REFERENCE POSITION.



SECURE THE SECOND MOUNTING FRAME TO THE SPACER BAR AT THE NUMBERED INDEX POSITION DETERMINED FROM THE INSTALLATION MENU.



** SEE SHEET 3 FOR INSTRUCTIONS TO COMPLETE TRANSDUCER INSTALLATION.

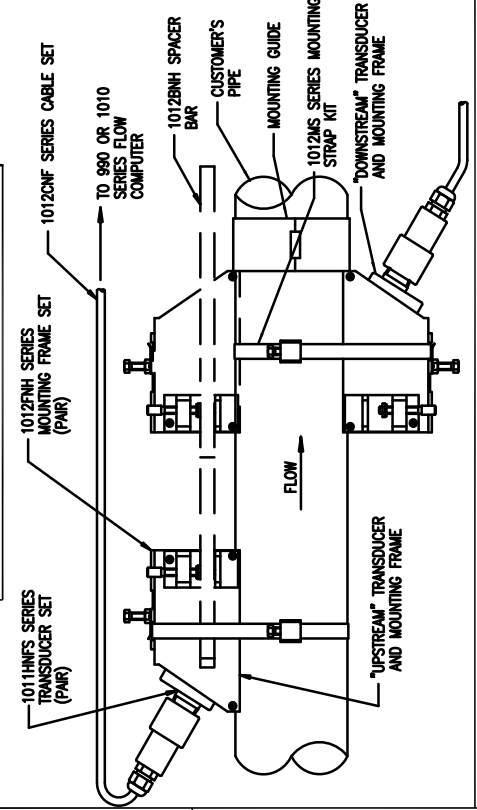
CLASS	DO NOT SCALE THIS DRAWING		CONTROLLED DRAWING	
	UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES (MM) TOLERANCES ON-		CHANGES TO THIS DRAWING REQUIRE RELEVANT AGENCY APPROVAL	
APPROVED	INCHES ± .1	DATE 3/20/09	DR H. J. ...	DATE
	(MM) ± .2	DATE	CHK	DATE
	MATERIAL:	DATE	ENG	DATE
	FINISH:	DATE	APPD	DATE
NEXT ASSY USED ON		CERTIFIED		
APPLICATION		DATE		

SIEMENS
Siemens Energy & Automation, Inc.
Process Instrumentation Business Unit
CoC Ultrasonic Flow - Heppauge, Long Island, NY 11788

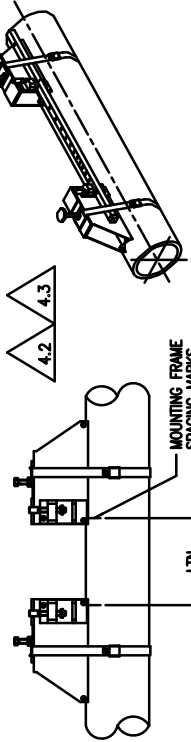
INSTALLATION, 1011HNF5 SERIES
DEDICATED PLASTIC BODY
TRANSDUCER

SIZE	SAP MATERIAL NO.	REV
C	ITEM NO.	AS
SCALE: NONE	DOCUMENT NO. 1011HNF5-7	DS 02
	WT.	SHEET 1 OF 3

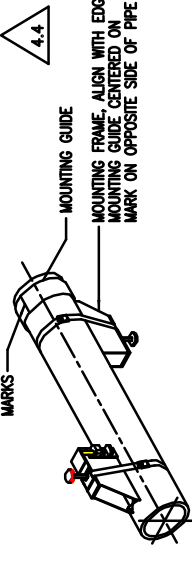
DIRECT MODE OPERATION



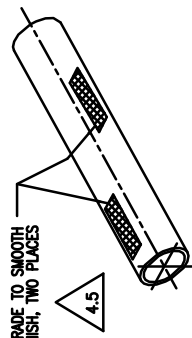
SECURING MOUNTING FRAMES TO THE PIPE SURFACE
 HOLD THE MOUNTING FRAME/SPACER BAR ASSEMBLY AGAINST THE PIPE AT THE SELECTED MOUNTING LOCATION OR POSITION USING LTN, TEMPORARILY STRAP IN PLACE.



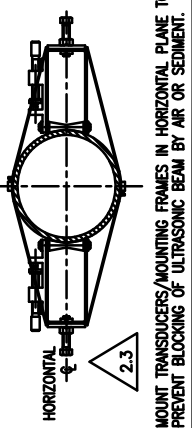
USE THE MOUNTING GUIDE TO TRANSFER ONE OF THE MOUNTING FRAMES TO THE OPPOSITE SIDE OF THE PIPE.



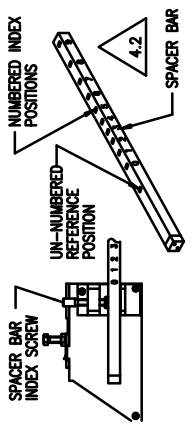
IF NECESSARY, USE THE ABRASIVE PAD SUPPLIED TO PRODUCE A SMOOTH FINISH ON THE PIPE AT THE TRANSDUCER MOUNTING POSITIONS.



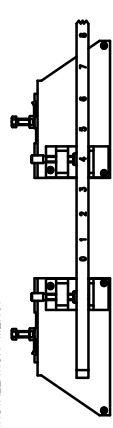
PREFERRED MOUNTING PLANE



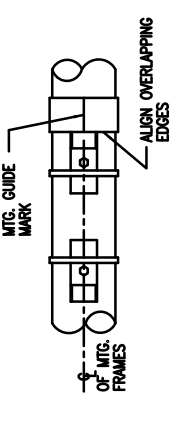
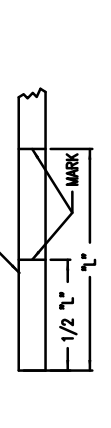
USING THE SPACER BAR TO SET TRANSDUCER MOUNTING FRAME SPACING
 USING THE INSTALLATION MENU, AS OUTLINED IN THE FLOW COMPUTER FIELD MANUAL, DETERMINE THE SPACING INDEX NUMBER FOR THE SELECTED APPLICATION.
 USE THE SPACER BAR INDEX SCREW TO SECURE THE SPACER BAR TO ONE OF THE MOUNTING FRAMES AT THE UN-NUMBERED REFERENCE POSITION.



SECURE THE SECOND MOUNTING FRAME TO THE SPACER BAR AT THE UN-NUMBERED INDEX POSITION DETERMINED FROM THE INSTALLATION MENU.



WRAP MOUNTING GUIDE AROUND PIPE AND MARK AT OVERLAPPING EDGE. UNWRAP GUIDE, MEASURE DISTANCE 1/2" FROM EDGE TO MARK. TAP AGAIN AT 1/2" RE-INSTALL THE MOUNTING GUIDE. TAPE IN PLACE WITH BOTH MARKS VISIBLE. ALIGN ONE MARK WITH THE CENTER LINE OF THE MOUNTING FRAMES.



INSTALLATION NOTES - SEE DRAWING REFERENCE **A**

1. USING THE INSTALLATION MENU AND THE PROCEDURE OUTLINED IN THE FLOW COMPUTER FIELD MANUAL, CONFIRM THAT YOU HAVE THE APPROPRIATE TRANSDUCERS AND SPACER BAR (IF USED) FOR DIRECT MODE OPERATION ON THE CHOSEN PIPE.
 - 2.1 CHOOSE LOCATION WHICH REMAINS FULL AT ZERO FLOW.
 - 2.2 WHERE POSSIBLE LOCATE TRACK ASSY TO PIPE DIAMETERS OR MORE FROM BEND TO ENSURE FULLY DEVELOPED AND STABLE FLOW PROFILE.
 - 2.3 ON HORIZONTAL PIPE, SELECT HORIZONTAL PLANE, IF POSSIBLE.
2. SELECT MOUNTING LOCATION:
 - 3.1 PREPARE PIPE FOR TRACK MOUNT.
 - 3.2 CLEAN AND DEGREASE SURFACE.
 - 3.3 DO NOT MOUNT OVER FROST.
 - 3.4 CONDITION PIPE SURFACE.
3. LOCATE MOUNTING FRAMES:
 - 4.1 CONSULT THE 1010 FIELD MANUAL AND USE THE INSTALLATION MENU TO SELECT THE APPROPRIATE INDEX HOLE OR SPACING (LTN) FOR YOUR APPLICATION.
 - 4.2 IF SPACER BAR IS USED:
 - 4.2.1 CLAMP ONE MOUNTING FRAME AT THE UN-NUMBERED REFERENCE POSITION OF THE SPACER BAR. BE SURE THE INDEX PIN AND SPACER BAR INDEX SCREW ENGAGE THE HOLE IN THE SPACER BAR.
 - 4.2.2 CLAMP THE SECOND MOUNTING FRAME TO THE SPACER BAR IN THE SAME MANNER AT THE INDEX HOLE INDICATED DURING STEP 4.1.
 - 4.2.3 HOLD THE MOUNTING FRAME/SPACER BAR ASSEMBLY ON THE PIPE AT THE SELECTED LOCATION AND TEMPORARILY SECURE IT TO THE PIPE USING STRAPS FROM THE 1012MS STRAP MOUNTING KIT. GO TO 4.4.
 - 4.3 IF MOUNTING FRAMES ARE SPACED BY MEASURING "L":
 - 4.3.1 TEMPORARILY SECURE ONE OF THE MOUNTING FRAMES TO THE PIPE USING STRAPS FROM THE 1012MS STRAP MOUNTING KIT.
 - 4.3.2 MEASURE ALONG THE PIPE AND TEMPORARILY SECURE THE SECOND MOUNTING FRAME TO THE PIPE USING STRAPS FROM THE 1012MS STRAP MOUNTING KIT. MEASURE THE DISTANCE BETWEEN THE SPACING MARKS ON THE MOUNTING FRAMES. USE A STRAIGHT EDGE OR OTHER MEANS TO ALIGN BOTH MOUNTING FRAMES WITH PIPE AXIS.
 - 4.3.3 USE THE MOUNTING GUIDE INCLUDED WITH THE 1012MS STRAP MOUNTING KIT TO TRANSFER ONE OF THE MOUNTING FRAMES TO THE OPPOSITE SIDE OF THE PIPE.
 - 4.3.4 WRAP THE MOUNTING GUIDE AROUND THE PIPE. POSITION IT SO THAT THE OVERLAPPING EDGES ARE EDGE-ALIGNED. MARK THE OVERLAPPING PORTION OF THE GUIDE AT THE EDGE OF THE OVERLAPPING PORTION. REMOVE THE GUIDE. MEASURE THE DISTANCE FROM THE END TO THE MARK AND MARK AGAIN HALFWAY BETWEEN.
 - 4.3.5 RE-POSITION THE GUIDE ON THE PIPE AND TAPE IN PLACE SO THAT ONE OF THE MARKS INDICATES THE CENTERLINE OF THE INSTALLED MOUNTING FRAMES AND THE MOUNTING GUIDE EDGE IS AGAINST THE END OF ONE OF THE MOUNTING FRAMES. MAKE SURE THE OVERLAPPING LENGTHS OF THE MOUNTING GUIDE ARE EDGE-ALIGNED. THIS ASSURES A DIAMETRICAL TRANSFER OF THE MOUNTING FRAME POSITION.
 - 4.3.6 LOOSEN THE MOUNTING STRAP ON THE MOUNTING FRAME WITH WHICH THE MOUNTING GUIDE HAS BEEN ALIGNED. ROTATE IT AROUND THE PIPE SURFACE UNTIL IT IS CENTERED ON THE OPPOSITE SIDE MOUNTING GUIDE. MARK MADE IN STEP 4.3.1. TIGHTEN THE STRAP. REMOVE THE MOUNTING GUIDE.
 - 4.5 IF THE PIPE SURFACE IS CLEAN AND SMOOTH, PROCEED TO TRANSDUCER INSTALLATION ON SH-3. IF PIPE SURFACE NEEDS CONDITIONING, MARK THE MOUNTING FRAME POSITION CAREFULLY, LOOSEN STRAPS AND MOVE THE MOUNTING FRAMES ASIDE. LOCALLY SMOOTH THE PIPE SURFACE IN THE MARKED AREAS USING THE ABRASIVE PAD SUPPLIED. SHIFT THE MOUNTING FRAMES BACK INTO THEIR APPROPRIATE LOCATIONS AND TIGHTEN THE MOUNTING STRAPS SECURELY. ** SEE SHEET 3 FOR INSTRUCTIONS TO COMPLETE TRANSDUCER INSTALLATION.

CONTROLLED DRAWING
 CHANGES TO THIS DRAWING REQUIRE RELEVANT AGENCY APPROVAL

DR	H.Jenkins	DATE	3/20/09
CHK		DATE	
ENG		DATE	
APPD		DATE	
CERTIFIED			
DATE			

DO NOT SCALE THIS DRAWING
 UNLESS OTHERWISE SPECIFIED:
 DIMENSIONS ARE IN INCHES (MM)
 TOLERANCES ON-

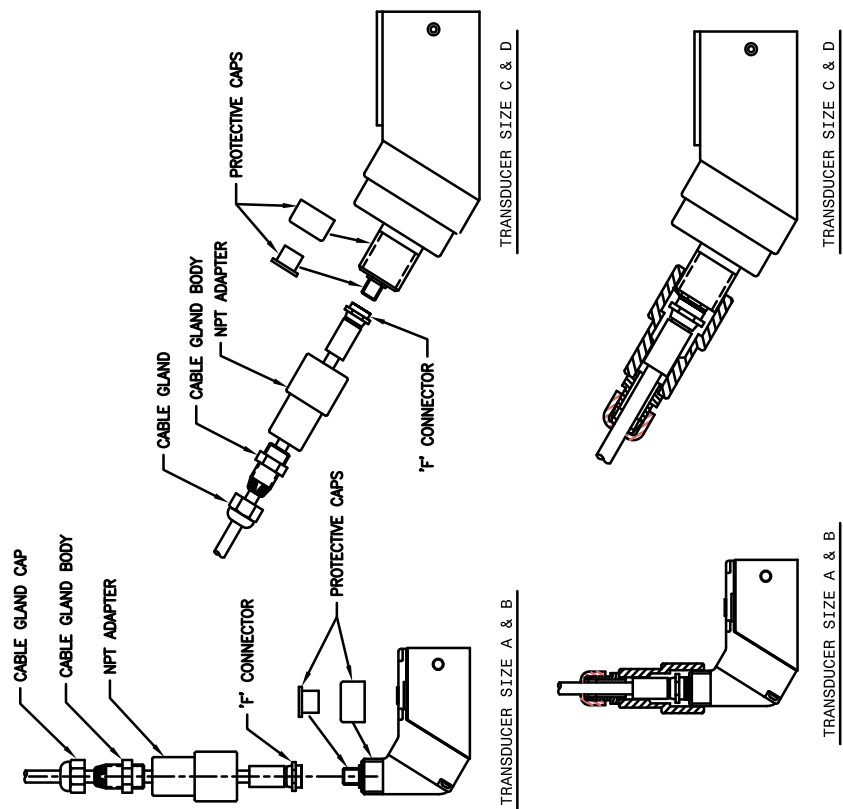
INCHES	± .1	(MM)	± .2
MATERIAL:			
FINISH:			

SIEMENS
 Siemens Energy & Automation, Inc.
 Process Instrumentation Business Unit
 CoC Ultrasonic Flow - Hauppauge, Long Island, NY 11788

INSTALLATION, 1011HNS SERIES DEDICATED PLASTIC BODY TRANSDUCER	
SAP MATERIAL NO.	REV
ITEM NO.	AS
DOCUMENT NO.	1011HNS-7
SCALE: NONE	WT.
	SHEET 2 OF 3

MATING 1012CNF SERIES TRANSDUCER CABLES WITH 1011HNF SERIES TRANSDUCERS

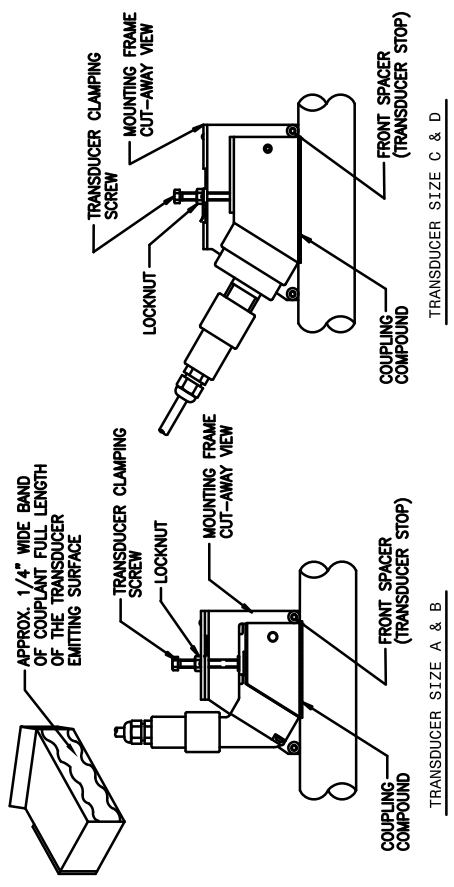
- a) REMOVE PROTECTIVE CAPS.
- b) SEE APPROPRIATE CABLE ASSEMBLY DRAWING FOR 'F' CONNECTOR, NPT ADAPTER AND GLAND ASSEMBLY DETAIL.
- c) MATE 'F' CONNECTORS, CABLES TO TRANSDUCER.
- d) FOR BEST WEATHER SEAL, WRAP TEFLON PIPE TAPE (NOT SUPPLIED) AROUND MALE NPT THREADS ON TRANSDUCER HOUSING.
- e) SCREW NPT ADAPTER TO TRANSDUCER HOUSING (HAND TIGHT IS SUFFICIENT).
- f) TIGHTEN GLAND BODY, WITH NPT ADAPTER AND SECURE CABLE BY TIGHTENING GLAND TOP NUT. (HAND TIGHT IS SUFFICIENT).



- INSTALLATION NOTES - CONT'D FROM SHIT. 1 OR SHIT. 2**
5. MAKE CABLE CONNECTIONS AT FLOW COMPUTER IN ACCORDANCE WITH APPROPRIATE FLOW COMPUTER INSTALLATION DRAWING AND 1010 FIELD MANUAL.
 6. SEE DRAWINGS 1012FNH-B AND 1011HNF-B FOR MOUNTING FRAME AND TRANSDUCER OUTLINE DIMENSIONS.

INSTALLING TRANSDUCERS IN MOUNTING FRAMES

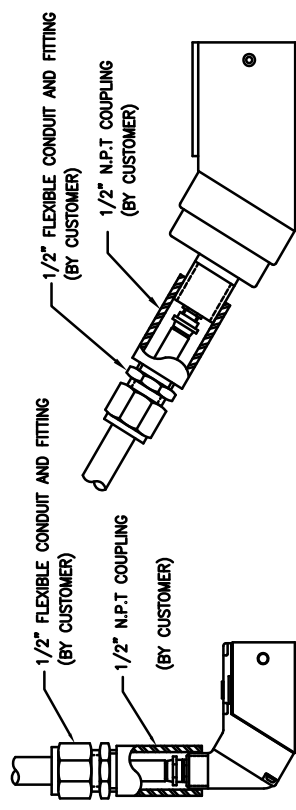
APPLY A THIN BAND OF COUPLANT TO THE EMITTING SURFACE OF THE TRANSDUCERS. SLIP THE TRANSDUCERS INTO THE MOUNTING FRAMES, SEATING THEM SQUARELY ON THE PIPE SURFACE. PUSH FORWARD INTO THE FRAMES AGAINST THE FRONT SPACER. LOCATE CLAMPING SCREW IN PROPER POSITION. TIGHTEN THE TRANSDUCER CLAMPING SCREW, FIRMLY SEATING THE TRANSDUCERS ON THE PIPE SURFACE. SECURE THE CLAMPING SCREW WITH LOCK NUT.



****SEE DRAWING 1012THP-7 FOR INSTALLATION USING 1012THP SERIES MOUNTING TRACKS.**

USE OF FLEXIBLE CONDUIT WITH TRANSDUCERS

THE TRANSDUCER WIRING HOUSING HAS INTEGRAL 1/2" N.P.T. THREADS TO ACCEPT A CONDUIT COUPLING IF FLEXIBLE CONDUIT IS USED. MAKE CONNECTION AS SHOWN, THEN PASS COUPLING AND CONDUIT OVER THE CABLE, SECURE TO THE TRANSDUCER WIRING HOUSING.



DO NOT SCALE THIS DRAWING UNLESS OTHERWISE SPECIFIED. DIMENSIONS ARE IN INCHES (MM) TOLERANCES ON-

INCHES $\pm .1$ (MM) ± 2

MATERIAL:

FINISH:

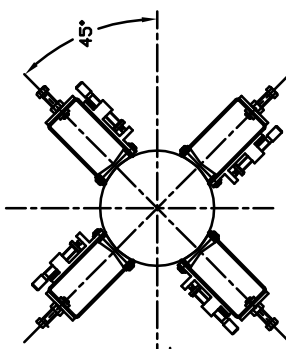
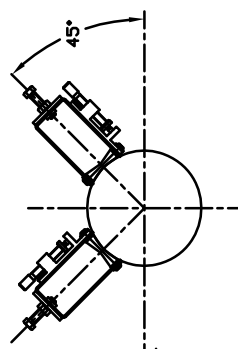
CONTROLLED DRAWING CHANGES TO THIS DRAWING REQUIRE RELEVANT AGENCY APPROVAL

DR	H. J. J. J.	DATE	5/20/09
CHK		DATE	
ENG		DATE	
PRD		DATE	
APPD		DATE	
CERTIFIED			
DATE			

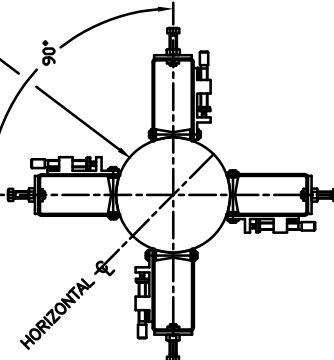
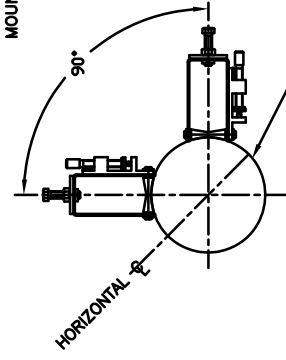
SIEMENS
Siemens Energy & Automation, Inc.
Process Instrumentation Business Unit
CoC Ultrasonic Flow - Hauppauge, Long Island, NY 11788

INSTALLATION, 1011HNF SERIES DEDICATED PLASTIC BODY TRANSDUCER

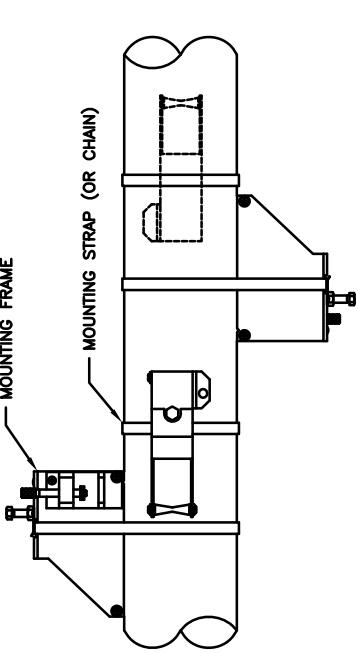
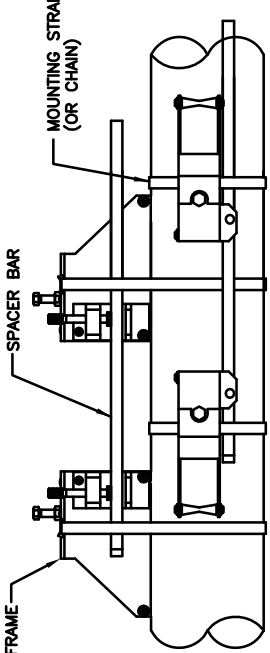
SIZE	SAP MATERIAL NO.	REV
C	ITEM NO.	AS
DOCUMENT NO.	1011HNF-7	DS 02
SCALE: NONE	WT.	SHEET 3 OF 3



RECOMMENDED INSTALLATION ON HORIZONTAL PIPES




POSITION FRAME ASSEMBLIES 90° APART BEFORE TIGHTENING ADJUSTING SCREW



NOTES:

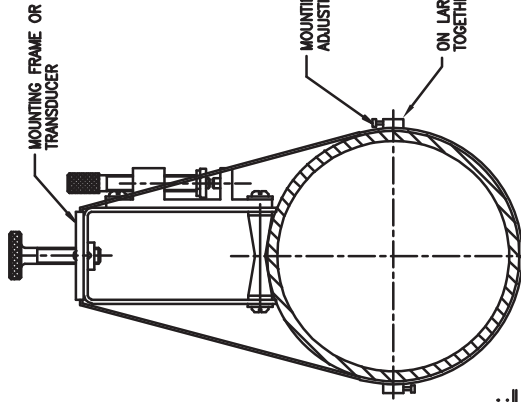
1. USING THE INSTALLATION MENU AND THE PROCEDURE OUTLINED IN THE FIELD MANUAL, SELECT THE APPROPRIATE TRANSDUCERS AND MOUNTING FRAMES FOR THE MODE OF OPERATION CHOSEN FOR YOUR APPLICATION. REFLECT MODE IS PREFERRED.
2. SELECT MOUNTING LOCATION:
 - a) TRANSDUCER SETS SHOULD BE MOUNTED SO THAT THE PLANES OF OPERATION OF THE TWO SETS INTERSECT ORTHOGONALLY; THAT IS, 90° OR 1/4 THE CIRCUMFERENCE OF THE PIPE APART.
 - b) CHOOSE A LOCATION WHICH REMAINS FULL AT ZERO FLOW ON HORIZONTAL PIPES. MOUNT AWAY FROM THE UNDERSIDE TO AVOID SEDIMENT BLOCKAGE OR ULTRASONIC BEAM, MOUNT AWAY FROM TOPSIDE TO AVOID BLOCKAGE DUE TO ENTRAPPED AIR.
 - c) WHERE POSSIBLE, LOCATE MOUNTING FRAME ASSEMBLIES AS FAR AS POSSIBLE DOWNSTREAM FROM ANY FLOW DISTURBANCE TO ASSURE FULLY DEVELOPED AND STABLE FLOW PROFILE.
3. MOUNT FRAMES ON PIPE:
 - a) REFER TO THE APPROPRIATE INSTALLATION DRAWING FOR THE PORTABLE OR DEDICATED TRANSDUCERS AND FRAMES SELECTED FOR USE. NOTE THESE DRAWINGS PROVIDE INSTRUCTIONS FOR SINGLE PATH INSTALLATIONS. DUAL PATH SYSTEMS ARE INSTALLED IN THE SAME FASHION BY OFFSETTING A SECOND SET OF MOUNTING FRAMES IN AN ORTHOGONAL PLANE AS SHOWN ABOVE.
4. CONDITION PIPE SURFACE:

LOCALLY SMOOTH THE PIPE SURFACE AT EACH TRANSDUCER LOCATION AND INSTALL TRANSDUCERS IN ACCORDANCE WITH THE PROCEDURE DESCRIBED ON THE APPROPRIATE TRANSDUCER AND FRAME INSTALLATION DRAWING. MAKE SURE THAT TRANSDUCER PAIRS ARE INSTALLED AND CONNECTED TO THE FLOW COMPUTER CORRECTLY.
5. REFER TO THE APPROPRIATE OUTLINE DRAWINGS FOR TRANSDUCER AND MOUNTING FRAME OUTLINE DIMENSIONS.

 <p>HAUPPAUGE, NY 11788</p>		<p>INSTALLATION DRAWING DUAL PATH TRANSDUCER SET WITH MOUNTING FRAMES</p>		<p>REV. B</p>
<p>DO NOT SCALE THIS DRAWING UNLESS OTHERWISE SPECIFIED. DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SHOWN.</p>		<p>CONTRACT NO. _____</p>		<p>SIZE C CODE IDENT. NO. 21614 1012F-DB-7</p>
<p>DR _____ DATE 9/10/98</p>	<p>CHK _____ DATE _____</p>	<p>ENG _____ DATE _____</p>	<p>PROD _____ DATE _____</p>	<p>SCALE: NONE WT. _____</p>
<p>APPD _____ DATE _____</p>	<p>CERTIFIED _____</p>	<p>DATE _____</p>	<p>DATE _____</p>	<p>SHEET 1 OF 1</p>

INSTALLATION PROCEDURE

MOUNTING STRAP KITS ARE TO FASTEN TRANSDUCERS OR MOUNTING FRAMES TO THE PIPE.



NOTES:

1. WRAP THE MOUNTING STRAP AROUND THE PIPE, PULL TAUT AND ENGAGE THE END OF MOUNTING STRAP WITH THE MOUNTING STRAP ADJUSTING SCREW.
2. TIGHTEN THE ADJUSTING SCREW TO SECURE THE ASSEMBLY TO THE PIPE.
3. TO SURROUND LARGER PIPES, LINK MOUNTING STRAP SECTIONS TOGETHER AS SHOWN.

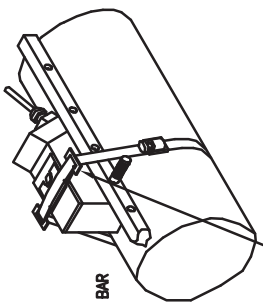
STRAP MTC. KIT PART No.	PIPE DIA.	BAND SIZE (QTY)	SPACING GUIDE P/N (DESCRIPTION)	KIT NET WT.
1012MS-1A	2"-7"	#88 (2) #128 (2)	1012-145-1A (2" x 26")	
1012MS-1	2"-13"	#88 (2) #152 (2)	1012-145-1 (2" x 45")	
1012MS-2	13"-24"	#188 (2) #280 (2)	1012-145-2 (4" x 81")	
1012MS-3	24"-48"	#152 (4) #312 (4)	1012-145-3 (4" x 155")	
1012MS-4	48"-60"	36' OF 1/2" BAND AND FASTENER	1012-145-4 (6" x 196")	
1012MS-5	60"-84"	46' OF 1/2" BAND AND FASTENER	NOT SUPPLIED	
1012MS-6	84"-120"	65' OF 1/2" BAND AND FASTENER	NOT SUPPLIED	
1012MS-7	120"-216"	116' OF 1/2" BAND AND FASTENER	NOT SUPPLIED	
1012MS-8	216"-360"	190' OF 1/2" BAND AND FASTENER	NOT SUPPLIED	

1

2

3

4



TRANSDUCERS INSTALLED WITH SPACER BARS ONLY

SPRING CLIP (NOT PRESENT ON SOME TRANSDUCER MODELS)

SPACER BAR

1011 SERIES TRANSDUCER

CUSTOMER'S PIPE

MOUNTING STRAP

1012 SERIES MOUNTING FRAME

SPRING CLIP (NOT PRESENT ON SOME MTC. FRAME MODELS)

SPACER BAR

TRANSDUCERS INSTALLED WITH MOUNTING FRAMES

TRANSDUCER CLAMPING

CUSTOMER'S PIPE

MOUNTING STRAP

SPACING GUIDE (SEE TABLE)

ON LARGER PIPES, ADDITIONAL STRAPS MAY BE INSTALLED FOR A MORE SECURE MOUNT

CONTROLTRON
HAUPPAUGE, NY 11788

INSTALLATION / OUTLINE
ADJUSTABLE MOUNTING STRAP

CONTRACT NO. _____
DATE 2/14/97

DO NOT SCALE THIS DRAWING UNLESS OTHERWISE SPECIFIED. DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

INCHES ± .1
MILLIMETERS ± .2

DATE _____
CHK _____
ENG _____
PRD _____
APPD _____
CERTIFIED _____

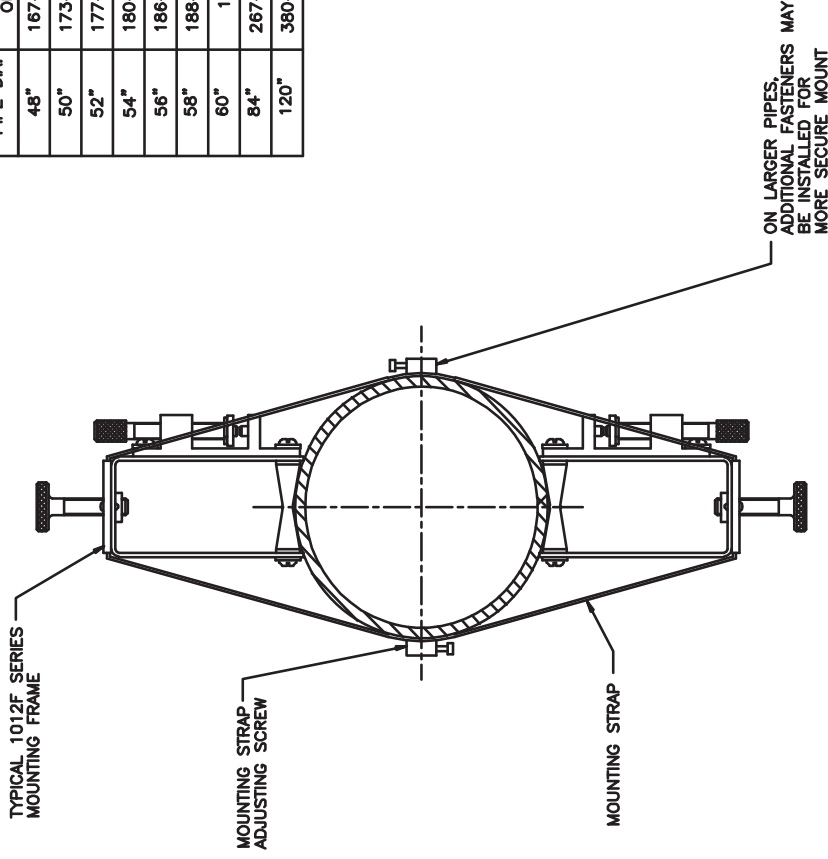
DATE _____

SIZE **C** CODE IDENT NO. **21614** REV. **F**

SCALE: NONE WT. _____

SHEET 1 OF 2

BAND LENGTH TABLE	
PIPE DIA.	LENGTH TO CUT ON MARK
48"	167-5/16"
50"	173-9/16"
52"	177-7/8"
54"	180-3/16"
56"	186-7/16"
58"	188-3/4"
60"	195"
84"	267-3/8"
120"	380-1/2"



NOTES:
 1. BAND LENGTHS ARE APPROXIMATE AND CALCULATED FOR USE OF SIZE "D" OR "E" 1011 TRANSDUCERS.

STEP - 1
 DETERMINE PROPER BAND LENGTH ONE OF TWO WAYS:
 A) IF DIAMETER IS KNOWN, REFER TO BAND LENGTH TABLE OR CALCULATE MAXIMUM BAND LENGTH 3.14 x DIA. + 18", TRIM TO FIT WHEN INSTALLING.
 B) IF DIAMETER IS NOT KNOWN, MEASURE CIRCUMFERENCE WITH STRING, TWINE, etc., AND ADD 18" (TO ENCIRCLE FRAMES). THIS DIMENSION IS APPROXIMATE, TRIM BAND TO FIT WHEN INSTALLING.

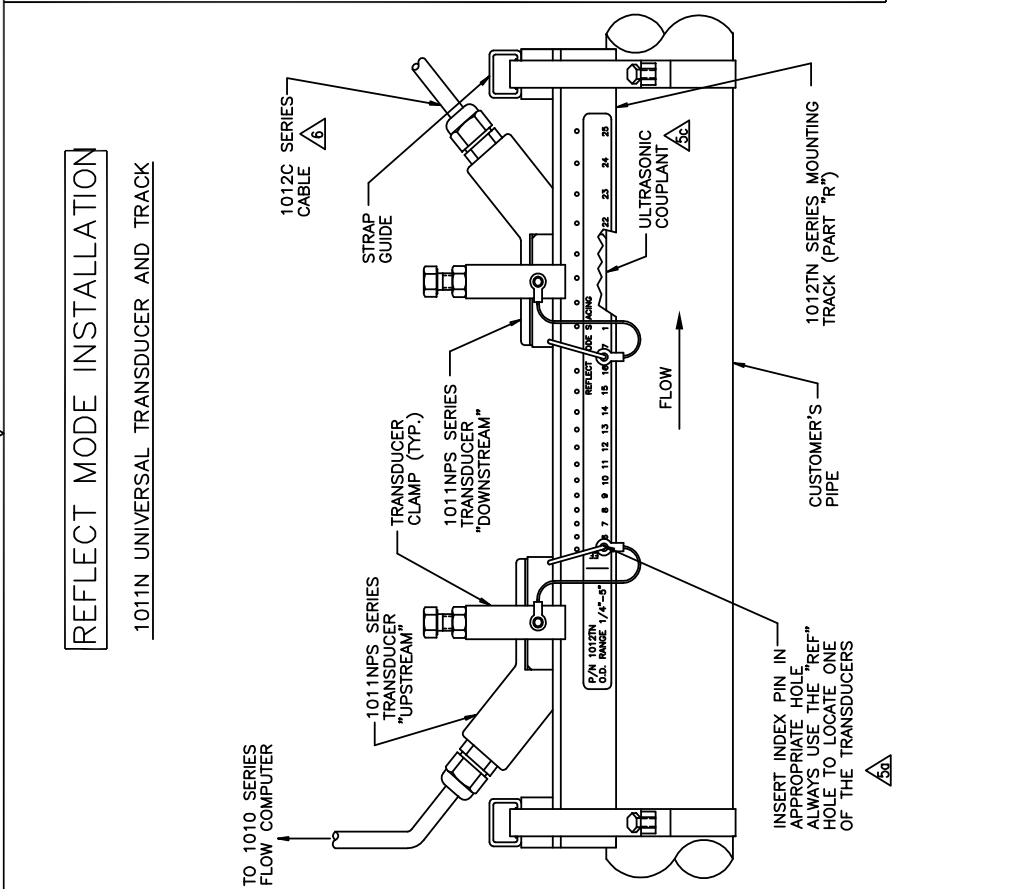
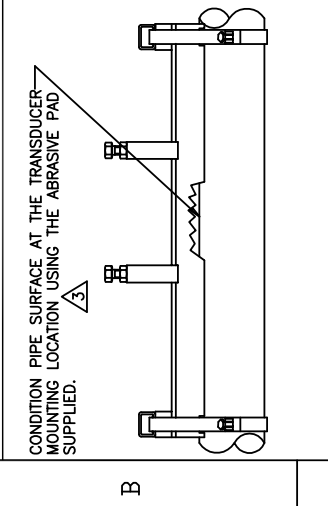
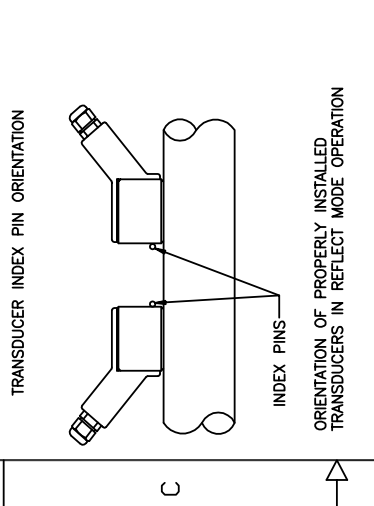
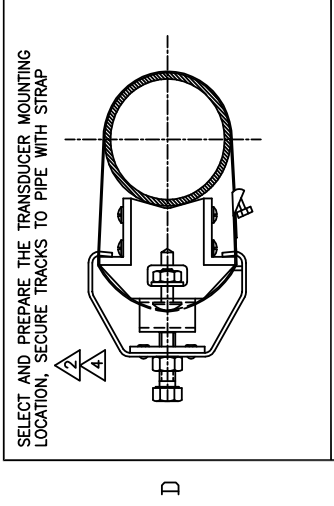
STEP - 2
 MEASURE BAND TO PROPER LENGTH AND CUT THROUGH CENTER OF NEAREST ROUND HOLE WITH SHEARS, SNIPS, HACKSAW etc.

STEP - 3
 EITHER MATE FASTENER HALVES AND THEN LINK TO STRAP ALREADY IN PLACE AROUND PIPE, OR LINK FASTENER HALVES INDEPENDENTLY TO STRAP ENDS (HOLD IN PLACE WITH TAPE IF NECESSARY) AND ENGAGE FASTENER AFTER WRAPPING STRAP AROUND PIPE.

STEP - 4
 DIAGONALLY INSERT FASTENER END INTO RECTANGULAR SLOTS TO LINK WITH STRAP (INSERT AT LOCATION BEST SUITED FOR TIGHT FIT).

STEP - 4
 USING STRAPS MADE TO SIZE REQUIRED, INSTALL MOUNTING TRACKS AND TRANSDUCERS IN ACCORDANCE WITH APPROPRIATE INSTALLATION DRAWING FOR SPECIFIC TRACK ASSEMBLIES.

CONTROLTRON HAUPPAUGE, NY 11768	
INSTALLATION / OUTLINE ADJUSTABLE MOUNTING STRAP	
SIZE: C CODE IDENT NO: 21614	REV: F 1012MS - 8
SCALE: NONE VT.	SHEET 2 OF 2
CONTRACT NO. DR: H, J CK: _____ DATE: 2/14/97 ENG: _____ DATE: _____ PRD: _____ DATE: _____ APPD: _____ DATE: _____ CERTIFIED: _____ DATE: _____	DO NOT SCALE THIS DRAWING UNLESS OTHERWISE SPECIFIED IN TOLERANCES OR DIMENSIONS UNLESS OTHERWISE SPECIFIED IN TOLERANCES OR DIMENSIONS INCHES (MM) ± .1 (± 2)
2	2
3	3
4	4



- INSTALLATION PROCEDURE - SEE DRAWING REFERENCES**
1. USING THE INSTALLATION MENU PROCEDURES PRESENTED IN THE 1010 FIELD MANUAL, CONFIRM THAT YOU HAVE THE APPROPRIATE TRANSDUCERS AND TRACK FOR REFLECT MODE OPERATION ON THE CHOSEN PIPE.
 2. SELECT MOUNTING LOCATION:
 - a) CHOOSE LOCATION WHICH REMAINS FULL AT ZERO FLOW.
 - b) WHERE POSSIBLE, LOCATE TRACK ASSY. TEN (10) PIPE DIAMETERS OR MORE FROM BEND TO ENSURE FULLY DEVELOPED AND STABLE FLOW PROFILE.
 - c) ON HORIZONTAL PIPE, SELECT HORIZONTAL PLANE, IF POSSIBLE; TO AVOID SEDIMENT BLOCKAGE OF TRANSDUCER SIGNAL.
 3. PREPARE PIPE FOR TRACK MOUNT:
 - a) REMOVE GRIT, CORROSION, COATING OR HEAVY PAINT
 - b) CLEAN AND DEGREASE SURFACE
 - c) DO NOT MOUNT OVER FROST.
 - d) CONDITION PIPE SURFACE:
 - i) LOCALLY SMOOTH THE PIPE SURFACE TO ACCEPT THE TRANSDUCERS. USE THE ABRASIVE PAD PROVIDED.
 4. MOUNT TRACK ON PIPE:
 - a) PLACE TRACK RAIL ASSY (ASSY WITH STRAP) AGAINST PIPE WHILE HOLDING TRACK, WRAP STRAP AROUND PIPE AND TIGHTEN.
 - b) ROTATE ASSY AROUND THE PIPE FOR PROPER POSITIONING. ONCE THAT HAS BEEN ACHIEVED, SECURE THE TRACK RAIL ASSY TO THE PIPE WITH THE STRAP.
 5. LOCATE TRANSDUCERS:
 - a) CONSULTING THE 1010 FIELD MANUAL, USE THE INSTALLATION MENU TO DETERMINE THE APPROPRIATE INDEX HOLES FOR YOUR APPLICATION AND INSERT PINS.
 - b) APPLY A THIN BAND OF THE ULTRASONIC COUPLANT PROVIDED TO THE BASE OF EACH TRANSDUCER.
 - c) INSERT TRANSDUCERS INTO TRACK AS SHOWN, BANKING AGAINST INDEX PINS. SECURE TRANSDUCERS WITH CLAMPS.
 6. MAKE TRANSDUCER CABLE CONNECTIONS IN ACCORDANCE WITH THE APPROPRIATE FLOW COMPUTER INSTALLATION DRAWING AND 1010 FIELD MANUAL.
 7. SEE DRAWING 1012TN-8 AND 1011NPS-8 FOR TRACK AND TRANSDUCER OUTLINE DIMENSIONS.

CONTROLTRON
HAUPPAUGE, NY 11788

INSTALLATION DRAWING
1010 SERIES TRANSDUCERS
AND MOUNTING TRACKS

SIZE	CODE IDENT NO.	REV.
C 21614	1012TN-7	A

SCALE: NONE WT. SHEET 1 OF 2
R14: 1012TN-7A rev.A

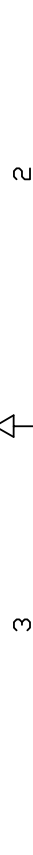
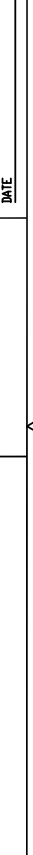
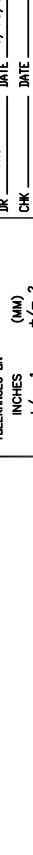
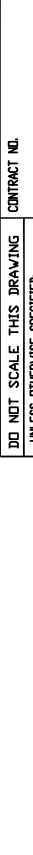
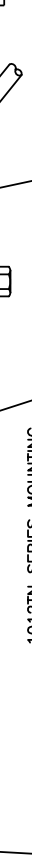
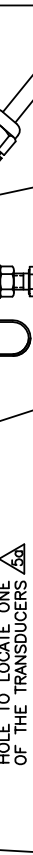
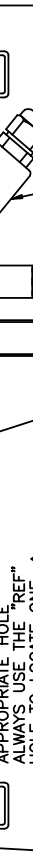
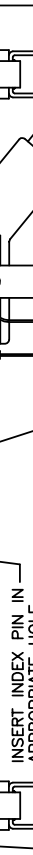
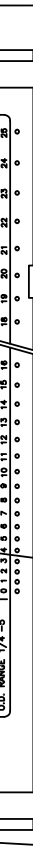
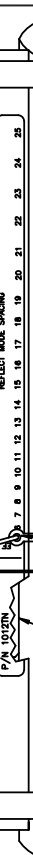
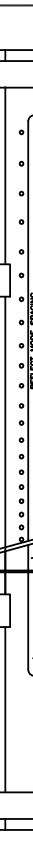
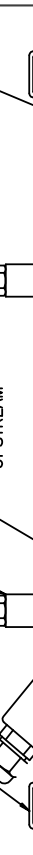
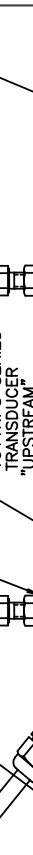
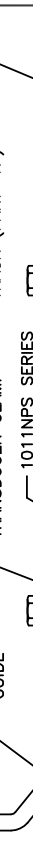
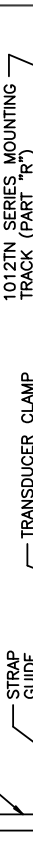
DO NOT SCALE THIS DRAWING UNLESS OTHERWISE SPECIFIED. DIMENSIONS ARE IN INCHES (MM) TOLERANCES UNLESS OTHERWISE SPECIFIED: INCHES +/- .1 MM +/- .2		CONTRACT NO.	DATE
DR	H, J	DATE	6/10/98
CHK		DATE	
ENG		DATE	
PRD		DATE	
APPD		DATE	
CERTIFIED		DATE	

DIRECT MODE INSTALLATION

1011N UNIVERSAL TRANSDUCER AND TRACK

INSTALLATION PROCEDURE - SEE DRAWING REFERENCES A

1. USING THE INSTALLATION MENU, PROCEDURES PRESENTED IN THE 1010 FIELD MANUAL, CONFIRM THAT YOU HAVE THE APPROPRIATE TRANSDUCERS AND TRACK FOR DIRECT MODE OPERATION ON THE CHOSEN PIPE.
2. SELECT MOUNTING LOCATION:
 - a) CHOOSE LOCATION WHICH REMAINS FULL AT ZERO FLOW.
 - b) WHERE POSSIBLE LOCATE TRACK ASSY TEN (10) PIPE DIAMETERS OR MORE FROM BEND TO ENSURE FULLY DEVELOPED AND STABLE FLOW PROFILE.
 - c) ON HORIZONTAL PIPE, SELECT HORIZONTAL PLANE IF POSSIBLE, TO AVOID SEDIMENT BLOCKAGE OF TRANSDUCER SIGNAL.
3. PREPARE PIPE FOR TRACK MOUNT:
 - a) REMOVE GRIT, CORROSION, COATING OR HEAVY PAINT
 - b) CLEAN AND DEGRADE SURFACE
 - c) DO NOT MOUNT OVER FROST.
 - d) CONDITION PIPE SURFACE.
4. MOUNT TRACK ON PIPE:
 - a) PLACE TRACK RAIL ASSY (ASSY WITH STRAP) AGAINST PIPE. WHILE HOLDING TRACK, PLACE THE SECOND TRACK ONTO THE PIPE AND HOLD TOGETHER IN PLACE.
 - b) ROTATE ASSY AROUND THE PIPE FOR PROPER POSITIONING. ONCE THAT HAS BEEN ACHIEVED, SECURE THE TRACK RAIL ASSY TO THE PIPE WITH THE STRAP.
5. LOCATE TRANSDUCERS:
 - a) CONSULTING THE 1010 FIELD MANUAL, USE THE INSTALLATION MENU TO DETERMINE THE APPROPRIATE INDEX HOLES FOR YOUR APPLICATION AND INSERT PINS.
 - b) APPLY A THIN BAND OF THE ULTRASONIC COUPLANT PROVIDED TO THE BASE OF EACH TRANSDUCER.
 - c) INSERT TRANSDUCERS INTO TRACK AS SHOWN, BANKING AGAINST INDEX PINS. SECURE TRANSDUCERS WITH CLAMPS.
6. MAKE TRANSDUCER CABLE CONNECTIONS IN ACCORDANCE WITH THE APPROPRIATE FLOW COMPUTER INSTALLATION DRAWING AND 1010 FIELD MANUAL.
7. SEE DRAWING 1012TN-8 AND 1011NPS-8 FOR TRACK AND TRANSDUCER OUTLINE DIMENSIONS.



CONTRONOTRON
HAUPPAUGE, NY 11788

INSTALLATION DRAWING
1010 SERIES TRANSDUCERS
AND MOUNTING TRACKS

CONTRACT NO.	DATE
IR	6/10/98
CHK	DATE
ENG	DATE
PRD	DATE
APPD	DATE
CERTIFIED	

DO NOT SCALE THIS DRAWING
UNLESS OTHERWISE SPECIFIED.
DIMENSIONS ARE IN INCHES UNP
TOLERANCES DIM-
INCHES (MM)
+/- .1 (MM)
+/- .2

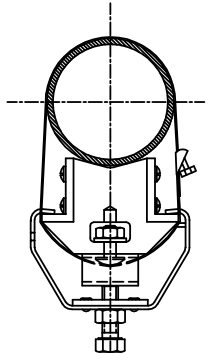
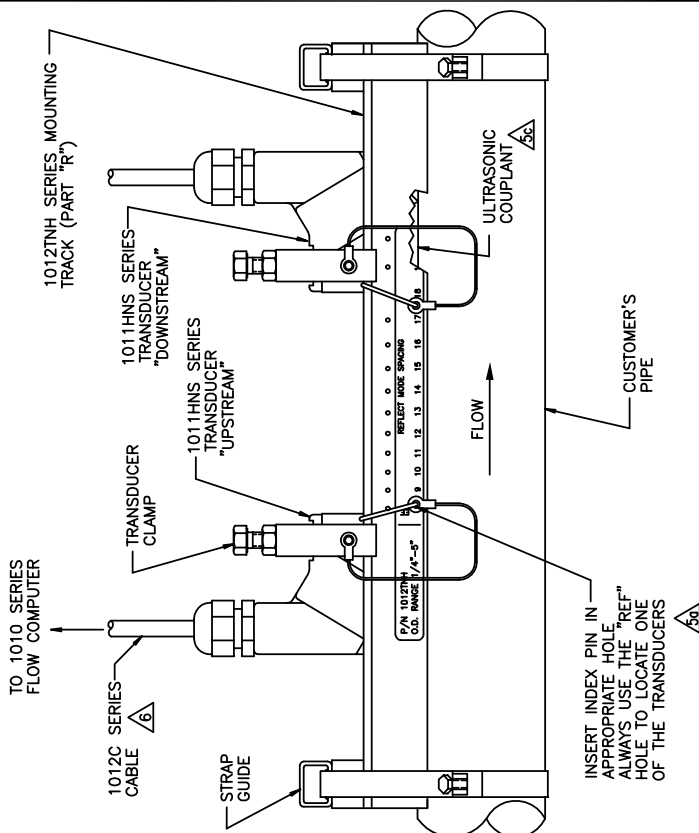
SIZE	CODE	IDENT NO.	REV.
C	21614	1012TN-7	A

SCALE: NONE WT. SHEET 2 OF 2

1 R14: 1012TN-7B rev.A

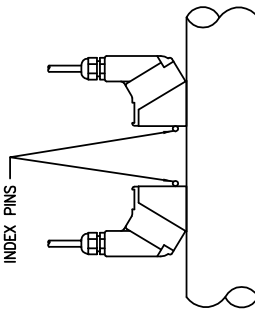
REFLECT MODE INSTALLATION

1011HN HIGH PRECISION TRANSDUCER AND TRACK



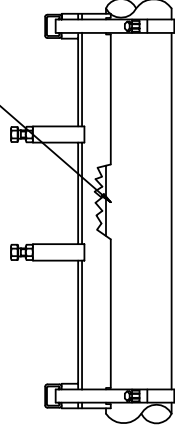
SELECT AND PREPARE THE TRANSDUCER MOUNTING LOCATION, SECURE TRACKS TO PIPE WITH STRAP

TRANSDUCER INDEX PIN ORIENTATION



ORIENTATION OF PROPERLY INSTALLED TRANSDUCERS IN REFLECT MODE OPERATION

CONDITION PIPE SURFACE AT THE TRANSDUCER MOUNTING LOCATION USING THE ABRASIVE PAD SUPPLIED.



INSTALLATION PROCEDURE - SEE DRAWING REFERENCES

1. USING THE INSTALLATION MENU PROCEDURES PRESENTED IN THE 1010 FIELD MANUAL, CONFIRM THAT YOU HAVE THE APPROPRIATE TRANSDUCERS AND TRACK FOR REFLECT MODE OPERATION ON THE CHOSEN PIPE.
2. SELECT MOUNTING LOCATION:
 - a) CHOOSE LOCATION WHICH REMAINS FULL AT ZERO FLOW.
 - b) WHERE POSSIBLE, LOCATE TRACK ASSY. TEN (10) PIPE DIAMETERS OR MORE FROM BEND, TO ENSURE FULLY DEVELOPED AND STABLE FLOW PROFILE.
 - c) ON HORIZONTAL PIPE, SELECT HORIZONTAL PLANE, IF POSSIBLE; TO AVOID SEDIMENT BLOCKAGE OF TRANSDUCER SIGNAL.
3. PREPARE PIPE FOR TRACK MOUNT:
 - a) REMOVE GRIT, CORROSION, COATING OR HEAVY PAINT
 - b) CLEAN AND DECREASE SURFACE
 - c) DO NOT MOUNT OVER FROST.
 - d) CONDITION PIPE SURFACE.

LOCALLY SMOOTH THE PIPE SURFACE TO ACCEPT THE TRANSDUCERS. USE THE ABRASIVE PAD PROVIDED.
4. MOUNT TRACK ON PIPE:
 - a) PLACE TRACK RAIL ASSY (ASSY WITH STRAP) AGAINST PIPE. WHILE HOLDING TRACK, WRAP STRAP AROUND PIPE AND TIGHTEN.
 - b) ROTATE ASSY AROUND THE PIPE FOR PROPER POSITIONING. ONCE THAT HAS BEEN ACHIEVED, SECURE THE TRACK RAIL ASSY TO THE PIPE WITH THE STRAP.
5. LOCATE TRANSDUCERS:
 - a) CONSULTING THE 1010 FIELD MANUAL, USE THE INSTALLATION MENU TO DETERMINE THE APPROPRIATE INDEX HOLES FOR YOUR APPLICATION AND INSERT PINS.
 - b) APPLY A THIN BAND OF THE ULTRASONIC COUPLANT PROVIDED TO THE BASE OF EACH TRANSDUCER.
 - c) INSERT TRANSDUCERS INTO TRACK AS SHOWN, BANKING AGAINST INDEX PINS. SECURE TRANSDUCERS WITH CLAMPS.
6. MAKE TRANSDUCER CABLE CONNECTIONS IN ACCORDANCE WITH THE APPROPRIATE FLOW COMPUTER INSTALLATION DRAWING AND 1010 FIELD MANUAL.
7. SEE DRAWING 1012TNH-8 AND 1011HNS-8 FOR TRACK AND TRANSDUCER OUTLINE DIMENSIONS.

CONTROLTRON
HAUPPAUGE, NY 11788

INSTALLATION DRAWING

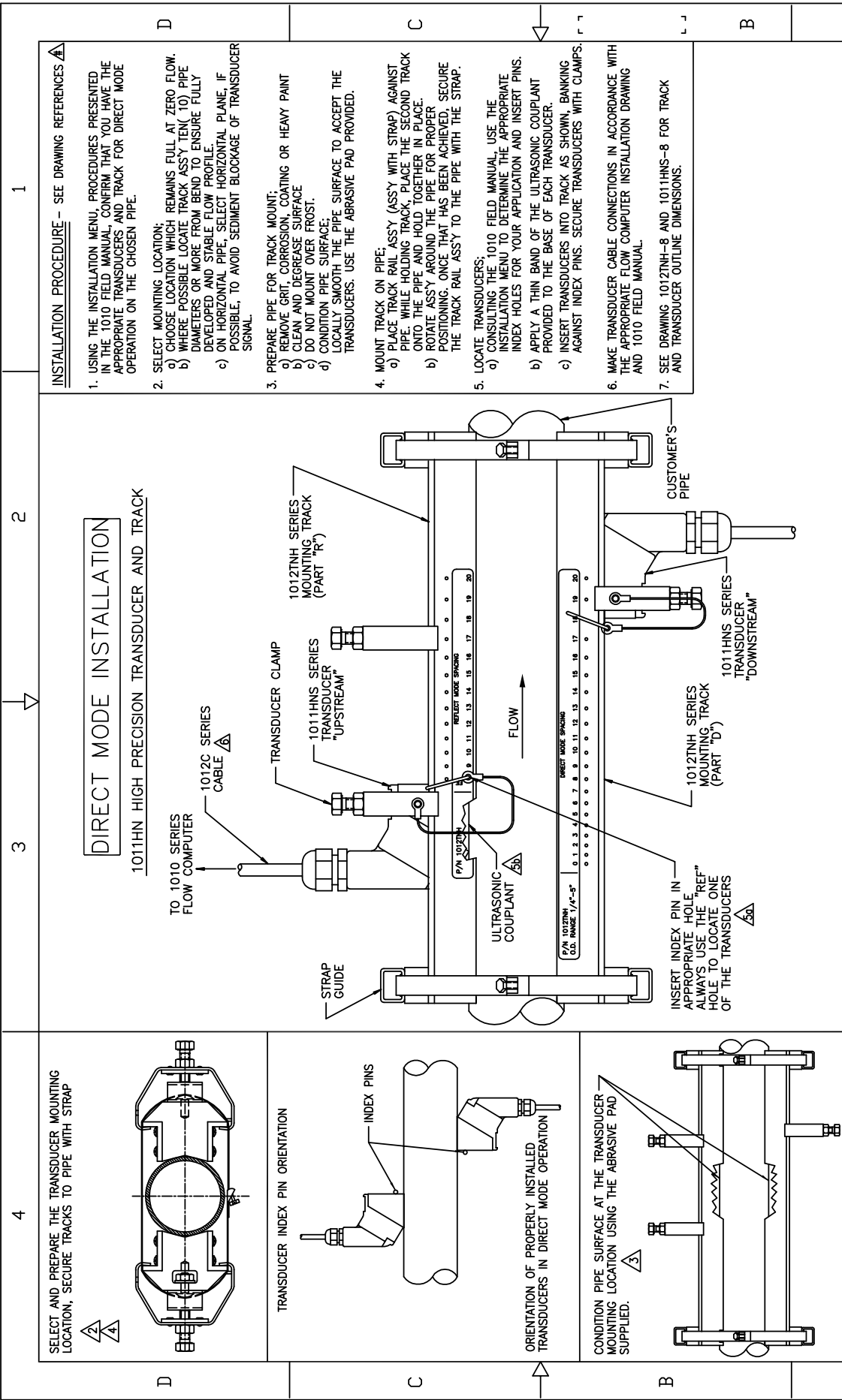
1010 SERIES TRANSDUCERS AND MOUNTING TRACKS

SIZE: **C 21614** CODE IDENT NO: **1012TNH-7** REV. **A**

SCALE: NONE WT. SHEET 1 OF 2

CONTRACT NO.		DATE	6/10/98
DR	H.J.	DATE	
CHK		DATE	
ENG		DATE	
PRD		DATE	
APPD		DATE	
CERTIFIED		DATE	

UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES (MM) TOLERANCES IN: INCHES +/- .1 (MM) +/- .2



- INSTALLATION PROCEDURE** - SEE DRAWING REFERENCES **A**
- USING THE INSTALLATION MENU, PROCEDURES PRESENTED IN THE 1010 FIELD MANUAL, CONFIRM THAT YOU HAVE THE APPROPRIATE TRANSDUCERS AND TRACK FOR DIRECT MODE OPERATION ON THE CHOSEN PIPE.
 - SELECT MOUNTING LOCATION:
 - CHOOSE LOCATION WHICH REMAINS FULL AT ZERO FLOW.
 - WHERE POSSIBLE LOCATE TRACK ASSY TEN (10) PIPE DIAMETERS OR MORE FROM BEND TO ENSURE FULLY DEVELOPED AND STABLE FLOW PROFILE.
 - ON HORIZONTAL PIPE, SELECT HORIZONTAL PLANE, IF POSSIBLE, TO AVOID SEDIMENT BLOCKAGE OF TRANSDUCER SIGNAL.
 - PREPARE PIPE FOR TRACK MOUNT:
 - REMOVE GRIT, CORROSION, COATING OR HEAVY PAINT
 - CLEAN AND DEGREASE SURFACE
 - DO NOT MOUNT OVER FROST.
 - CONDITION PIPE SURFACE:
 - LOCALLY SMOOTH THE PIPE SURFACE TO ACCEPT THE TRANSDUCERS. USE THE ABRASIVE PAD PROVIDED.
 - MOUNT TRACK ON PIPE;
 - PLACE TRACK RAIL ASSY (ASSY WITH STRAP) AGAINST PIPE. WHILE HOLDING TRACK, PLACE THE SECOND TRACK ONTO THE PIPE AND HOLD TOGETHER IN PLACE.
 - ROTATE ASSY AROUND THE PIPE FOR PROPER POSITIONING. ONCE THAT HAS BEEN ACHIEVED, SECURE THE TRACK RAIL ASSY TO THE PIPE WITH THE STRAP.
 - LOCATE TRANSDUCERS;
 - CONSULTING THE 1010 FIELD MANUAL, USE THE INSTALLATION MENU TO DETERMINE THE APPROPRIATE INDEX HOLES FOR YOUR APPLICATION AND INSERT PINS.
 - APPLY A THIN BAND OF THE ULTRASONIC COUPLANT PROVIDED TO THE BASE OF EACH TRANSDUCER.
 - INSERT TRANSDUCERS INTO TRACK AS SHOWN, BANKING AGAINST INDEX PINS. SECURE TRANSDUCERS WITH CLAMPS.
 - MAKE TRANSDUCER CABLE CONNECTIONS IN ACCORDANCE WITH THE APPROPRIATE FLOW COMPUTER INSTALLATION DRAWING AND 1010 FIELD MANUAL.
 - SEE DRAWING 1012TNH-8 AND 1011HNS-8 FOR TRACK AND TRANSDUCER OUTLINE DIMENSIONS.

DIRECT MODE INSTALLATION

1011HN HIGH PRECISION TRANSDUCER AND TRACK

CONTROLTRON
HAUPPAUGE, NY 11788

INSTALLATION DRAWING
1010 SERIES TRANSDUCERS
AND MOUNTING TRACKS

SIZE	CODE IDENT. NO.	REV.
C	21614	1012TNH-7
SCALE: NONE	WT.	SHEET 2 OF 2

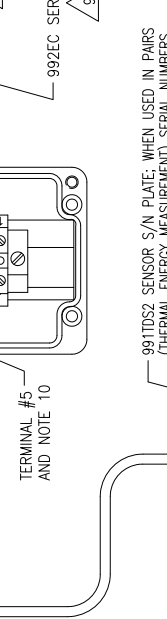
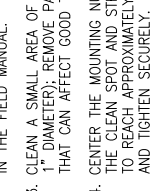
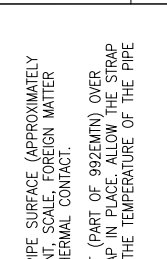
DDI NOT SCALE THIS DRAWING UNLESS OTHERWISE SPECIFIED. DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED. TOLERANCES ARE: INCHES +/- .1 (MM) +/- .2		CONTRACT NO.
DATE	CERTIFIED	DATE
APPD	DATE	DATE
PRD	DATE	DATE
ENG	DATE	DATE
CHK	DATE	DATE
JR	HJJ	DATE 6/10/98

STEP - 1
 DETERMINE PROPER BAND LENGTH ONE OF TWO WAYS:
 A) IF DIAMETER IS KNOWN, REFER TO BAND LENGTH TABLE
 B) IF DIAMETER IS NOT KNOWN, MEASURE CIRCUMFERENCE
 (WITH STRING, TWINE, ETC., AND SUBTRACT 3.5"
 TO ALLOW LENGTH OF FASTENER) TO DETERMINE
 PROPER BAND LENGTH.

STEP - 2
 MEASURE BAND TO PROPER LENGTH AND CUT THROUGH
 CENTER OF NEAREST ROUND HOLE WITH SHEARS, SNIPS,
 HACKSAW etc.

STEP - 3
 EITHER MATE FASTENER HALVES AND THEN LINK TO STRAP
 ALREADY IN PLACE AROUND PIPE, OR LINK FASTENER HALVES
 INDEPENDENTLY TO STRAP ENDS (HOLD IN PLACE WITH TAPE
 STRAP AROUND PIPE, ENGAGE FASTENER AFTER WRAPPING
 STRAP AROUND PIPE).

STEP - 4
 MATE "T" ON FASTENERS WITH RECTANGULAR CUT-OUT ON
 MOUNTING NUT ASSEMBLY.
 SIZE 2 MOUNTING ASSY'S INCLUDE FIXED LENGTH STRAPS TO
 MATE WITH FASTENERS ATTACHED TO MOUNTING NUT.
 MATE WITH FASTENERS ATTACHED TO MOUNTING NUT.
 MATE WITH FASTENERS ATTACHED TO MOUNTING NUT.
 MOUNTING STRAP (SEE STEP 3).

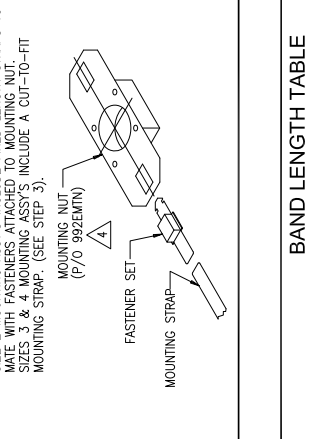
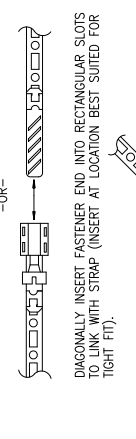


INSTALLATION PROCEDURE - SEE DRAWING REFERENCE **A**
 1. INSTALLATION OF THE DEDICATED NEMA-4 TEMPERATURE
 SENSOR FOR PIPES 1 1/4" - 48" DIAMETER CONSISTS OF
 THE FOLLOWING: THE SENSOR P/N 991TDS2/991TDS2 WITH
 INTEGRAL CABLE AND JUNCTION BOX, A CABLE
 992ECC-(LENGTH), AND MOUNTING ASSY
 992EMTN(-2, -3 OR -4).

2. SELECT THE PIPE LOCATION WHERE TEMPERATURE IS
 TO BE MONITORED IN ACCORDANCE WITH RECOMMENDATIONS
 IN THE FIELD MANUAL.
 3. CLEAN A SMALL AREA OF PIPE SURFACE (APPROXIMATELY
 1" DIAMETER); REMOVE PAINT, SCALE, FOREIGN MATTER
 THAT CAN AFFECT GOOD THERMAL CONTACT.
 4. CENTER THE MOUNTING NUT (PART OF 992EMTN) OVER
 THE CLEAN SPOT AND STRAP IN PLACE. ALLOW THE STRAP
 TO REACH APPROXIMATELY THE TEMPERATURE OF THE PIPE
 AND TIGHTEN SECURELY.
 5. SPIN THE JAM NUT (PART OF 992EMTN) ONTO THE
 SENSOR BODY (991TDS2 OR 991TDS2). APPLY A GENEROUS
 AMOUNT OF THERMAL COUPLANT (SUPPLIED WITH 992EMTN)
 TO THE FACE OF THE SENSOR AND SCREW IT INTO THE
 MOUNTING NUT. HAND TIGHT ENGAGEMENT IS SUFFICIENT.
 SECURE THE SENSOR BY TIGHTENING THE JAM NUT AGAINST
 THE MOUNTING NUT.

6. SELECT A MOUNTING LOCATION FOR THE JUNCTION BOX
 USE INTEGRAL MOUNTING HOLES OR SECURE AT END
 OF RIGID CONDUIT. IF CONDUIT IS USED, REMOVE THE
 WATERTIGHT GLAND SUPPLIED WITH THE JUNCTION BOX.
 INSTALL THE 992ECC CABLE, MAKING WIRING CONNECTIONS
 1-5 AS SHOWN.
 7. AFTER TEMPERATURE SENSOR HAS BEEN POSITIONED
 PROPERLY, PROTECTIVELY ENCAPSULATE IT AS FOLLOWS:
 PACK "DENSO" MASTIC AROUND TEMPERATURE SENSOR.
 SURFACE OF PIPE AND MOUNTING STRAP SHOULD BE CLEAN
 AND RUBBED WITH "DENSO" PASTE BEFORE WRAPPING. WRAP
 "DENSO" TAPE AROUND PIPE, STRAP AND TEMPERATURE
 SENSOR. SMOOTH THE TAPE SURFACE AFTER WRAPPING.
 8. MAKE CABLE CONNECTIONS TO THE 994 OR 1010 SERIES
 FLOWMETER IN ACCORDANCE WITH THE APPROPRIATE
 FLOWMETER INSTALLATION DRAWING.
 9. STANDARD TEMPERATURE SENSOR CABLE
 IS PART NUMBER 992ECC-(LENGTH)
 FOR PLENUM RATED CABLE ASSEMBLIES, USE
 CABLE PART NUMBER 992ECCD-(LENGTH)

10. IF NECESSARY, TO ISOLATE RTD BODY FROM
 FLOW METER GROUND, DISCONNECT TERMINAL #5
 AND TAPE BACK TO PREVENT ELECTRICAL CONTACT,
 THIS GROUND ISOLATION DOES NOT AFFECT SAFETY.
 11. SEE DRAWING 991TDS2-8 FOR OUTLINE DIMENSIONS.



NOTES:
 1. TO AID INSTALLATION, THE TEMP. SENSOR CABLE MAY
 BE DISCONNECTED FROM THE CABLE JUNCTION. THE
 CAP RING AND SEALING GLAND REMAIN ON CABLE.
 2. EACH TEMP SENSOR WRAP KIT CONSISTS OF:
 1- ROLL OF 2" WIDE "DENSO" TAPE
 1- 1# BLOCK OF "DENSO" MASTIC
 1- 1/2# CONTAINER OF "DENSO" PASTE
 (P/N 991-82).

BAND LENGTH TABLE

PIPE DIA.	LENGTH TO CUT ON MARK	PIPE DIA.	LENGTH TO CUT ON MARK
6"	14-3/16"	16"	45-7/8"
7"	16-3/4"	17"	48-7/16"
8"	20-1/2"	18"	52-1/8"
9"	23-1/8"	19"	54-3/4"
10"	26-7/8"	20"	58-1/2"
11"	29-3/8"	22"	64-7/8"
12"	33-5/16"	24"	71-1/8"
13"	33-3/4"	26"	76-1/4"
14"	39-1/2"	28"	85-5/8"
15"	42-1/16"	30"	88-7/8"

SIEMENS
 Siemens Energy & Automation, Inc.
 Process Instrumentation Business Unit
 CoC Ultrasonic Flow - Hauptpaugle, Long Island, NY 11788

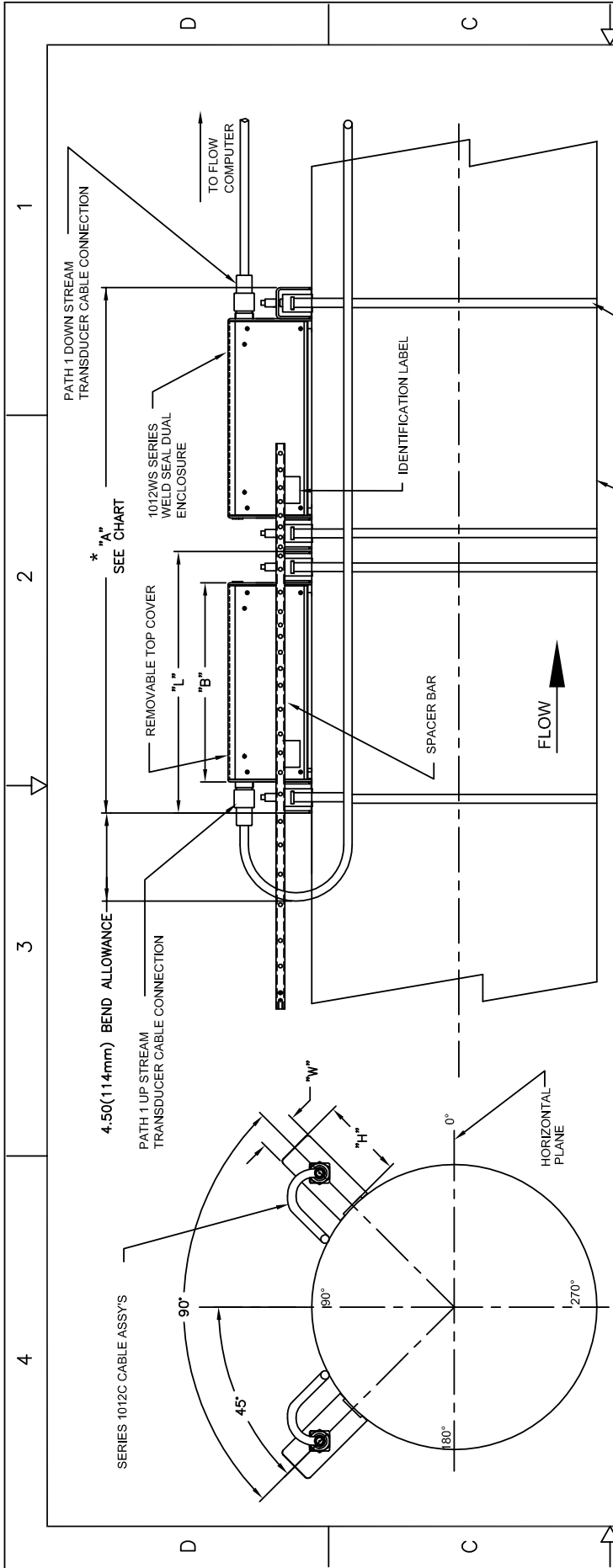
INSTALLATION DRAWING
 991TD TEMPERATURE SENSOR
 SUBMERSIBLE, "FM" APPROVED

SAP MATERIAL NO. _____
 ITEM NO. _____
 DOCUMENT NO. 991TDS2-7
 SCALE: NONE WT. _____ SHEET 1 OF 1

DATE _____
 DR H/J _____ DATE 11/14/96
 CHK _____ DATE _____
 ENG _____ DATE _____
 APPD _____ DATE _____
 CERTIFIED _____

DO NOT SCALE THIS DRAWING
 UNLESS OTHERWISE SPECIFIED:
 DIMENSIONS ARE IN INCHES (MM)
 TOLERANCES ON-
 INCHES (MM)
 ± .1 (± 2)

MATERIAL: _____
 FINISH: _____



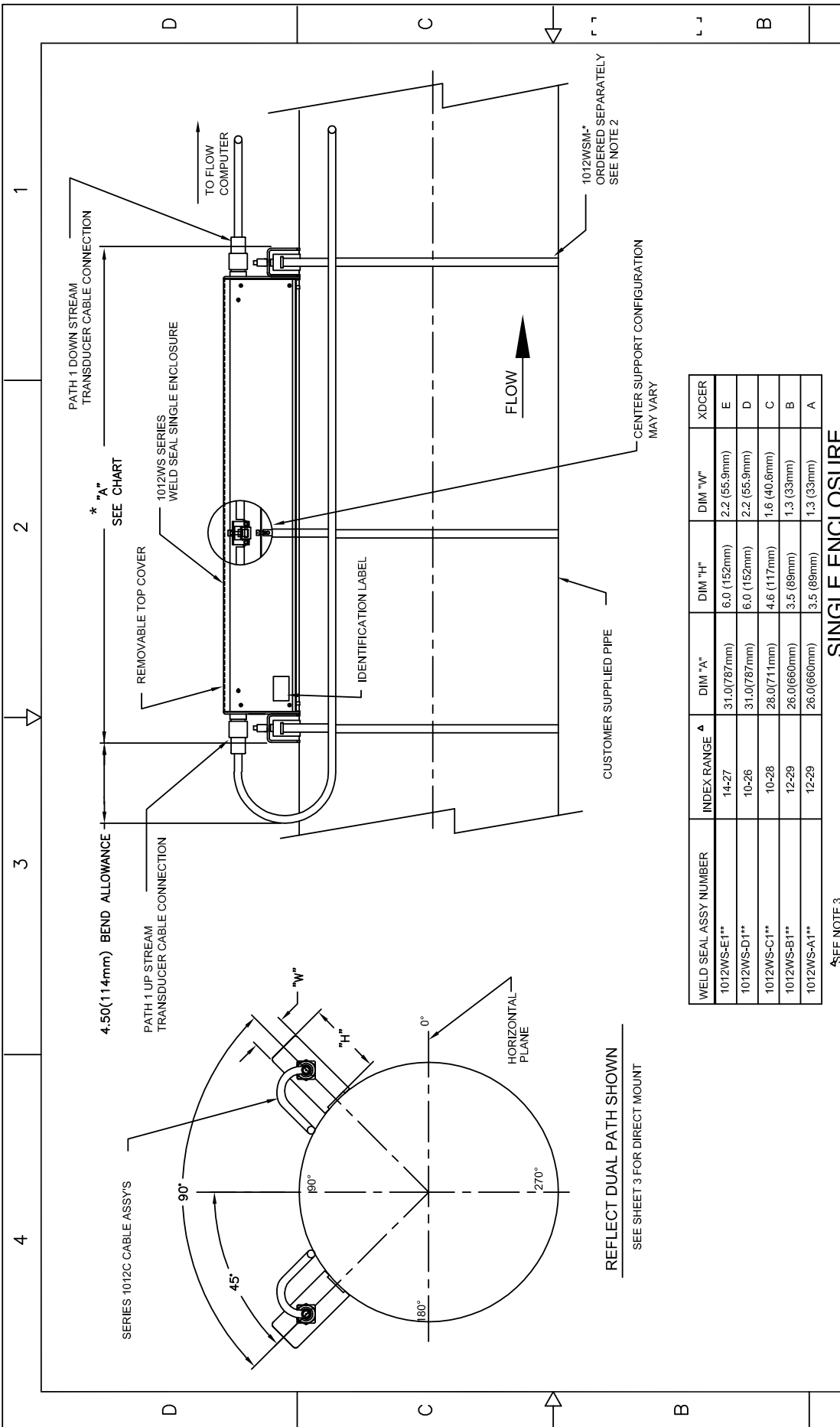
REFLECT DUAL PATH SHOWN
SEE SHEET 3 FOR DIRECT MOUNT

WELD SEAL ASSY NUMBER	DIM "A"	INDEX RANGE ^A	DIM "B"	DIM "L"	DIM "H"	DIM "W"	XDCER	SPACER BAR
1012WS-D2**	29.5(749mm)MIN/85.0(2159mm)MAX	23-62	11.19 (284mm)	15.0 (381mm)	5.0 (127mm)	2.2 (55.9mm)	D	TWO PIECE BAR
1012WS-C2**	26.0(660mm)MIN/81.5(2070mm)MAX	23-47	9.50 (241mm)	13.0 (330mm)	3.5 (89mm)	1.6 (40.6mm)	C	SINGLE BAR
1012WS-E2**	29.5(749mm)MIN/85.0(2159mm)MAX	23-62	11.19 (284mm)	15.0 (381mm)	6.0 (152mm)	2.2 (55.9mm)	E	TWO PIECE BAR

^ASEE NOTE 3

DUAL ENCLOSURE

<p>DO NOT SCALE THIS DRAWING UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES (MM) TOLERANCES ARE: INCHES ± .1 (MM) ± .2</p>		<p>CONTRACT NO.</p> <p>DR. M. KEENEAN DATE 2/6/02</p> <p>CHK DATE</p> <p>ENG DATE</p> <p>PRD DATE</p> <p>APPD DATE</p> <p>CERTIFIED</p> <p>DATE</p>		<p>SIEMENS Siemens Energy & Automation, Inc. Process Instrumentation Business Unit CoC Ultrasonic Flow - Hauppauge, Long Island, NY 11788</p>	
<p>OUTLINE DRAWING WELD SEAL CLAMP ON TRANSDUCER ENCLOSURE</p>				<p>SIZE CODE IDENT. NO. C 21614</p>	<p>REV. G</p>
<p>NOTES:</p> <p>1. FOR INSTALLATION PROCEDURE SEE 1012WS-2-7</p> <p>2. 1012WSM* MOUNTING STRAP KITS ARE ORDERED TO MATCH PIPE SIZE. SEE 1012WSM-8 TWO MOUNTING STRAP KITS REQUIRED (INDEPENDENT OF NUMBER OF PATHS INSTALLED)</p> <p>3. DIMENSION "A" IS DETERMINED BY LTN. LTN IS DEPENDENT ON PIPE SIZE AND SOUND VELOCITY OF LIQUID.</p>			<p>SCALE: 1/4"</p>	<p>SHEET 1 OF 3</p>	<p>1 CN#5277</p>

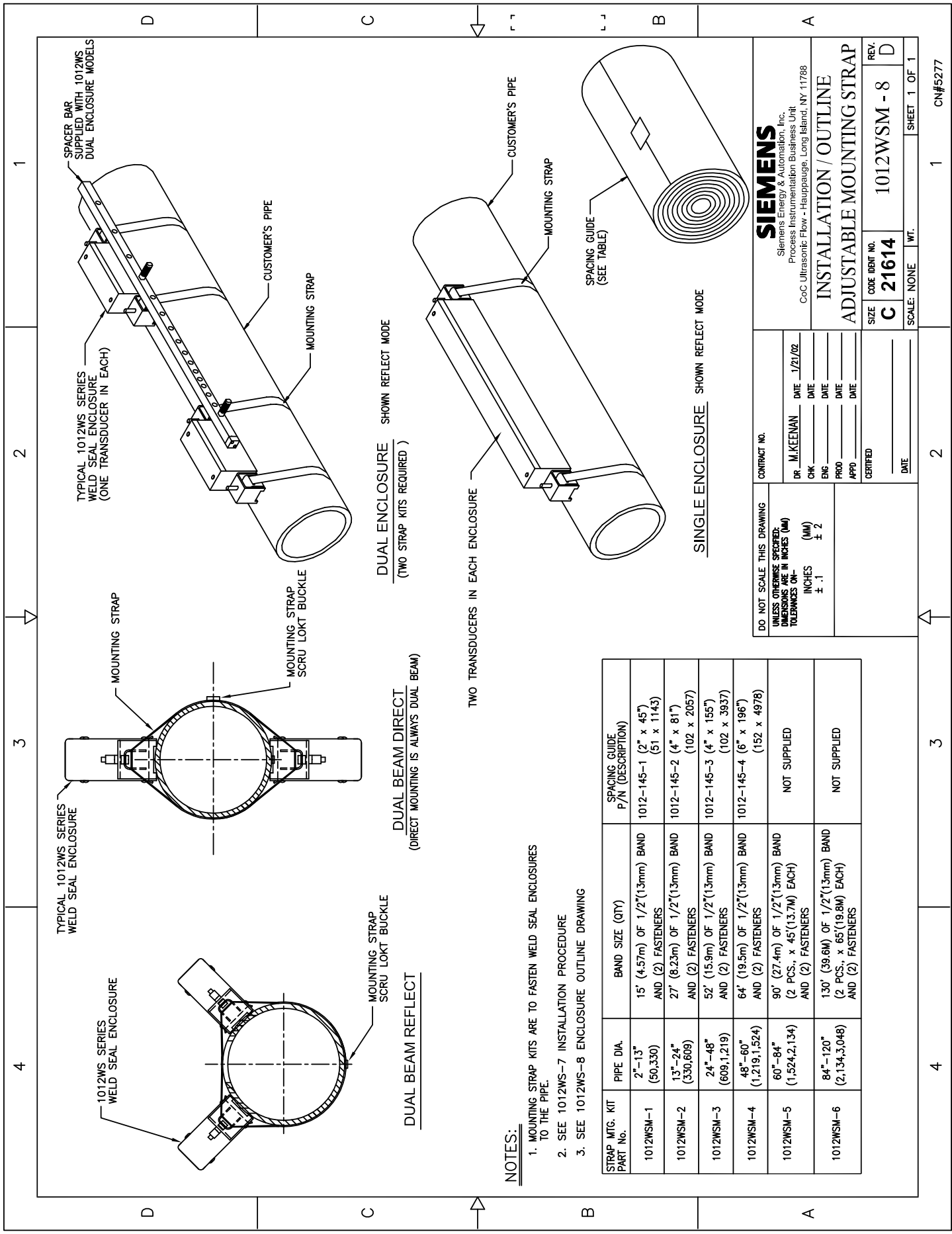


WELD SEAL ASSY NUMBER	INDEX RANGE ^A	DIM "A"	DIM "H"	DIM "W"	XDCER
1012WS-E1**	14-27	31.0(787mm)	6.0 (152mm)	2.2 (55.9mm)	E
1012WS-D1**	10-26	31.0(787mm)	6.0 (152mm)	2.2 (55.9mm)	D
1012WS-C1**	10-28	28.0(711mm)	4.6 (117mm)	1.6 (40.6mm)	C
1012WS-B1**	12-29	26.0(660mm)	3.5 (89mm)	1.3 (33mm)	B
1012WS-A1**	12-29	26.0(660mm)	3.5 (89mm)	1.3 (33mm)	A

SIEMENS Siemens Energy & Automation, Inc. Process Instrumentation Business Unit CoC Ultrasonic Flow - Hauppauge, Long Island, NY 11788		CONTRACT NO. DR. M. KEENAN DATE 2/6/02 CHK _____ DATE _____ ENG _____ DATE _____ PROD _____ DATE _____ APPD _____ DATE _____ CERTIFIED _____ DATE _____	
DO NOT SCALE THIS DRAWING UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES (MM) TOLERANCES ON- INCHES ± .1 (MM) ± .2		OUTLINE DRAWING WELD SEAL CLAMP ON TRANSDUCER ENCLOSURE	
SCALE: 1/4		SIZE C 21614	REV. G
SEE NOTE 3		1012WS-8	
SCALE: 1/4		SHEET 2 OF 3	

NOTES:

- FOR INSTALLATION PROCEDURE SEE 1012WS-1-7
- 1012WSM* MOUNTING STRAP ASSEMBLIES ARE ORDERED TO MATCH PIPE SIZE. SEE 1012WSM-8
TWO MOUNTING STRAPS KITS REQUIRED (INDEPENDENT OF NUMBER OF PATHS INSTALLED)
- LTN IS DEPENDENT ON PIPE SIZE AND SOUND VELOCITY OF FLUID.



DUAL ENCLOSURE SHOWN REFLECT MODE
(TWO STRAP KITS REQUIRED)

DUAL BEAM DIRECT
(DIRECT MOUNTING IS ALWAYS DUAL BEAM)

DUAL BEAM REFLECT

SINGLE ENCLOSURE SHOWN REFLECT MODE

NOTES:

1. MOUNTING STRAP KITS ARE TO FASTEN WELD SEAL ENCLOSURES TO THE PIPE.
2. SEE 1012WS-7 INSTALLATION PROCEDURE
3. SEE 1012WS-8 ENCLOSURE OUTLINE DRAWING

STRAP MFG. KIT PART No.	PIPE DIA.	BAND SIZE (QTY)	SPACING GUIDE P/N (DESCRIPTION)
1012WSM-1	2"-13" (50,330)	15' (4.57m) OF 1/2"(13mm) BAND AND (2) FASTENERS	1012-145-1 (2" x 45") (51 x 1143)
1012WSM-2	13"-24" (330,609)	27' (8.23m) OF 1/2"(13mm) BAND AND (2) FASTENERS	1012-145-2 (4" x 81") (102 x 2057)
1012WSM-3	24"-48" (609,1219)	52' (15.9m) OF 1/2"(13mm) BAND AND (2) FASTENERS	1012-145-3 (4" x 155") (102 x 3937)
1012WSM-4	48"-60" (1,219,1,524)	64' (19.5m) OF 1/2"(13mm) BAND AND (2) FASTENERS	1012-145-4 (6" x 196") (152 x 4978)
1012WSM-5	60"-84" (1,524,2,134)	90' (27.4m) OF 1/2"(13mm) BAND (2 PCS., x 45'(13.7M) EACH) AND (2) FASTENERS	NOT SUPPLIED
1012WSM-6	84"-120" (2,134,3,048)	130' (39.6M) OF 1/2"(13mm) BAND (2 PCS., x 65'(19.8M) EACH) AND (2) FASTENERS	NOT SUPPLIED

SIEMENS
Siemens Energy & Automation, Inc.
Process Instrumentation Business Unit
CoC Ultrasonic Flow - Hauppauge, Long Island, NY 11788

INSTALLATION / OUTLINE
ADJUSTABLE MOUNTING STRAP

CONTRACT NO. _____
DATE 1/21/02

DR. M. KEENAN
CHK _____ DATE _____
ENG. _____ DATE _____
PROD. _____ DATE _____
APPD. _____ DATE _____
CERTIFIED _____

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES (MM)
TOLERANCES ON:
INCHES ± .1
MM ± .2

DATE _____
SCALE: NONE
WT. _____
REV. D
C 21614
1012WSM-8
SHEET 1 OF 1

Installation Instructions



1012WS-1-7

Weld Seal Installation Instructions

Inspection Proc	Test Proc	Prep By	Date	Approval	Initial	Date
NA	NA	G VanPopering	10/29/01	Engineering:	DR	05/04/05
Covered Assemblies:				Valid By:	IR	05/04/05
1012WS <u>Single Enclosure</u> (Reflect and Direct-X Modes)						

Change Log

Document Rev	Change Description	Date	Change By	Approved
A/-	Original Release	04/18/02	GV	MF
A/1	(CN4763) Added reference to Fixed Spacer, CC110, Clean Gasket	06/24/03	GV	MF
A/2	(CN5000) Added reference to proper unpacking and disassembly	04/25/05	GV	MF
B	(CN5157) Changed LOGO to Siemens. Updated Fig 3-B	08/14/06	GV	MF

Tools Required

1) Hex Key Set	S.A.E. 5/32 and 1/8 In.
2) Phillips Head Screwdriver	#2
3) 7/16" Socket	Deep throat
4) 7/16" Wrench	Open end
5) Razor Blade	
6) Flat Blade screwdriver	
7) Torque limiting driver/wrench	in/lbs
8) Grease Pencil	For marking pipe

Compounds Used

1) CC128	Super Lube
2) CC110	G662 Silicone Grease

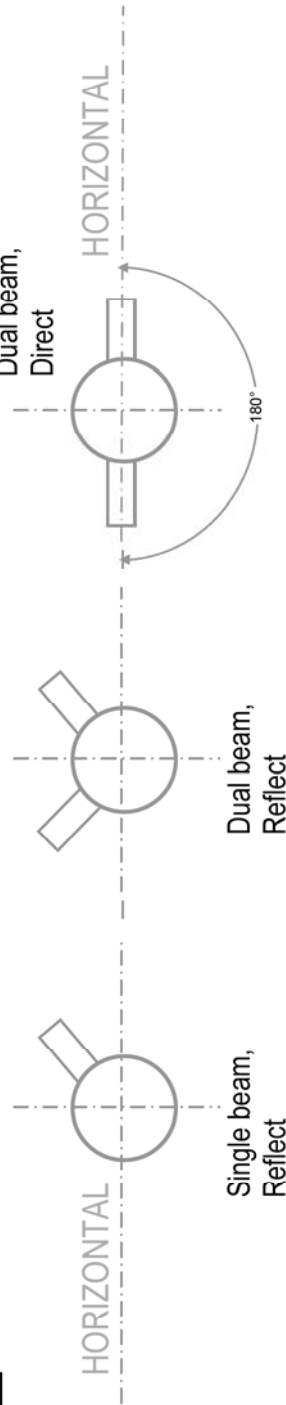
General Notes

- Pre Assembly Note:**
- Using the installation menu and the procedure outlined in the FDC Field Manual, confirm that you have the appropriate transducers and Enclosure Set for operation on the chosen pipe.
 - Select mounting location
 - Choose location that remains full at zero flow.
 - Where possible, locate enclosure ass'y 10 pipe diameters or more from elbow or valve to ensure fully developed and stable flow profile.
 - On horizontal pipe sections, select horizontal plane to avoid sediment or gas blockage of ultrasonic beam.
 - Multiple beam applications see drawing 1012WS-8 and/or **Fig 1-1** of this procedure.
 - Prepare pipe for enclosure mounting.
 - Remove grit, corrosion, coating or heavy paint. (Avoid grinding which could cause distortion of the pipe surface)
 - Clean and degrease surface.
 - Do not mount over frost.
 - Do not mount on the seam of the pipe.
 - Locally, smooth the pipe surface to accept the transducers. Use the abrasive pad provided.
- (Note: It is recommended two people be available to perform this procedure.)

SIEMENS

1012WS-1-7

Fig 1-1



Mount above horizontal plane on pipe. Avoid mounting directly on top and bottom of horizontal pipes.

Step 1: Mounting the straps.

- Unpack and disassemble the enclosure. Remove the Covers. Remove the Keepers. Remove the Clamp assembly. Loosen the transducer clamping screw. Retain all hardware for future use. **See Fig 1-1, 1-2**
- Determine the correct spacing required as outlined in the FDC Menu and Field Manual.
- Place the assembly on the pipe and mark the pipe at each strap location using chalk or a grease pencil. **See Fig 1-3.**
- Prepare straps for mounting. Cut strap to length. Strap length should be twice the pipe circumference plus 6 inches. Orient all hardware to the outside of the radius. Remove setscrew from Screw-Lock Buckle. Retain for later use. **See Fig 1-4** (Note: For Reflect mode, install one keeper for each path (i.e. Dual Beam Reflect will have two keepers at each strap location). For Direct-X mode install two keepers at each strap location.)
- Mount the straps at the previously marked locations. Loop once around the pipe and feed the open end of the strap through the Screw-Lock Buckle and the Keeper/s as shown in **Fig 1-5**. Pull the loose end to remove most of the slack. Continue with another loop around the pipe and through the Screw-Lock Buckle a second time. Pull tight to remove slack.

Continue to **Step 1-R** for mounting in Reflect Mode.
Continue to **Step 1-D** for mounting in Direct-X Mode.

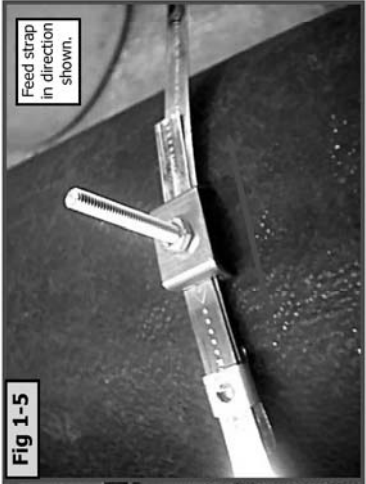
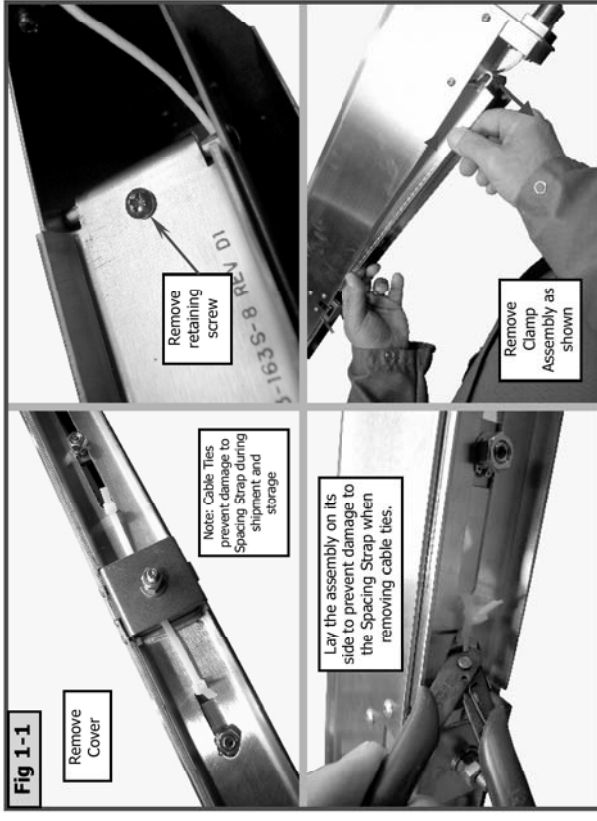


Fig 1-5

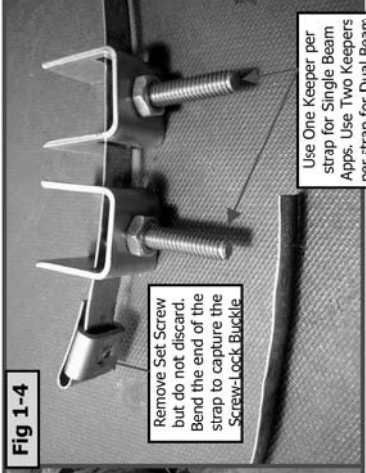


Fig 1-4

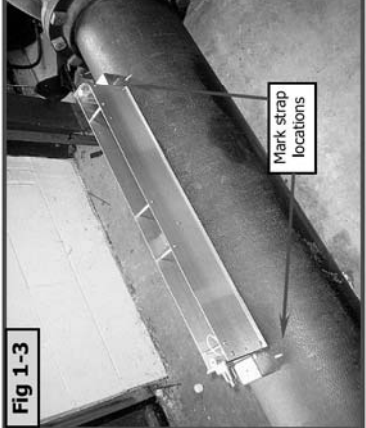


Fig 1-3

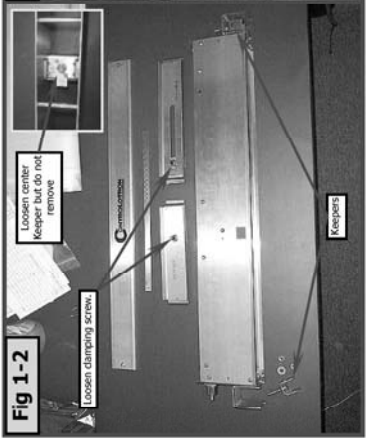
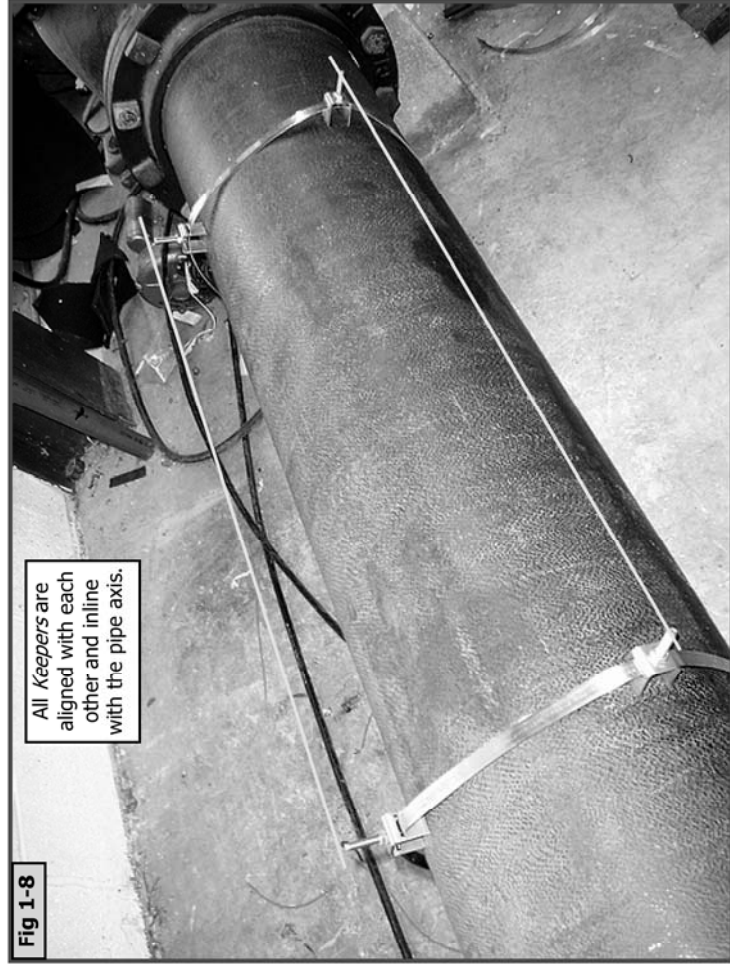
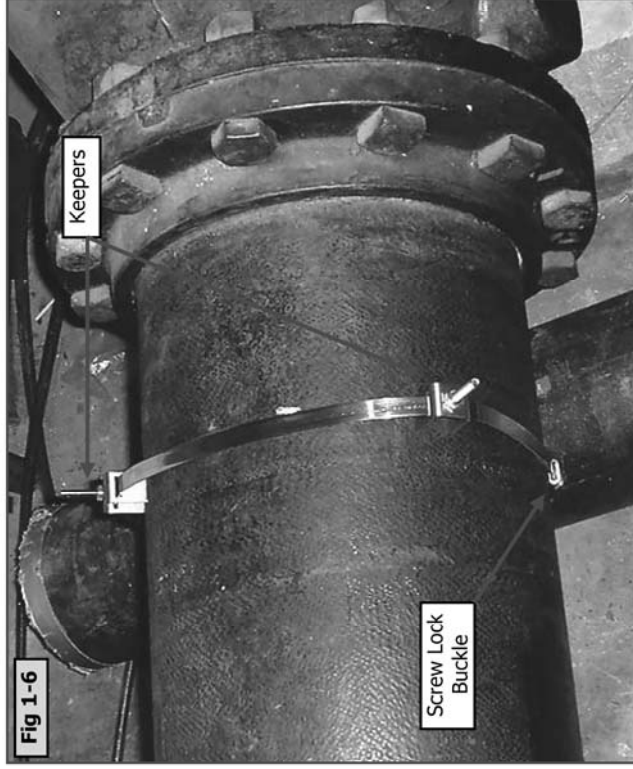


Fig 1-2

Step 1-R: Mounting the Straps For Reflect Mode

- A. Determine the mounting plane of the path/s. See Fig 1-1 and refer to General Notes on page 1 of 8. Take up the slack in the strap and locate the keeper/s at the selected plane/s. Locate the Screw-Lock Buckle 180 degrees from the nearest Keeper or best location. See Fig 1-6.
- B. Bend the loose end of the strap to prevent it from loosening while you install and tighten the selfscrew you retained from Step 1-C. See Fig 1-7.
- C. Fig 1-8 shows the final results of Step 1-R.

Continue to Step 2.

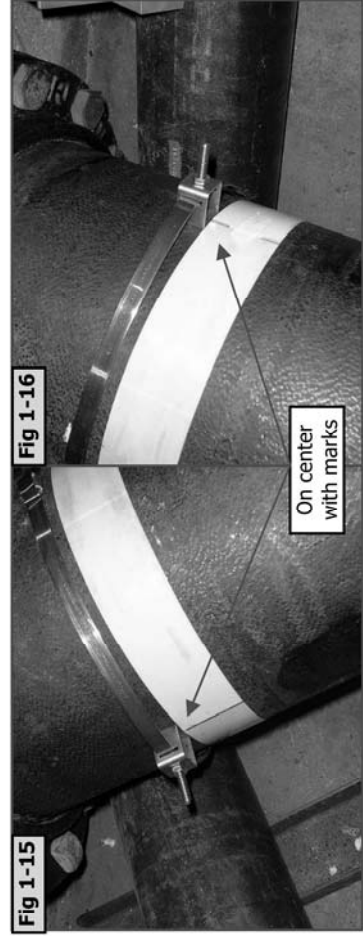
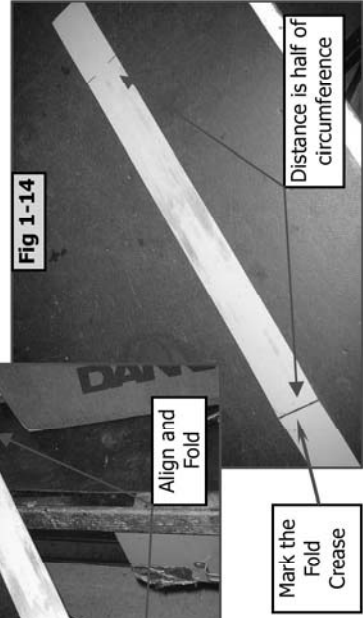
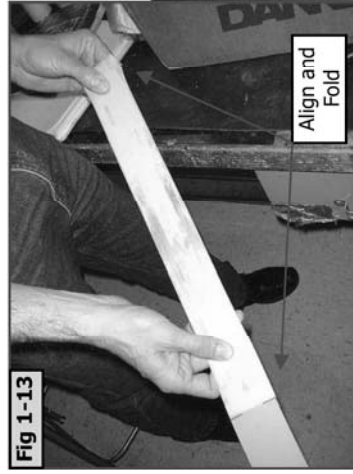
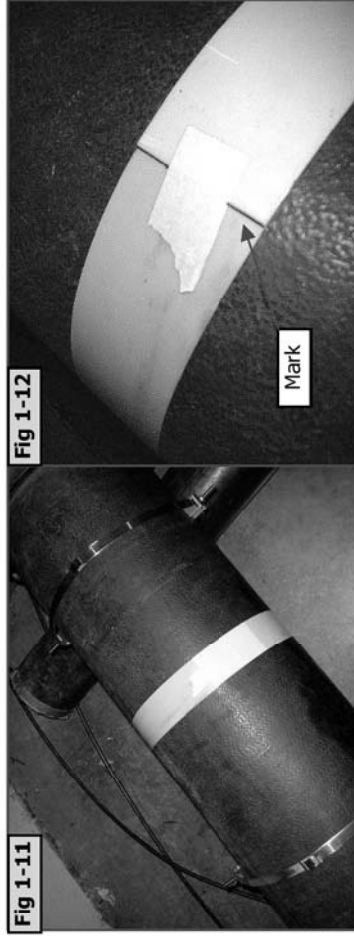
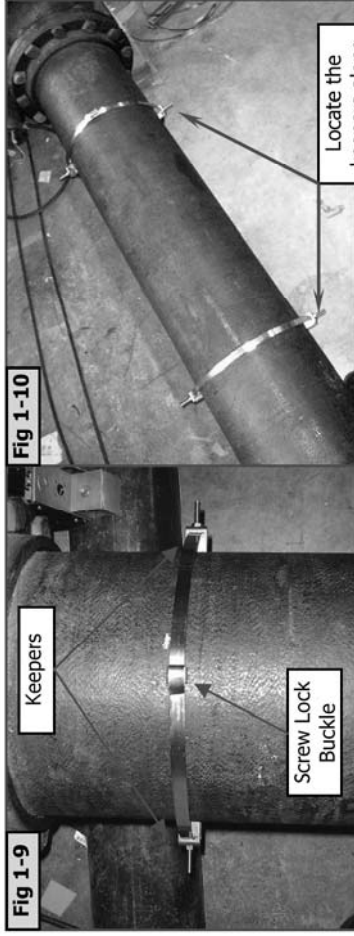


All Keepers are aligned with each other and inline with the pipe axis.

Step 1-D: Mounting the Straps for Direct-X Mode

- A. Roughly locate the Keepers on the horizontal plane of the pipe. See Fig 1-9 and 1-10.
- B. Using the Mylar material provided, make a template. Tightly wrap the Mylar strip around the pipe and overlap the ends. Cut off any excess. Temporarily tape the end together. Mark the template with a marker where the ends overlap. See Fig 1-11 and -1-12.
- C. Remove the template. Align the mark with the other end of the template and fold the Mylar while maintaining alignment. Mark the fold crease with a marker. (Note: If you lay the template out on a table you will observe that the distance between marks is half the actual circumference of the pipe). See Fig 1-13 and 1-14.
- D. Reinstall the template. Locate it next to one of the most outer strap locations. Align the marks of the template to the horizontal plane of the pipe. Now align the keepers on center, with the marks on the template. See Fig 1-15 and 1-16. (Note: It is important to maintain alignment of this set of keepers throughout the remaining process. This is the reference point when mounting the housings and aligning and manipulating the remaining Keepers.)

Continue to Step 2.



Step 2: Mounting the Enclosure

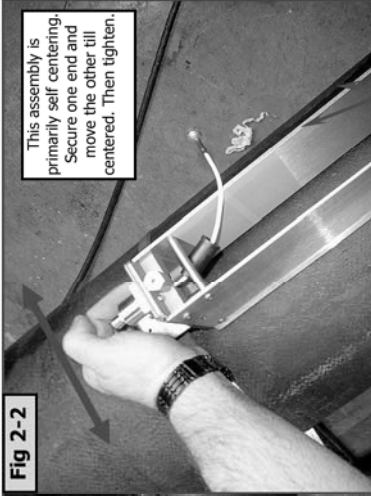
- A. Place the Enclosure assembly over the Keepers and slip into place. You may be required to align and manipulate the Keeper studs into their respective holes. Be aware of Up-stream vs. Down-stream. **See Fig 2-1** (Note: When mounting Direct-X Mode, maintain alignment of Keepers as outlined in step "1-D" section "H". Orient the enclosures so the fixed transducers of both paths are located at the same end of the pipe.)
- B. Install retaining nuts at every Keeper location. Tighten ONE end, just enough to keep assembly from moving. Rock the other end, perpendicular to the pipe, to allow the assembly to find center. Tighten nut just enough to keep assembly from moving. **See Fig 2-2** (Note: When mounting Direct-X Mode, maintain alignment of Keepers as outlined in step "1-D" section "H".)
- C. Visually verify the assembly to be in line with the pipe axis by comparing the top edge of the assembly to the linear axis of the pipe. Adjust if necessary. **See Fig 2-2**
- D. Tighten all retaining nuts just enough to keep assembly from moving.
- E. Repeat steps **A** through **E** for remaining paths.
- F. Fully tighten all retaining nuts to approximately 20 – 25 in/lbs. **Lock in place with second nut.**
- G. When you have mounted the enclosures and fully tightened the retaining nuts you may now install the middle strap. Simply feed the strap through the center Keeper. Wrap around the pipe twice and tighten as you did the previous straps. See Fig 2-3 and 2-4

Fig 2-1

Up-stream Side
(Reference)



Fig 2-2

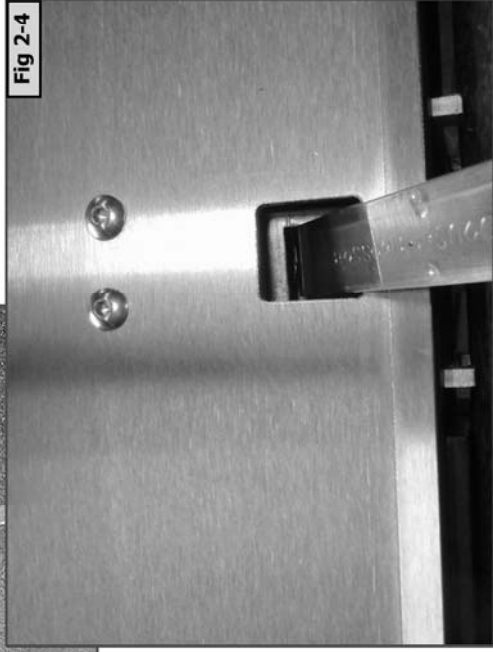


Visually check alignment of the assembly against the pipe axis.

Fig 2-3



Fig 2-4



Continue to Step 3

Step 3: Install the Transducers.

- A. Apply a thin bead of CC128 to the bottom side of the transducers along their center length. **See Fig 3-1.**
- B. **Visually confirm the presence of insulating tape on the inside walls of the enclosure.** Insert the Fixed Transducer into the Enclosure at the Reference location. Don't land the transducer on the pipe at this time. Install the cable. **See Fig 3-2 through 3-4.** Fill connector with CC110 grease prior to connection. Backfill the protective boot and slide into place. (Note: Be careful not to catch or compromise the insulating tape while inserting the transducer.).
- C. Land the transducer onto pipe. Butt the front face of the transducer against the center support. **See Fig 3-5.** Secure the spacing strap as shown in **Fig 3-6.** Lift up on spring clip to install.

(Note that on some assemblies, the spacing strap will be fixed to the center support. In this case the Reference transducer is adjustable and the spacing strap is used to space both the reference and the moveable transducers. **See Fig 3-A)** (Note: If this is a Clamp-on Gas application using size C1 or D1 transducers, use "ALT" hole to position the Reference Transducer. **See Fig 3-B)**

(Note: For direct mode, each enclosure will have one transducer from each opposing set. {I.E. The enclosure at path 1 will have, mounted in the Up-stream location, the "A" transducer from set "1" and mounted in the Down-stream location will be transducer "B" from set "2". The enclosure at Path 2 will have, mounted in the Up-stream location, the "A" transducer from set "2" and mounted in the Down-stream location will be transducer "B" from set "1"})

Continued on next page...



Fig 3-1



Fig 3-2



Fig 3-3



Fig 3-4

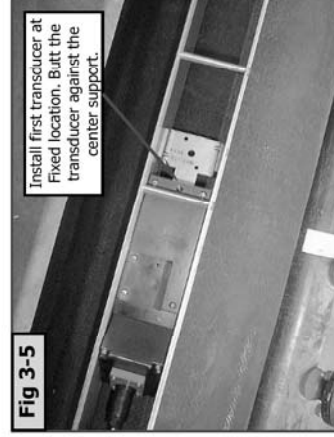


Fig 3-5

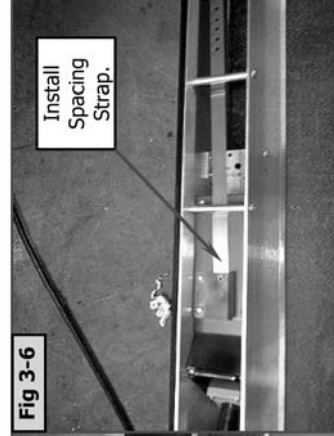


Fig 3-6

Step 3: Install the Transducers.

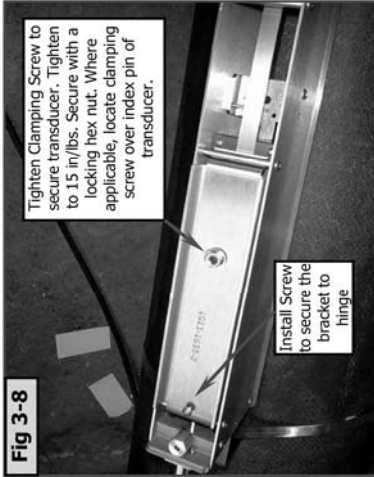
- D. Install bracket at outside hinge. Bracket hooks over the hinge. **See Fig 3-7.**
- E. Drop bracket in place. Slide forward to latch. Secure bracket by installing screw at hinged location. Tighten Clamping Screw to secure transducer. Where applicable, locate clamping screw over index pin of transducer. (Torque to 15 in/lbs) Secure with hex nut. **See Fig 3-8.**
- F. Install the adjustable transducer into the enclosure. Slide the transducer into the enclosure but do not land onto the pipe. Install the cable. Install the spacing strap at the desired Number Index. Land the transducer to the pipe. **See Fig 3-9 and 3-10.**
- G. Secure the bracket and slide the Clamping Screw assembly into place. Where applicable, locate the Clamping Screw over index pin on the transducer. Tighten clamping screw to 15 in/lbs to secure the transducer. **See Fig 3-11.**
- H. Verify LTN by comparing the calculated value from the FDC to the actual distance from transducer front face to transducer front face. (Transducer edge is visible at bottom of side plates.)
- I. Complete the make-up process and verify the operation of the installation before continuing to final step. Adjustment of transducer spacing may be required.

Fig 3-7



Bracket hooks onto hinge.

Fig 3-8



Tighten Clamping Screw to secure transducer. Tighten to 15 in/lbs. Secure with a locking hex nut. Where applicable, locate clamping screw over index pin of transducer.

Install Screw to secure the bracket to hinge.

Fig 3-9

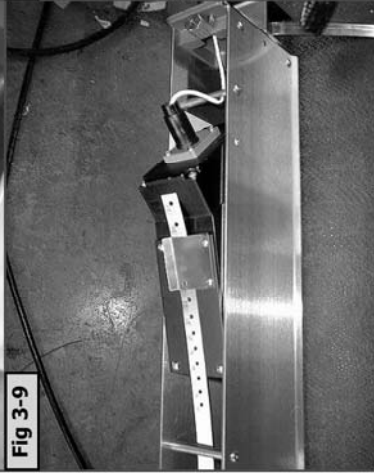


Fig 3-10

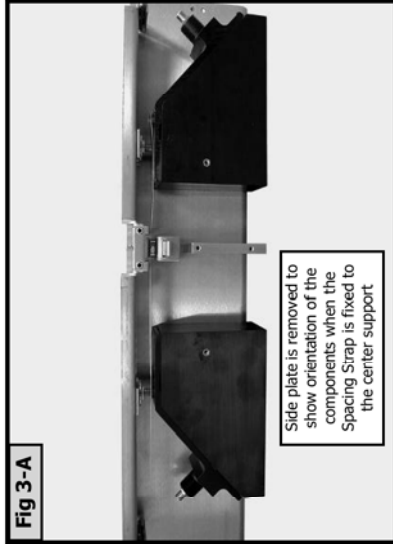


Fig 3-11



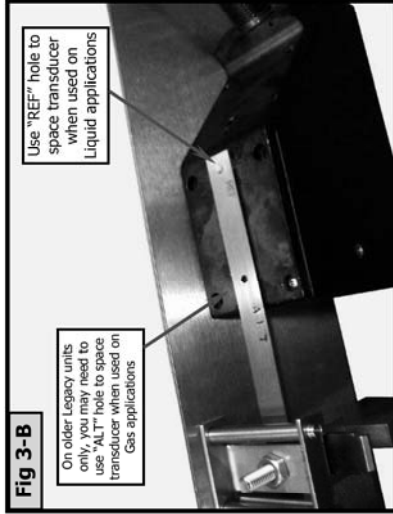
Tighten Clamping Screw to secure transducer. Tighten to 15 in/lbs. Secure with a locking hex nut. Where applicable, locate clamping screw over index pin of transducer.

Fig 3-A



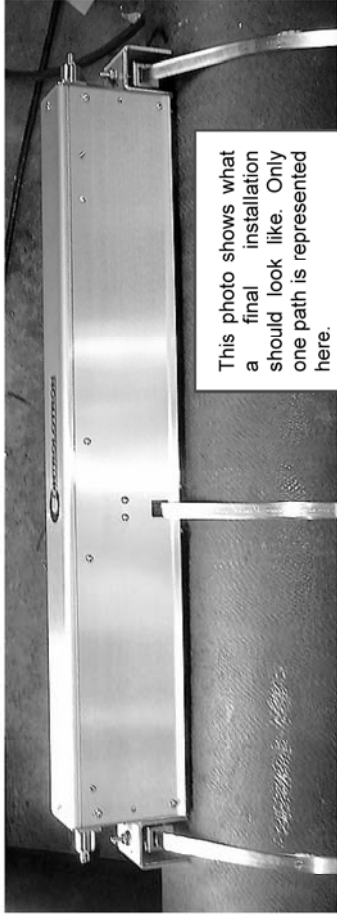
Side plate is removed to show orientation of the components when the Spacing Strap is fixed to the center support.

Fig 3-B



On older Legacy units only, you may need to use "ALT" hole to space transducer when used on Gas applications.

Use "REF" hole to space transducer when used on Liquid applications.



This photo shows what a final installation should look like. Only one path is represented here.

Step 4: (Optional) Weld assembly to pipe. If you desire, you may weld the assembly to the pipe.

Considerations:

1. It is recommended you remove the transducers prior to welding.
2. Removal of the side plates may be required in some situations where the gap between the pipe and the enclosure is diminished due to a large pipe diameter. Retain all hardware.

Procedure:

- A. While strap is in place, Tack Weld at the outer ends of each bracket as shown in **Fig 4-1**.
- B. Tack weld the center support. **See Fig 4-2**
- C. **IMPORTANT:** Do not weld the center of the bracket. The space is necessary for maintaining proper operation.
- D. Remove the straps and fully weld all locations. **See Fig 4-3.**
- E. Reassemble if side plates were removed.
- F. Reinstall transducers per Step 3.

Note: Bracket Material is Type 316 Stainless Steel, Suitable for welding to both Stainless Steel and Carbon Steel pipes.

Continue to Step 5

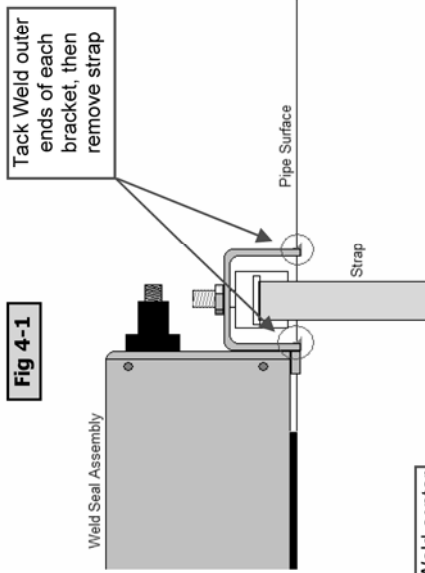


Fig 4-1

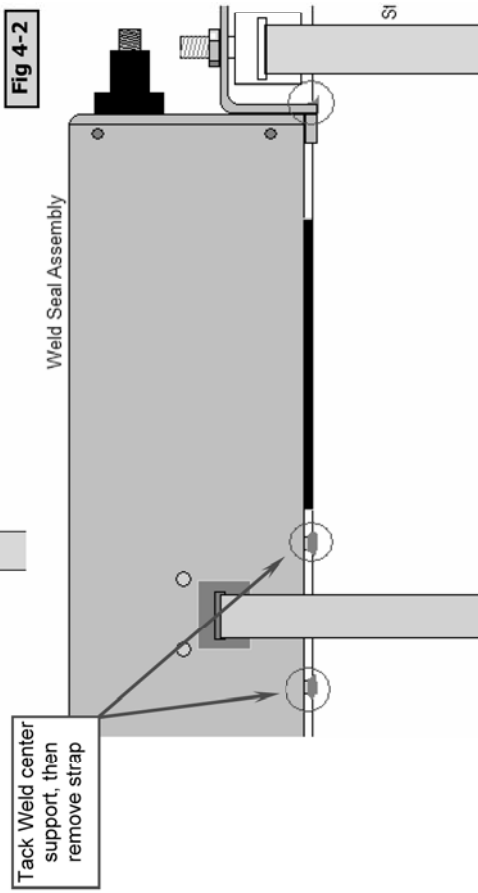


Fig 4-2

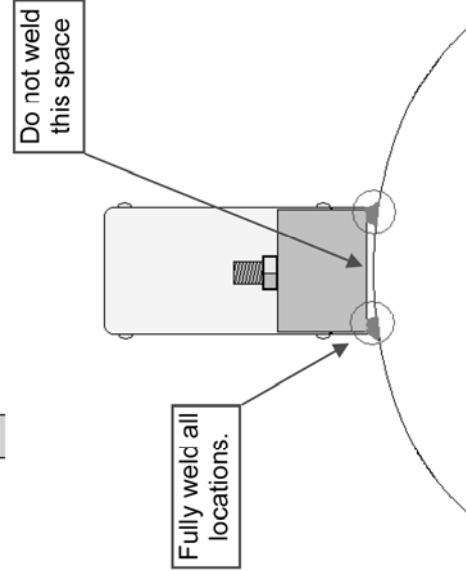


Fig 4-3

Step 5: Install Gasket Seal. Two people may be required to perform this step.

The procedure below is a recommended process. Any suitable method for achieving a snug inner ring is acceptable.

Follow **Fig's 5-1 to 5-12**. Surfaces must be clean and dry. Clean away any excess coupling compound. Do not allow any slack to occur in the gasket throughout this step. It must remain tight at all times. **Gasket Must Remain Clean and Free of Grease at all times**, if the gasket should become contaminated, remove and use acetone to clean.

The idea here is to seal the exposed gap between the transducers footprint and the pipe. Wrap the transducer footprint, twice, with the O-ring gasket material provided, then tie to secure in place. The inner layer performs the function of seal. The second outer layer protects and backs up the first.

Install the Housing Covers and remove the spacer bar to complete this procedure.

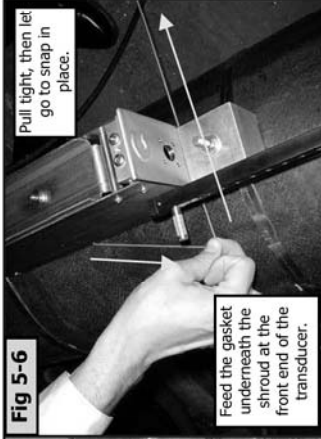


Fig 5-6

Feed the gasket underneath the shroud at the front end of the transducer.

Pull tight, then let go to snap in place.

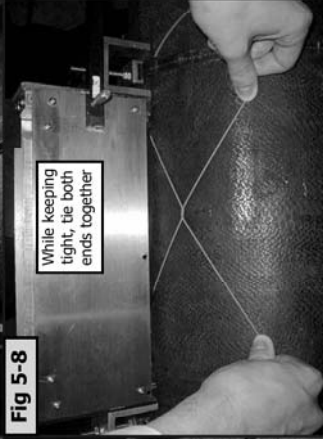


Fig 5-8

While keeping tight, tie both ends together

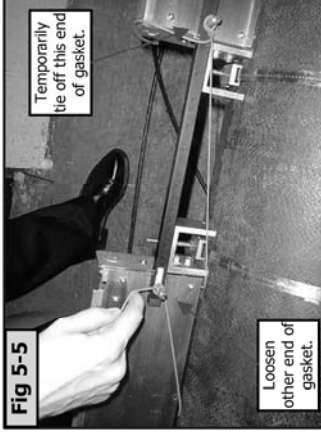


Fig 5-5

Temporarily tie off this end of gasket.

Loosen other end of gasket.

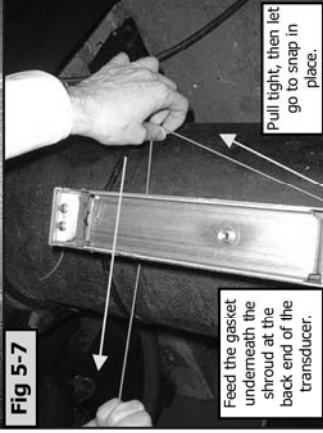


Fig 5-7

Feed the gasket underneath the shroud at the back end of the transducer.

Pull tight, then let go to snap in place.

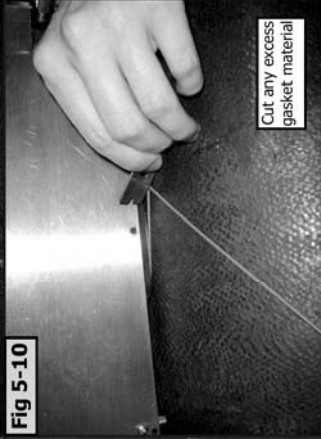


Fig 5-10

Cut any excess gasket material

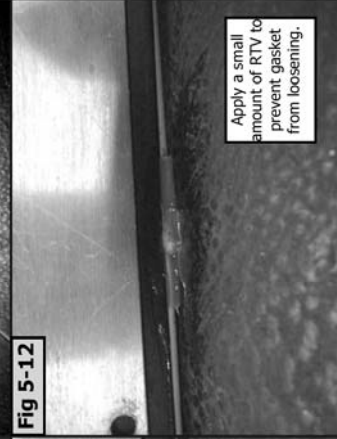


Fig 5-12

Apply a small amount of RTV to prevent gasket from loosening.

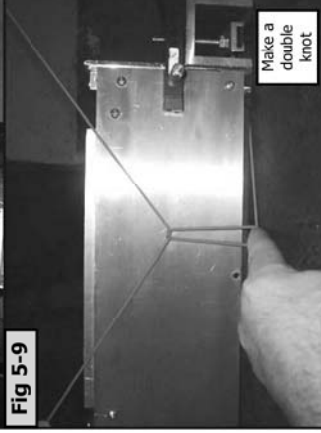


Fig 5-9

Make a double knot

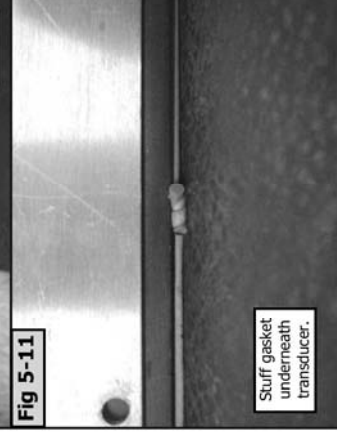


Fig 5-11

Stuff gasket underneath transducer.



Fig 5-1

Use any protruding hardware to temporarily tie off one of the ends while maintaining pull on the other

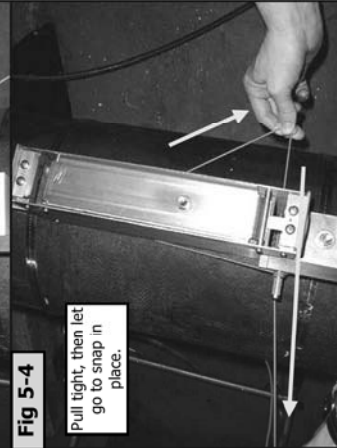


Fig 5-4

Pull tight, then let go to snap in place.



Fig 5-3

Feed the gasket underneath the opening in the shroud at the back end of the transducer. Pull both ends tight



Fig 5-2

Feed the gasket underneath the shroud at the front end of the transducer.

Maintain pull

Installation Instructions



1012WS-2-7

Weld Seal Installation Instructions

Inspection Proc	Test Proc	Prep By	Date	Approval	Initial	Date
NA	NA	G VanPopering	10/29/01	Engineering:	DR	03/22/06
Covered Assemblies:				Valid By:	N/A	N/A
1012WS <u>Dual Enclosure</u> (Reflect and Direct-X Modes)						

Change Log

Document Rev	Change Description	Date	Change By	Approved
A/-	Original Release		GV	
A/1	Added provisions for welding to pipe (Page 8 Step 5)		GV	
A/2	Fixed Typo Step 2 Paragraph A,C (Notes)	03/16/06	GV	DR
B	(CN5157) Changed LOGO to Siemens	08/14/06	GV	MF

Tools Required

- 1) Hex Key Set
- 2) Phillips Head Screwdriver
- 3) 7/16" Socket
- 4) 7/16" Wrench
- 5) Razor Blade
- 6) Flat Blade screwdriver
- 7) Torque limiting driver/wrench

Compounds Used

- 1) CC128 Super Lube
- 2) CC110 G662 Silicone Grease

General Notes

Pre Assembly Note:

1. Using the installation menu and the procedure outlined in the FDC Field Manual, confirm that you have the appropriate transducers and Enclosure Set for operation on the chosen pipe.
 2. Select mounting location
 - 2.1 Choose location that remains full at zero flow.
 - 2.2 Where possible, locate enclosure ass'y 10 pipe diameters or more from elbow or valve to ensure fully developed and stable flow profile.
 - 2.3 On horizontal pipe sections, select horizontal plane to avoid sediment or gas blockage of ultrasonic beam.
 - 2.4 Multiple beam applications see drawing 1012WS-8 and/or Fig 1-1 of this procedure.
3. Prepare pipe for enclosure mounting.
 - 3.1 Remove grit, corrosion, coating or heavy paint. (Avoid grinding which could cause distortion of the pipe surface)
 - 3.2 Clean and degrease surface.
 - 3.3 Do not mount over frost.
 - 3.4 Do not mount on the seam of the pipe.
 - 3.5 Locally, smooth the pipe surface to accept the transducers. Use the abrasive pad provided.

(Note: It is recommended two people be available to perform this procedure.)

Fig 1-1

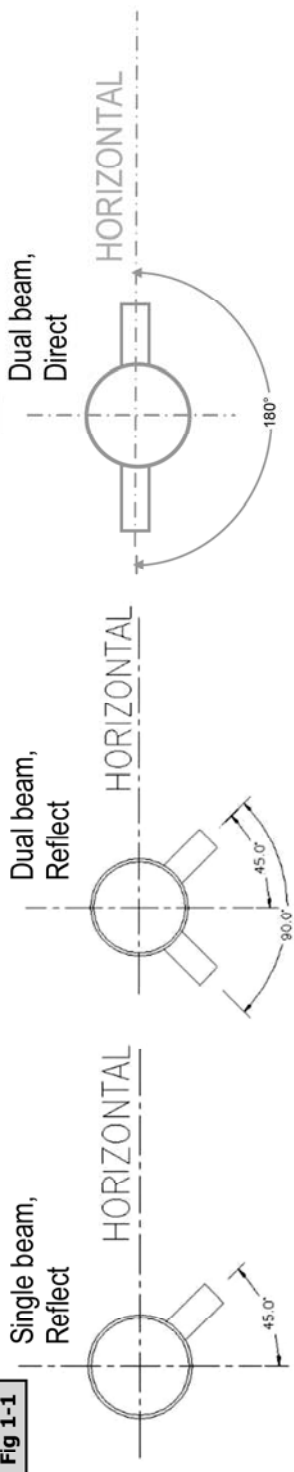
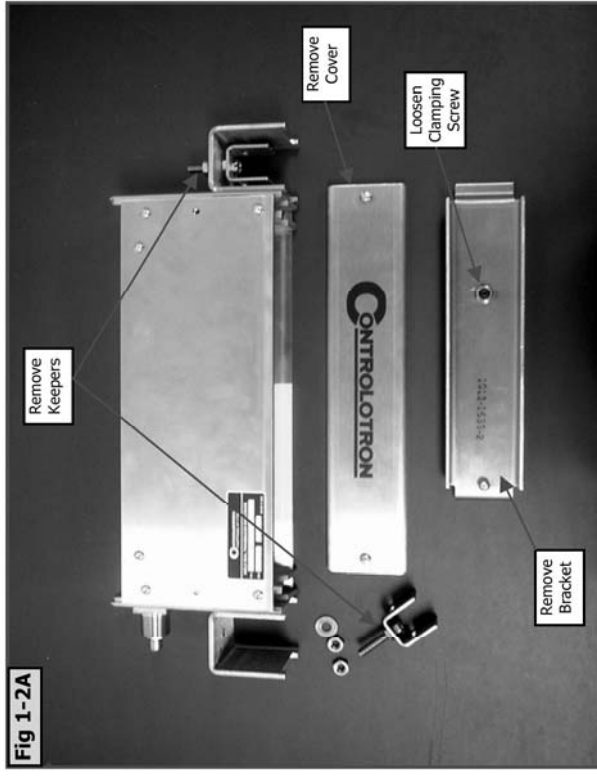


Fig 1-2A



Step 1: Mounting the straps.

- Disassemble the enclosure. Remove the Covers. Remove the Keepers. Remove the Clamping Bracket. Loosen the transducer clamping screw. Retain all hardware for future use. **See Fig 1-2A**
- Determine the correct spacing required as outlined in the FDC Menu and Field Manual. Lay out the parts on a bench or table and install the spacer bar using the FDC Calculated spacing index. **See Fig 1-2B.**
- Place the assembly on the pipe and mark the pipe at each strap location using chalk or a grease pencil. **See Fig 1-3.**
- Prepare straps for mounting. Cut strap to length. Strap length should be twice the pipe circumference plus 6 inches. Orient all hardware to the outside of the radius. Remove setscrew from Screw-Lock Buckle. Retain for later use. **See Fig 1-4** (Note: For Reflect mode, install one keeper for each path (i.e. Dual Beam Reflect will have two keepers at each strap location). For Direct-X mode install two keepers at each strap location.)
- Mount the straps at the previously marked locations. Loop once around the pipe and feed the open end of the strap through the Screw-Lock Buckle and the Keeper/s as shown in **Fig 1-5**. Pull the loose end to remove most of the slack. Continue with another loop around the pipe and through the Screw-Lock Buckle a second time. Pull tight to remove slack.

Continue to **Step 1-R** for mounting in Reflect Mode.
Continue to **Step 1-D** for mounting in Direct-X Mode.

Fig 1-2B

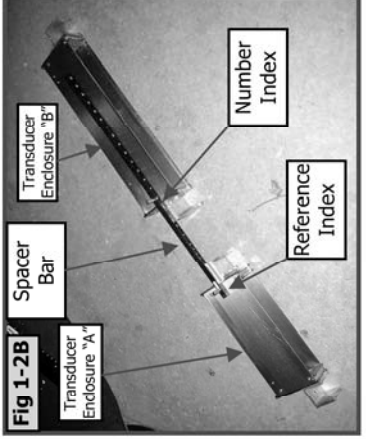


Fig 1-3

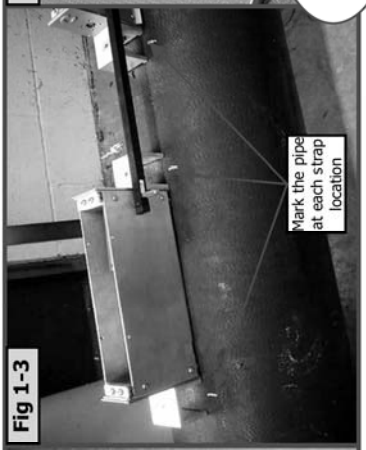


Fig 1-4

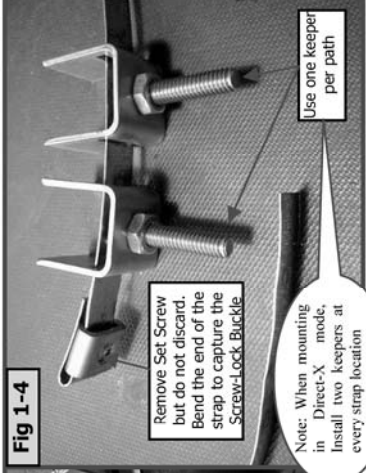
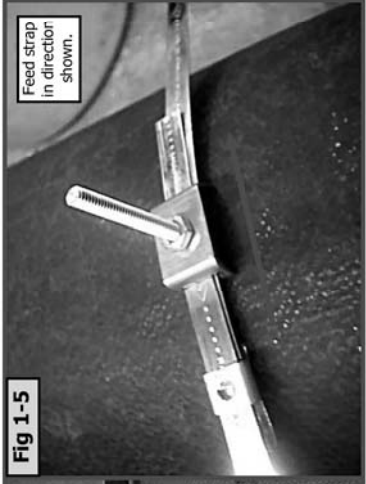


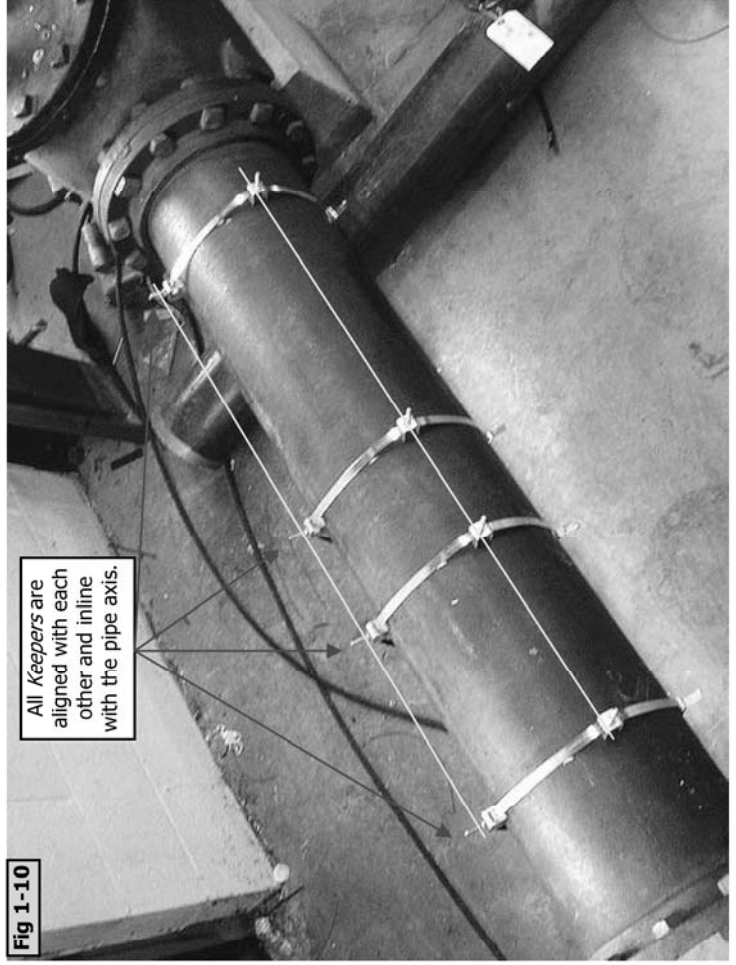
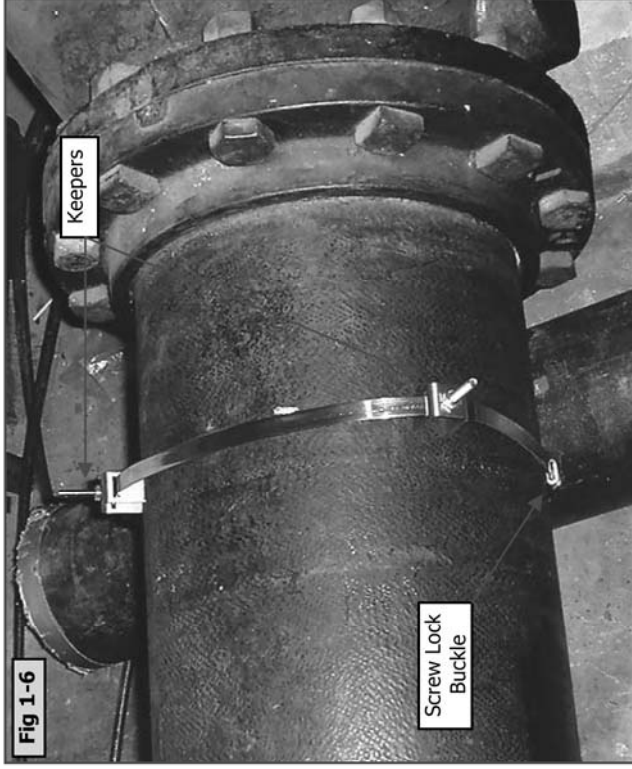
Fig 1-5



Step 1-R: Mounting the Straps For Reflect Mode

- A. Determine the mounting plane of the path/s. See Fig 1-1 and refer to General Notes on page 1 of 8. Take up the slack in the strap and locate the keeper/s at the selected plane/s. Locate the Screw-Lock Buckle 180 degrees from nearest Keeper or best location. See Fig 1-6.
- B. Bend the loose end of the strap to prevent it from loosening while you install and tighten the setscrew you retained from Step 1-C. See Fig 1-9.
- C. Fig 1-10 shows the final results of Step 1-R.

Continue to Step 2.



Step 1-D: Mounting the Straps For Direct-X Mode

- Roughly locate the Keepers on the horizontal plane of the pipe. See Fig 1-11 and 1-12.
- Using the Mylar material provided, make a template. Tightly wrap the Mylar strip around the pipe and overlap the ends. Cut off any excess. Temporarily tape the end together. Mark the template with a marker where the ends overlap. See Fig 1-13 and -1-14.
- Remove the template. Align the mark with the other end of the template and fold the Mylar while maintaining alignment. Mark the seam with a marker. (Note: If you lay the template out on a table you will observe that the distance between marks is half the actual circumference of the pipe). See Fig 1-15 and 1-16.
- Reinstall the template. Locate it next to one of the most outer strap locations. Align the marks of the template to the horizontal plane of the pipe. Now align the keepers, on center, with the marks on the template. See Fig 1-17 and 1-18. (Note: It is important to maintain alignment of this set of keepers throughout the remaining process. This is the reference point when mounting the housings and aligning and manipulating the remaining Keepers.)

Continue to Step 2.

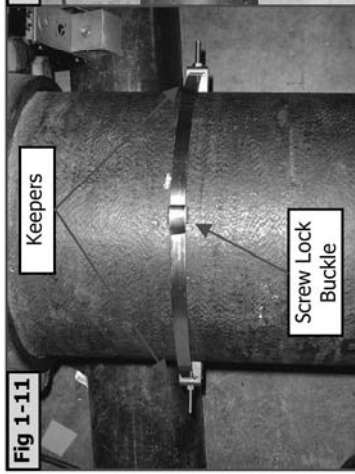


Fig 1-11

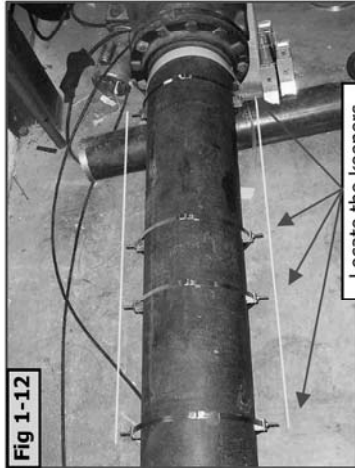


Fig 1-12

Locate the keepers along the horizontal plane of the pipe



Fig 1-13

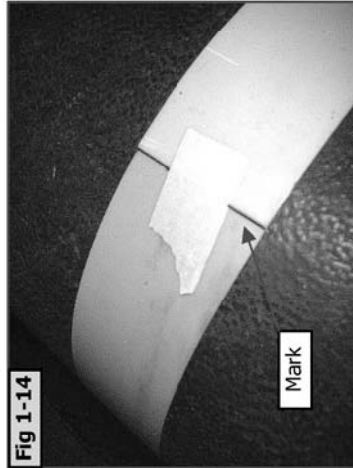


Fig 1-14

Mark



Fig 1-15

Align and Fold

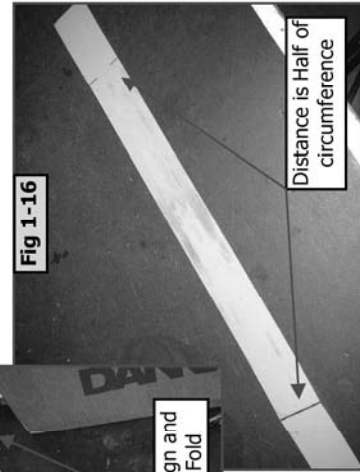


Fig 1-16

Distance is Half of circumference

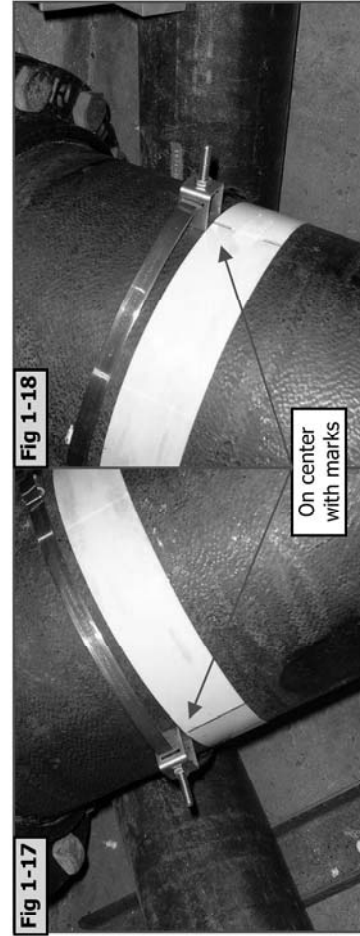


Fig 1-17

On center with marks

Fig 1-18

Step 2: Mounting the Enclosure

- A. Place the Enclosure assembly over the Keepers and slip into place. You may be required to align and manipulate the Keeper studs into their respective holes. Be aware of Up-stream vs. Dwn-stream. **See Fig 2-1** (Note: When mounting Direct-X Mode, maintain alignment of Keepers as outlined in step "1-D" Paragraph "D".)
- B. Install retaining nuts at every Keeper location. Tighten ONE end, just enough to keep assembly from moving. **See Fig 2-2**
- C. Rock the other end, perpendicular to the pipe, to allow the assembly to find center. Tighten nut just enough to keep assembly from moving. **See Fig 2-3** (Note: When mounting Direct-X Mode, maintain alignment of Keepers as outlined in step "1-D" Paragraph "D".)
- D. Visually verify co-planarity with the pipe by comparing the top edge of the assembly to the linear axis of the pipe. Adjust if necessary. **See Fig 2-4**
- E. Tighten all retaining nuts just enough to keep assembly from moving.
- F. Repeat steps **A** through **E** for remaining paths.
- G. Fully tighten all retaining nuts to approximately 20 – 25 in/lbs. Lock in place with second nut.

Continue to Step 3

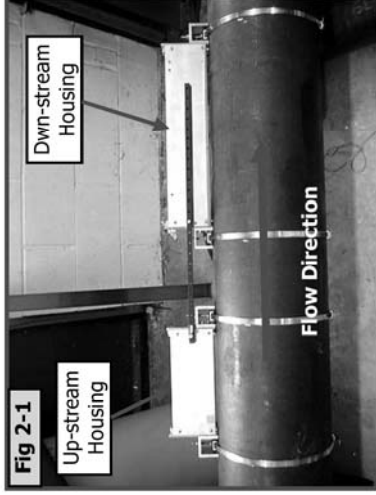


Fig 2-1

Up-stream
Housing

Fig 2-2

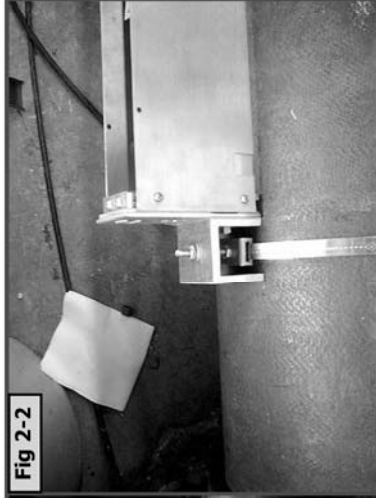


Fig 2-3

This assembly is primarily self centering. Secure one end and move the other till centered. Then tighten.

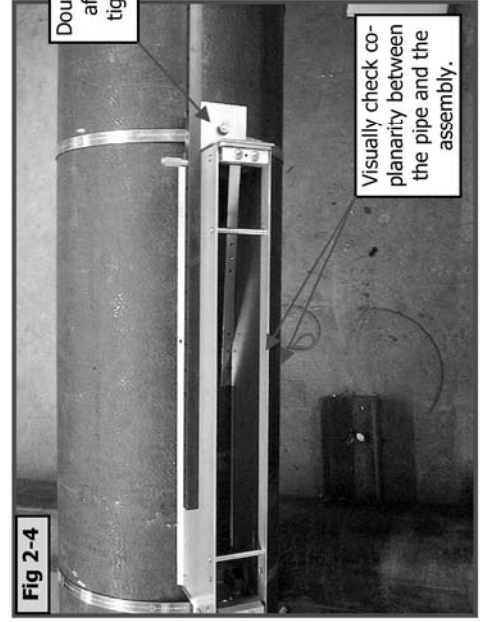


Fig 2-4

Double nutted
after final
tightening.

Visually check co-
planarity between
the pipe and the
assembly.

Step 3: Install the Transducers.

- A. Apply a thin bead of CC128 to the bottom side of the transducers along their center length. **See Fig 3-1.**
- B. Visually confirm the presence of insulating tape on the inside walls of the housings. Insert Transducer into housing. (Note: Be careful not to catch or compromise the insulating tape while inserting the transducer.) Secure the spacing strap as shown in **Fig 3-2**. Lift up on spring clip to install.
- C. Drop transducer into place. Install the cable. **See Fig 3-3 and 3-3A**. Fill connector with CC110 grease prior to connection. Backfill the protective boot and slide into place.
- D. Install bracket at outside hinge. Bracket hooks over the hinge. **See Fig 3-3 and 3-4**.
- E. Drop bracket in place. **See Fig 3-5**.
- F. Slide forward to latch. **See Fig 3-6**.
- G. Secure bracket by installing screw to secure transducer. **See Fig 3-7**.
- H. Tighten Clamping Screw to secure transducer. (Torque to 15 in/lbs) Secure with hex nut. **See Fig 3-8**.
- I. Verify LTN by comparing the calculated value from the FDC to the actual distance from transducer front face to transducer front face. (transducer edge is visible at bottom of side plates.)
- J. Complete the make-up process and verify the operation of the installation before continuing to final step. Adjustment of transducer spacing may be required, if this is so, one of the housings for that path must be repositioned to the re-specified spacing index.

Continue to Step 4



Fig 3-1

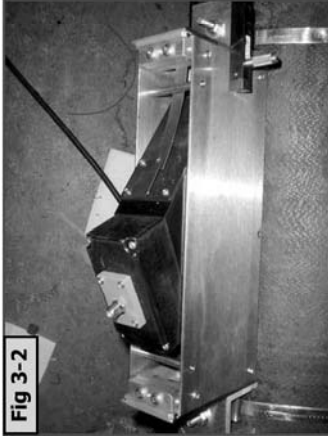


Fig 3-2

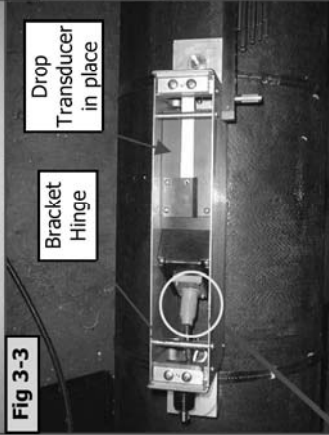


Fig 3-3



Fig 3-4

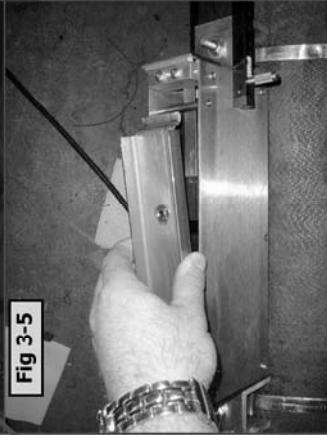


Fig 3-5

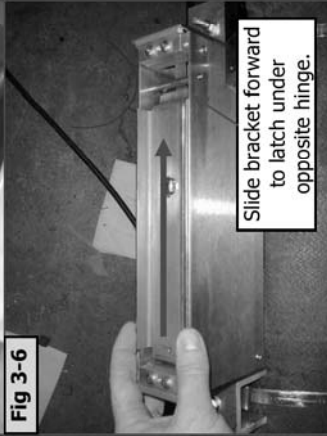


Fig 3-6

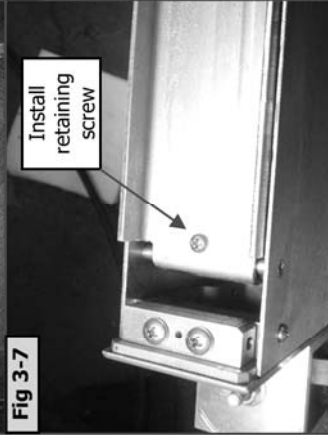


Fig 3-7

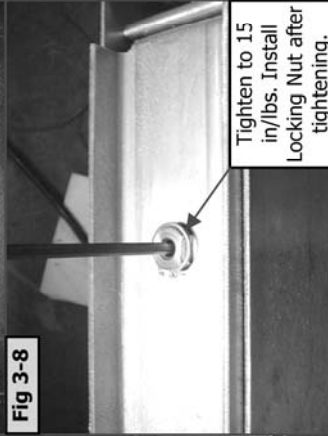


Fig 3-8

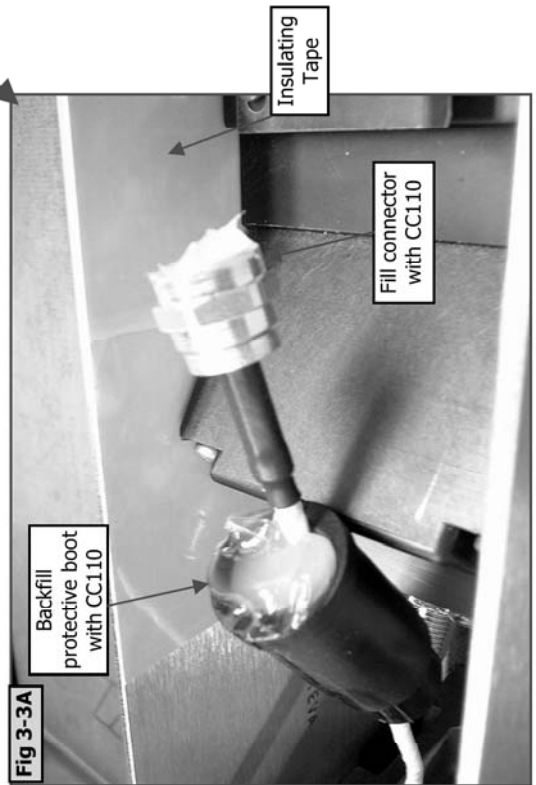


Fig 3-3A

Backfill protective boot with CC110

Insulating Tape

Fill connector with CC110

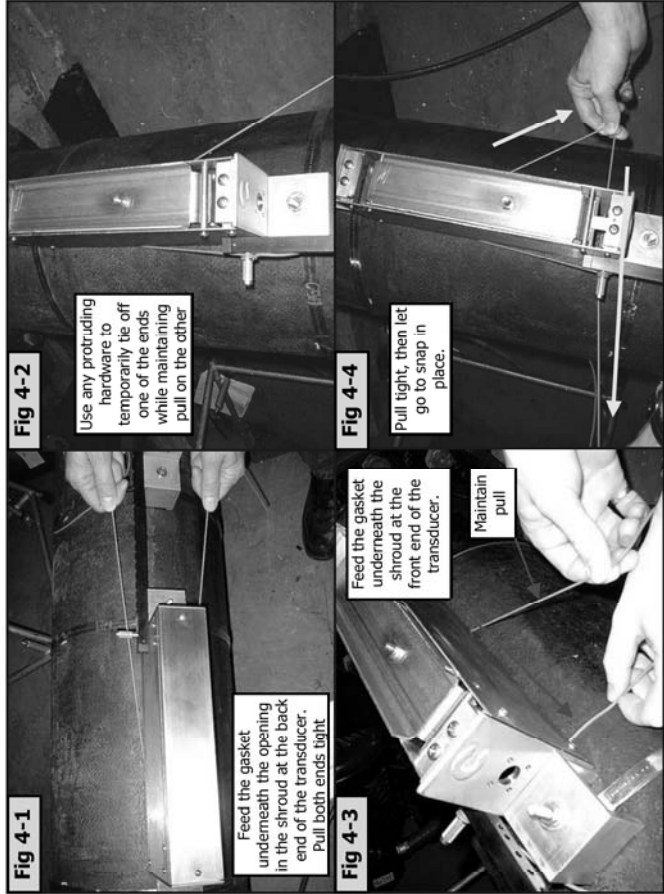
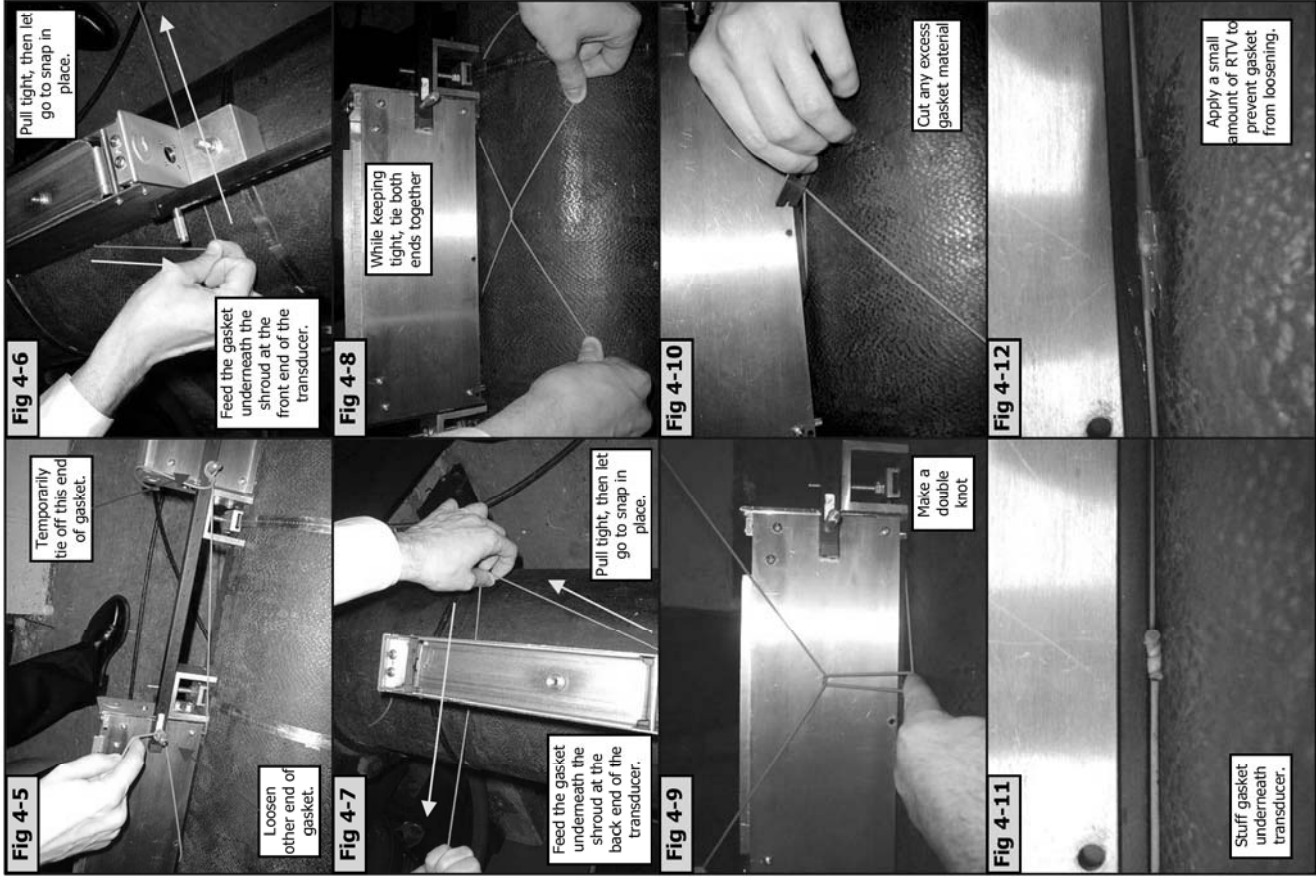
Step 4: Install Gasket Seal. Two people may be required to perform this step.

The procedure below is a recommended process. Any suitable method for achieving a snug inner ring is acceptable.

Follow **Fig's 4-1 to 4-12**. Do not allow any slack to occur in the gasket throughout this step. It must remain tight at all times.

The idea here is to seal the exposed gap between the transducers footprint and the pipe. Wrap the transducer footprint, twice, with the O-ring gasket material provided, then tie to secure in place. The inner layer performs the function of seal. The second outer layer protects and backs up the first.

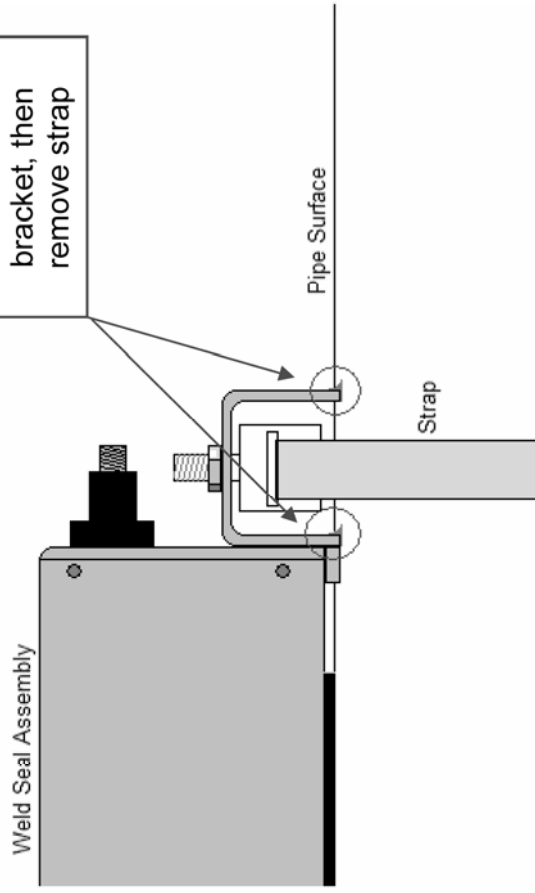
Install the *Housing Covers* and remove the spacer bar to complete this procedure.



This photo shows what a final installation should look like. Only one path is represented here.



Fig 5-1

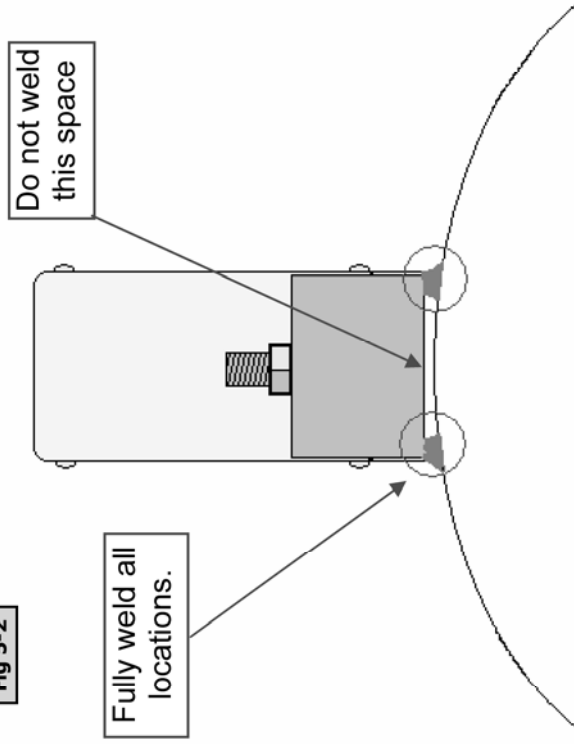


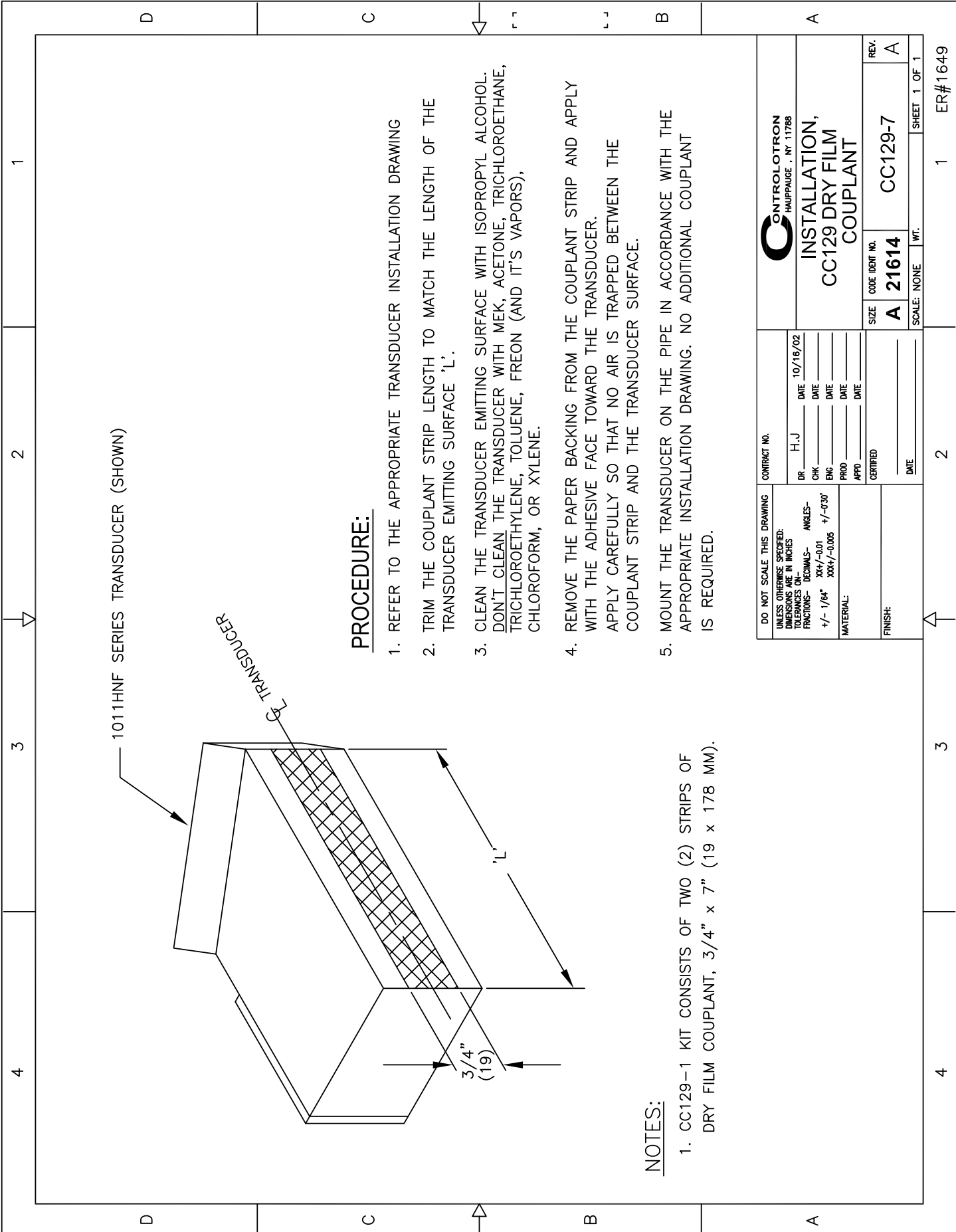
Step 5: (Optional) Weld assembly to pipe. If you desire, you may weld the assembly to the pipe.

- A. While strap is in place, Tack Weld at the outer ends of each bracket as shown in Fig 5-1.
- B. **IMPORTANT:** Do not weld the center of the bracket. The space is necessary for maintaining proper operation.
- C. Remove the straps and fully weld all locations. See Fig 5-2.

Note: Bracket Material is Type 316 Stainless Steel, Suitable for welding to both Stainless Steel and Carbon Steel pipes.

Fig 5-2






PROCEDURE:

1. REFER TO THE APPROPRIATE TRANSDUCER INSTALLATION DRAWING
2. TRIM THE COUPLANT STRIP LENGTH TO MATCH THE LENGTH OF THE TRANSDUCER EMITTING SURFACE 'L'.
3. CLEAN THE TRANSDUCER EMITTING SURFACE WITH ISOPROPYL ALCOHOL. DON'T CLEAN THE TRANSDUCER WITH MEK, ACETONE, TRICHLOROETHANE, TRICHLOROETHYLENE, TOLUENE, FREON (AND IT'S VAPORS), CHLOROFORM, OR XYLENE.
4. REMOVE THE PAPER BACKING FROM THE COUPLANT STRIP AND APPLY WITH THE ADHESIVE FACE TOWARD THE TRANSDUCER. APPLY CAREFULLY SO THAT NO AIR IS TRAPPED BETWEEN THE COUPLANT STRIP AND THE TRANSDUCER SURFACE.
5. MOUNT THE TRANSDUCER ON THE PIPE IN ACCORDANCE WITH THE APPROPRIATE INSTALLATION DRAWING. NO ADDITIONAL COUPLANT IS REQUIRED.

NOTES:

1. CC129-1 KIT CONSISTS OF TWO (2) STRIPS OF DRY FILM COUPLANT, 3/4" x 7" (19 x 178 MM).

DO NOT SCALE THIS DRAWING		CONTRACT NO.		 INSTALLATION, CC129 DRY FILM COUPLANT	
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES		H.I.J			
FRACTIONS- XX/100	DECIMALS- .XX	ANGLES- +/- 0'30"	DR	DATE	REV. A
+/- 1/64"	XXx7-0.01	+/- 0'30"	CHK	DATE	SIZE A
	XXx7-0.005		ENG	DATE	CODE DBIT NO. 21614
			PROD	DATE	SCALE: NONE
MATERIAL:			APPD	DATE	WT.
FINISH:			CERTIFIED		CC129-7
			DATE		SHEET 1 OF 1

STAINLESS STEEL, HASTELLOY "C" & TITANIUM PIPE

Sched.	Size	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	5	6	8	10	12	14	16	18	20	22	24	
5S	O.D.	0.840	1.050	1.315	1.660	1.900	2.375	2.875	3.500	4.000	4.500	5.563	6.625	8.625	10.750	12.750	14.000	16.000	18.000	20.000	22.000	24.000	
	I.D.	0.710	0.920	1.185	1.530	1.770	2.245	2.709	3.334	3.834	4.334	5.345	6.407	8.407	10.482	12.438	13.688	15.670	17.670	19.634	21.624	23.563	
	Wall	0.065	0.065	0.065	0.065	0.065	0.083	0.083	0.083	0.083	0.083	0.109	0.109	0.109	0.134	0.156	0.156	0.165	0.165	0.188	0.188	0.218	
10S	I.D.	0.674	0.884	1.097	1.442	1.682	2.157	2.635	3.260	3.760	4.260	5.295	6.357	8.329	10.420	12.390	13.624	15.624	17.624	19.564	21.564	23.500	
	Wall	0.083	0.083	0.109	0.109	0.109	0.120	0.120	0.120	0.120	0.120	0.134	0.134	0.148	0.165	0.180	0.188	0.188	0.188	0.218	0.218	0.250	
	I.D.	0.622	0.824	1.049	1.380	1.610	2.067	2.469	3.068	3.548	4.026	5.047	6.065	7.981	10.020	12.000							
40S	Wall	0.109	0.113	0.133	0.140	0.145	0.154	0.203	0.216	0.226	0.237	0.258	0.280	0.322	0.365	0.375							
	I.D.	0.546	0.742	0.957	1.278	1.500	1.939	2.323	2.900	3.364	3.826	4.813	5.761	7.625	9.750	11.750	13.000	15.000	17.000	19.000	21.000	23.000	25.000
	Wall	0.147	0.154	0.179	0.191	0.200	0.218	0.276	0.300	0.318	0.337	0.375	0.432	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500
80S	I.D.	0.252	0.434	0.599	0.896	1.100	1.503	1.771	2.300	2.728	3.152	4.063	4.897	6.875	8.750	10.750							
	Wall	0.294	0.308	0.358	0.400	0.436	0.552	0.600	0.636	0.674	0.750	0.864	0.875	1.000	1.000								
	I.D.																						

CARBON STEEL and PVC PIPE

Pipe	Size	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	5	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	42
Stand-ard	O.D.	0.840	1.050	1.315	1.660	1.900	2.375	2.875	3.500	4.000	4.500	5.563	6.625	8.625	10.750	12.750	14.000	16.000	18.000	20.000	22.000	24.000	26.000	28.000	30.000	32.000	34.000	36.000	42.000
Extra Strong (XS)	I.D.	0.622	0.824	1.049	1.380	1.610	2.067	2.469	3.068	3.548	4.026	5.047	6.065	7.981	10.020	12.000	13.250	15.250	17.250	19.250	21.250	23.250	25.250	27.250	29.250	31.250	33.250	35.250	41.250
Sched. 10	Wall	0.109	0.113	0.133	0.140	0.145	0.203	0.216	0.226	0.237	0.258	0.280	0.322	0.365	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375
Sched. 20	I.D.	0.546	0.742	0.957	1.278	1.500	1.939	2.323	2.900	3.364	3.826	4.813	5.761	7.625	9.750	11.750	13.000	15.000	17.000	19.000	21.000	23.000	25.000	27.000	29.000	31.000	33.000	35.000	41.000
Sched. 30	Wall	0.147	0.154	0.179	0.191	0.200	0.218	0.276	0.300	0.318	0.337	0.375	0.432	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500
Sched. 40	I.D.	0.252	0.434	0.599	0.896	1.100	1.503	1.771	2.300	2.728	3.152	4.063	4.897	6.875	8.750	10.750													
Sched. 60	Wall	0.294	0.308	0.358	0.400	0.436	0.552	0.600	0.636	0.674	0.750	0.864	0.875	1.000	1.000														
Sched. 80	I.D.	0.622	0.824	1.049	1.380	1.610	2.067	2.469	3.068	3.548	4.026	5.047	6.065	7.981	10.020	11.938	13.124	15.000	16.876	18.184	20.250	22.626							
Sched. 100	Wall	0.109	0.113	0.133	0.140	0.145	0.203	0.216	0.226	0.237	0.258	0.280	0.322	0.365	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375
Sched. 120	I.D.	0.546	0.742	0.957	1.278	1.500	1.939	2.323	2.900	3.364	3.826	4.813	5.761	7.625	9.564	11.376	12.500	14.314	16.126	17.938	19.750	21.564							
Sched. 140	Wall	0.147	0.154	0.179	0.191	0.200	0.218	0.276	0.300	0.318	0.337	0.375	0.432	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500
Sched. 160	I.D.	0.466	0.614	0.815	1.160	1.338	1.689	2.125	2.624	3.438	4.313	5.189	6.812	8.812	10.812	11.812	12.812	14.438	16.064	17.750	19.314								
	Wall	0.187	0.218	0.250	0.281	0.343	0.375	0.438	0.531	0.625	0.718	0.906	1.125	1.312	1.406	1.593	1.781	1.968	2.125	2.343									

NON-STANDARD CARBON

Size	10	20	24
O.D.	10.750	20.000	24.000
I.D.	10.192	19.375	23.375
Wall	0.279	0.312	0.312

The above sizes are produced by pipe mills but dimensions do not conform to any regular standard or schedule.

- △ These materials are generally available in Schedules 40 and 80 only.
- ◇ Wall Thickness of Schedule 5S & 10S does not permit threading in accordance with the American Standard for Pipe Threads (ASA No. B2.1)
- ⊗ Wall thickness identical with thickness of "Standard Weight" pipe.
- ▲ Wall Thickness identical with thickness of "Extra-Heavy" pipe.
- * These do not conform to American Standard B36. 10.

PIPE WEIGHT FORMULA FOR STEEL PIPE (lbs per foot)
10.68 (D-t), where D=Outside Diameter and t=Wall Thickness



Siemens Industry Inc.
 Industry Automation Division
 Coc Ultrasonic Flow
 Hauppauge, New York 11788 USA
 Web: www.usa.siemens.com

Glossary

Active Memory

Section of RAM allocated for active site parameters (all current values). The flowmeter receives site-specific operating instructions from Active Memory.

Alphanumeric Field

An 8-character data entry field that allows you to specify a Site Name or a Security code.

Arrow Keys

Use the <Up, Down, Left and Right> Arrows to navigate through the Installation Menu in their respective directions. The <Up or Down> Arrows allow you also to scroll through option list items.

Asterisk

Refers to the marker used in the Installation Menu to indicate a current option list selection. When you access an option list, you can move the asterisk with the <Up or Down> Arrows to a new selection, then press <ENT> to select the item.

CLR (Clear) Key

Use the <CLR> key to erase a numeric value or clear a selection from a multiple select option list.

Cursor

This refers to the highlighted text and the arrow cursor that you move via the arrow direction when navigating through menus or menu cells.

Data Entry

Refers to data entered into a menu cell (either numeric or option list selection).

Datalogger Memory

Memory segment that stores data items logged during operation. You can view the Datalogger contents either on-screen or transmit it to an external device via the RS-232 serial port. The amount of Datalogger memory depends on how many sites reside in Site Storage memory.

ENT (Enter) Key

Use the <ENT> key to store a current numeric value or option list item.

Flowmeter

Refers to the flowmeter itself (the transmitter and sensors combined).

Graphic Screen

Refers to the integral display screen.

Initial Makeup

An internal process performed during installation, where the flowmeter acquires its receive signal and enhances other parameters for optimal operation at a site.

In-process Makeup

An internal process where the flowmeter recovers its Initial Makeup parameters after a fault condition interrupts operation.

Installation Menu

The flowmeter's overall menu structure. It allows you to define all aspects of operation for the flowmeter.

Interface m/s

Refers to an alarm function that declares the passage of a liquid or gas interface by a comparison of the relative sonic velocities of the two liquids or two gases.

LAPTOT

Refers to a system function that freezes the Totalizer display, while the Totalizer continues to update its registers.

Local Display

Refers to the transmitter integral display screen.

Menu

Sub-sections of the Installation Menu that allow you to define specific operational functions (e.g., RS-232 Setup).

Menu Cell

A location within a menu where you define either a single numeric value or option list selection that supports the Sub-Menu's function. Certain view-only menu cells show reference data appropriate to the current application.

NEGFLOW

Totalizer mode for negative flow total only.

NETFLOW

Totalizer mode that combines positive and negative flow totals.

NOTOT

System function that disables the internal Totalizer.

Number Index

Computed sensor spacing index based on the estimated sonic velocity measurement. This Index can not be overridden by installer.

Numeric Data

Refers to a value entered into a menu cell. An example would be the pipe outer diameter.

Numeric Entry

Refers to a number you type into menu cell that stores numeric data.

Numeric Keys

Use the Numeric keys to type a numeric value where appropriate.

OpSys ROM

The Read-Only-Memory that stores its basic operating instructions and permanent defaults.

Option List

Lists of options presented at menu cells that allow you to select either a single item or multiple items (depending on the function that the menu cell controls).

Parameters

Refers to value (either numeric or list selection) stored in a menu cell.

POSFLOW

Totalizer mode for positive flow total only.

Register

Refers to a memory location used by the flowmeter to store data such as the flow total, etc.

RTD

Resistive Temperature Device. Temperature sensors used with energy flow of mass flow systems.

Sensor

Refers to entire spool piece in some instances. Flow sensors that the flowmeter uses to measure the flow rate. Also called transducers and abbreviated as Xdcr

Site Name

A user-entered name that the flowmeter associates with a stored Site Setup. You retrieve a particular Site by selecting its name from a site name list.

Site Setup

A collection of parameters used by the flowmeter to service a specific site (or location). The flowmeter allows you to store several independent Site Setups.

Site Storage Memory

Section of RAM allocated for permanent data storage. This memory segment stores inactive site setups (including a backup of active site). The flowmeter's Site Setup storage capacity depends on the dynamic memory allocation as dictated by each application. In addition, the flowmeter uses Site Storage Memory to store configurable operating parameters such as pipe, liquid or gas tables.

Spacing Index

Refers to the Number Index used by the flowmeter to determine the space between the upstream and downstream sensors on clamp-on systems.

Spacing Offset

Fixed sensor offset assigned by the flowmeter. This can be overridden by the installer.

TOTCNT

A Totalizer pulse count function used for Batching or Sampling.

Transducer

Also known as sensor.

Vaer

The flowmeter's aeration percent output.

Vps

The sonic propagation velocity of a pipe.

Vs

The sonic velocity of a liquid or gas.

Index

C

CE marked equipment, 12
CE-mark, 12
Contact person, 10
Customer Support Hotline, 141

D

Decontamination, 142
Device inspection, 9
Digital Damping Control: (Hot Key 1 and 2), 150

F

Flow Profile Compensation, 25
Flowmeter Types, 27

H

Hazardous area safety requirements, 13
History, 10
Hotline, 141

I

Installation
 Safety instructions, 33
Internet
 Contact person, 10, 142
 Flow documentation, 10
 Support, 141
Introduction, 9

L

Lithium batteries
 Safety, 12

M

Maintenance, 141

P

Pipe Mounting, 35
Pressure
 Safety instructions, 33

R

Return procedures, 142

S

Safety instructions
 Installation, 33
Safety notes, 11
Service, 141
SITRANS FUG1010 Transmitters, 21
SmartSlew, 118
Support, 141

T

Time Average, 118
Typical Applications, 23
Typical Industries Serviced, 24

W

Wall Mounting, 35
Wide Beam Transmission, 31

Get more information:

www.siemens.com/flow

Siemens Industry, Inc.
Industry Automation Division
CoC Ultrasonic Flow
Hauppauge, NY 11788
USA

Subject to change without prior notice
Order No.: A5E02951519-02
Printed in the USA
© Siemens AG 02.2011

www.siemens.com/processinstrumentation

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions. Responsibility for suitability and intended use of this instrument rests solely with the user.