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Reference Manual
00809-0100-4664, Rev BA
January 2010

Rosemount 8712

Remote Mount Magnetic Flowmeter System



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Reference Manual
00809-0100-4664, Rev BA
January 2010

Remote Mount Magnetic Flowmeter System

NOTICE

Read this manual before working with the product. For personal and system safety, and for optimum product performance, make sure you thoroughly understand the contents before installing, using, or maintaining this product.

Rosemount Inc. has two toll-free assistance numbers:

Customer Central
Technical support, quoting, and order-related questions.

United States - 1-800-999-9307 (7:00 am to 7:00 pm CST)

Asia Pacific- 65 777 8211

Europe/ Middle East/ Africa - 49 (8153) 9390

North American Response Center
Equipment service needs.

1-800-654-7768 (24 hours—includes Canada)

Outside of these areas, contact your local Emerson Process Management representative.

⚠CAUTION

The products described in this document are NOT designed for nuclear-qualified applications. Using non-nuclear qualified products in applications that require nuclear-qualified hardware or products may cause inaccurate readings.

For information on Rosemount nuclear-qualified products, contact your local Emerson Process Management Sales Representative.

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Section 1 Introduction

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SYSTEM DESCRIPTION

The Rosemount® 8700 Series Magnetic Flowmeter System consists of a sensor and transmitter, and measures volumetric flow rate by detecting the velocity of a conductive liquid that passes through a magnetic field.

There are four Rosemount magnetic flowmeter sensors:

- Flanged Rosemount 8705
- Flanged High-Signal Rosemount 8707
- Wafer-Style Rosemount 8711
- Sanitary Rosemount 8721

There are two Rosemount magnetic flowmeter transmitters:

- Rosemount 8712
- Rosemount 8732

The sensor is installed in-line with process piping — either vertically or horizontally. Coils located on opposite sides of the sensor create a magnetic field. Electrodes located perpendicular to the coils make contact with the process fluid. A conductive liquid moving through the magnetic field generates a voltage at the two electrodes that is proportional to the flow velocity.

The transmitter drives the coils to generate a magnetic field, and electronically conditions the voltage detected by the electrodes to provide a flow signal. The transmitter can be integrally or remotely mounted from the sensor.

This manual is designed to assist in the installation and operation of the Rosemount 8712 Magnetic Flowmeter Transmitter and the Rosemount 8700 Series Magnetic Flowmeter Sensors.

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SAFETY MESSAGES

Procedures and instructions in this manual may require special precautions to ensure the safety of the personnel performing the operations. Refer to the safety messages listed at the beginning of each section before performing any operations.

⚠WARNING

Attempting to install and operate the Rosemount 8705, Rosemount 8707 High-Signal, Rosemount 8711, or Rosemount 8721 Magnetic Sensors with the Rosemount 8712 or Rosemount 8732 Magnetic Flowmeter Transmitter without reviewing the instructions contained in this manual could result in personal injury or equipment damage.

SERVICE SUPPORT

To expedite the return process outside the United States, contact the nearest Rosemount representative.

Within the United States and Canada, call the North American Response Center using the 800-654-RSMT (7768) toll-free number. The Response Center, available 24 hours a day, will assist you with any needed information or materials.

The center will ask for product model and serial numbers, and will provide a Return Material Authorization (RMA) number. The center will also ask for the name of the process material to which the product was last exposed.

⚠ Mishandling products exposed to a hazardous substance may result in death or serious injury. If the product being returned was exposed to a hazardous substance as defined by OSHA, a copy of the required Material Safety Data Sheet (MSDS) for each hazardous substance identified must be included with the returned goods.

The North American Response Center will detail the additional information and procedures necessary to return goods exposed to hazardous substances.

⚠ See “Safety Messages” on page D-1 for complete warning information.

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Section 2 Installation

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This section covers the steps required to physically install the magnetic flowmeter. Instructions and procedures in this section may require special precautions to ensure the safety of the personnel performing the operations. Please refer to the following safety messages before performing any operation in this section.

SAFETY MESSAGES

⚠ This symbol is used throughout this manual to indicate that special attention to warning information is required.

Instructions and procedures in this section may require special precautions to ensure the safety of the personnel performing the operations. Please refer to the following safety messages before performing any operation in this section.

⚠WARNING

Failure to follow these installation guidelines could result in death or serious injury:

Installation and servicing instructions are for use by qualified personnel only. Do not perform any servicing other than that contained in the operating instructions, unless qualified. Verify that the operating environment of the sensor and transmitter is consistent with the appropriate hazardous area approval.

Do not connect a Rosemount 8712 to a non-Rosemount sensor that is located in an explosive atmosphere.

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⚠WARNING

Explosions could result in death or serious injury:

Installation of this transmitter in an explosive environment must be in accordance with the appropriate local, national, and international standards, codes, and practices. Please review the approvals section of the 8712 reference manual for any restrictions associated with a safe installation.

Before connecting a handheld communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.

Electrical shock can result in death or serious injury

Avoid contact with the leads and terminals. High voltage that may be present on leads can cause electrical shock.

⚠WARNING

The sensor liner is vulnerable to handling damage. Never place anything through the sensor for the purpose of lifting or gaining leverage. Liner damage can render the sensor useless.

To avoid possible damage to the sensor liner ends, do not use metallic or spiral-wound gaskets. If frequent removal is anticipated, take precautions to protect the liner ends. Short spool pieces attached to the sensor ends are often used for protection.

Correct flange bolt tightening is crucial for proper sensor operation and life. All bolts must be tightened in the proper sequence to the specified torque limits. Failure to observe these instructions could result in severe damage to the sensor lining and possible sensor replacement.

TRANSMITTER SYMBOLS

Caution symbol — check product documentation for details ⚠

Protective conductor (grounding) terminal ⏚

PRE-INSTALLATION

Before installing the Rosemount 8712 Magnetic Flowmeter Transmitter, there are several pre-installation steps that should be completed to make the installation process easier:

- Identify the options and configurations that apply to your application
- Set the hardware switches if necessary
- Consider mechanical, electrical, and environmental requirements

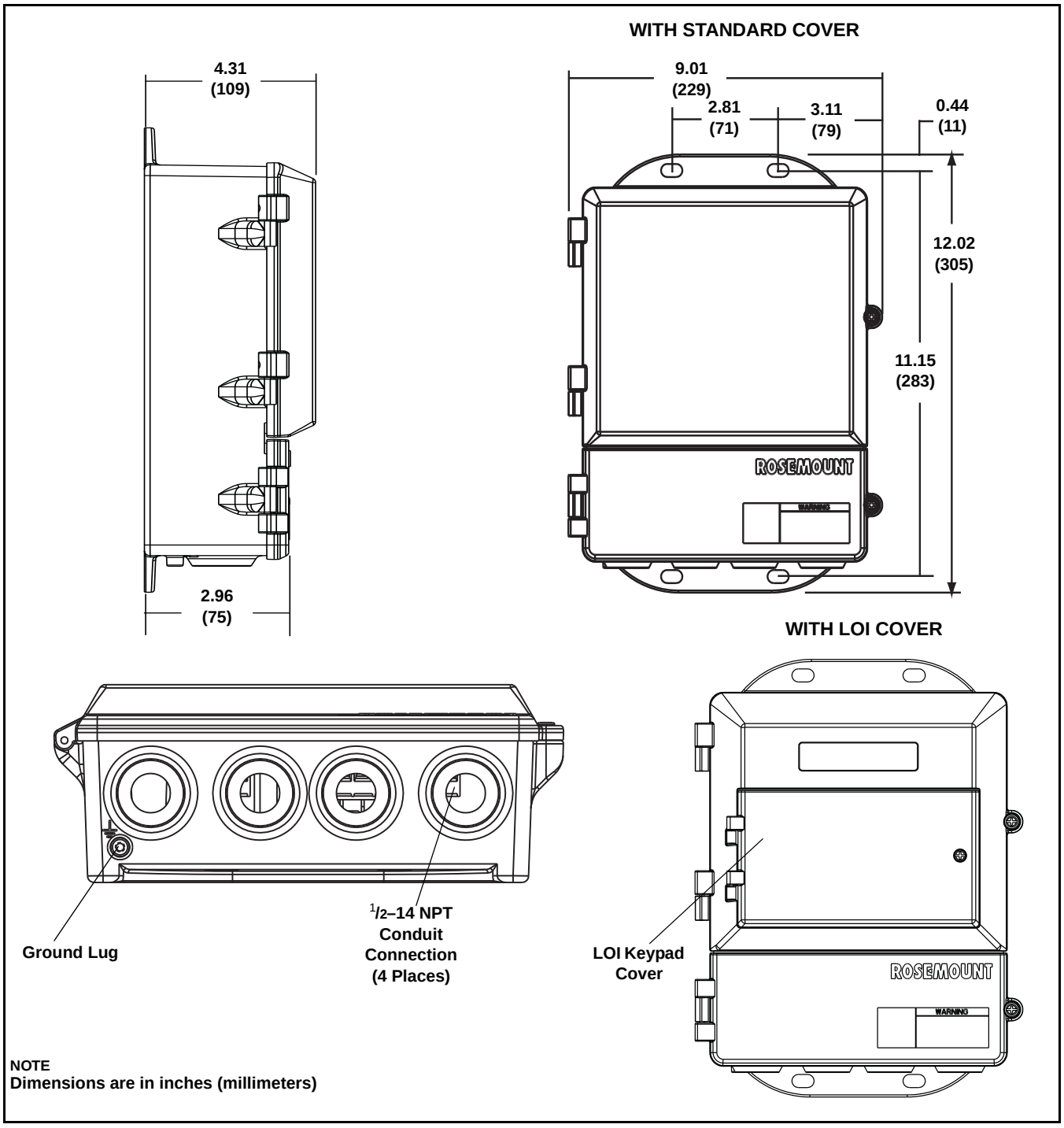
Mechanical Considerations

The mounting site for the Rosemount 8712 transmitter should provide enough room for secure mounting, easy access to conduit ports, full opening of the transmitter covers, and easy readability of the LOI screen (see Figure 2-1). The transmitter should be mounted in a manner that prevents moisture in the conduit from collecting in the transmitter.

The 8712 is mounted separately from the sensor, it is not subject to limitations that might apply to the sensor.

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Figure 2-1. Rosemount 8712
Dimensional Drawing



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Environmental Considerations

To ensure maximum transmitter life, avoid excessive heat and vibration. Typical problem areas:

- high-vibration lines with integrally mounted transmitters
- warm-climate installations in direct sunlight
- outdoor installations in cold climates.

Remote-mounted transmitters may be installed in the control room to protect the electronics from the harsh environment and provides easy access for configuration or service.

Rosemount 8712 transmitters require external power and there must be access to a suitable power source.

INSTALLATION PROCEDURES

Rosemount 8712 installation includes both detailed mechanical and electrical installation procedures.

Mount the Transmitter

At a remote site the transmitter may be mounted on a pipe up to two inches in diameter or against a flat surface.

Pipe Mounting

To mount the transmitter on a pipe:

1. Attach the mounting plate to the pipe using the mounting hardware.
2. Attach the 8712 to the mounting plate using the mounting screws.

Surface Mounting

To surface mount the transmitter:

1. Attach the 8712 to the mounting location using the mounting screws.

Identify Options and Configurations

The standard application of the 8712 includes a 4–20 mA output and control of the sensor coils. Other applications may require one or more of the following configurations or options:

- Multidrop Communications
- PZR (Positive Zero Return)
- Auxiliary Output
- Pulse Output

Additional options may apply. Be sure to identify those options and configurations that apply to your situation, and keep a list of them nearby for consideration during the installation and configuration procedures.

Hardware Switches

The 8712 electronics board is equipped with three user-selectable hardware switches. These switches set the Failure Alarm Mode, Internal/External Analog Power, and Transmitter Security. The standard configuration for these switches when shipped from the factory are as follows:

Failure Alarm Mode:	HIGH
Internal/External Analog Power:	INTERNAL
Transmitter Security:	OFF

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Changing Hardware Switch Settings

In most cases, it is not necessary to change the setting of the hardware switches. If you need to change the switch settings, complete the steps outlined in the manual.

Definitions of these switches and their functions are provided below. If you determine that the settings must be changed, see below.

Failure Alarm Mode

If the 8712 experiences a catastrophic failure in the electronics, the current output can be driven high (23.25 mA) or low (3.75 mA). The switch is set in the *HIGH* (23.25 mA) position when it is shipped from the factory.

Internal/External Analog Power

The Rosemount 8712 4–20 mA loop may be powered internally or by an external power supply. The internal/external power supply switch determines the source of the 4–20 mA loop power. Transmitters are shipped from the factory with the switch set in the *INTERNAL* position.

The external power option is required for multidrop configurations. A 10–30 V DC external supply is required and the 4-20mA power switch must be set to “EXT” position. For further information on 4–20 mA external power, see Connect 4–20 mA Loop External Power Source on page 2-9.

Transmitter Security

The security switch on the 8712 allows the user to lock out any configuration changes attempted on the transmitter. No changes to the configuration are allowed when the switch is in the *ON* position. The flow rate indication and totalizer functions remain active at all times.

With the switch in the *ON* position, you may still access and review any of the operating parameters and scroll through the available choices, but no actual data changes are allowed. Transmitter security is set in the *OFF* position when shipped from factory.

Changing Hardware Switch Settings

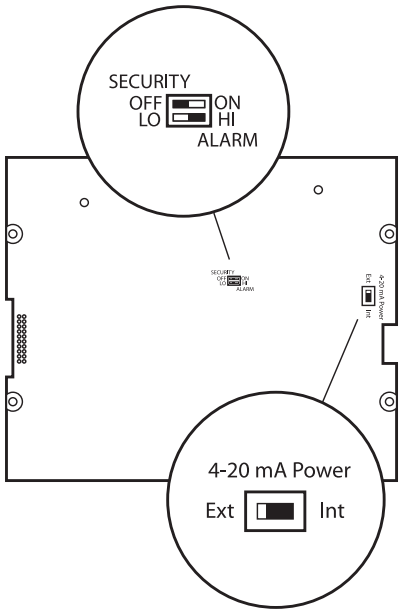
In most cases, it is not necessary to change the setting of the hardware switches. If you need to change the switch settings, complete the steps below:

NOTE
The hardware switches are located on the non-component side of the electronics board and changing their settings requires opening the electronics housing. If possible, carry out these procedures away from the plant environment in order to protect the electronics.

1. Disconnect power to the transmitter.
2. Loosen the housing door screw and open the housing door.
3. Identify the location of each switch (see Figure 2-2).
4. Change the setting of the desired switches with a small screwdriver.
5. Close the housing door and tighten the housing door screw.

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Figure 2-2. Rosemount 8712 Electronics Board and Hardware Switches



Conduit Ports and Connections

Both the sensor and transmitter junction boxes have ports for 1/2-in. NPT conduit connections. These connections should be made in accordance with local or plant electrical codes. Unused ports should be sealed with metal plugs. Proper electrical installation is necessary to prevent errors due to electrical noise and interference. Separate conduits are not necessary for the two cables, but a dedicated conduit line between each transmitter and sensor is required. Shielded cable must be used for best results in electrically noisy environments.

Example 1: Installing flanged sensors into an IP68 area. Sensors must be installed with IP68 cable glands and cable to maintain IP68 rating. Unused conduit connections must be properly sealed to prevent water ingress. For added protection, dielectric gel can be used to pot the sensor terminal block.

Example 2: Installing flowmeters into explosion proof/flameproof areas. Conduit connections and conduit must be rated for use in the hazardous area to maintain flowmeter approval rating.

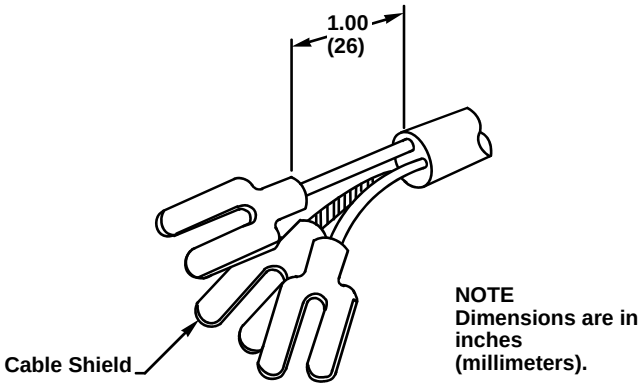
Conduit Cables

Run the appropriate size cable through the conduit connections in your magnetic flowmeter system. Run the power cable from the power source to the transmitter. Run the coil drive and electrode cables between the flowmeter and transmitter. Refer to Electrical Considerations for wire type. Prepare the ends of the coil drive and electrode cables as shown in Figure 2-3. Limit the unshielded wire length to 1-inch on both the electrode and coil drive cables. Excessive lead length or failure to connect cable shields can create electrical noise resulting in unstable meter readings.

- Installed signal wiring should not be run together and should not be in the same cable tray as AC or DC power wiring.
- Device must be properly grounded or earthed according to local electric codes.
- Rosemount combination cable model number 08712-0752-0001 (ft) or 08712-0752-0003 (m) is required to be used to meet EMC requirements.

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Figure 2-3. Cable Preparation Detail



Electrical Considerations

Before making any electrical connections to the Rosemount 8712, consider the following standards and be sure to have the proper power supply, conduit, and other accessories.

Transmitter Input Power

The 8712 transmitter is designed to be powered by 90-250 V AC, 50–60 Hz or 12–42 V DC. The eight digit in the transmitter model number designates the appropriate power supply requirement.

Model Number	Power Supply Requirement
2	12-42 V DC
1	90-250 V AC

Supply Wire Temperature Rating

Use 12 to 18 AWG wire. For connections in ambient temperatures exceeding 140 °F (60 °C), use wire rated to at least 194 °F (90 °C).

Disconnects

Connect the device through an external disconnect or circuit breaker. Clearly label the disconnect or circuit breaker and locate it near the transmitter.

Requirements for 90-250 V AC Power Supply

Wire the transmitter according to local electrical requirements for the supply voltage. In addition, follow the supply wire and disconnect requirements on page 2-9.

Requirements for 12-42 V DC Power Supply

Units powered with 12-42 V DC may draw up to 1 amp of current. As a result, the input power wire must meet certain gauge requirements.

Figure 2-4 shows the surge current for each corresponding supply voltage. For combinations not shown, you can calculate the maximum distance given the supply current, the voltage of the source, and the minimum start-up voltage of the transmitter, 12 V DC, using the following equation:

$$\text{Maximum Resistance} = \frac{\text{Supply Voltage} - 12\text{VDC}}{1 \text{ amp}}$$

Use Table 2-1 and Table 2-2 to determine the maximum wire length allowable for your power supply and maximum resistance.

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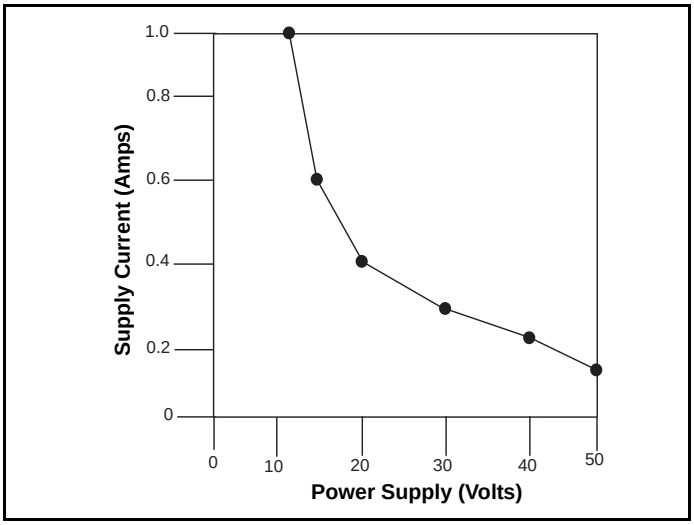
Table 2-1. Length of Annealed Copper (cu) Wires

Types of Power Supply Wires		Maximum Length of the Wire for Each Corresponding Power Supply Source			
Wire Gauge	**Annealed Cu milliohms/ft (milliohms/m)**	**42 V DC Supply ft (m)**	**30 V DC Supply ft (m)**	**20 V DC Supply ft (m)**	**12.5 V DC Supply ft (m)**
20	0.01015 (0.033292)	1478 (451)	887 (270)	394 (120)	25 (8)
18	0.006385 (0.020943)	2349 (716)	1410 (430)	626 (191)	39 (12)
16	0.004016 (0.013172)	3735 (1139)	2241 (683)	996 (304)	62 (19)
14	0.002525 (0.008282)	5941 (1811)	3564 (1087)	1584 (483)	99 (30)
12	0.001588 (0.005209)	9446 (2880)	5668 (1728)	2519 (768)	157 (48)
10	0.000999 (0.003277)	15015 (4578)	9009 (2747)	4004 (1221)	250 (76)

Table 2-2. Length of Hand-drawn Copper (cu) Wires

Types of Power Supply Wires		Maximum Length of the Wire for Each Corresponding Power Supply Source			
Wire Gauge	**Annealed Cu milliohms/ft (milliohms/m)**	**42 V DC Supply ft (m)**	**30 V DC Supply ft (m)**	**20 V DC Supply ft (m)**	**12.5 V DC Supply ft (m)**
18	0.00664 (0.021779)	2259 (689)	1355 (413)	602 (184)	38 (11)
16	0.004176 (0.013697)	3592 (1095)	2155 (657)	958 (292)	60 (18)
14	0.002626 (0.008613)	5712 (1741)	3427 (1045)	1523 (464)	95 (29)
12	0.001652 (0.005419)	9080 (2768)	5448 (1661)	2421 (738)	151 (46)
10	0.01039 (0.003408)	14437 (4402)	8662 (2641)	3850 (1174)	241 (73)

Figure 2-4. Supply Current versus Input Voltage



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Installation Category

The installation category for the Rosemount 8712 is (Overvoltage) Category II.

Overcurrent Protection

The Rosemount 8712 Flowmeter Transmitter requires overcurrent protection of the supply lines. Maximum ratings of overcurrent devices are as follows:

Power System	Fuse Rating	Manufacturer
90–250 V AC	2 Amp, Quick Acting	Bussman AGCI or Equivalent
12-42 V DC	3 Amp, Quick Acting	Bussman AGC3 or Equivalent

OPTIONS, CONSIDERATIONS, AND PROCEDURES

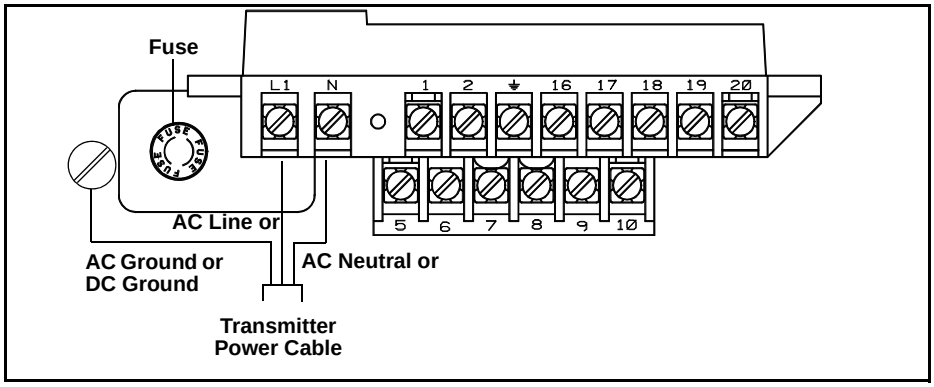
If the application of the 8712 includes the use of options such as multidrop communications, auxiliary output control, or pulse output, certain requirements may apply in addition to those previously listed. Be prepared to meet these requirements before attempting to install and operate the Rosemount 8712.

Connect Transmitter Power

To connect power to the transmitter, complete the following steps.

1. Ensure that the power source and connecting cable meet the requirements outlined on page 2-8.
2. Turn off the power source.
3. Open the power terminal cover.
4. Run the power cable through the conduit to the transmitter.
5. Loosen the terminal guard for terminals L1 and N.
6. Connect the power cable leads as shown in Figure 2-5.
   a. Connect AC Neutral or DC- to terminal N.
   b. Connect AC Line or DC+ to terminal L1.
   c. Connect AC Ground or DC Ground to the ground screw mounted on the transmitter enclosure.

Figure 2-5. Transmitter Power Connections



Connect 4–20 mA Loop External Power Source

The 4–20 mA output loop provides the process variable output from the transmitter. Its signal may be powered internally or externally. The default position of the internal/external analog power switch is in the *internal* position. The user-selectable power switch is located on the electronics board.

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Internal
The 4–20 mA analog power loop may be powered from the transmitter itself. Resistance in the loop must be 1,000 ohms or less. If a Handheld Communicator or control system will be used, it must be connected across a minimum of 250 ohms resistance in the loop.

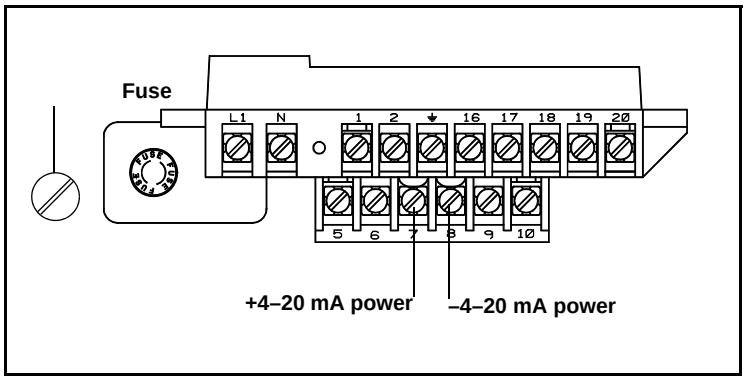
External
HART multidrop installations require a 10–30 V DC external power source (see Multidrop Communications on page 3-16). If a Handheld Communicator or control system is to be used, it must be connected across a minimum of 250 ohms resistance in the loop.

To connect external power to the 4–20 mA loop, complete the following steps.

1. Ensure that the power source and connecting cable meet the requirements outlined above and in Electrical Considerations on page 2-7.
2. Turn off the transmitter and analog power sources.
3. Run the power cable into the transmitter.
4. Connect –DC to Terminal 8.
5. Connect +DC to Terminal 7.

Refer to Figure 2-6 on page 2-10.

Figure 2-6. 4–20 mA Loop Power Connections



Connect Pulse Output Power Source

The pulse output function provides an isolated switch-closure frequency signal that is proportional to the flow through the sensor. The signal is typically used in conjunction with an external totalizer or control system. The following requirements apply:

Supply Voltage: 5 to 24 V DC

Load Resistance: 1,000 to 100 k ohms (typical ≈ 5 k)

Pulse Duration: 1.5 to 500 msec (adjustable), 50% duty cycle below 1.5 msec

Maximum Power: 2.0 watts up to 4,000 Hz and 0.1 watts at 10,000 Hz

Switch Closure: solid state switch

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The pulse output option requires an external power source. Complete the following steps to connect an external power supply.

1. Ensure that the power source and connecting cable meet the requirements outlined previously.
2. Turn off the transmitter and pulse output power sources.
3. Run the power cable to the transmitter.
4. Connect –DC to terminal 6.
5. Connect +DC to terminal 5.

Refer to Figure 2-7 and Figure 2-8.

Figure 2-7. Connecting to a Electromechanical Totalizer/Counter

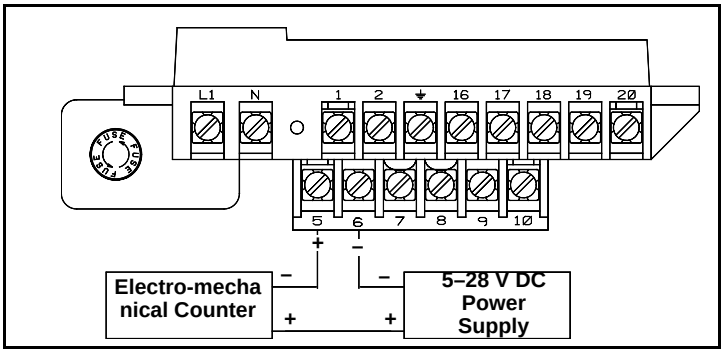
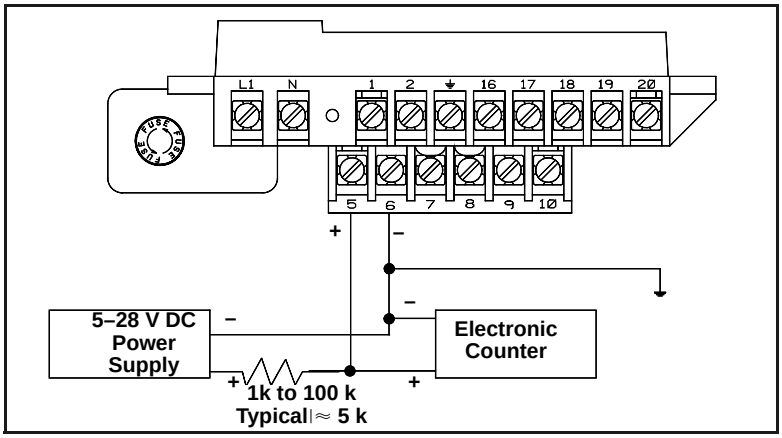


Figure 2-8. Connecting to a Electronic Totalizer/Counter without Integral Power Supply



Connect Auxiliary Channel 1

Auxiliary channel 1 can be configured as either a digital input or a digital output. When configured as an input, the following requirements apply:

Supply Voltage:	5 to 28V DC
Maximum Power:	2 watts
Switch Closure:	optically isolated solid state switch
Maximum Impedance	2.5 k Ω

When using channel 1 as a digital input, the power source and the control relay must be connected to the transmitter. See Figure 2-9 for more details on this connection.

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When configured as an output, the following requirements apply:

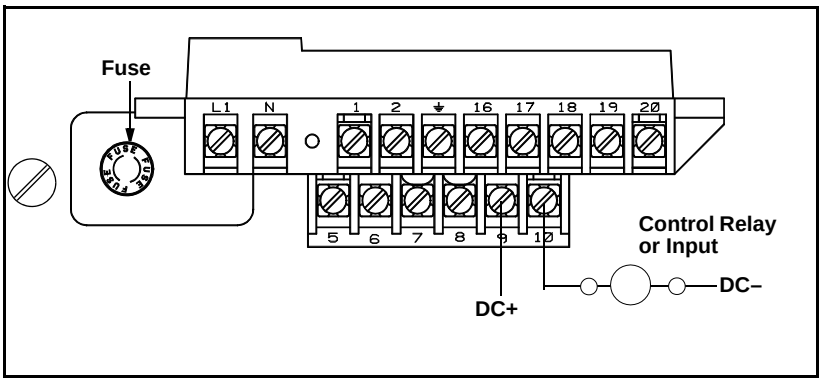
Supply Voltage:	5 to 28V DC
Maximum Power:	2 watts
Switch Closure:	optically isolated solid state switch

When using channel 1 as a digital output, the power source must be connected to the transmitter. See Figure 2-10 for more details on this connection.

When connecting power to channel 1, complete the following steps:

1. Ensure that the power source and connecting cable meet the requirements outlined previously.
2. Turn off the transmitter and auxiliary power sources.
3. Run the power cable to the transmitter.
4. Connect –DC to terminal 10.
5. Connect +DC to terminal 9.

Figure 2-9. Connect Digital Input 1 to Relay or Input to Control System



Connect Auxiliary Channel 2

Auxiliary channel 2 is configured to provide a digital output based on the configuration parameters set in the transmitter.

The following requirements apply to this channel:

Supply Voltage:	5 to 28V DC
Maximum Power:	2 watts
Switch Closure:	optically isolated solid state switch

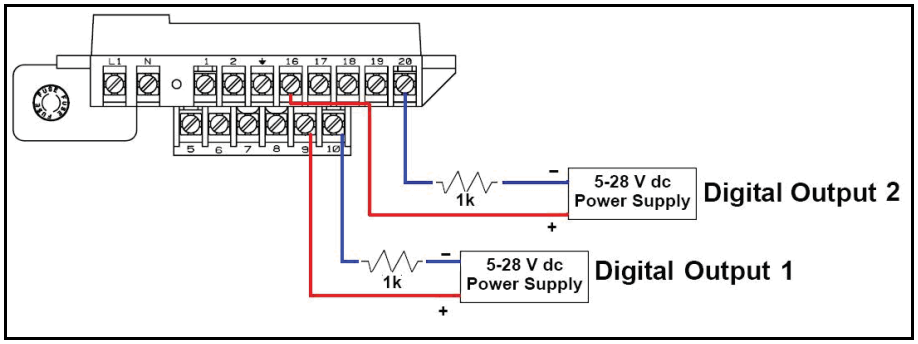
When connecting power to channel 2, complete the following steps:

1. Ensure that the power source and connecting cable meet the requirements outlined previously.
2. Turn off the transmitter and auxiliary power sources.
3. Run the power cable to the transmitter.
4. Connect –DC to terminal 20.
5. Connect +DC to terminal 16.

See Figure 2-10 for more details on this connection.

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Figure 2-10. Connecting Digital Outputs



SENSOR CONNECTIONS

This section covers the steps required to physically install the transmitter including wiring and calibration.

Rosemount Sensors

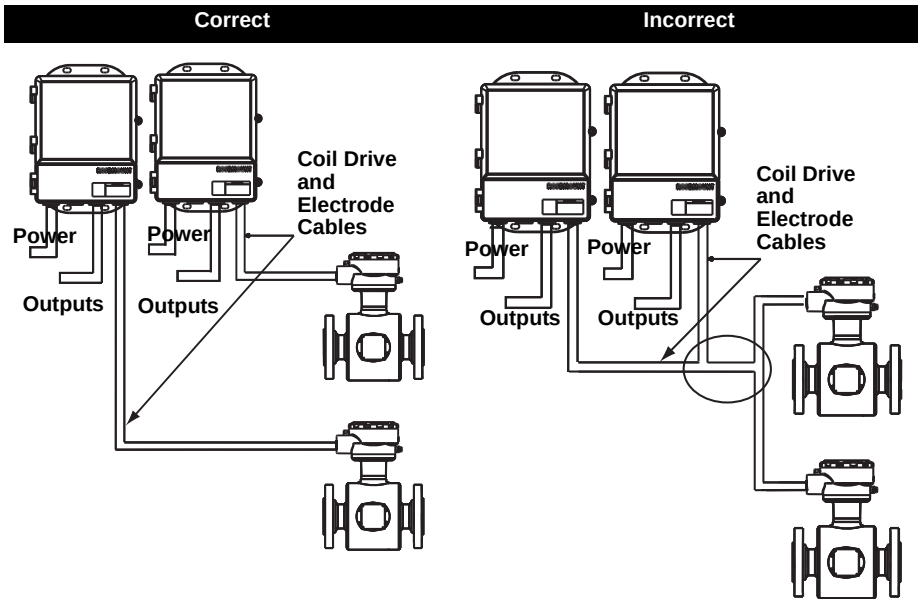
To connect the transmitter to a non-Rosemount sensor, refer to the appropriate wiring diagram in Appendix D: Wiring Diagrams. The calibration procedure listed is not required for use with Rosemount sensors.

Transmitter to Sensor Wiring

Flanged and wafer sensors have two conduit ports as shown in Figures 4-13, 4-14, 4-15, and 4-16. Either one may be used for both the coil drive and electrode cables. Use the stainless steel plug that is provided to seal the unused conduit port.

A single dedicated conduit run for the coil drive and electrode cables is needed between a sensor and a remote transmitter. Bundled cables in a single conduit are likely to create interference and noise problems in your system. Use one set of cables per conduit run. See Figure 2-11 for proper conduit installation diagram and Table 2-3 for recommended cable. For integral and remote wiring diagrams refer to Figure 2-13.

Figure 2-11. Conduit Preparation



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Table 2-3. Cable Requirements

Description	Units	Part Number
Signal Cable (20 AWG) Belden 8762, Alpha 2411 equivalent	ft m	08712-0061-0001 08712-0061-0003
Coil Drive Cable (14 AWG) Belden 8720, Alpha 2442 equivalent	ft m	08712-0060-0001 08712-0060-0003
Combination Signal and Coil Drive Cable (18 AWG)(1)	ft m	08712-0752-0001 08712-0752-0003

(1) Combination signal and coil drive cable is not recommended for high-signal magmeter system. For remote mount installations, combination signal and coil drive cable should be limited to less than 300 ft. (100 m).

Rosemount recommends using the combination signal and coil drive for N5, E5 approved sensors for optimum performance.

Remote transmitter installations require equal lengths of signal and coil drive cables. Integrally mounted transmitters are factory wired and do not require interconnecting cables.

Lengths from 5 to 1,000 feet (1.5 to 300 meters) may be specified, and will be shipped with the sensor.

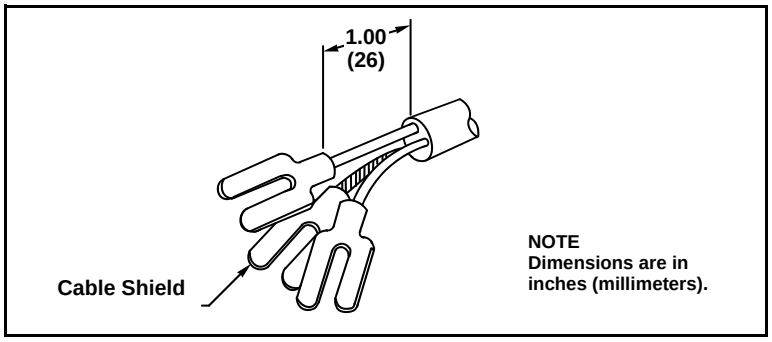
Conduit Cables

Run the appropriate size cable through the conduit connections in your magnetic flowmeter system. Run the power cable from the power source to the transmitter. Run the coil drive and electrode cables between the flowmeter and transmitter.

Prepare the ends of the coil drive and electrode cables as shown in Figure 2-12. Limit the unshielded wire length to 1-inch on both the electrode and coil drive cables.

NOTE
Excessive lead length or failure to connect cable shields can create electrical noise resulting in unstable meter readings.

Figure 2-12. Cable Preparation Detail



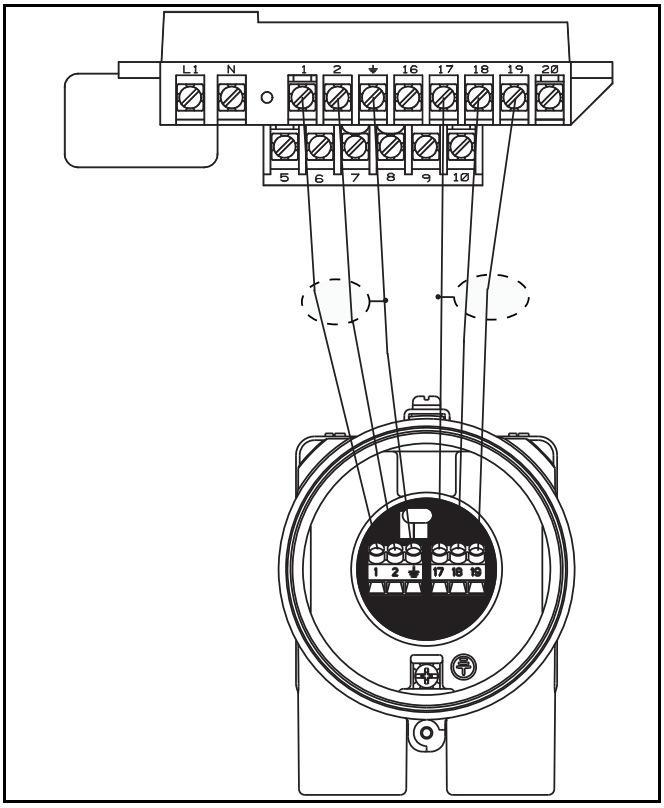
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Sensor to Remote Mount Transmitter Connections

Connect coil drive and electrode cables as shown in Figure 2-13.

Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter, or replacement of the electronics board will be necessary.

Figure 2-13. Wiring Diagram



Rosemount 8712 Transmitter	Rosemount 8705/8707/8711/8721 sensors
1	1
2	2
⏚	⏚
17	17
18	18
19	19

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Section 3 Configuration

Introduction . . . . . **page 3-1**
Installation Check and Guide . . . . . **page 3-1**
Basic Features . . . . . **page 3-3**
LOI Examples . . . . . **page 3-4**
Diagnostic Messages . . . . . **page 3-6**
Process Variables . . . . . **page 3-6**
Basic Setup . . . . . **page 3-8**

INTRODUCTION

This section covers basic operation, software functionality, and configuration procedures for the Rosemount 8712 Magnetic Flowmeter Transmitter. For information on connecting another manufacturer's sensor, refer to "Universal Sensor Wiring Diagrams" on page E-1.

The Rosemount 8712 features a full range of software functions for configuration of output from the transmitter. Software functions are accessed through the LOI, AMS, a Handheld Communicator, or a control system. Configuration variables may be changed at any time and specific instructions are provided through on-screen instructions.

Table 3-1. Parameters

Basic Set-up Parameters	Page
Review	page 3-6
Process Variables	page 3-6
Basic Setup	page 3-8
Flow Units	page 3-8
Range Values	page 3-11
PV Sensor Calibration Number	page 3-12
Totalizer Setup	page 3-7

INSTALLATION CHECK AND GUIDE

Use this guide to check new installations of Rosemount magnetic flowmeter systems that appear to malfunction.

Before You Begin

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Transmitter

Apply power to your system before making the following transmitter checks.

1. Verify that the correct sensor calibration number is entered in the transmitter. The calibration number is listed on the sensor nameplate.
2. Verify that the correct sensor line size is entered in the transmitter. The line size value is listed on the sensor nameplate.
3. Verify that the analog range of the transmitter matches the analog range in the control system.
4. Verify that the forced analog output of the transmitter produces the correct output at the control system.

Sensor

Be sure that power to your system is removed before beginning sensor checks.

1. **For horizontal flow installations**, ensure that the electrodes remain covered by process fluid.

   For vertical or inclined installations, ensure that the process fluid is flowing up into the sensor to keep the electrodes covered by process fluid.
2. Ensure that the grounding straps on the sensor are connected to grounding rings, lining protectors, or the adjacent pipe flanges. Improper grounding will cause erratic operation of the system.

Wiring

1. The signal wire and coil drive wire must be twisted shielded cable. Emerson Process Management, Rosemount division. recommends 20 AWG twisted shielded cable for the electrodes and 14 AWG twisted shielded cable for the coils.
2. The cable shield must be connected at both ends of the electrode and coil drive cables. Connection of the shield at both ends is absolutely necessary for proper operation.
3. The signal and coil drive wires must be separate cables, unless Emerson Process Management specified combo cable is used.
4. The single conduit that houses both the signal and coil drive cables should not contain any other wires.

Process Fluid

1. The process fluid conductivity should be 5 microsiemens (5 micro mhos) per centimeter minimum.
2. The process fluid must be free of air and gasses.
3. The sensor should be full of process fluid.

Refer to Section 6 "Maintenance and Troubleshooting" for further information.

LOCAL OPERATOR INTERFACE

The optional Local Operator Interface (LOI) provides an operator communications center for the 8712. By using the LOI, the operator can access any transmitter function for changing configuration parameter settings, checking totalized values, or other functions. The LOI is integral to the transmitter housing.

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BASIC FEATURES

The basic features of the LOI include display control, totalizer, data entry, and transmitter parameters. These features provide control of all transmitter functions, see Figure 3-1.

Display Control Keys

The display control keys provide control over the variable displayed on the LOI screen. Push **FLOW RATE** to display the process variable, or push **TOTALIZE** to display the totalized value.

Totalizer Keys

The totalizer keys enable you to start, stop, read, and reset the totalizer.

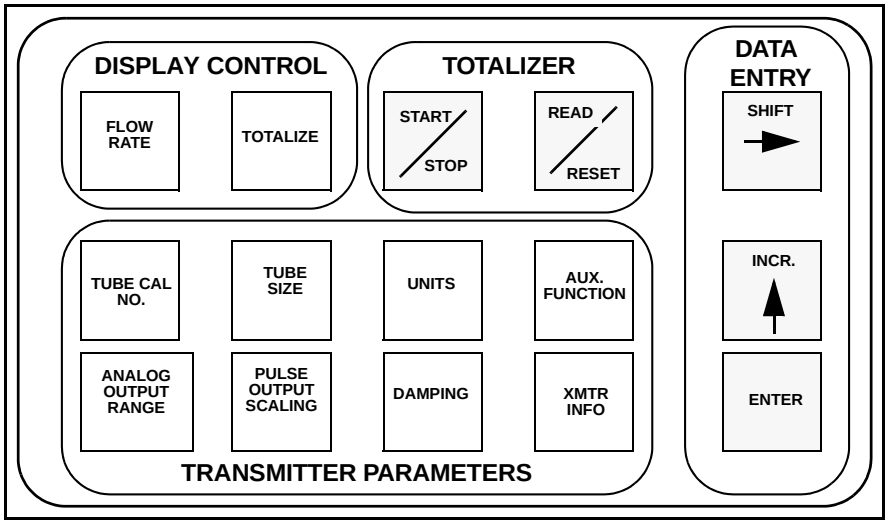
Data Entry Keys

The data entry keys enable you to move the display cursor, incrementally increase the value, or enter the selected value.

Transmitter Parameter Keys

The transmitter parameter keys provide direct access to the most common transmitter parameters and stepped access to the advanced functions of the 8712 through the **AUX. FUNCTION** key.

Figure 3-1. Local Operator Interface Keypad



Data Entry

The LOI keypad does not have numerical keys. Numerical data is entered by the following procedure.

1. Access the appropriate function.
2. Use **SHIFT** to highlight the digit you want to enter or change.
3. Use **INCR.** to change the highlighted value. For numerical data, **INCR.** toggle through the digits **0–9**, **decimal point,** and **dash**. For alphabetical data, toggle through the letters of the alphabet **A–Z**, digits **0–9**, and the symbols l,**&, +, -, *, /, $,** @,**%,** and the **blank space**. (**INCR.** is also used to toggle through pre-determined choices that do not require data entry.)
4. Use **SHIFT** to highlight other digits you want to change and change them.
5. Press **ENTER**.

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Selecting Options

To select pre-defined software options on the LOI, use the following procedure:

1. Access the appropriate option.
2. Use **SHIFT** or **INCR.** to toggle between the applicable choices.
3. Press **ENTER** when the desired choice is displayed on the screen.

LOI EXAMPLES

Use the TRANSMITTER PARAMETER keys shown in Figure 3-1 to change the parameters, which are set in one of two ways, table values or select values.

Table Values:
Parameters such as units, that are available from a predefined list

Select Values:
Parameters that consist of a user-created number or character string, such as calibration number; values are entered one character at a time using the data entry keys

Table Value Example

Setting the sensor line size:

1. Press **TUBE SIZE**.
2. Press **SHIFT** or **INCR.** to increase (incrementally) the size to the next value.
3. When you reach the desired size, press **ENTER**.
4. Set the loop to manual if necessary, and press **ENTER** again.

After a moment, the LCD will display the new tube size and the maximum flow rate.

Select Value Example

Changing the ANALOG OUTPUT RANGE:

1. Press **ANALOG OUTPUT RANGE**.
2. Press **SHIFT** to position the cursor.
3. Press **INCR.** to set the number.
4. Repeat steps 2 and 3 until desired number is displayed.
5. Press **ENTER**.

After a moment, the LCD will display the new analog output range.

Table 3-2. LOI Data Entry Keys and Functions

Data Entry Keys	Function Performed
Shift	• Moves the blinking cursor on the display one character to the right • Scrolls through available values
Increment	• Increments the character over the cursor by one • Steps through all the digits, letters, and symbols that are applicable to the present operation • Scrolls through available values
Enter	Stores the displayed value previously selected with the SHIFT and INCR. keys
Display Control Keys	Function Performed
Flow Rate	Displays the user-selected parameters for flow indication
Totalize	Displays the present totalized output of the transmitter, and activates the Totalizer group of keys The choices, **Forward** and **Reverse** totals or **Net** and **Gross** totals, are selected in Auxiliary Functions
Start/Stop	Starts the totalizing display if it is stopped, and stops the display if it is running
Read/Reset	Resets the net totalizing display to zero if it is stopped, and halts the display if the display is running

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Table 3-2. LOI Data Entry Keys and Functions

Transmitter Parameters Keys	Function Performed	
Tube Cal No.	Identifies the calibration number when using Rosemount sensors, or other manufacturers' sensors calibrated at the Rosemount factory	
Tube Size	Specifies the sensor size and identifies the corresponding maximum flow (0.1 - through 80-inch line sizes)	
Units	Specifies the desired units: Gal/Min Liters/Min ImpGal/Min CuMeter/Hr Ft/Sec Meters/Sec Special (user defined) For a complete list of available units, see Table 3-3 on page 3-9	
Auxiliary Functions	Function Run 8714i Operating Mode Coil Pulse Mode Flow rate Display Totalizer Display Totalizer Units Signal Processing Special Units Process Density DI/DO 1 Config Digital Output 2 Flow Limit 1 Flow Limit 2 Totalizer Limit Diagnostic Status Alert Reverse Flow Enable Licensed Options License Key Diagnostics Enable 8714i Setup Re-signature Sensor Recall Last Signature Empty Pipe Universal Auto Trim Low Flow Cutoff Pulse Width Analog Output Zero Analog Output Test Pulse Output Test Transmitter Test 4–20 mA Output Trim Auto Zero Electronics Trim	Options Runs the meter verification diagnostic Normal or Filter 5 or 37 Hz Flow–% Span, Flow–Totalize, %Span–Totalize Forward–Reverse or Net–Gross Configure the totalizer units of measure On/Off Volume units, base volume units, conversion, time base, rate units Required for units of mass flow Configure Auxiliary Channel 1 Configure Auxiliary Channel 2 Configure Flow Limit 1 Alert Configure Flow Limit 2 Alert Configure Totalizer Limit Alert Configure Diagnostic Status Alert Reverse Flow/Zero Flow On/Off Field license advanced functionality Turn diagnostics On/Off Configure test criteria parameters Base line sensor characteristics Recall previous signature values Configure empty pipe diagnostic parameters In-process Sensor Calibration 0.01 ft/s to 1 ft/s Pulse Width 4 mA Value Analog Output Loop Test Pulse Output Loop Test Test the Transmitter Adjust the 4–20 mA Output Zero Sensor for 37 Hz Coil Drive Operation Transmitter Calibration
Analog Output Range	Sets the desired 20 mA point – **must set the sensor size first**	
Pulse Output Scaling	Sets one pulse to a selectable number of volume units – **must set the sensor size first**	
Damping	Sets response time (single pole time constant), in seconds, to a step change in flow rate	
Transmitter Information	Allows you to view and change useful information about the transmitter and sensor	
Empty Pipe Tuning	Allowable range 3.0 - 2000.0	

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DIAGNOSTIC MESSAGES

The following error messages may appear on the LOI screen. See “Maintenance and Troubleshooting” on page 6-1 for potential causes and corrective actions for these errors:

- Electronics Failure
- Coil open circuit
- Digital trim failure
- Auto zero failure
- Auto trim failure
- Flow rate >42 ft/sec
- Analog out of range
- PZR activated
- Empty pipe
- Reverse flow
- Reverse flow indicator
  (A flashing letter “R” on the LOI indicates a reverse flow)
- Totalizer indicator
  (A flashing letter “T” on the LOI indicates to totalizer is activated)

Review

Fast Keys	1, 5

The 8712 includes a capability that enables you to review the configuration variable settings.

The flowmeter configuration parameters set at the factory should be reviewed to ensure accuracy and compatibility with your particular application of the flowmeter.

NOTE
If you are using the LOI to review variables, each variable must be accessed as if you were going to change its setting. The value displayed on the LOI screen is the configured value of the variable.

PROCESS VARIABLES

Fast Keys	1, 1

The *process variables* measure flow in several ways that reflect your needs and the configuration of your flowmeter. When commissioning a flowmeter, review each process variable, its function and output, and take corrective action if necessary before using the flowmeter in a process application

Process Variable (PV) – The actual measured flow rate in the line. Use the Process Variable Units function to select the units for your application.

Percent of Range – The process variable as a percentage of the Analog Output range, provides an indication where the current flow of the meter is within the configured range of the flowmeter. For example, the Analog Output range may be defined as 0 gal/min to 20 gal/min. If the measured flow is 10 gal/min, the percent of range is 50 percent.

Analog Output – The analog output variable provides the analog value for the flow rate. The analog output refers to the industry standard output in the 4–20 mA range.

Totalizer Setup – Provides a reading of the total flow of the flowmeter since the totalizer was last reset. The totalizer value should be zero during commissioning on the bench, and the units should reflect the volume units of the flow rate. If the totalizer value is not zero, it may need to be reset. This function also allows for configuration of the totalizer parameters.

Pulse Output – The pulse output variable provides the pulse value for the flow rate.

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PV - Primary Variable

Fast Keys	1, 1, 1
LOI Key	FLOW RATE

The *Primary Variable* shows the current measured flow rate. This value determines the analog output from the transmitter.

PV -% Range

Fast Keys	1, 1, 2

The *PV% Range* shows where in the flow range the current flow value is as a percentage of the configured span.

PV - Analog Output

Fast Keys	1, 1, 3

The *PV Analog Output* displays the mA output of the transmitter corresponding to the measured flow rate.

Totalizer Setup

Fast Keys	1, 1, 4
LOI Key	AUX. FUNCTION

The *Totalizer Setup* menu allows for the viewing and configuration of the totalizer parameters.

Totalizer Units

Fast Keys	1, 1, 4, 1
LOI Key	AUX. FUNCTION

Totalizer units allow for the configuration of the units that the totalized value will be displayed as. These units are independent of the flow units.

Measured Gross Total

Fast Keys	1, 1, 4, 2
LOI Key	TOTALIZE

Measured gross total provides the output reading of the totalizer. This value is the amount of process fluid that has passed through the flowmeter since the totalizer was last reset.

NOTE
To reset the measured gross total value, the line size must be changed.

Measured Net Total

Fast Keys	1, 1, 4, 3
LOI Key	TOTALIZE

Measured net total provides the output reading of the totalizer. This value is the amount of process fluid that has passed through the flowmeter since the totalizer was last reset. When reverse flow is enabled, the net total represents the difference between the total flow in the forward direction less the total flow in the reverse direction.

Measured Reverse Total

Fast Keys	1, 1, 4, 4
LOI Key	TOTALIZE

Measured reverse total provides the output reading of the totalizer. This value is the amount of process fluid that has passed through the flowmeter in the reverse direction since the totalizer was last reset. This value is only totalized when reverse flow is enabled.

Start Totalizer

Fast Keys	1, 1, 4, 5
LOI Key	START/STOP

Start totalizer starts the totalizer counting from its current value.

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Stop Totalizer

Fast Keys	**1, 1, 4, 6**
LOI Key	**START/STOP**

Stop totalizer interrupts the totalizer count until it is restarted again. This feature is often used during pipe cleaning or other maintenance operations.

Reset Totalizer

Fast Keys	**1, 1, 4, 7**
LOI Key	**READ/RESET**

Reset totalizer resets the net totalizer value to zero. The totalizer must be stopped before resetting.

NOTE
The totalizer value is saved in the Non-Volatile memory of the electronics every three seconds. Should power to the transmitter be interrupted, the totalizer value will start at the last saved value when power is re-applied.

Pulse Output

Fast Keys	**1, 1, 5**

The *Pulse Output* displays the current value of the pulse signal.

BASIC SETUP

Fast Keys	**1, 3**

The basic configuration functions of the Rosemount 8712 must be set for all applications of the transmitter in a magnetic flowmeter system. If your application requires the advanced functionality features of the Rosemount 8712, see Section 4 "Operation" of this manual.

Tag

Fast Keys	**1, 3, 1**
LOI Key	**XMTR INFO**

Tag is the quickest and shortest way of identifying and distinguishing between transmitters. Transmitters can be tagged according to the requirements of your application. The tag may be up to eight characters long.

Flow Units

Fast Keys	**1, 3, 2**

Flow Units set the output units for the Primary Variable which controls the analog output of the transmitter.

Primary Variable Units

Fast Keys	**1, 3, 2, 1**
LOI Key	**UNITS**

The *Primary Variable Units* specifies the format in which the flow rate will be displayed. Units should be selected to meet your particular metering needs.

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Table 3-3. Options for Flow Rate Units

• ft/sec	• B31/sec (1 Barrel = 31.5 gallons)
• m/sec	• B31/min (1 Barrel = 31.5 gallons)
• gal/sec	• B31/hr (1 Barrel = 31.5 gallons)
• gal/min	• B31/day (1 Barrel = 31.5 gallons)
• gal/hr	• lbs/sec
• gal/day	• lbs/min
• l/sec	• lbs/hr
• l/min	• lbs/day
• l/hr	• kg/sec
• l/day	• kg/min
• ft^3/sec	• kg/hr
• ft^3/min	• kg/day
• ft^3/hr	• (s)tons/min
• ft^3/day	• (s)tons/hr
• m^3/sec	• (s)tons/day
• m^3/min	• (m)tons/min
• m^3/hr	• (m)tons/hr
• m^3/day	• (m)tons/day
• Impgal/sec	• Special (User Defined, see "Special Units" on page 3-9)
• Impgal/min	
• Impgal/hr	
• Impgal/day	
• B42/sec (1 Barrel = 42 gallons)	
• B42/min (1 Barrel = 42 gallons)	
• B42/hr (1 Barrel = 42 gallons)	
• B42/day (1 Barrel = 42 gallons)	

Special Units

Fast Keys	**1, 3, 2, 2**
LOI Key	**AUX. FUNCTION**

The Rosemount 8712 provides a selection of standard unit configurations that meet the needs of most applications (see "Flow Units" on page 3-8). If your application has special needs and the standard configurations do not apply, the Rosemount 8712 provides the flexibility to configure the transmitter in a custom-designed units format using the *special units* variable.

Special Volume Unit

Fast Keys	**1, 3, 2, 2, 1**

Special volume unit enables you to display the volume unit format to which you have converted the base volume units. For example, if the desired special units are cubic cm/min, the special volume variable can be represented as cc or cm3. The volume units variable is also used in totalizing the special units flow.

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Base Volume Unit

Fast Keys	1, 3, 2, 2, 2

Base volume unit is the unit from which the conversion is being made. Set this variable to the appropriate option.

Conversion Number

Fast Keys	1, 3, 2, 2, 3

The special units *conversion number* is used to convert base units to special units. For a straight conversion of volume units from one to another, the conversion number is the number of base units in the new unit. For example, if you are converting from liters to cm3 and there are 0.001 liters in a cm3, the conversion factor is 0.001.

Base Time Unit

Fast Keys	1, 3, 2, 2, 4

Base time unit provides the time unit from which to calculate the special units. For example, if your special units is a volume per minute, select minutes.

Special Flow Rate Unit

Fast Keys	1, 3, 2, 2, 5

Special flow rate unit is a format variable that provides a record of the units to which you are converting. The Handheld Communicator will display a special units designator as the units format for your primary variable. The actual special units setting you define will not appear. Four characters are available to store the new units designation. The 8712 LOI will display the four character designation as configured.

Example

To display flow in cubic cm per minute, and one cm3 is equal to 0.001 liters, the procedure would be:

Set the Volume Unit to cm3 or cc.
Set the Base Volume Unit to liters.
Set the Input Conversion Number to 0.001.
Set the Time Base to Min.
Set the Rate Unit to CC/M.

Line Size

Fast Keys	1, 3, 3
LOI Key	TUBE SIZE

The *line size* (sensor size) must be set to match the actual sensor connected to the transmitter. The size must be specified in inches according to the available sizes listed below. If a value is entered from a control system or Handheld Communicator that does not match one of these figures, the value will go to the next highest option.

The line size (inches) options are as follows:

0.1, 0.15, 0.25, 0.30, 0.50, 0.75, 1, 1.5, 2, 2.5, 3, 4, 6, 8, 10, 12, 14, 16, 18, 20, 24, 28, 30, 32, 36, 40, 42, 44, 48, 54, 56, 60, 64, 72, 80

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PV URV (Upper Range Value)

Fast Keys	1, 3, 4
LOI Key	ANALOG OUTPUT RANGE

The *upper range value* (URV), or analog output range, is preset to 30 ft/s at the factory. The units that appear will be the same as those selected under the units parameter.

The URV (20 mA point) can be set for both forward or reverse flow rate. Flow in the forward direction is represented by positive values and flow in the reverse direction is represented by negative values. The URV can be any value from –39.3 ft/s to +39.3 ft/s (-12 m/s to +12 m/s), as long as it is at least 1 ft/s (0.3 m/s) from the lower range value (4 mA point). The URV can be set to a value less than the lower range value. This will cause the transmitter analog output to operate in reverse, with the current increasing for lower (or more negative) flow rates.

NOTE
Line size, special units, and density must be selected prior to configuration of URV and LRV.

PV LRV (Lower Range Value)

Fast Keys	1, 3, 5
LOI Key	AUX. FUNCTION

Set the *lower range value* (LRV), or analog output zero, to change the size of the range (or span) between the URV and LRV. Under normal circumstances, the LRV should be set to a value near the minimum expected flow rate to maximize resolution. The LRV must be between –39.3 ft/s to +39.3 ft/s (-12 m/s to +12 m/s).

NOTE
Line size, special units, and density must be selected prior to configuration of URV and LRV.

Example

If the URV is greater than the LRV, the analog output will saturate at 3.9 mA when the flow rate falls below the selected 4 mA point.

The minimum allowable span between the URV and LRV is 1 ft/s (0.3 m/s). Do not set the LRV within 1 ft/s (0.3 m/s) of the 20 mA point. For example, if the URV is set to 15.67 ft/s (4.8 m/s) and if the desired URV is greater than the LRV, then the highest allowable analog zero setting would be 14.67 ft/s (4.5 m/s). If the desired URV is less than the LRV, then the lowest allowable LRV would be 16.67 ft/s (5.1 m/s).

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Calibration Number

Fast Keys	1, 3, 6
LOI Key	TUBE CAL NO.

The sensor *calibration number* is a 16-digit number used to identify sensors calibrated at the Rosemount factory. The calibration number is also printed inside the sensor terminal block or on the sensor name plate. The number provides detailed calibration information to the Rosemount 8712. To function properly within accuracy specifications, the number stored in the transmitter must match the calibration number on the sensor exactly.

NOTE
Sensors from manufacturers other than Rosemount Inc. can also be calibrated at the Rosemount factory. Check the sensor for Rosemount calibration tags to determine if a 16-digit calibration number exists for your sensor.

NOTE
Be sure the calibration number reflects a calibration to a Rosemount reference transmitter. If the calibration number was generated by a means other than a certified Rosemount flow lab, accuracy of the system may be compromised.

If your sensor is not a Rosemount sensor and was not calibrated at the Rosemount factory, contact your Rosemount representative for assistance.

If your sensor is imprinted with an eight-digit number or a k-factor, check in the sensor wiring compartment for the sixteen-digit calibration number. If there is no serial number, contact the factory for a proper conversion.

PV Damping

Fast Keys	1, 3, 7
LOI Key	DAMPING

Adjustable between 0.0 and 256 seconds

PV Damping allows selection of a response time, in seconds, to a step change in flow rate. It is most often used to smooth fluctuations in output.

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Section 4 Operation

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Detailed Setup . . . . . page 4-16

INTRODUCTION

This section contains information for advanced configuration parameters and diagnostics.

The software configuration settings for the Rosemount 8712 can be accessed through a HART-based communicator, Local Operator Interface (LOI), or through a control system. The software functions for the Field Communicator are described in detail in this section of the manual. It provides an overview and summary of communicator functions. For more complete instructions, see the communicator manual. Before operating the Rosemount 8712 in an actual installation, you should review all of the factory set configuration data to ensure that they reflect the current application.

DIAGNOSTICS

Field Comm.	1, 2

Diagnostics are used to verify that the transmitter is functioning properly, to assist in troubleshooting, to identify potential causes of error messages, and to verify the health of the transmitter and sensor. Diagnostic tests can be initiated through the use of a HART-based communications device, the Local Operator Interface, or through the control system.

Rosemount offers several different diagnostic suites providing various functionality.

Standard diagnostics included with every Rosemount 8712 transmitter are Empty Pipe detection, Electronics Temperature monitoring, Coil Fault detection, and various loop and transmitter tests.

Advanced diagnostics suite option one (DA1 option) contains advanced diagnostics for High Process Noise detection and Grounding and Wiring fault detection.

Advanced diagnostics suite option two (DA2 option) contains advanced diagnostics for the 8714i Meter Verification. This diagnostic is used to verify the accuracy and performance of the magnetic flowmeter installation.

Diagnostic Controls

Field Comm.	1, 2, 1
LOI Key	AUX. FUNCTION

The diagnostic controls menu provides a centralized location for enabling or disabling each of the diagnostics that are available. Note that for some diagnostics to be available, a diagnostics suite package is required.

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Empty Pipe

Field Comm.	1, 2, 1, 1

Turn the empty pipe diagnostic on or off as required by the application. For more details on the empty pipe diagnostic, see Appendix C: "Diagnostics".

High Process Noise

Field Comm.	1, 2, 1, 2

Turn the high process noise diagnostic on or off as required by the application. For more details on the high process noise diagnostic, see Appendix C: "Diagnostics".

Grounding / Wiring

Field Comm.	1, 2, 1, 3

Turn the grounding / wiring diagnostic on or off as required by the application. For more details on the grounding / wiring diagnostic, see Appendix C: "Diagnostics".

Electronics Temperature

Field Comm.	1, 2, 1, 4

Turn the electronics temperature diagnostic on or off as required by the application. For more details on the electronics temperature diagnostic, see Appendix C: "Diagnostics".

Basic Diagnostics

Field Comm.	1, 2, 2

The basic diagnostics menu contains all of the standard diagnostics and tests that are available in the 8712 transmitter.

Self Test

Field Comm.	1, 2, 2, 1
LOI Key	AUX. FUNCTION

The transmitter test initiates a series of diagnostic tests that are not performed continuously during normal operation. It performs the following tests:

- Display Test
- RAM Test
- PROM Test

During the entire test, all outputs respond to flow signal. The test requires about ten seconds to complete.

AO Loop Test

Field Comm.	1, 2, 2, 2
LOI Key	AUX. FUNCTION

The AO Loop test allows you to drive the transmitter output to a desired electrical current output on terminals 1 and 2. The user then has the ability to independently measure the actual loop current against the desired level set by the transmitter. On the LOI, the test will end after five minutes if the transmitter is not returned to normal operation manually.

4 mA

Field Comm.	1, 2, 2, 2, 1

Fix the analog loop current at 4 mA.

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20 mA

Field Comm.	1, 2, 2, 2, 2

Fix the analog loop current at 20 mA.

Simulate Alarm

Field Comm.	1, 2, 2, 2, 3

Send the analog output into an alarm mA value. Actual mA value depends on the alarm configuration.

- Rosemount Standard High Alarm – 22.6 mA
- Rosemount Standard Low Alarm – 3.75 mA
- Namur Compliant High Alarm – 22.6 mA
- Namur Compliant Low Alarm – 3.5 mA

Other

Field Comm.	1, 2, 2, 2, 4

Fix the analog loop current to some other mA value between 3.5 mA and 23.0 mA.

End

Field Comm.	1, 2, 2, 2, 5

This command cancels the analog loop test and returns the analog output back into normal operating mode.

Pulse Output Loop Test

Field Comm.	1, 2, 2, 3
LOI Key	AUX. FUNCTION

The Pulse Output Loop Test allows you to drive the frequency output at terminals 3 and 4 to a desired value. The user then has the ability to compare the pulse output value measured by auxiliary equipment to the desired pulse output level set by the transmitter. On the LOI the test will end after five minutes if the transmitter is not returned to normal operation manually.

Select Value

Field Comm.	1, 2, 2, 3, 1

Set the value of the pulse output for the test to a value between 1 pulse/day to 10,000 Hz.

End

Field Comm.	1, 2, 2, 3, 2

This command cancels the pulse output loop test and returns the pulse output back into normal operating mode.

Tune Empty Pipe

Field Comm.	1, 2, 2, 4
LOI Key	AUX. FUNCTION

Empty Pipe allows you to view the current value and configure the diagnostic parameters. For more detail on this parameter see Appendix C: "Diagnostics".

Empty Pipe Value

Field Comm.	1, 2, 2, 4, 1
LOI Key	AUX. FUNCTION

Read the current Empty Pipe Value. This number is a unitless number and is calculated based on multiple installation and process variables. For more detail on this parameter see Appendix C: "Diagnostics".

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Empty Pipe Trigger Level

Field Comm.	**1, 2, 2, 4, 2**
LOI Key	**AUX. FUNCTION**

Limits: 3 to 2000

Configure the threshold limit that the empty pipe value must exceed before the diagnostic alert activates. Default from the factory is set to 100. For more detail on this parameter see Appendix C: "Diagnostics".

Empty Pipe Counts

Field Comm.	**1, 2, 2, 4, 3**
LOI Key	**AUX. FUNCTION**

Limits: 5 to 50

Configure the number of consecutive times that the empty pipe value must exceed the empty pipe trigger level before the diagnostic alert activates. Counts are taken at 1.5 second intervals. Default from the factory is set to 5. For more detail on this parameter see Appendix C: "Diagnostics".

Electronics Temperature

Field Comm.	**1, 2, 2, 5**
LOI Key	**XMTR INFO**

Electronics Temperature allows you to view the current value for the electronics temperature.

Flow Limit 1

Field Comm.	**1, 2, 2, 6**
LOI Key	**AUX. FUNCTION**

Configure the Parameters that will determine the criteria for activating a HART alert if the measured flow rate falls within a set of configured criteria. This functionality can be used for operating simple batching operations or generating alerts when certain flow conditions are met. This parameter can be configured as a discrete output if the transmitter was ordered with auxiliary outputs enabled (option code AX), or if this functionality has been licensed in the field.

Control 1

Field Comm.	**1, 2, 2, 6, 1**

Turns the Flow Limit 1 ON or OFF.

ON – The transmitter will generate a HART alert when the defined conditions are met. If a digital output is configured for Flow Limit 1, the digital output will activate when the conditions for mode 1 are met.

OFF – The transmitter will not generate a HART alert for the Flow Limit 1.

Mode 1

Field Comm.	**1, 2, 2, 6, 2**

Mode that determines when the Flow Limit 1 HART Alert will activate.

> High Limit – The HART Alert will activate when the measured flow rate exceeds the High Limit 1 set point.

< Low Limit – The HART Alert will activate when the measured flow rate falls below the Low Limit 1 set point.

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In Range – The HART Alert will activate when the measured flow rate is between the High Limit 1 and Low Limit 1 set points.

Out of Range – The HART Alert will activate when the measured flow rate exceeds the High Limit 1 set point or falls below the Low Limit 1 set point.

High Limit 1

Field Comm.	**1, 2, 2, 6, 3**

Set the flow rate value that corresponds to the high limit set point for the Flow Limit 1 alert.

Low Limit 1

Field Comm.	**1, 2, 2, 6, 4**

Set the flow rate value that corresponds to the low limit set point for the Flow Limit 1 alert.

Flow Limit Hysteresis

Field Comm.	**1, 2, 2, 6, 5**

Set the hysteresis band for the flow limit to determine how quickly the transmitter comes out of Alert status. This hysteresis value is used for both Flow Limit 1 and Flow Limit 2.

Flow Limit 2

Field Comm.	**1, 2, 2, 7**
LOI Key	**AUX. FUNCTION**

Configure the Parameters that will determine the criteria for activating a HART alert if the measured flow rate falls within a set of configured criteria. This functionality can be used for operating simple batching operations or generating alerts when certain flow conditions are met. This parameter can be configured as a discrete output if the transmitter was ordered with auxiliary outputs enabled (option code AX), or if this functionality has been licensed in the field. If a digital output is configured for Flow Limit 1, the digital output will activate when the conditions for mode 1 are met.

Control 2

Field Comm.	**1, 2, 2, 7, 1**

Turns the Flow Limit 2 HART Alert ON or OFF.

ON – The transmitter will generate a HART alert when the defined conditions are met.

OFF – The transmitter will not generate a HART alert for the Flow Limit 2.

Mode 2

Field Comm.	**1, 2, 2, 7, 2**

Mode that determines when the Flow Limit 2 HART Alert will activate.

> High Limit – The HART Alert will activate when the measured flow rate exceeds the High Limit 2 set point.

< Low Limit – The HART Alert will activate when the measured flow rate falls below the Low Limit 2 set point.

In Range – The HART Alert will activate when the measured flow rate is between the High Limit 2 and Low Limit 2 set points.

Out of Range – The HART Alert will activate when the measured flow rate exceeds the High Limit 2 set point or falls below the Low Limit 2 set point.

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High Limit 2

Field Comm.	1, 2, 2, 7, 3

Set the flow rate value that corresponds to the high limit set point for the Flow Limit 2 alert. If a digital output is configured for Flow Limit 1, the digital output will activate when the conditions for mode 1 are met.

Low Limit 2

Field Comm.	1, 2, 2, 7, 4

Set the flow rate value that corresponds to the low limit set point for the Flow Limit 2 alert.

Flow Limit Hysteresis

Field Comm.	1, 2, 2, 7, 5

Set the hysteresis band for the flow limit to determine how quickly the transmitter comes out of Alert status. This hysteresis value is used for both Flow Limit 1 and Flow Limit 2.

Total Limit

Field Comm.	1, 2, 2, 8

Configure the Parameters that will determine the criteria for activating a HART alert if the measured net total falls within a set of configured criteria. This functionality can be used for operating simple batching operations or generating alerts when certain flow conditions are met. This parameter can be configured as a discrete output if the transmitter was ordered with auxiliary outputs enabled (option code AX), or if this functionality has been licensed in the field.

Total Control

Field Comm.	1, 2, 2, 8, 1

Turns the Total Limit HART Alert ON or OFF.

ON – The transmitter will generate a HART alert when the defined conditions are met.

OFF – The transmitter will not generate a HART alert for the Total Limit.

Total Mode

Field Comm.	1, 2, 2, 8, 2

Mode that determines when the Total Limit HART Alert will activate.

> High Limit – The HART Alert will activate when the measured net total exceeds the Total High Limit set point.

< Low Limit – The HART Alert will activate when the measured net total falls below the Total Low Limit set point.

In Range – The HART Alert will activate when the measured net total is between the Total High Limit and Total Low Limit set points.

Out of Range – The HART Alert will activate when the measured net total exceeds the Total High Limit set point or falls below the Total Low Limit set point.

Total High Limit

Field Comm.	1, 2, 2, 8, 3

Set the net total value that corresponds to the high limit set point for the Flow Limit 1 alert.

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Total Low Limit

Field Comm.	1, 2, 2, 8, 4

Set the net total value that corresponds to the low limit set point for the Flow Limit 1 alert.

Total Limit Hysteresis

Field Comm.	1, 2, 2, 8, 5

Set the hysteresis band for the total limit to determine how quickly the transmitter comes out of Alert status.

Advanced Diagnostics

Field Comm.	1, 2, 3

The advanced diagnostics menu contains information on all of the additional diagnostics and tests that are available in the 8712 transmitter if one of the diagnostics suite packages was ordered.

Rosemount offers two advanced diagnostic suites. Functionality under this menu will depend on which of these suites are ordered.

Advanced diagnostics suite option one (DA1 option) contains advanced diagnostics for High Process Noise detection and Grounding and Wiring fault detection.

Advanced diagnostics suite option two (DA2 option) contains advanced diagnostics for the 8714i Meter Verification. This diagnostic is used to verify the accuracy and performance of the magnetic flowmeter installation.

8714i Meter Verification

Field Comm.	1, 2, 3, 1
LOI Key	AUX. FUNCTION

This diagnostic allows you to test and verify that the sensor, transmitter, or both are working within specifications. For more details on this diagnostic, see Appendix C: "Diagnostics".

Run 8714i

Field Comm.	1, 2, 3, 1, 1
LOI Key	AUX. FUNCTION

Run the meter verification test to check the transmitter, sensor, or entire installation.

Full Meter Verification

Field Comm.	1, 2, 3, 1, 1, 1

Run the internal meter verification to validate the entire installation, sensor and transmitter at the same time.

Transmitter Only

Field Comm.	1, 2, 3, 1, 1, 2

Run the internal meter verification to validate the transmitter only.

Sensor Only

Field Comm.	1, 2, 3, 1, 1, 3

Run the internal meter verification to validate the sensor only.

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8714i Results

Field Comm.	**1, 2, 3, 1, 2**
LOI Key	**XMTR INFO**

Review the results of the most recently performed 8714i Meter Verification test. Information in this section details the measurements taken and if the meter passed the verification test. For more details on these results and what they mean, see Appendix C: "Diagnostics".

Test Condition

Field Comm.	**1, 2, 3, 1, 2, 1**

Displays the conditions that the 8714i Meter Verification test was performed under. For more details on this parameter see Appendix C: "Diagnostics".

Test Criteria

Field Comm.	**1, 2, 3, 1, 2, 2**

Displays the criteria that the 8714i Meter Verification test was performed against. For more details on this parameter see Appendix C: "Diagnostics".

8714i Test Result

Field Comm.	**1, 2, 3, 1, 2, 3**

Displays the results of the 8714i Meter Verification test as pass or fail. For more details on this parameter see Appendix C: "Diagnostics".

Simulated Velocity

Field Comm.	**1, 2, 3, 1, 2, 4**

Displays the test velocity used to verify transmitter calibration. For more details on this parameter see Appendix C: "Diagnostics".

Actual Velocity

Field Comm.	**1, 2, 3, 1, 2, 5**

Displays the velocity measured by the transmitter during the transmitter calibration verification test. For more details on this parameter see Appendix C: "Diagnostics".

Velocity Deviation

Field Comm.	**1, 2, 3, 1, 2, 6**

Displays the deviation of the transmitter calibration verification test. For more details on this parameter see Appendix C: "Diagnostics".

Transmitter Calibration Test Result

Field Comm.	**1, 2, 3, 1, 2, 7**

Displays the result of the transmitter calibration verification test as pass or fail. For more details on this parameter see Appendix C: "Diagnostics".

Sensor Calibration Deviation

Field Comm.	**1, 2, 3, 1, 2, 8**

Displays the deviation of the sensor calibration verification test. For more details on this parameter see Appendix C: "Diagnostics".

Sensor Calibration Test Result

Field Comm.	**1, 2, 3, 1, 2, 9**

Displays the result of the sensor calibration verification test as pass or fail. For more details on this parameter see Appendix C: "Diagnostics".

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Coil Circuit Test Result

Field Comm.	**1, 2, 3, 1, 2, 10**

Displays the result of the coil circuit test as pass or fail. For more details on this parameter see Appendix C: "Diagnostics".

Electrode Circuit Test Result

Field Comm.	**1, 2, 3, 1, 2, 11**

Displays the result of the electrode circuit test as pass or fail. For more details on this parameter see Appendix C: "Diagnostics".

NOTE
To access the coil circuit test result and electrode circuit test result, you must scroll to this option in the HART Field Communicator.

Sensor Signature

Field Comm.	**1, 2, 3, 1, 3**
LOI Key	**AUX. FUNCTION**

The sensor signature describes the sensor characteristics to the transmitter and is an integral part of the sensor meter verification test. From this menu you can view the current stored signature, have the transmitter take and store the sensor signature, or re-call the last saved good values for the sensor signature. For more details on this parameter see Appendix C: "Diagnostics".

Signature Values

Field Comm.	**1, 2, 3, 1, 3, 1**
LOI Key	**XMTR INFO**

Review the current values stored for the sensor signature. For more details on this parameter see Appendix C: "Diagnostics".

Coil Resistance

Field Comm.	**1, 2, 3, 1, 3, 1, 1**

View the base line value for the coil resistance taken during the sensor signature process.

Coil Signature

Field Comm.	**1, 2, 3, 1, 3, 1, 2**

View the base line value for the coil signature taken during the sensor signature process.

Electrode Resistance

Field Comm.	**1, 2, 3, 1, 3, 1, 3**

View the base line value for the electrode resistance taken during the sensor signature process.

Re-Signature Meter

Field Comm.	**1, 2, 3, 1, 3, 2**
LOI Key	**AUX. FUNCTION**

Have the transmitter measure and store the sensor signature values. These values will then be used as the baseline for the meter verification test. Use this when connecting to older Rosemount or another manufacturers sensors, or installing the magnetic flowmeter system for the first time. For more details on this parameter see Appendix C: "Diagnostics".

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Recall Last Saved Values

Field Comm.	**1, 2, 3, 1, 3, 3**
LOI Key	**AUX. FUNCTION**

Recalls the last saved “good” values for the sensor signature.

Set Pass/Fail Criteria

Field Comm.	**1, 2, 3, 1, 4**
LOI Key	**AUX. FUNCTION**

Set the maximum allowable deviation percentage test criteria for the 8714i Internal Meter Verification test. There are three tests that this criteria can be set for:

- Full Pipe; No Flow (Best test condition) – Default is 2%
- Full Pipe; Flowing – Default is 3%
- Empty Pipe – Default is 5%

NOTE
If the 8714i Meter Verification test is done with an empty pipe, the electrode circuit will NOT be tested.

No Flow Limit

Field Comm.	**1, 2, 3, 1, 4, 1**

1 to 10 percent

Set the pass/fail test criteria for the 8714i Meter Verification test at Full Pipe, No Flow conditions.

Flowing Limit

Field Comm.	**1, 2, 3, 1, 4, 2**

1 to 10 percent

Set the pass/fail test criteria for the 8714i Meter Verification test at Full Pipe, Flowing conditions.

Empty Pipe Limit

Field Comm.	**1, 2, 3, 1, 4, 3**

1 to 10 percent

Set the pass/fail test criteria for the 8714i Meter Verification test at Empty Pipe conditions.

Measurements

Field Comm.	**1, 2, 3, 1, 5**
LOI Key	**XMTR INFO**

View the measured values taken during the meter verification test. Values are shown for the Coil Resistance, Coil Signature, and Electrode Resistance.

Coil Resistance

Field Comm.	**1, 2, 3, 1, 5, 1**

View the measured value for the coil resistance taken during the 8714i meter verification test.

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Coil Signature

Field Comm.	1, 2, 3, 1, 5, 2

View the measured value for the coil signature taken during the 8714i meter verification test.

Electrode Resistance

Field Comm.	1, 2, 3, 1, 5, 3

View the measured value for the electrode resistance taken during the 8714i meter verification test.

Licensing

Field Comm.	1, 2, 3, 2
LOI Key	AUX. FUNCTION

If a diagnostic suite or the auxiliary output option was not ordered initially, these features can be licensed in the field. Access the licensing information from this menu. For more details on licensing, see Appendix C: "Diagnostics".

License Status

Field Comm.	1, 2, 3, 2, 1

Determine what capabilities have been licensed, and are available for activation.

License Key

Field Comm.	1, 2, 3, 2, 2

A license key is required to activate features in the field if the desired functionality was not initially ordered. This menu allows for gathering of necessary data to generate a license key and also the ability to enter the license key once it has been received.

Device ID

Field Comm.	1, 2, 3, 2, 2, 1

This function displays the Device ID and Software Revision for the transmitter. Both of these pieces of information are required to generate a license key.

License Key

Field Comm.	1, 2, 3, 2, 2, 2

Allows you to enter a license key to activate the desired functionality.

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Diagnostic Variable Values

Field Comm.	1, 2, 4
LOI Key	XMTR INFO

From this menu, all of the diagnostic variable values can be reviewed. This information can be used to get more information about the transmitter, sensor, and process, or to get more detail about an alert that may have activated.

Empty Pipe Value

Field Comm.	1, 2, 4, 1

Read the current value of the Empty Pipe parameter. This value will read zero if Empty Pipe is turned off.

Electronics Temperature

Field Comm.	1, 2, 4, 2

Read the current value of the Electronics Temperature.

Line Noise

Field Comm.	1, 2, 4, 3

Read the current value of the amplitude of AC line noise measured on the transmitter's electrode inputs. This value is used in the grounding / wiring diagnostic.

5 Hz Signal to Noise Ratio

Field Comm.	1, 2, 4, 4

Read the current value of the signal to noise ratio at 5 Hz. For optimum performance, a value greater than 50 is preferred. Values less than 25 will cause the High Process Noise alert to activate.

37 Hz Signal to Noise Ratio

Field Comm.	1, 2, 4, 5

Read the current value of the signal to noise ratio at 37.5 Hz. For optimum performance, a value greater than 50 is preferred. Values less than 25 will cause the High Process Noise alert to activate.

Signal Power

Field Comm.	1, 2, 4, 6

Read the current value of the velocity of the fluid through the sensor. Higher velocities result in greater signal power.

8714i Results

Field Comm.	1, 2, 4, 7

Review the results of the 8714i Meter Verification tests. For more details on these results and what they mean, see Appendix C: "Diagnostics".

Test Condition

Field Comm.	1, 2, 3, 7, 1

Displays the conditions that the 8714i Meter Verification test was performed under. For more details on this parameter see Appendix C: "Diagnostics".

Test Criteria

Field Comm.	1, 2, 3, 7, 2

Displays the criteria that the 8714i Meter Verification test was performed against. For more details on this parameter see Appendix C: "Diagnostics".

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8714i Test Result

Field Comm.	1, 2, 3, 7, 3

Displays the results of the 8714i Meter Verification test as pass or fail. For more details on this parameter see Appendix C: "Diagnostics".

Simulated Velocity

Field Comm.	1, 2, 3, 7, 4

Displays the test velocity used to verify transmitter calibration. For more details on this parameter see Appendix C: "Diagnostics".

Actual Velocity

Field Comm.	1, 2, 3, 7, 5

Displays the velocity measured by the transmitter during the transmitter calibration verification test. For more details on this parameter see Appendix C: "Diagnostics".

Velocity Deviation

Field Comm.	1, 2, 3, 7, 6

Displays the deviation of the transmitter calibration verification test. For more details on this parameter see Appendix C: "Diagnostics".

Transmitter Verification Test Result

Field Comm.	1, 2, 3, 7, 7

Displays the result of the transmitter calibration verification test as pass or fail. For more details on this parameter see Appendix C: "Diagnostics".

Sensor Verification Deviation

Field Comm.	1, 2, 3, 7, 8

Displays the deviation of the sensor calibration verification test. For more details on this parameter see Appendix C: "Diagnostics".

Sensor Verification Result

Field Comm.	1, 2, 3, 7, 9

Displays the result of the sensor calibration verification test as pass or fail. For more details on this parameter see Appendix C: "Diagnostics".

Coil Circuit Test Result

Field Comm.	1, 2, 3, 7, 10

Displays the result of the coil circuit test as pass or fail. For more details on this parameter see Appendix C: "Diagnostics".

Electrode Circuit Test Result

Field Comm.	1, 2, 3, 7, 11

Displays the result of the electrode circuit test as pass or fail. For more details on this parameter see Appendix C: "Diagnostics".

NOTE
To access the coil circuit test result and electrode circuit test result, you must scroll to this option in the HART Field Communicator.

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Trims

Field Comm.	1, 2, 5
LOI Key	AUX. FUNCTION

Trims are used to calibrate the analog loop, calibrate the transmitter, re-zero the transmitter, and calibrate the transmitter with another manufacturer's sensor. Proceed with caution whenever performing a trim function.

D/A Trim

Field Comm.	1, 2, 5, 1
LOI Key	AUX. FUNCTION

The D/A Trim is used to calibrate the 4-20 mA analog loop output from the transmitter. For maximum accuracy, the analog output should be trimmed for your system loop. Use the following steps to complete the Output Trim function.

1. Set the loop to manual, if necessary.
2. Connect a precision ammeter in the 4–20 mA loop.
3. Initiate the D/A Trim function with the LOI or Handheld Communicator.
4. Enter the 4 mA meter value when prompted to do so.
5. Enter the 20 mA meter value when prompted to do so.
6. Return the loop to automatic control, if necessary.

The 4–20 mA trim is now complete. You may repeat the 4–20 mA trim to check the results, or use the analog output test.

Scaled D/A Trim

Field Comm.	1, 2, 5, 2
LOI Key	AUX. FUNCTION

Scaled D/A trim enables you to calibrate the flowmeter analog output using a different scale than the standard 4-20 mA output scale. Non-scaled D/A trimming (described above), is typically performed using an ammeter where calibration values are entered in units of milliamperes. Scaled D/A trimming allows you to trim the flowmeter using a scale that may be more convenient based upon your method of measurement.

For example, it may be more convenient for you to make current measurements by direct voltage readings across the loop resistor. If your loop resistor is 500 ohms, and you want to calibrate the meter using voltage measurements made across this resistor, you could rescale your trim points from 4-20mA to 4-20mA x 500 ohm or 2-10 VDC. Once your scaled trim points have been entered as 2 and 10, you can calibrate your flowmeter by entering voltage measurements directly from the voltmeter.

Digital Trim

Field Comm.	1, 2, 5, 3
LOI Key	AUX. FUNCTION

Digital trim is the function by which the factory calibrates the transmitter. This procedure is rarely needed by users. It is only necessary if you suspect the Rosemount 8712 is no longer accurate. A Rosemount 8714D Calibration Standard is required to complete a digital trim. Attempting a digital trim without a Rosemount 8714D Calibration Standard may result in an inaccurate transmitter or an error message. Digital trim must be performed only with the coil drive mode set to 5 Hz and with a nominal sensor calibration number stored in the memory.

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NOTE
Attempting a digital trim without a Rosemount 8714D Calibration Standard may result in an inaccurate transmitter, or a “DIGITAL TRIM FAILURE” message may appear. If this message occurs, no values were changed in the transmitter. Simply power down the Rosemount 8712 to clear the message.

To simulate a nominal sensor with the Rosemount 8714D Calibration Standard, you must change the following four parameters in the Rosemount 8712:

1. Tube Calibration Number—1000015010000000
2. Units—ft/s
3. PV URV—20 mA = 30.00 ft/s
4. PV LRV—4 mA = 0 ft/s
5. Coil Drive Frequency—5 Hz

The instructions for changing the Sensor Calibration Number, Units, PV URV, and PV LRV are located in “Basic Setup” on page 3-8. Instructions for changing the Coil Drive Frequency can be found on page 4-16 in this section.

Set the loop to manual, if necessary, before you begin. Complete the following steps:

1. Power down the transmitter.
2. Connect the transmitter to a Rosemount 8714D Calibration Standard.
3. Power up the transmitter with the Rosemount 8714D Calibration Standard connected and read the flow rate. The electronics need about a 5-minute warm-up time to stabilize.
4. Set the 8714D Calibration Standard to the 30 ft/s (9.1 m/s) setting.
5. The flow rate reading after warm-up should be between 29.97 (9.1 m/s) and 30.03 ft/s (9.2 m/s).
6. If the reading is within the range, return the transmitter to the original configuration parameters.
7. If the reading is not within this range, initiate a digital trim with the LOI or Handheld Communicator. The digital trim takes about 90 seconds to complete. No transmitter adjustments are required.

Auto Zero

Field Comm.	1, 2, 5, 4
LOI Key	AUX. FUNCTION

The auto zero function initializes the transmitter for use with the 37 Hz coil drive mode only. Run this function only with the transmitter and sensor installed in the process. The sensor must be filled with process fluid at zero flow. Before running the auto zero function, be sure the coil drive mode is set to 37 Hz (Auto Zero will not run with the coil drive frequency set at 5 Hz).

Set the loop to manual if necessary and begin the auto zero procedure. The transmitter completes the procedure automatically in about 90 seconds. A symbol appears in the lower right-hand corner of the display to indicate that the procedure is running.

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Universal Trim

Field Comm.	1, 2, 5, 5
LOI Key	AUX. FUNCTION

The universal auto trim function enables the Rosemount 8712 to calibrate sensors that were not calibrated at the Rosemount factory. The function is activated as one step in a procedure known as in-process calibration. If your Rosemount sensor has a 16-digit calibration number, in-process calibration is not required. If it does not, or if your sensor is made by another manufacturer, complete the following steps for in-process calibration.

1. Determine the flow rate of the process fluid in the sensor.

NOTE
The flow rate in the line can be determined by using another sensor in the line, by counting the revolutions of a centrifugal pump, or by performing a bucket test to determine how fast a given volume is filled by the process fluid.

2. Complete the universal auto trim function.
3. When the routine is completed, the sensor is ready for use.

Status

Field Comm.	1, 2, 6
LOI Key	XMTR INFO

Status displays a summary of the health of the transmitter. If there are any alerts or error messages that have activated, they will be listed here.

ADVANCED CONFIGURATION

In addition to the basic configuration options and the diagnostic information and controls, the 8712 has many advanced functions that can also be configured as required by the application.

DETAILED SETUP

Field Comm.	1, 4

The detailed setup function provides access to other parameters within the transmitter that can be configured such as coil drive frequency, output parameters, local display configuration, and other general information about the device.

Additional Parameters

Field Comm.	1, 4, 1

The additional parameters menu provides a means to configure optional parameters within the 8712 transmitter.

Coil Drive Frequency

Field Comm.	1, 4, 1, 1
LOI Key	AUX. FUNCTION

Coil drive frequency allows pulse-rate selection of the sensor coils.

5 Hz

The standard coil drive frequency is 5 Hz, which is sufficient for nearly all applications.

37 Hz

If the process fluid causes a noisy or unstable output, increase the coil drive frequency to 37 Hz. If the 37 Hz mode is selected, perform the auto zero function.

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Density Value

Field Comm.	**1, 4, 1, 2**
LOI Key	**AUX. FUNCTION**

The density value is used to convert from a volumetric flow rate to a mass flow rate using the following equation:

$Q_m = Q_v$ 3 r

Where:

Q_m is the mass flow rate

Q_v is the volumetric flow rate, and

r is the fluid density

PV Upper Sensor Limit (USL)

Field Comm.	**1, 4, 1, 3**

The PV USL is the maximum value that the 20 mA value can be set to. This is the upper measuring limit of the transmitter and sensor.

PV Lower Sensor Limit (LSL)

Field Comm.	**1, 4, 1, 4**

The PV LSL is the minimum value that the 4 mA value can be set to. This is the lower measuring limit of the transmitter and sensor.

PV Minimum Span

Field Comm.	**1, 4, 1, 5**

The PV minimum span is the minimum flow range that must separate the 4 mA and 20 mA set point values.

Configure Outputs

Field Comm.	**1, 4, 2**

The configure outputs functionality contains functionality to configure the more advanced features that control the analog, pulse, auxiliary, and totalizer outputs of the transmitter.

Analog Output

Field Comm.	**1, 4, 2, 1**

Under this function the advanced features of the analog output can be configured.

PV Upper Range Value (URV)

Field Comm.	**1, 4, 2, 1, 1**
LOI Key	**ANALOG OUTPUT RANGE**

The upper range value (URV), or analog output range, is preset to 30 ft/s at the factory. The units that appear will be the same as those selected under the units parameter.

The URV (20 mA point) can be set for both forward or reverse flow rate. Flow in the forward direction is represented by positive values and flow in the reverse direction is represented by negative values. The URV can be any value from –39.3 ft/s to +39.3 ft/s (-12 m/s to +12 m/s), as long as it is at least 1 ft/s (0.3 m/s) from the lower range value (4 mA point). The URV can be set to a value less than the lower range value. This will cause the transmitter analog output to operate in reverse, with the current increasing for lower (or more negative) flow rates.

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NOTE
Line size, special units, and density must be selected prior to configuration of URV and LRV.

PV Lower Range Value (LRV)

Field Comm.	**1, 4, 2, 1, 2**
LOI Key	**AUX. FUNCTION**

The lower range value (LRV) is preset to 0 ft/s at the factory. The units that appear will be the same as those selected under the units parameter.

Reset the lower range value (LRV), or analog output zero, to change the size of the range (or span) between the URV and LRV. Under normal circumstances, the LRV should be set to a value near the minimum expected flow rate to maximize resolution. The LRV must be between –39.3 ft/s to +39.3 ft/s (-12 m/s to +12 m/s).

NOTE
The LRV can be set to a value greater than the URV, which will cause the analog output to operate in reverse. In this mode, the analog output will increase with lower (more negative) flow rates.

Example

If the URV is greater than the LRV, the analog output will saturate at 3.9 mA when the flow rate falls below the selected 4 mA point. The minimum allowable span between the URV and LRV is 1 ft/s. Do not set the LRV within 1 ft/s (0.3 m/s) of the 20 mA point. For example, if the URV is set to 15.67 ft/s (4.8 m/s) and if the desired URV is greater than the LRV, then the highest allowable analog zero setting would be 14.67 ft/s (4.5 m/s). If the desired URV is less than the LRV, then the lowest allowable LRV would be 16.67 ft/s (5.1 m/s).

NOTE
Line size, special units, and density must be selected prior to configuration of URV and LRV.

PV Analog Output

Field Comm.	**1, 4, 2, 1, 3**

The PV analog output displays the current analog output value (mA) of the transmitter corresponding to the current measured flow rate.

Analog Output Alarm Type

Field Comm.	**1, 4, 2, 1, 4**

The analog output alarm type displays the alarm mode the 8712 is currently set for. This value is set by a switch on the electronics board. There are two available options for this setting:

- High
- Low

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Loop Test

Field Comm.	**1, 4, 2, 1, 5**
LOI Key	**AUX. FUNCTION**

The loop test allows you to drive the transmitter output to a desired electrical current output on terminals 1 and 2. This capability allows you to check the entire current loop prior to start-up. On the LOI the test will end after five minutes if the transmitter is not returned to normal operation manually.

D/A Trim

Field Comm.	**1, 4, 2, 1, 6**
LOI Key	**AUX. FUNCTION**

The D/A Trim is used to calibrate the 4-20 mA analog loop output from the transmitter. For maximum accuracy, the analog output should be trimmed for your system loop. Use the following steps to complete the Output Trim function.

1. Set the loop to manual, if necessary.
2. Connect a precision ammeter in the 4–20 mA loop.
3. Initiate the Output Trim function with the LOI or Handheld Communicator.
4. Enter the 4 mA meter value when prompted to do so.
5. Enter the 20 mA meter value when prompted to do so.
6. Return the loop to automatic control, if necessary.

The 4–20 mA trim is now completed. You may repeat the 4–20 mA trim to check the results, or use the analog output test.

Scaled D/A Trim

Field Comm.	**1, 4, 2, 1, 7**
LOI Key	**AUX. FUNCTION**

Scaled D/A trim enables you to calibrate the flowmeter analog output using a different scale than the standard 4-20 mA output scale. Non-scaled D/A trimming (described above), is typically performed using an ammeter where calibration values are entered in units of milliamperes. Scaled D/A trimming allows you to trim the flowmeter using a scale that may be more convenient based upon your method of measurement.

For example, it may be more convenient for you to make current measurements by direct voltage readings across the loop resistor. If your loop resistor is 500 ohms, and you want to calibrate the meter using voltage measurements made across this resistor, you could rescale your trim points from 4-20mA to 4-20mA x 500 ohm or 2-10 VDC. Once your scaled trim points have been entered as 2 and 10, you can calibrate your flowmeter by entering voltage measurements directly from the voltmeter.

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Alarm Level

Field Comm.	1, 4, 2, 1, 8

The alarm level allows you to drive the transmitter to preset values if an alarm occurs. There are two options:

- Rosemount Alarm and Saturation Values
- NAMUR-Compliant Alarm and Saturation Levels

Table 4-1. Rosemount (Standard) Alarm and Saturation Values

Level	4-20 mA Saturation	4-20 mA Alarm
Low	3.9 mA	≤3.75 mA
High	20.8 mA	≥22.6 mA

Table 4-2. NAMUR-Compliant Alarm and Saturation Values

Level	4-20 mA Saturation	4-20 mA Alarm
Low	3.8 mA	≤3.5 mA
High	20.5 mA	≥22.6 mA

Pulse Output

Field Comm.	1, 4, 2, 2
LOI Key	AUX. FUNCTION

Under this function the pulse output of the 8712 can be configured.

Pulse Scaling

Field Comm.	1, 4, 2, 2, 1
LOI Key	PULSE OUTPUT SCALING

Transmitter may be commanded to supply a specified frequency between 1 pulse/ day at 39.37 ft/sec (12 m/s) to 10,000 Hz at 1 ft/sec (0.3 m/s).

NOTE
Line size, special units, and density must be selected prior to configuration of the Pulse Scaling factor.

The pulse output scaling equates one transistor switch closure pulse to a selectable number of volume units. The volume unit used for scaling pulse output is taken from the numerator of the configured flow units. For example, if gal/min had been chosen when selecting the flow rate unit, the volume unit displayed would be gallons.

NOTE
The pulse output scaling is designed to operate between 0 and 10,000 Hz. The minimum conversion factor value is found by dividing the minimum span (in units of volume per second) by 10,000 Hz.

When selecting pulse output scaling, remember that the maximum pulse rate is 10,000 Hz. With the 110 percent overrange capability, the absolute limit is 11,000 Hz. For example, if you want the Rosemount 8712 to pulse every time 0.01 gallons pass through the sensor, and the flow rate is 10,000 gal/min, you will exceed the 10,000 Hz full-scale limit:

$$\frac{10{,}000\,\text{gal}}{1\,\text{min}} \times \frac{}{60\,\text{sec}} \times \frac{1\,\text{pulse}}{0.01\,\text{gal}} = 16666.7\ \text{Hz}$$

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The best choice for this parameter depends upon the required resolution, the number of digits in the totalizer, the extent of range required, and the maximum counter external frequency.

NOTE
For totalizing on the LOI, ten digits are available.

Pulse Width

Field Comm.	**1, 4, 2, 2, 2**
LOI Key	**AUX. FUNCTION**

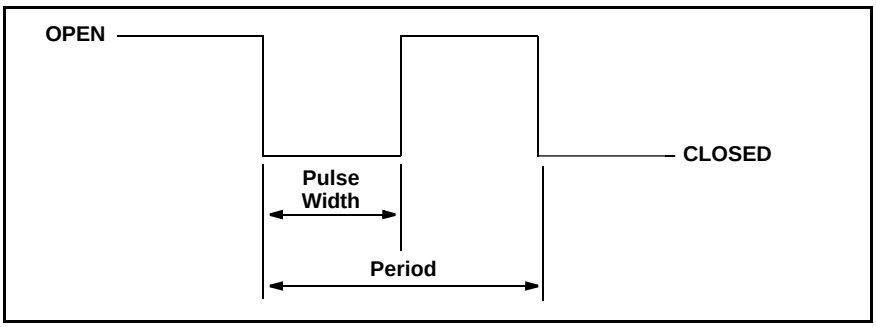
The factory default pulse width is 0.5 ms.

The width, or duration, of the pulse width can be adjusted to match the requirements of different counters or controllers (see Figure 4-1 on page 4-21). These are typically lower frequency applications (< 1000 Hz). The transmitter will accept values from 0.1 ms to 650 ms.

For frequencies higher than 1000 Hz, it is recommended to set the pulse mode to 50% duty cycle.

If the pulse width is set too wide (more than 1/2 the period of the pulse) the transmitter will automatically default to a pulse width of 50% duty cycle.

Figure 4-1. Pulse Output



Example

If pulse width is set to 100 ms, the maximum output is 5 Hz; for a pulse width of 0.5 ms, the maximum output would be 1000 Hz (at the maximum frequency output there is a 50 percent duty cycle).

PULSE WIDTH	MINIMUM PERIOD (50% duty cycle)	MAXIMUM FREQUENCY
100 ms	200 ms	$\frac{1\ \text{Cycle}}{200\ \text{mS}} = 5\ \text{Hz}$
0.5 ms	1.0 ms	$\frac{1\ \text{Cycle}}{1.0\ \text{mS}} = 1000\ \text{Hz}$

To achieve the greatest maximum frequency output, set the pulse width to the lowest value that is consistent with the requirements of the pulse output power source, pulse driven external totalizer, or other peripheral equipment.

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Example

The maximum flow rate is 10,000 gpm. Set the pulse output scaling such that the transmitter outputs 10,000 Hz at 10,000 gpm.

$$\text{Pulse Scaling} = \frac{\text{Flow Rate (gpm)}}{(60\ \text{s/min})(\text{Frequency})}$$

$$\text{Pulse Scaling} = \frac{10{,}000\ \text{gpm}}{(60\ \text{s/min})(10{,}000\ \text{Hz})}$$

$$\text{Pulse Scaling} = 0.0167\ \text{gal/pulse}$$

$$1\ \text{Pulse} = 0.0167\ \text{gallon}$$

NOTE
Changes to pulse width are only required when there is a minimum pulse width required for external counters, relays, etc. If frequency generated by the transmitter requires a smaller pulse width than the pulse width selected, the transmitter will automatically go to 50% duty cycle.

Example

The external counter is ranged for 350 gpm and pulse is set for one gallon. Assuming the pulse width is 0.5 ms, the maximum frequency output is 5.833 Hz.

$$\text{Frequency} = \frac{\text{Flow Rate (gpm)}}{(60\ \text{s/min})(\text{Pulse Scaling gal/pulse})}$$

$$\text{Frequency} = \frac{350\ \text{gpm}}{(60\ \text{s/min})(1\ \text{gal/pulse})}$$

$$\text{Frequency} = 5.833\ \text{Hz}$$

Example

The upper range value (20 mA) is 3000 gpm. To obtain the highest resolution of the pulse output, 10,000 Hz is scaled to the full scale analog reading.

$$\text{Pulse Scaling} = \frac{\text{Flow Rate (gpm)}}{(60\ \text{s/min})(\text{Frequency})}$$

$$= \frac{3000\ \text{gpm}}{(60\ \text{s/min})(10{,}000\text{Hz})}$$

$$= 0.005\ \text{gal/pulse}$$

$$1\ \text{Pulse} = 0.005\ \text{gallon}$$

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Pulse Output Loop Test

Field Comm.	**1, 4, 2, 2, 3**
LOI Key	**AUX. FUNCTION**

The Pulse Output Loop Test allows you to drive the frequency output at terminals 3 and 4 to a desired value. This capability allows you to check auxiliary equipment prior to start-up. On the LOI the test will end after five minutes if the transmitter is not returned to normal operation manually.

Digital Input / Digital Output

Field Comm.	**1, 4, 2, 3**
LOI Key	**AUX. FUNCTION**

This menu is used to configure the optional digital input and digital output parameters of the 8712 transmitter. Note that this configuration option is only active if the auxiliary output suite (option code AX) was ordered or licensed in the field.

DI/DO 1

Field Comm.	**1, 4, 2, 3, 1**

Configure the auxiliary output channel 1. This controls the auxiliary channel 1 of the transmitter on terminals 9(+) and 10(-). Note that the transmitter must have been ordered with the auxiliary output option (Model Code AX) or have been licensed in the field in order to have access to this functionality.

Configure I/O 1

Field Comm.	**1, 4, 2, 3, 1, 1**

Configure channel 1 for either an Input or an Output.

Input – Channel 1 will be configured as a discrete input. Options are:

PZR – Positive Zero Return. When conditions are met to activate the input, the transmitter will force the output to zero flow.

Net Total Reset – When conditions are met to activate the input, the transmitter will reset the Net Total value to zero.

Output – Channel 1 will be configured as a discrete output. Options are:

Reverse Flow – The output will activate when the transmitter detects a reverse flow condition.

Zero Flow – The output will activate when a no flow condition is detected.

Transmitter Fault – The output will activate when a transmitter fault condition is detected.

Empty Pipe – The output will activate when the transmitter detects an empty pipe condition.

Flow Limit 1 – The output will activate when the transmitter measures a flow rate that meets the conditions established for the Flow Limit 1 Alert.

Flow Limit 2 – The output will activate when the transmitter measures a flow rate that meets the conditions established for the Flow Limit 2 Alert.

Diagnostic Status Alert – The output will activate when the transmitter detects a condition that meets the configured criteria of the Diagnostic Status Alert.

Total Limit – The output will activate when the transmitter net total value meets the conditions established for the Total Limit Alert.

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DIO 1 Control

Field Comm.	**1, 4, 2, 3, 1, 2**

Displays the configuration for Channel 1 as either a discrete Input or Output.

Digital Input 1

Field Comm.	**1, 4, 2, 3, 1, 3**

Displays what digital input Channel 1 will be set to when the Control for Channel 1 is set to Input.

Digital Output 1

Field Comm.	**1, 4, 2, 3, 1, 4**

Displays what digital output Channel 1 will be set to when the Control for Channel 1 is set to Output.

DO 2

Field Comm.	**1, 4, 2, 3, 2**

Configure the digital output value here. This controls the digital output from the transmitter on terminals 16(+) and 20(-). There are four options that the digital output can be configured for:

- Reverse Flow – The output will activate when the transmitter detects a reverse flow condition.
- Zero Flow – The output will activate when a no flow condition is detected.
- Transmitter Fault – The output will activate when a transmitter fault condition is detected.
- Empty Pipe – The output will activate when the transmitter detects an empty pipe condition.
- Flow Limit 1 – The output will activate when the transmitter measures a flow rate that meets the conditions established for the Flow Limit 1 Alert.
- Flow Limit 2 – The output will activate when the transmitter measures a flow rate that meets the conditions established for the Flow Limit 2 Alert.
- Diagnostic Status Alert – The output will activate when the transmitter detects a condition that meets the configured criteria of the Diagnostic Status Alert.
- Total Limit – The output will activate when the transmitter net total value meets the conditions established for the Total Limit Alert.

Flow Limit 1

Field Comm.	**1, 4, 2, 3, 3**
LOI Key	**AUX. FUNCTION**

Configure the Parameters that will determine the criteria for activating a HART alert if the measured flow rate falls within a set of configured criteria. This functionality can be used for operating simple batching operations or generating alerts when certain flow conditions are met. This parameter can be configured as a discrete output if the transmitter was ordered with auxiliary outputs enabled (option code AX), or if this functionality has been licensed in the field.

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Control 1

Field Comm.	1, 4, 2, 3, 3, 1

Turns the Flow Limit 1 HART Alert ON or OFF.

ON – The transmitter will generate a HART alert when the defined conditions are met. If a digital output is configured for Flow Limit 1, the digital output will activate when the conditions for mode 1 are met.

OFF – The transmitter will not generate a HART alert for the Flow Limit 1.

Mode 1

Field Comm.	1, 4, 2, 3, 3, 2

Mode that determines when the Flow Limit 1 HART Alert will activate.

> High Limit – The HART Alert will activate when the measured flow rate exceeds the High Limit 1 set point.

< Low Limit – The HART Alert will activate when the measured flow rate falls below the Low Limit 1 set point.

In Range – The HART Alert will activate when the measured flow rate is between the High Limit 1 and Low Limit 1 set points.

Out of Range – The HART Alert will activate when the measured flow rate exceeds the High Limit 1 set point or falls below the Low Limit 1 set point.

High Limit 1

Field Comm.	1, 4, 2, 3, 3, 3

Set the flow rate value that corresponds to the high limit set point for the Flow Limit 1 alert.

Low Limit 1

Field Comm.	1, 4, 2, 3, 3, 4

Set the flow rate value that corresponds to the low limit set point for the Flow Limit 1 alert.

Flow Limit Hysteresis

Field Comm.	1, 4, 2, 3, 3, 5

Set the hysteresis band for the flow limit to determine how quickly the transmitter comes out of Alert status. This hysteresis value is used for both Flow Limit 1 and Flow Limit 2.

Flow Limit 2

Field Comm.	1, 4, 2, 3, 4
LOI Key	AUX. FUNCTION

Configure the Parameters that will determine the criteria for activating a HART alert if the measured flow rate falls within a set of configured criteria. This functionality can be used for operating simple batching operations or generating alerts when certain flow conditions are met. This parameter can be configured as a discrete output if the transmitter was ordered with auxiliary outputs enabled (option code AX), or if this functionality has been licensed in the field. If a digital output is configured for Flow Limit 1, the digital output will activate when the conditions for mode 1 are met.

Control 2

Field Comm.	1, 4, 2, 3, 4, 1

Turns the Flow Limit 2 HART Alert ON or OFF.

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ON – The transmitter will generate a HART alert when the defined conditions are met. If a digital output is configured for Flow Limit 1, the digital output will activate when the conditions for mode 1 are met.

OFF – The transmitter will not generate a HART alert for the Flow Limit 2.

Mode 2

Field Comm.	1, 4, 2, 3, 4, 2

Mode that determines when the Flow Limit 2 HART Alert will activate.

> High Limit – The HART Alert will activate when the measured flow rate exceeds the High Limit 2 set point.

< Low Limit – The HART Alert will activate when the measured flow rate falls below the Low Limit 2 set point.

In Range – The HART Alert will activate when the measured flow rate is between the High Limit 2 and Low Limit 2 set points.

Out of Range – The HART Alert will activate when the measured flow rate exceeds the High Limit 2 set point or falls below the Low Limit 2 set point.

High Limit 2

Field Comm.	1, 4, 2, 3, 4, 3

Set the flow rate value that corresponds to the high limit set point for the Flow Limit 2 alert.

Low Limit 2

Field Comm.	1, 4, 2, 3, 4, 4

Set the flow rate value that corresponds to the low limit set point for the Flow Limit 2 alert.

Flow Limit Hysteresis

Field Comm.	1, 4, 2, 3, 4, 5

Set the hysteresis band for the flow limit to determine how quickly the transmitter comes out of Alert status. This hysteresis value is used for both Flow Limit 1 and Flow Limit 2.

Total Limit

Field Comm.	1, 4, 2, 3, 5
LOI Key	AUX. FUNCTION

Configure the Parameters that will determine the criteria for activating a HART alert if the measured net total falls within a set of configured criteria. This functionality can be used for operating simple batching operations or generating alerts when certain flow conditions are met. This parameter can be configured as a discrete output if the transmitter was ordered with auxiliary outputs enabled (option code AX), or if this functionality has been licensed in the field.

Total Control

Field Comm.	1, 4, 2, 3, 5, 1

Turns the Total Limit HART Alert ON or OFF.

ON – The transmitter will generate a HART alert when the defined conditions are met.

OFF – The transmitter will not generate a HART alert for the Total Limit.

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Total Mode

Field Comm.	1, 4, 2, 3, 5, 2

Mode that determines when the Total Limit HART Alert will activate.

> High Limit – The HART Alert will activate when the measured net total exceeds the Total High Limit set point.

< Low Limit – The HART Alert will activate when the measured net total falls below the Total Low Limit set point.

In Range – The HART Alert will activate when the measured net total is between the Total High Limit and Total Low Limit set points.

Out of Range – The HART Alert will activate when the measured net total exceeds the Total High Limit set point or falls below the Total Low Limit set point.

Total High Limit

Field Comm.	1, 4, 2, 3, 5, 3

Set the net total value that corresponds to the high limit set point for the Flow Limit 1 alert.

Total Low Limit

Field Comm.	1, 4, 2, 3, 5, 4

Set the net total value that corresponds to the low limit set point for the Flow Limit 1 alert.

Total Limit Hysteresis

Field Comm.	1, 4, 2, 3, 5, 5

Set the hysteresis band for the total limit to determine how quickly the transmitter comes out of Alert status.

Diagnostic Status Alert

Field Comm.	1, 4, 2, 3, 6
LOI Key	AUX. FUNCTION

Turn ON / OFF the diagnostics that will cause this Alert to activate.

ON – The Diagnostic Status Alert will activate when a transmitter detects a diagnostic designated as ON.

OFF – The Diagnostic Status Alert will not activate when diagnostics designated as OFF are detected.

Reverse Flow

Field Comm.	1, 4, 2, 4
LOI Key	AUX. FUNCTION

Enable or disable the transmitter's ability to read reverse flow.

Reverse Flow allows the transmitter to read negative flow. This may occur when flow in the pipe is going the negative direction, or when either electrode wires or coil wires are reversed. This also enables the totalizer to count in the reverse direction.

Totalizer Setup

Field Comm.	1, 4, 2, 5
LOI Key	AUX. FUNCTION

The totalizer setup menu allows for the viewing and configuration of the totalizer parameters.

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Totalizer Units

Field Comm.	**1, 4, 2, 5, 1**
LOI Key	**AUX. FUNCTION**

Totalizer units allow for the configuration of the units that the totalized value will be displayed as. These units are independent of the flow units.

Measured Gross Total

Field Comm.	**1, 4, 2, 5, 2**
LOI Key	**TOTALIZE**

Measured gross total provides the output reading of the totalizer. This value is the amount of process fluid that has passed through the flowmeter since the totalizer was last reset.

To reset the gross total value, you must change the line size. See “Line Size” on page 3-10 for details on how to change the line size.

Measured Net Total

Field Comm.	**1, 4, 2, 5, 3**
LOI Key	**TOTALIZE**

Measured net total provides the output reading of the totalizer. This value is the amount of process fluid that has passed through the flowmeter since the totalizer was last reset. When reverse flow is enabled, the net total represents the difference between the total flow in the forward direction less the total flow in the reverse direction.

Measured Reverse Total

Field Comm.	**1, 4, 2, 5, 4**
LOI Key	**TOTALIZE**

Measured reverse total provides the output reading of the totalizer. This value is the amount of process fluid that has passed through the flowmeter in the reverse direction since the totalizer was last reset. This value is only totalized when reverse flow is enabled.

Start Totalizer

Field Comm.	**1, 4, 2, 5, 5**
LOI Key	**START/STOP**

Start totalizer starts the totalizer counting from its current value.

Stop Totalizer

Field Comm.	**1, 4, 2, 5, 6**
LOI Key	**START/STOP**

Stop totalizer interrupts the totalizer count until it is restarted again. This feature is often used during pipe cleaning or other maintenance operations.

Reset Totalizer

Field Comm.	**1, 4, 2, 5, 7**
LOI Key	**READ/RESET**

Reset totalizer resets the net totalizer value to zero. The totalizer must be stopped before resetting.

NOTE
The totalizer value is saved in the Non-Volatile memory of the electronics every three seconds. Should power to the transmitter be interrupted, the totalizer value will start at the last saved value when power is re-applied.

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Alarm Level

Field Comm.	1, 4, 2, 6

The alarm level allows you to drive the transmitter to preset values if an alarm occurs. There are two options:

- Rosemount Alarm and Saturation Values
- NAMUR-Complaint Alarm and Saturation Levels

Table 4-3. Rosemount (Standard) Alarm and Saturation Values

Level	4-20 mA Saturation	4-20 mA Alarm
Low	3.9 mA	≤3.75 mA
High	20.8 mA	≥22.6 mA

Table 4-4. NAMUR-Compliant Alarm and Saturation Values

Level	4-20 mA Saturation	4-20 mA Alarm
Low	3.8 mA	≤3.5 mA
High	20.5 mA	≥22.6 mA

HART Output

Field Comm.	1, 4, 2, 7

Multidrop configuration refers to the connection of several flowmeters to a single communications transmission line. Communication occurs digitally between a HART-based communicator or control system and the flowmeters. Multidrop mode automatically deactivates the analog output of the flowmeters. Using the Field Communications protocol, up to 15 transmitters can be connected on a single twisted pair of wires or over leased phone lines. The use of a multidrop installation requires consideration of the update rate necessary from each transmitter, the combination of transmitter models, and the length of the transmission line. Multidrop installations are not recommended where intrinsic safety is a requirement. Communication with the transmitters can be accomplished with commercially available Bell 202 modems and a host implementing the HART protocol. Each transmitter is identified by a unique address (1-15) and responds to the commands defined in the HART protocol.

Variable Mapping

Field Comm.	1, 4, 2, 7, 1

Variable mapping allows you to configure the variables that are mapped to the tertiary and quaternary variables. The primary and secondary variables are fixed and cannot be configured.

- PV is configured for flow
- SV is configured for pulse

Tertiary Variable

Field Comm.	1, 4, 2, 7, 1, 1

The tertiary variable maps the third variable of the transmitter. This variable is a HART only variable and can be read off of the HART signal with a HART enabled input card, or can be burst for use with a HART Tri-Loop to convert the HART signal to an analog output. Options available for mapping to this variable are:

- Forward Gross
- Forward Net
- Reverse Gross
- Electronics Temp

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Quaternary Variable

Field Comm.	1, 4, 2, 7, 1, 2

The quaternary variable maps the fourth variable of the transmitter. This variable is a HART only variable and can be read off of the HART signal with a HART enabled input card, or can be burst for use with a HART Tri-Loop to convert the HART signal to an analog output. Options available for mapping to this variable are:

- Forward Gross
- Forward Net
- Reverse Gross
- Electronics Temp

Polling Address

Field Comm.	1, 4, 2, 7, 2

Poll Address enables you to set the poll address for a multi- dropped meter. The poll address is used to identify each meter on the multi-drop line. Follow the on-screen instructions to set the address at a number from 1 to 15. To set or change the flowmeter address, establish communication with the selected Rosemount 8712 in the loop.

NOTE
The Rosemount 8712 is set to poll address zero at the factory, allowing it to operate in the standard point-to-point manner with a 4–20 mA output signal. To activate multidrop communication, the transmitter poll address must be changed to a number between 1 and 15. This change deactivates the 4–20 mA analog output, setting it to 4 mA, and disables the failure mode alarm signal.

Number of Request Preambles

Field Comm.	1, 4, 2, 7, 3

This is the number of preambles required by the 8712 for Field Communications.

Number of Response Preambles

Field Comm.	1, 4, 2, 7, 4

This is the number of preambles sent by the 8712 in response to any host request.

Burst Mode

Field Comm.	1, 4, 2, 7, 5

Burst Mode Configuration

The Rosemount 8712 includes a burst mode function that broadcasts the primary variable or all dynamic variables approximately three to four times a second. The burst mode is a specialized function used in very specific applications. The burst mode function enables you to select the variables to broadcast while in the burst mode and to select the burst mode option.

The Burst Mode variable enables you to set the Burst Mode to the needs of your application. Options for the Burst Mode setting include:

- Off–Turns off the Burst Mode so that no data are broadcast on the loop.
- On–Turns Burst Mode on so that the data selected under Burst Option are broadcast over the loop.

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Additional command options may appear that are reserved and do not apply to the Rosemount 8712.

Burst Option

Field Comm.	1, 4, 2, 7, 6

Burst option enables you to select the variables to broadcast over the transmitter burst. Choose one of the following options:

- PV–Selects the process variable for broadcast over the transmitter burst.
- Percent Range/Current–Selects the process variable as percent of range and analog output variables for broadcast over the transmitter burst.
- Process vars/crnt–Selects the process variables and analog output variables for broadcast over the transmitter burst.
- Dynamic Vars–Burst all dynamic variables in the transmitter.

LOI Configuration

Field Comm.	1, 4, 3

The LOI (local operator interface) configuration contains functionality to configure the LOI outputs of the transmitter.

Flowrate Display

Field Comm.	1, 4, 3, 2

This allows you to configure the items that the LOI will display when at the flowrate screen. There are five options available:

- Flow rate and % Span
- % Span and Net Total
- Flowrate and Net Total
- % Span and Gross Total
- Flowrate and Gross Total

Totalizer Display

Field Comm.	1, 4, 3, 3

This allows you to configure the items that the LOI will display when in the totalizer screen. There are two options available:

- Forward Total and Reverse Total
- Net Total and Gross Total

Signal Processing

Field Comm.	1, 4, 4
LOI Key	AUX. FUNCTION

The 8712 contains several advanced functions that can be used to stabilize erratic outputs caused by process noise. The signal processing menu contains this functionality.

Operating Mode

Field Comm.	1, 4, 4, 1

The Operating Mode should be used only when the signal is noisy and gives an unstable output. Filter mode automatically uses 37 Hz coil drive mode and activates signal processing at the factory set default values. When using filter mode, perform an auto zero with no flow and a full sensor. Either of the parameters, coil drive mode or signal processing, may still be changed individually. Turning Signal Processing off or changing the coil drive frequency to 5 Hz will automatically change the Operating Mode from filter mode to normal mode.

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Manually Configure Digital Signal Processing (DSP)

Field Comm.	1, 4, 4, 2

The 8712 transmitter includes digital signal processing capabilities that can be used to condition the output from the transmitter by enabling noise rejection. See Appendix D: "Digital Signal Processing" for a more information on the DSP functionality.

Enable/Disable DSP

Field Comm.	1, 4, 4, 2, 1

When ON is selected, the Rosemount 8712 output is derived using a running average of the individual flow inputs. Signal processing is a software algorithm that examines the quality of the electrode signal against user-specified tolerances. This average is updated at the rate of 10 samples per second with a coil drive frequency of 5 Hz, and 75 samples per second with a coil drive frequency of 37Hz. The three parameters that make up signal processing (number of samples, maximum percent limit, and time limit) are described below.

Samples

Field Comm.	1, 4, 4, 2, 2

0 to 125 Samples

The number of samples function sets the amount of time that inputs are collected and used to calculate the average value. Each second is divided into tenths (1/10) with the number of samples equaling the number of 1/10 second increments used to calculate the average.

For example, a value of:

1 averages the inputs over the past 1/10 second

10 averages the inputs over the past 1 second

100 averages the inputs over the past 10 seconds

125 averages the inputs over the past 12.5 seconds

% Limit

Field Comm.	1, 4, 4, 2, 3

0 to 100 Percent

The maximum percent limit is a tolerance band set up on either side of the running average. The percentage value refers to deviation from the running average. For example, if the running average is 100 gal/min, and a 2 percent maximum limit is selected, then the acceptable range is from 98 to 102 gal/min.

Values within the limit are accepted while values outside the limit are analyzed to determine if they are a noise spike or an actual flow change.

Time Limit

Field Comm.	1, 4, 4, 2, 4

0 to 256 Seconds

The time limit parameter forces the output and running average values to the new value of an actual flow rate change that is outside the percent limit boundaries. It thereby limits response time to flow changes to the time limit value rather than the length of the running average.

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For example, if the number of samples selected is 100, then the response time of the system is 10 seconds. In some cases this may be unacceptable. By setting the time limit, you can force the 8712 to clear the value of the running average and re-establish the output and average at the new flow rate once the time limit has elapsed. This parameter limits the response time added to the loop. A suggested time limit value of two seconds is a good starting point for most applicable process fluids. The selected signal processing configuration may be turned ON or OFF to suit your needs.

Coil Drive Frequency

Field Comm.	**1, 4, 4, 3**
LOI Key	**AUX. FUNCTION**

Coil drive frequency allows pulse-rate selection of the sensor coils.

5 Hz

The standard coil drive frequency is 5 Hz, which is sufficient for nearly all applications.

37 Hz

If the process fluid causes a noisy or unstable output, increase the coil drive frequency to 37 Hz. If the 37 Hz mode is selected, perform the auto zero function with no flow and a full sensor.

Low Flow Cutoff

Field Comm.	**1, 4, 4, 4**
LOI Key	**AUX. FUNCTION**

Low flow cutoff allows you to specify the flow rate, between 0.01 and 38.37 f/s, below which the outputs are driven to zero flow. The units format for low flow cutoff cannot be changed. It is always displayed as feet per second regardless of the PV Units format selected. The low flow cutoff value applies to both forward and reverse flows.

Primary Variable Damping

Field Comm.	**1, 4, 4, 5**
LOI Key	**DAMPING**

0 to 256 Seconds

Primary Variable Damping allows selection of a response time, in seconds, to a step change in flow rate. It is most often used to smooth fluctuations in output.

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Universal Auto Trim

Field Comm.	1, 4, 5
LOI Key	AUX. FUNCTION

The universal auto trim function enables the Rosemount 8712 to calibrate sensors that were not calibrated at the Rosemount factory. The function is activated as one step in a procedure known as in-process calibration. If your Rosemount sensor has a 16-digit calibration number, in-process calibration is not required. If it does not, or if your sensor is made by another manufacturer, complete the following steps for in-process calibration.

1. Determine the flow rate of the process fluid in the sensor.

NOTE
The flow rate in the line can be determined by using another sensor in the line, by counting the revolutions of a centrifugal pump, or by performing a bucket test to determine how fast a given volume is filled by the process fluid.

2. Complete the universal auto trim function.
3. When the routine is completed, the sensor is ready for use.

Device Info

Field Comm.	1, 4, 6
LOI Key	XMTR INFO

Information variables are used for identification of Flowmeters in the field and to store information that may be useful in service situations. Information variables have no effect on flowmeter output or process variables.

Manufacturer

Field Comm.	1, 4, 6, 1
LOI Key	XMTR INFO

Manufacturer is an informational variable provided by the factory. For the Rosemount 8712, the Manufacturer is Rosemount.

Tag

Field Comm.	1, 4, 6, 2
LOI Key	XMTR INFO

Tag is the quickest variable to identify and distinguish between flowmeters. Flowmeters can be tagged according to the requirements of your application. The tag may be up to eight characters long.

Descriptor

Field Comm.	1, 4, 6, 3
LOI Key	XMTR INFO

Descriptor is a longer user-defined variable to assist with more specific identification of the particular flowmeter. It is usually used in multi-flowmeter environments and provides 16 characters.

Message

Field Comm.	1, 4, 6, 4
LOI Key	XMTR INFO

The message variable provides an even longer user-defined variable for identification and other purposes. It provides 32 characters of information and is stored with the other configuration data.

Date

Field Comm.	1, 4, 6, 5
LOI Key	XMTR INFO

Date is a user-defined variable that provides a place to save a date, typically used to store the last date that the transmitter configuration was changed.

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Device ID

Field Comm.	**1, 4, 6, 6**
LOI Key	**AUX. FUNCTION**

This function displays the Device ID of the transmitter. This is one piece of information required to generate a license code to enable diagnostics in the field.

Sensor Serial Number

Field Comm.	**1, 4, 6, 7**

The PV sensor serial number is the serial number of the sensor connected to the transmitter and can be stored in the transmitter configuration for future reference. The number provides easy identification if the sensor needs servicing or for other purposes.

Sensor Tag

Field Comm.	**1, 4, 6, 8**

Sensor Tag is the quickest and shortest way of identifying and distinguishing between sensors. Sensors can be tagged according to the requirements of your application. The tag may be up to eight characters long.

Write Protect

Field Comm.	**1, 4, 6, 9**

Write protect is a read-only informational variable that reflects the setting of the hardware security switch. If write protect is ON, configuration data is protected and cannot be changed from a HART-based communicator, the LOI, or control system. If write protect is OFF, configuration data may be changed using the communicator, LOI, or control system.

Revision Numbers

Field Comm.	**1, 4, 6, 10**

Revisions numbers are fixed informational variables that provide the revision number for different elements of your Field Communicator and Rosemount 8712. These revision numbers may be required when calling the factory for support. Revision numbers can only be changed at the factory and are provided for the following elements:

NOTE
To access these features, you must scroll to this option in the HART Field Communicator.

Universal Revision Number

Field Comm.	**1, 4, 6, 10, 1**

Universal revision number – Designates the HART Universal Command specification to which the transmitter is designed to conform.

Field Device Revision Number

Field Comm.	**1, 4, 6, 10, 2**

Field device revision number – Designates the revision for the Rosemount 8712 specific command identification for HART compatibility.

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Software Revision Number

Field Comm.	1, 4, 6, 10, 3

This function displays the software revision number of the transmitter. This is one piece of information required to generate a license code to enable diagnostics in the field.

Final Assembly Number

Field Comm.	1, 4, 6, 10, 4
LOI Key	XMTR INFO

Final Assembly Number – Factory set number that refers to the electronics of your flowmeter. The number is configured into the flowmeter for later reference.

Construction Materials

Field Comm.	1, 4, 6, 11
LOI Key	XMTR INFO

Construction materials contain information about the sensor that is connected to the transmitter. This information is configured into the transmitter for later reference. This information can be helpful when calling the factory for support.

NOTE
To access these features, you must scroll to this option in the HART Field Communicator.

Flange Type

Field Comm.	1, 4, 6, 11, 1
LOI Key	XMTR INFO

Flange type enables you to select the flange type for your magnetic transmitter system. This variable only needs to be changed if you have changed your sensor. Options for this value are:

- 150# ANSI
- 300# ANSI
- 600# ANSI
- 900# ANSI
- 1500# ANSI
- 2500# ANSI
- PN 10
- PN 16
- PN 25
- PN 40
- PN 64
- Wafer
- Other

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Flange Material

Field Comm.	**1, 4, 6, 11, 2**
LOI Key	**XMTR INFO**

Flange material enables you to select the flange material for your magnetic transmitter system. This variable only needs to be changed if you have changed your sensor. Options for this value are:

- Carbon Steel
- 304 Stainless Steel
- 316 Stainless Steel
- Wafer
- Other

Electrode Type

Field Comm.	**1, 4, 6, 11, 3**
LOI Key	**XMTR INFO**

Electrode type enables you to select the electrode type for your magnetic transmitter system. This variable only needs to be changed if you have replaced electrodes or if you have replaced your sensor. Options for this value are:

- Standard
- Std & Ground
- Bullet
- Other

Electrode Material

Field Comm.	**1, 4, 6, 11, 4**
LOI Key	**XMTR INFO**

Electrode Material enables you to select the electrode material for your magnetic transmitter system. This variable only needs to be changed if you have replaced electrodes or if you have replaced your sensor. Options for this value are:

- 316L SST
- Nickel Alloy 276 (UNS N10276)
- Tantalum
- Titanium
- 80% Platinum – 20% Iridium
- Alloy 20
- Other

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Liner Material

Field Comm.	**1, 4, 6, 11, 5**
LOI Key	**XMTR INFO**

Liner material enables you to select the liner material for the attached sensor. This variable only needs to be changed if you have replaced your sensor. Options for this value are:

- PTFE
- ETFE
- PFA
- Polyurethane
- Linatex
- Natural Rubber
- Neoprene
- Other

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Figure 4-2. Field Communicator Menu Tree for the Rosemount 8712



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Figure 4-3. HART Fast Key

Function	HART Fast Keys
Process Variables (PV)	**1,1**
Primary Variable Value	1,1,1
Primary Variable %	1,1,2
PV Loop Current	1,1,3
Totalizer Set-Up	1,1,4
Totalizer Units	1,1,4,1
Gross Total	1,1,4,2
Net Total	1,1,4,3
Reverse Total	1,1,4,4
Start Totalizer	1,1,4,5
Stop Totalizer	1,1,4,6
Reset Totalizer	1,1,4,7
Pulse Output	1,1,5
Diagnostics	**1,2**
Diagnostic Controls	1,2,1
Basic Diagnostics	1,2,2
Self Test	1,2,2,1
AO Loop Test	1,2,2,2
Pulse Output Loop Test	1,2,2,3
Tune Empty Pipe	1,2,2,4
EP Value	1,2,2,4,1
EP Trigger Level	1,2,2,4,2
EP Counts	1,2,2,4,3
Electronics Temp	1,2,2,5
Flow Limit 1	1, 2,2,6
Control 1	1,2,2,6,1
Mode 1	1,2,2,6,2
High Limit 1	1,2,2,6,3
Low Limit 1	1,2,2,6,4
Flow Limit Hysteresis	1,2,2,6,5
Flow Limit 2	1,2,2,7
Control 2	1,2,2,7,1
Mode 2	1,2,2,7,2
High Limit 2	1,2,2,7,3
Low Limit 2	1,2,2,7,4
Flow Limit Hysteresis	1,2,2,7,5
Total Limit	1,2,2,8
Total Control	1,2,2,8,1
Total Mode	1,2,2,8,2
Total High Limit	1,2,2,8,3
Total Low Limit	1,2,2,8,4
Total Limit Hysteresis	1,2,2,8,5
Advanced Diagnostics	1,2,3
8714i Meter Verification	1,2,3,1
Run 8714i	1,2,3,1,1
8714i Results	1,2,3,1,2
Test Condition	1,2,3,1,2,1
Test Criteria	1,2,3,1,2,2
8714i Test Result	1,2,3,1,2,3
Simulated Velocity	1,2,3,1,2,4
Actual Velocity	1,2,3,1,2,5
Velocity Deviation	1,2,3,1,2,6
Xmtr Cal Test Result	1,2,3,1,2,7
Sensor Cal Deviation	1,2,3,1,2,8

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Function	HART Fast Keys
Sensor Cal Test Result	1,2,3,1,2,9
Coil Circuit Test Result	1,2,3,1,2,x
Electrode Circuit Test Result	1,2,3,1,2,x
Sensor Signature	1,2,3,1,3
Signature Values	1,2,3,1,3,1
Coil Resistance	1,2,3,1,3,1,1
Coil Signature	1,2,3,1,3,1,2
Electrode Resistance	1,2,3,1,3,1,3
Re-Signature Meter	1,2,3,1,3,2
Recall Last Saved Values	1,2,3,1,3,3
Set Pass/Fail Criteria	1,2,3,1,4
No Flow Limit	1,2,3,1,4,1
Flowing Limit	1,2,3,1,4,2
Empty Pipe Limit	1,2,3,1,4,3
Measurements	1,2,3,1,5
Coil Resistance	1,2,3,1,5,1
Coil Signature	1,2,3,1,5,2
Electrode Resistance	1,2,3,1,5,3
Licensing	1,2,3,2
License Status	1,2,3,2,1
License Key	1,2,3,2,2
Device ID	1,2,3,2,2,1
License Key	1,2,3,2,2,2
Diagnostic Variables	1,2,4
EP Value	1,2,4,1
Electronics Temp	1,2,4,2
Line Noise	1,2,4,3
5 Hz Signal to Noise Ratio (SNR)	1,2,4,4
37 Hz SNR	1,2,4,5
Signal Power	1,2,4,6
8714i results	1,2,4,7
Test Condition	1,2,4,7,1
Test Criteria	1,2,4,7,2
8714i Test Result	1,2,4,7,3
Simulated Velocity	1,2,4,7,4
Actual Velocity	1,2,4,7,5
Velocity Deviation	1,2,4,7,6
Xmtr Cal Test Result	1,2,4,7,7
Sensor Cal Deviation	1,2,4,7,8
Sensor Cal Test Result	1,2,4,7,9
Coil Circuit Test Result	1,2,4,7,x
Electrode Circuit Test Result	1,2,4,7,x
Trims	1,2,5
D/A Trim	1,2,5,1
Scaled D/A Trim	1,2,5,2
Digital Trim	1,2,5,3
Auto Zero	1,2,5,4
Universal Trim	1,2,5,5
View Status	1,2,6
Basic Setup	**1,3**
Tag	1,3,1
Flow Units	1,3,2
PV Units	1,3,2,1
Special Units	1,3,2,2
Volume Unit	1,3,2,2,1

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Function	HART Fast Keys
Base Volume Unit	1,3,2,2,2
Conversion Number	1,3,2,2,3
Base Time Unit	1,3,2,2,4
Flow Rate Unit	1,3,2,2,5
Line Size	1,3,3
PV URV	1,3,4
PV LRV	1,3,5
Calibration Number	1,3,6
PV Damping	1,3,7
Detailed Setup	**1,4**
Additional Params	1,4,1
Coil Drive Freq	1,4,1,1
Density Value	1,4,1,2
PV USL	1,4,1,3
PV LSL	1,4,1,4
PV Min Span	1,4,1,5
Configure Output	1,4,2
Analog Output	1,4,2,1
PV URV	1,4,2,1,1
PV LRV	1,4,2,1,2
PV Loop Current	1,4,2,1,3
PV Alarm Type	1,4,2,1,4
AO Loop Test	1,4,2,1,5
D/A Trim	1,4,2,1,6
Scaled D/A Trim	1,4,2,1,7
Alarm Level	1,4,2,1,8
Pulse Output	1,4,2,2
Pulse Scaling	1,4,2,2,1
Pulse Width	1,4,2,2,2
Pulse Output Loop Test	1,4,2,2,3
Digital I/O	1,4,2,3
DI/DO 1	1,4,2,3,1
Configure I/O 1	1,4,2,3,1,1
DIO 1 Control	1,4,2,3,1,2
Digital Input 1	1,4,2,3,1,3
Digital Output 1	1,4,2,3,1,4
DO 2	1,4,2,3,2
Flow Limit 1	1,4,2,3,3
Control 1	1,4,2,3,3,1
Mode 1	1,4,2,3,3,2
High Limit 1	1,4,2,3,3,3
Low Limit 1	1,4,2,3,3,4
Flow Limit Hysteresis	1,4,2,3,3,5
Flow Limit 2	1,4,2,3,4
Control 2	1,4,2,3,4,1
Mode 2	1,4,2,3,4,2
High Limit 2	1,4,2,3,4,3
Low Limit 2	1,4,2,3,4,4
Flow Limit Hysteresis	1,4,2,3,4,5
Total Limit	1,4,2,3,5
Total Control	1,4,2,3,5,1
Total Mode	1,4,2,3,5,2
Total High Limit	1,4,2,3,5,3
Total Low Limit	1,4,2,3,5,4
Total Limit Hysteresis	1,4,2,3,5,5

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Function	HART Fast Keys
Diagnostic Status Alert	1,4,2,3,6
Reverse Flow	1,4,2,4
Totalizer Setup	1,4,2,5
Totalizer Units	1,4,2,5,1
Gross Total	1,4,2,5,2
Net Total	1,4,2,5,5
Reverse Total	1,4,2,5,4
Start Totalizer	1,4,2,5,5
Stop Totalizer	1,4,2,5,6
Reset Totalizer	1,4,2,5,7
Alarm Level	1,4,2,6
HART Output	1,4,2,7
Variable Mapping	1,4,2,7,1
TV is	1,4,2,7,1,1
QV is	1,4,2,7,1,2
Poll Address	1,4,2,7,2
# of Req Preams	1,4,2,7,3
# Resp Preams	1,4,2,7,4
Burst Mode	1,4,2,7,5
Burst Option	1,4,2,7,6
Signal Processing	1,4,3
Operating Mode	1,4,3,1
Man Config DSP	1,4,3,2
Status	1,4,3,2,1
Samples	1,4,3,2,2
% Limit	1,4,3,2,3
Time Limit	1,4,3,2,4
Coil Drive Freq	1,4,3,3
Low Flow Cutoff	1,4,3,4
PV Damping	1,4,3,5
Universal Trim	1,4,4
Device Info	1,4,5
Manufacturer	1,4,5,1
Tag	1,4,5,2
Descriptor	1,4,5,3
Message	1,4,5,4
Date	1,4,5,5
Device ID	1,4,5,6
PV Sensor S/N	1,4,5,7
PV Sensor Tag	1,4,5,8
Write Protect	1,4,5,9
Revision No.	1,4,5,x
Universal Rev	1,4,5,x,1
Transmitter Rev	1,4,5,x,2
Software Rev	1,4,5,x,3
Final Assembly #	1,4,5,x,4
Construction Materials	1,4,5,x
Flange Type	1,4,5,x,1
Flange Material	1,4,5,x,2
Electrode Type	1,4,5,x,3
Electrode Material	1,4,5,x,4
Liner Material	1,4,5,x,5
Review	**1,5**

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Figure 4-4. Local Operator Interface (LOI) Data Entry Keys for the Rosemount 8712

Data Entry Keys	Function Performed
Shift	• Moves the blinking cursor on the display one character to the right • Scrolls through available values
Increment	• Increments the character over the cursor by one • Steps through all the digits, letters, and symbols that are applicable to the present operation • Scrolls through available values
Enter	Stores the displayed value previously selected with the SHIFT and INCR. keys
Display Control Keys	Function Performed
Flow Rate	Displays the user-selected parameters for flow indication
Totalize	Displays the present totalized output of the transmitter, and activates the Totalizer group of keys The choices, **Forward** and **Reverse** totals or **Net** and **Gross** totals, are selected in Auxiliary Functions
Start/Stop	Starts the totalizing display if it is stopped, and stops the display if it is running
Read/Reset	Resets the net totalizing display to zero if it is stopped, and halts the display if the display is running
Transmitter Parameters Keys	Function Performed
Tube Cal No.	Identifies the calibration number when using Rosemount sensors, or other manufacturers' sensors calibrated at the Rosemount factory
Tube Size	Specifies the sensor size and identifies the corresponding maximum flow (0.1 - through 80-inch line sizes)
Units	Specifies the desired units: Gal/Min Liters/Min ImpGal/Min CuMeter/Hr Ft/Sec Meters/Sec Special (user defined) For a complete list of available units, see Table 3-3 on page 3-9

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Auxiliary Functions	Function	Options
	Run 8714i	Runs the meter verification diagnostic
	Operating Mode	Normal or Filter
	Coil Pulse Mode	5 or 37 Hz
	Flow rate Display	Flow–% Span, Flow–Totalize, %Span–Totalize
	Totalizer Display	Forward–Reverse or Net–Gross
	Totalizer Units	Configure the totalizer units of measure
	Configure Signal Processing	On/Off
	Special Units	Volume units, base volume units, conversion, time base, rate units
	Process Density	Required for units of mass flow
	DI/DO 1 Config	Configure Auxiliary Channel 1
	Digital Output 2	Configure Auxiliary Channel 2
	Flow Limit 1	Configure Flow Limit 1 Alert
	Flow Limit 2	Configure Flow Limit 2 Alert
	Totalizer Limit	Configure Totalizer Limit Alert
	Diagnostic Status Alert	Configure Diagnostic Status Alert
	Reverse Flow Enable	On/Off
	Licensed Options	Displays Licensed Options
	License Key	Field license advanced functionality
	Diagnostics Enable	Turn diagnostics On/Off
	8714i Setup	Configure test criteria parameters
	Re-signature Sensor	Base line sensor characteristics
	Recall Last Signature	Recall previous signature values
	Empty Pipe	Configure empty pipe diagnostic parameters
	Universal Auto Trim	In-process Sensor Calibration
	Low Flow Cutoff	0.01 ft/s to 1 ft/s
	Pulse Width	Pulse Width
	Analog Output Zero	4 mA Value
	Analog Output Test	Analog Output Loop Test
	Pulse Output Test	Pulse Output Loop Test
	Transmitter Test	Test the Transmitter
	4–20 mA Output Trim	Adjust the 4–20 mA Output
	Auto Zero	Zero Sensor for 37 Hz Coil Drive Operation
	Electronics Trim	Transmitter Calibration
Analog Output Range	Sets the desired 20 mA point – **must set the sensor size first**	
Pulse Output Scaling	Sets one pulse to a selectable number of volume units – **must set the sensor size first**	
Damping	Sets response time (single pole time constant), in seconds, to a step change in flow rate	
Transmitter Information	Allows you to view and change useful information about the transmitter and sensor	
Empty Pipe Tuning	Allowable range 3.0 - 2000.0	

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Section 5 Sensor Installation

Safety Messages . . . . . page 5-1
Sensor Handling . . . . . page 5-3
Sensor Mounting . . . . . page 5-4
Installation (Flanged Sensor) . . . . . page 5-7
Installation (Wafer Sensor) . . . . . page 5-10
Installation (Sanitary Sensor) . . . . . page 5-12
Grounding . . . . . page 5-12
Process Leak Protection (Optional) . . . . . page 5-15

This section covers the steps required to physically install the magnetic sensor. For electrical connections and cabling see Section 2: "Installation". Instructions and procedures in this section may require special precautions to ensure the safety of the personnel performing the operations. Please refer to the following safety messages before performing any operation in this section.

SAFETY MESSAGES

⚠ This symbol is used throughout this manual to indicate that special attention to warning information is required.

⚠WARNING

Failure to follow these installation guidelines could result in death or serious injury:

Installation and servicing instructions are for use by qualified personnel only. Do not perform any servicing other than that contained in the operating instructions, unless qualified. Verify that the operating environment of the sensor and transmitter is consistent with the appropriate hazardous area approval.

Do not connect a Rosemount 8712 to a non-Rosemount sensor that is located in an explosive atmosphere.

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⚠WARNING

Explosions could result in death or serious injury:

Installation of this transmitter in an explosive environment must be in accordance with the appropriate local, national, and international standards, codes, and practices. Please review the approvals section of the 8712 reference manual for any restrictions associated with a safe installation.

Before connecting a HART-based communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.

Electrical shock can result in death or serious injury

Avoid contact with the leads and terminals. High voltage that may be present on leads can cause electrical shock.

⚠WARNING

The sensor liner is vulnerable to handling damage. Never place anything through the sensor for the purpose of lifting or gaining leverage. Liner damage can render the sensor useless.

To avoid possible damage to the sensor liner ends, do not use metallic or spiral-wound gaskets. If frequent removal is anticipated, take precautions to protect the liner ends. Short spool pieces attached to the sensor ends are often used for protection.

Correct flange bolt tightening is crucial for proper sensor operation and life. All bolts must be tightened in the proper sequence to the specified torque limits. Failure to observe these instructions could result in severe damage to the sensor lining and possible sensor replacement.

Emerson Process Management can supply lining protectors to prevent liner damage during removal, installation, and excessive bolt torquing.

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SENSOR HANDLING

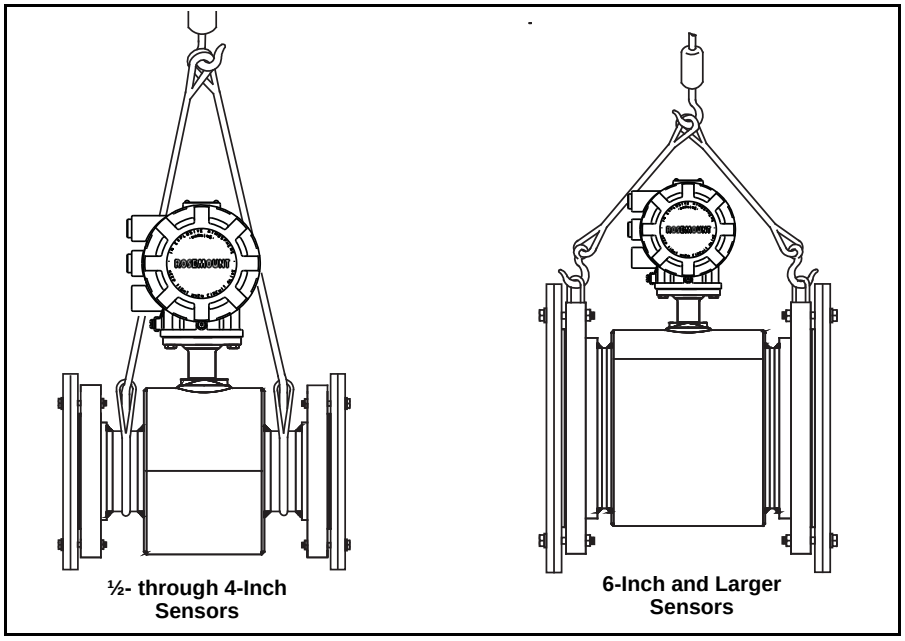
⚠ Handle all parts carefully to prevent damage. Whenever possible, transport the system to the installation site in the original shipping containers. PTFE-lined sensors are shipped with end covers that protect it from both mechanical damage and normal unrestrained distortion. Remove the end covers just before installation.

Flanged 6- through 36-inch sensors come with a lifting lug on each flange. The lifting lugs make the sensor easier to handle when it is transported and lowered into place at the installation site.

Flanged ½- to 4-inch sensors do not have lugs. They must be supported with a lifting sling on each side of the housing.

Figure 5-1 shows sensors correctly supported for handling and installation. Notice the plywood end pieces are still in place to protect the sensor liner during transportation.

Figure 5-1. Rosemount 8705 Sensor Support for Handling



⚠ See ”Safety Messages” on pages 5-1 and 5-2 for complete warning information.

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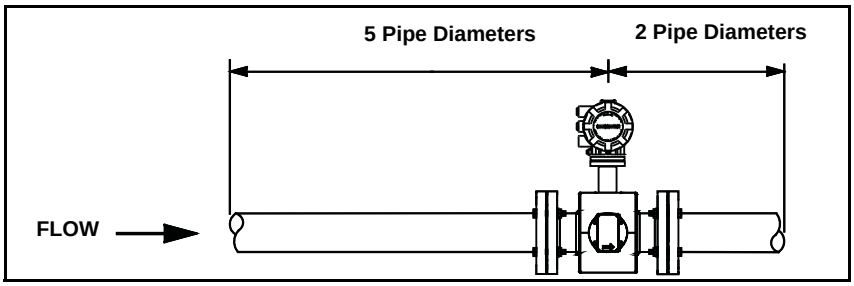
SENSOR MOUNTING

Physical mounting of a sensor is similar to installing a typical section of pipe. Conventional tools, equipment, and accessories (bolts, gaskets, and grounding hardware) are required.

Upstream/Downstream Piping

To ensure specification accuracy over widely varying process conditions, install the sensor a minimum of five straight pipe diameters upstream and two pipe diameters downstream from the electrode plane (see Figure 5-2).

Figure 5-2. Upstream and Downstream Straight Pipe Diameters



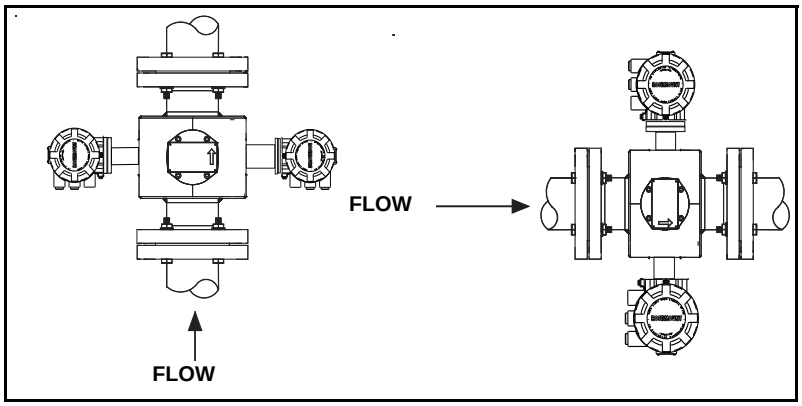
Sensor Orientation

The sensor should be installed in a position that ensures the sensor remains full during operation. Figures 5-3, 5-4, and 5-5 show the proper sensor orientation for the most common installations. The following orientations ensure that the electrodes are in the optimum plane to minimize the effects of entrapped gas.

Vertical installation allows upward process fluid flow and is generally preferred. Upward flow keeps the cross-sectional area full, regardless of flow rate. Orientation of the electrode plane is unimportant in vertical installations. As illustrated in Figures 5-3 and 5-4, avoid *downward* flows where back pressure does not ensure that the sensor remains full at all times.

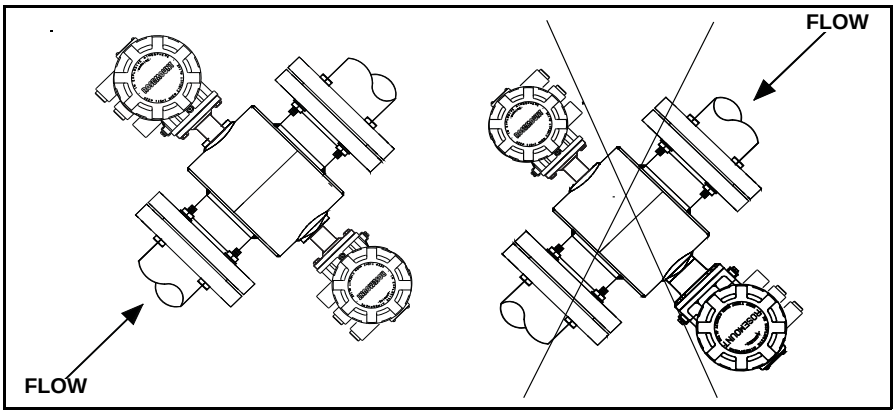
Installations with reduced straight runs from 0 to five pipe diameters are possible. In reduced straight pipe run installations, performance will shift to as much as 0.5% of rate. Reported flow rates will still be highly repeatable.

Figure 5-3. Vertical Sensor Orientation



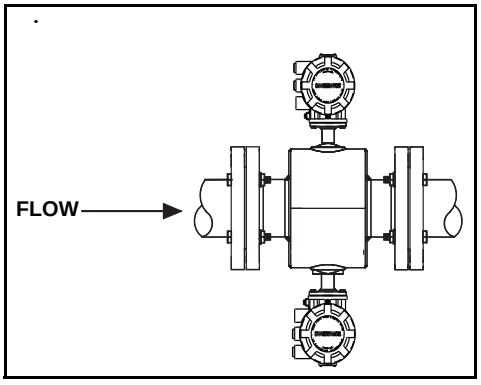
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Figure 5-4. Incline or Decline Orientation



Horizontal installation should be restricted to low piping sections that are normally full. Orient the electrode plane to within 45 degrees of horizontal in horizontal installations. A deviation of more than 45 degrees of horizontal would place an electrode at or near the top of the sensor thereby making it more susceptible to insulation by air or entrapped gas at the top of the sensor.

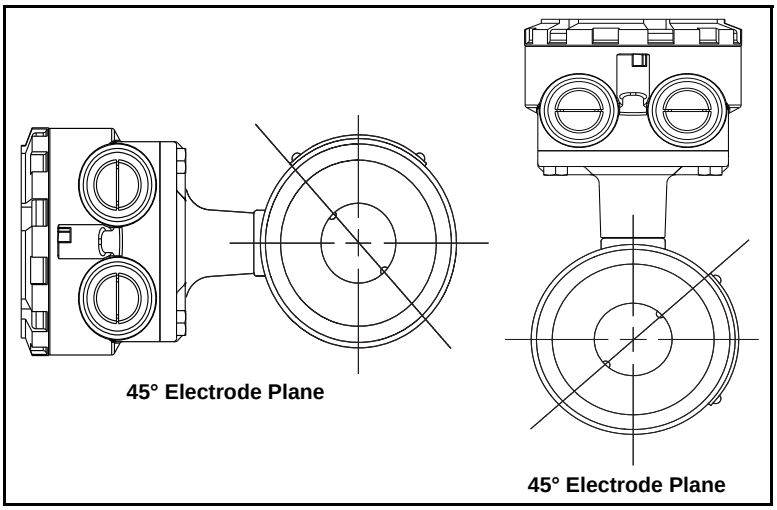
Figure 5-5. Horizontal Sensor Orientation



The electrodes in the Rosemount 8711 are properly oriented when the top of the sensor is either vertical or horizontal, as shown in Figure 5-6. Avoid any mounting orientation that positions the top of the sensor at 45 degrees from the vertical or horizontal position.

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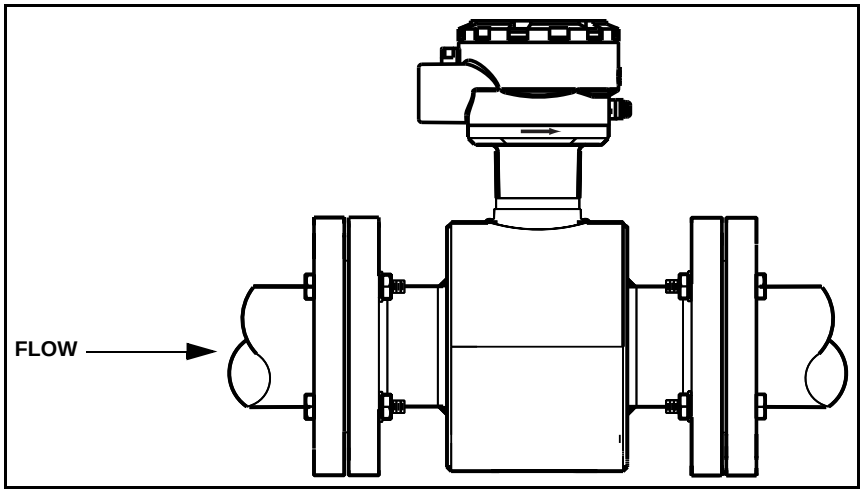
Figure 5-6. Rosemount 8711 Mounting Position



Flow Direction

The sensor should be mounted so that the FORWARD end of the flow arrow, shown on the sensor identification tag, points in the direction of flow through the tube (see Figure 5-7).

Figure 5-7. Flow Direction



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INSTALLATION (FLANGED SENSOR)

The following section should be used as a guide in the installation of the flange-type Rosemount 8705 and Rosemount 8707 High-Signal Sensors. Refer to page 5-10 for installation of the wafer-type Rosemount 8711 Sensor.

Gaskets

⚠ The sensor requires a gasket at each of its connections to adjacent devices or piping. The gasket material selected must be compatible with the process fluid and operating conditions. **Metallic or spiral-wound gaskets can damage the liner.** If the gaskets will be removed frequently, protect the liner ends. All other applications (including sensors with lining protectors or a grounding electrode) require only one gasket on each end connection, as shown in Figure 5-8. If grounding rings are used, gaskets are required on each side of the grounding ring, as shown in Figure 5-9.

Figure 5-8. Gasket Placement

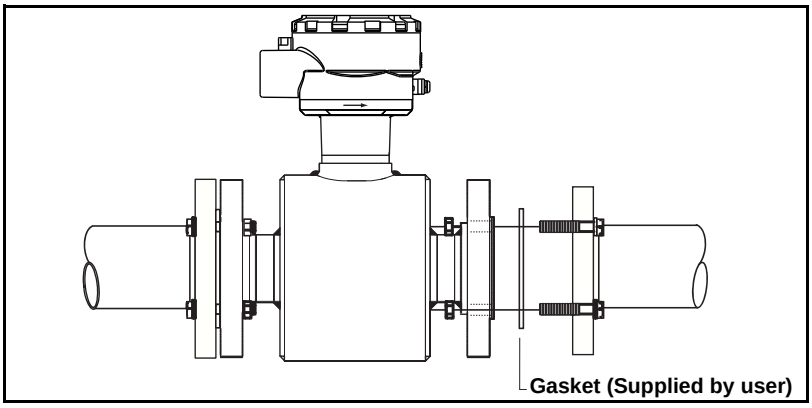
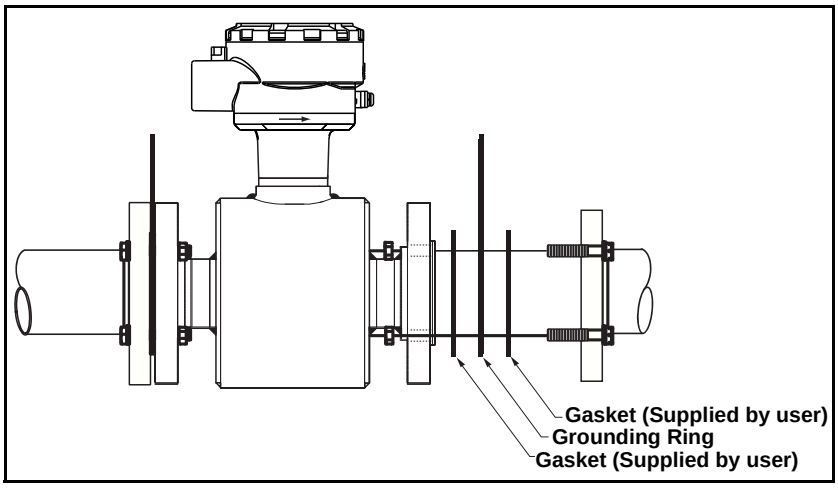


Figure 5-9. Gasket Placement with Non-attached Grounding Rings



Flange Bolts

Suggested torque values by sensor line size and liner type are listed in Table 5-1 on page 5-8 for ASME B16.5 (ANSI) flanges and Table 5-2 and Table 5-3 for DIN flanges. Consult the factory for other flange ratings. Tighten flange bolts in the incremental sequence as shown in Figure 5-10. See Table 5-1 and Table 5-2 for bolt sizes and hole diameters.

⚠ See ”Safety Messages” on pages 5-1 and 5-2 for complete warning information.

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NOTE
Do not bolt one side at a time. Tighten each side simultaneously. Example:
1. Snug left
2. Snug right
3. Tighten left
4. Tighten right

Do not snug and tighten the upstream side and then snug and tighten the downstream side. Failure to alternate between the upstream and downstream flanges when tightening bolts may result in liner damage.

⚠ Always check for leaks at the flanges after tightening the flange bolts. Failure to use the correct flange bolt tightening methods can result in severe damage. All sensors require a second torquing 24 hours after initial flange bolt tightening.

Table 5-1. Flange Bolt Torque Specifications for Rosemount 8705 and 8707 High-Signal Sensors

		PTFE/ETFE liner		Polyurethane liner	
Size Code	**Line Size**	**Class 150 (pound-feet)**	**Class 300 (pound-feet)**	**Class 150 (pound-feet)**	**Class 300 (pound-feet)**
005	1/2-inch (15 mm)	8	8	—	—
010	1 inch (25 mm)	8	12	—	—
015	1 1/2 inch (40 mm)	13	25	7	18
020	2 inch (50 mm)	19	17	14	11
030	3 inch (80 mm)	34	35	23	23
040	4 inch (100 mm)	26	50	17	32
060	6 inch (150mm)	45	50	30	37
080	8 inch (200 mm)	60	82	42	55
100	10 inch (250 mm)	55	80	40	70
120	12 inch (300 mm)	65	125	55	105
140	14 inch (350 mm)	85	110	70	95
160	16 inch (400 mm)	85	160	65	140
180	18 inch (450 mm)	120	170	95	150
200	20 inch (500 mm)	110	175	90	150
240	24 inch (600 mm)	165	280	140	250
300	30 inch (750 mm)	195	415	165	375
360	36 inch (900 mm)	280	575	245	525

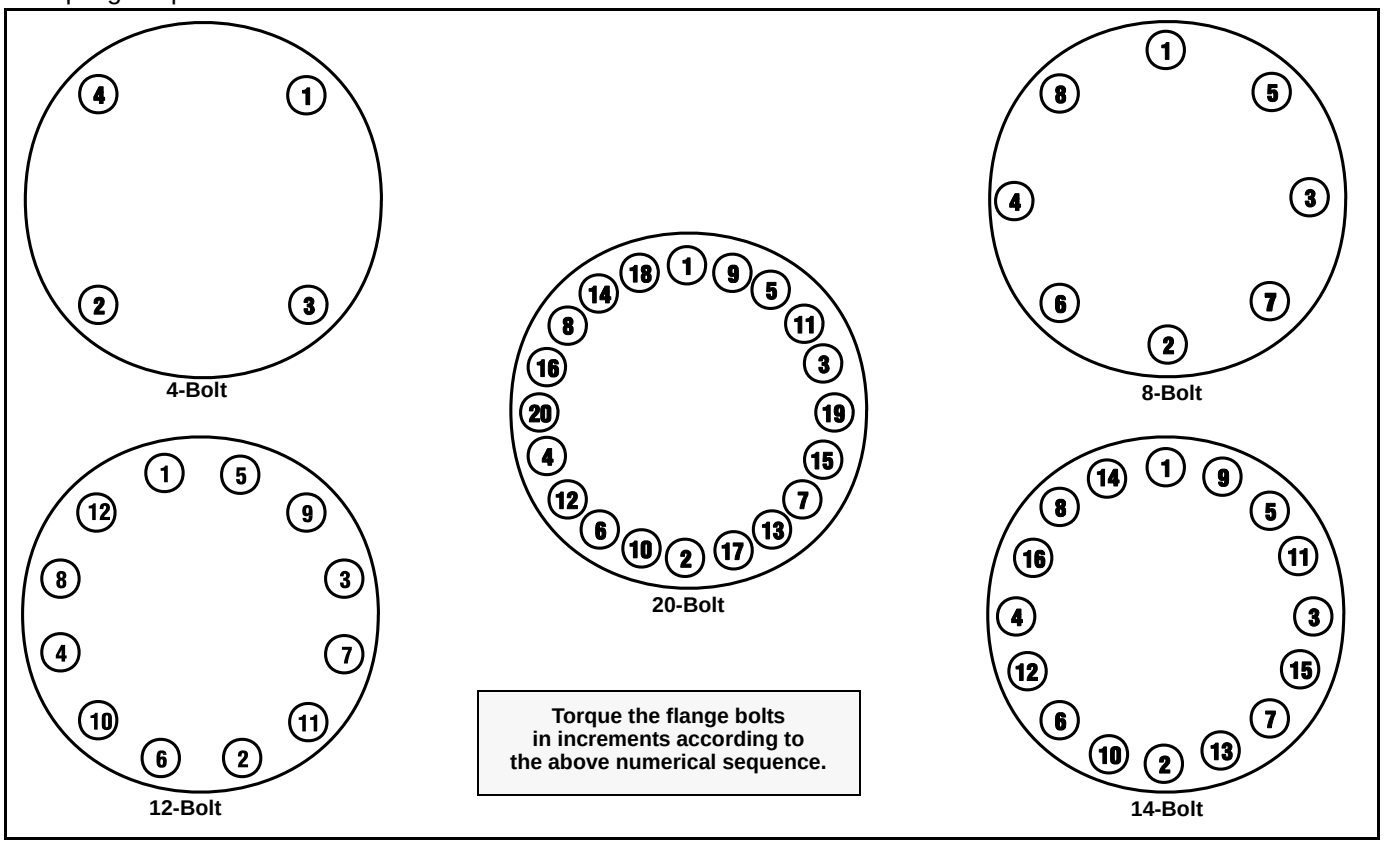
⚠ See ”Safety Messages” on pages 5-1 and 5-2 for complete warning information.

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Table 5-2. Flange Bolt Torque and Bolt Load Specifications for Rosemount 8705

		PTFE/ETFE liner							
		PN10		PN 16		PN 25		PN 40	
Size Code	Line Size	(Newton-meter)	(Newton)	(Newton-meter)	(Newton)	(Newton-meter)	(Newton)	(Newton-meter)	(Newton)
005	1/2-inch (15 mm)	7	3209	7	3809	7	3809	7	4173
010	1 inch (25 mm)	13	6983	13	6983	13	6983	13	8816
015	1 1/2 inch (40 mm)	24	9983	24	9983	24	9983	24	13010
020	2 inch (50 mm)	25	10420	25	10420	25	10420	25	14457
030	3 inch (80 mm)	14	5935	14	5935	18	7612	18	12264
040	4 inch (100 mm)	17	7038	17	7038	30	9944	30	16021
060	6 inch (150mm)	23	7522	32	10587	60	16571	60	26698
080	8 inch (200 mm)	35	11516	35	11694	66	18304	66	36263
100	10 inch (250 mm)	31	10406	59	16506	105	25835	105	48041
120	12 inch (300 mm)	43	14439	82	22903	109	26886	109	51614
140	14 inch (350 mm)	42	13927	80	22091	156	34578	156	73825
160	16 inch (400 mm)	65	18189	117	28851	224	45158	224	99501
180	18 inch (450 mm)	56	15431	99	24477	—	—	—	67953
200	20 inch (500 mm)	66	18342	131	29094	225	45538	225	73367
240	24 inch (600 mm)	104	25754	202	40850	345	63940	345	103014

Figure 5-10. Flange Bolt Torquing Sequence



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Table 5-3. Flange Bolt Torque and Bolt Load Specifications for Rosemount 8705

		Polyurethane Liner							
		PN 10		PN 16		PN 25		PN 40	
Size Code	Line Size	(Newton-meter)	(Newton)	(Newton-meter)	(Newton)	(Newton-meter)	(Newton)	(Newton-meter)	(Newton)
005	1/2-inch (15 mm)	1	521	1	826	2	1293	6	3333
010	1 inch (25 mm)	2	1191	3	1890	5	2958	10	5555
015	1 1/2 inch (40 mm)	5	1960	7	3109	12	4867	20	8332
020	2 inch (50 mm)	6	2535	10	4021	15	6294	26	10831
030	3 inch (80 mm)	5	2246	9	3563	13	5577	24	19998
040	4 inch (100 mm)	7	3033	12	4812	23	7531	35	11665
060	6 inch (150mm)	16	5311	25	8425	47	13186	75	20829
080	8 inch (200 mm)	27	8971	28	9487	53	14849	100	24687
100	10 inch (250 mm)	26	8637	49	13700	87	21443	155	34547
120	12 inch (300 mm)	36	12117	69	19220	91	22563	165	36660
140	14 inch (350 mm)	35	11693	67	18547	131	29030	235	47466
160	16 inch (400 mm)	55	15393	99	24417	189	38218	335	62026
200	20 inch (500 mm)	58	15989	114	25361	197	39696	375	64091
240	24 inch (600 mm)	92	22699	178	36006	304	56357	615	91094

INSTALLATION (WAFER SENSOR)

The following section should be used as a guide in the installation of the Rosemount 8711 Sensor. Refer to page 5-7 for installation of the flange-type Rosemount 8705 and 8707 High-Signal sensor.

Gaskets

⚠ The sensor requires a gasket at each of its connections to adjacent devices or piping. The gasket material selected must be compatible with the process fluid and operating conditions. **Metallic or spiral-wound gaskets can damage the liner.** If the gaskets will be removed frequently, protect the liner ends. If grounding rings are used, a gasket is required on each side of the grounding ring.

Alignment and Bolting

1. On 1 1/2 - through 8-inch (40 through 200 mm) line sizes, place centering rings over each end of the sensor. The smaller line sizes, 0.15- through 1-inch (4 through 25 mm), do not require centering rings.
2. Insert studs for the bottom side of the sensor between the pipe flanges. Stud specifications are listed in Table 5-4. **Using carbon steel bolts on smaller line sizes, 0.15- through 1-inch (4 through 25 mm), rather than the required stainless steel bolts, will degrade performance.**

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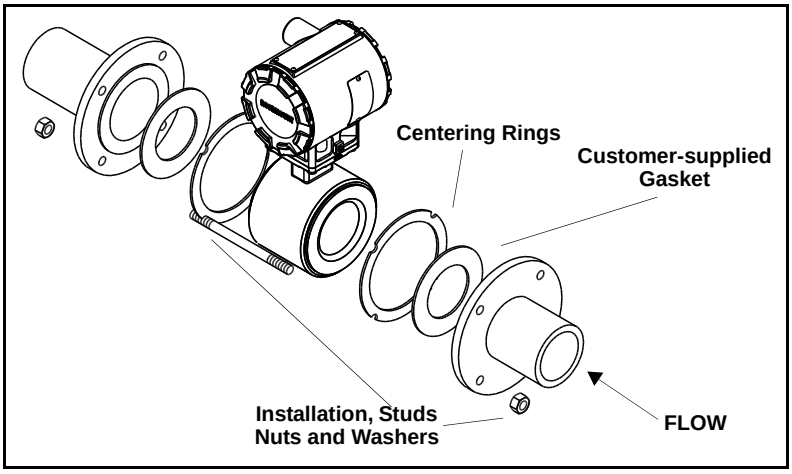
Table 5-4. Stud Specifications

Nominal Sensor Size	Stud Specifications
0.15 – 1 inch (4 – 25 mm)	316 SST ASTM A193, Grade B8M Class 1 threaded mounted studs
1 1/2 – 8 inch (40 – 200 mm)	CS, ASTM A193, Grade B7, threaded mounting studs

3. Place the sensor between the flanges. Make sure that the centering rings are properly placed in the studs. The studs should be aligned with the markings on the rings that correspond to the flange you are using.
4. Insert the remaining studs, washers, and nuts.
5. Tighten to the torque specifications shown in Table 5-5. Do not overtighten the bolts or the liner may be damaged.

NOTE
On the 4- and 6- inch PN 10-16, insert the sensor with rings first and then insert the studs. The slots on this ring scenario are located on the inside of the ring.

Figure 5-11. Gasket Placement with Centering Rings



Flange Bolts

Sensor sizes and torque values for both Class 150 and Class 300 flanges are listed in Table 5-5. Tighten flange bolts in the incremental sequence, shown in Figure 5-10.

NOTE
Do not bolt one side at a time. Tighten each side simultaneously. Example:
1. Snug left
2. Snug right
3. Tighten left
4. Tighten right

Do not snug and tighten the upstream side and then snug and tighten the downstream side. Failure to alternate between the upstream and downstream flanges when tightening bolts may result in liner damage.

⚠ Always check for leaks at the flanges after tightening the flange bolts. All sensors require a second torquing 24 hours after initial flange bolt tightening.

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Table 5-5. Flange bolt Torque Specifications of Rosemount 8711 Sensors

Size Code	Line Size	Pound-feet	Newton-meter
15F	0.15 inch (4 mm)	5	6.8
30F	0.30 inch (8 mm)	5	6.8
005	1/2-inch (15 mm)	5	6.8
010	1 inch (25 mm)	10	13.6
015	1 1/2 inch (40 mm)	15	20.5
020	2 inch (50 mm)	25	34.1
030	3 inch (80 mm)	40	54.6
040	4 inch (100 mm)	30	40.1
060	6 inch (150 mm)	50	68.2
080	8 inch (200 mm)	70	81.9

INSTALLATION (SANITARY SENSOR)

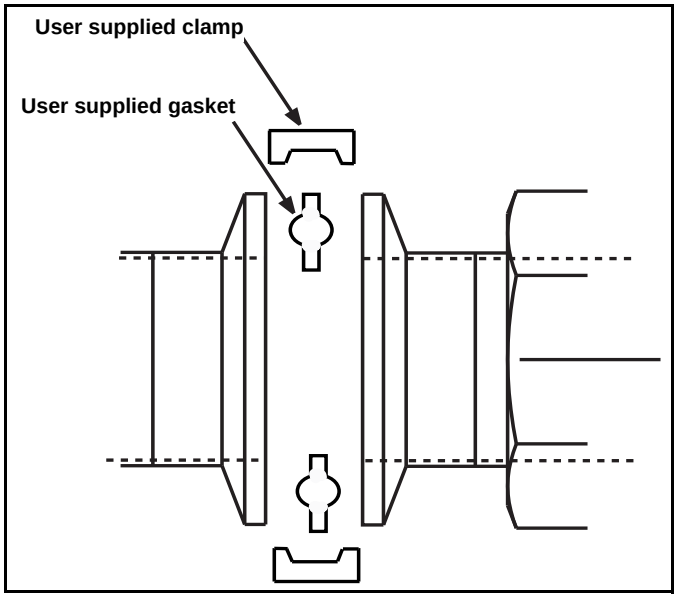
Gaskets

The sensor requires a gasket at each of its connections to adjacent devices or piping. The gasket material selected must be compatible with the process fluid and operating conditions. Gaskets are supplied with all Rosemount 8721 Sanitary sensors except when the process connection is an IDF sanitary screw type.

Alignment and Bolting

Standard plant practices should be followed when installing a magmeter with sanitary fittings. Unique torque values and bolting techniques are not required.

Figure 5-12. Rosemount 8721 Sanitary Installation



GROUNDING

Process grounding the sensor is one the most important details of sensor installation. Proper process grounding ensures that the transmitter amplifier is referenced to the process. This creates the lowest noise environment for the transmitter to make a stable reading. Use Table 5-6 to determine which grounding option to follow for proper installation.

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NOTE
Consult factory for installations requiring cathodic protection or situations where there are high currents or high potential in the process.

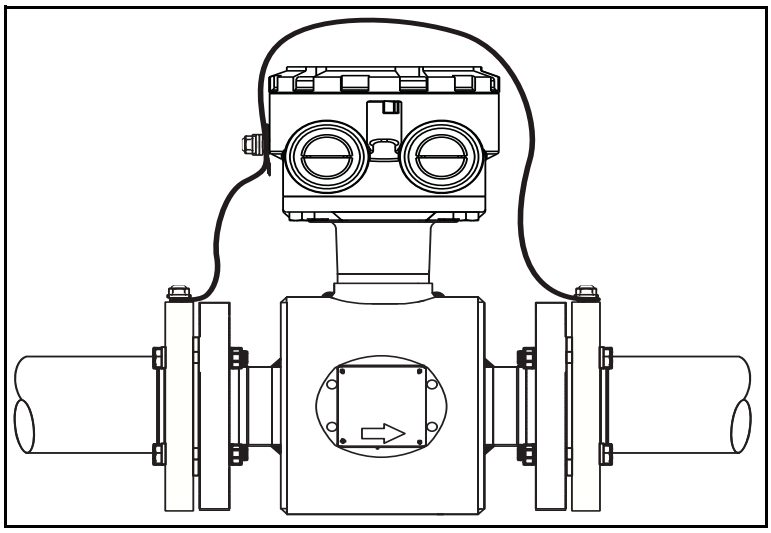
The sensor case should always be earth grounded in accordance with national and local electrical codes. Failure to do so may impair the protection provided by the equipment. The most effective grounding method is direct connection from the sensor to earth ground with minimal impedance.

The Internal Ground Connection (Protective Ground Connection) located in side the junction box is the Internal Ground Connection screw. This screw is identified by the ground symbol: ⏚

Table 5-6. Grounding Installation

	Grounding Options			
Type of Pipe	**No Grounding Options**	**Grounding Rings**	**Grounding Electrodes**	**Lining Protectors**
Conductive Unlined Pipe	See Figure 5-13	Not Required	Not Required	See Figure 5-14
Conductive Lined Pipe	Insufficient Grounding	See Figure 5-14	See Figure 5-13	See Figure 5-14
Non-Conductive Pipe	Insufficient Grounding	See Figure 5-15	See Figure 5-16	See Figure 5-15

Figure 5-13. No Grounding Options or Grounding Electrode in Lined Pipe



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Figure 5-14. Grounding with Grounding Rings or Lining Protectors

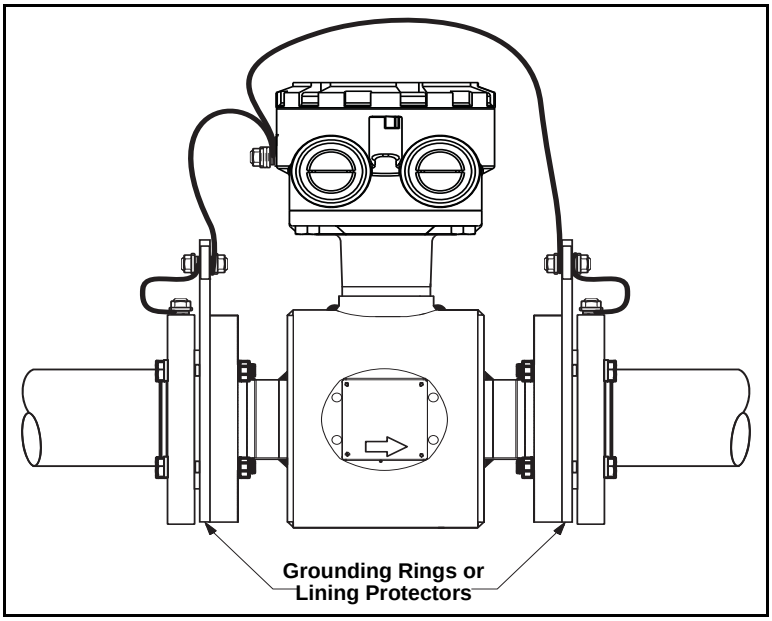
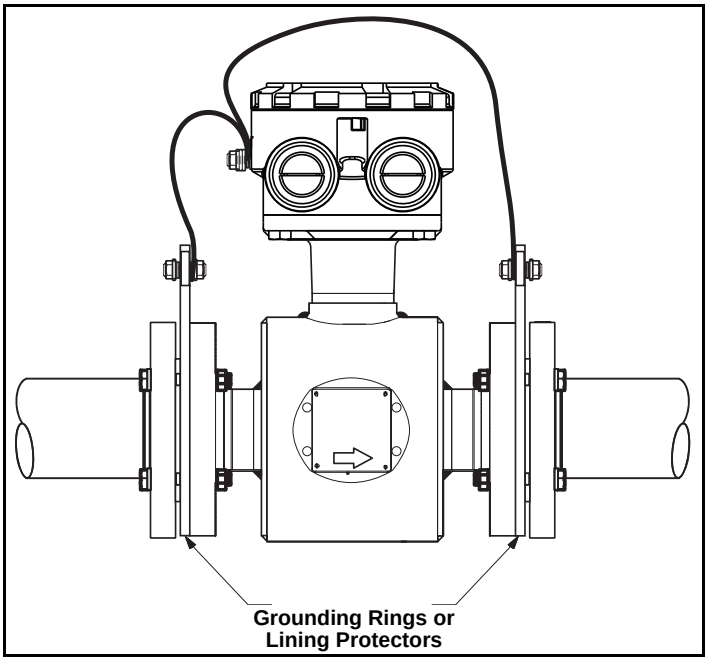
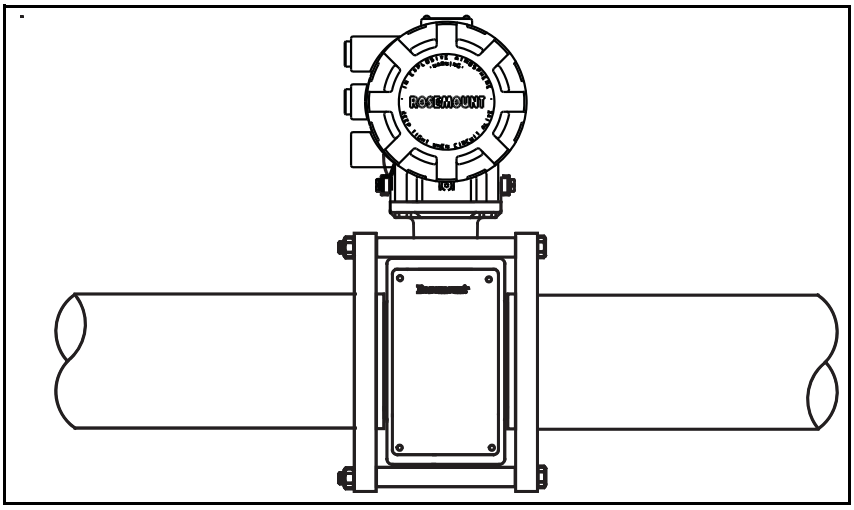


Figure 5-15. Grounding with Grounding Rings or Lining Protectors



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Figure 5-16. Grounding with Grounding Electrodes



PROCESS LEAK PROTECTION (OPTIONAL)

The Rosemount 8705 and 8707 High-Signal Sensor housing is fabricated from carbon steel to perform two separate functions. First, it provides shielding for the sensor magnetics so that external disturbances cannot interfere with the magnetic field and thus affect the flow measurement. Second, it provides the physical protection to the coils and other internal components from contamination and physical damage that might occur in an industrial environment. The housing is completely welded and gasket-free.

The three housing configurations are identified by the W0, W1, or W3 in the model number option code when ordering. Below are brief descriptions of each housing configuration, which are followed by a more detailed overview.

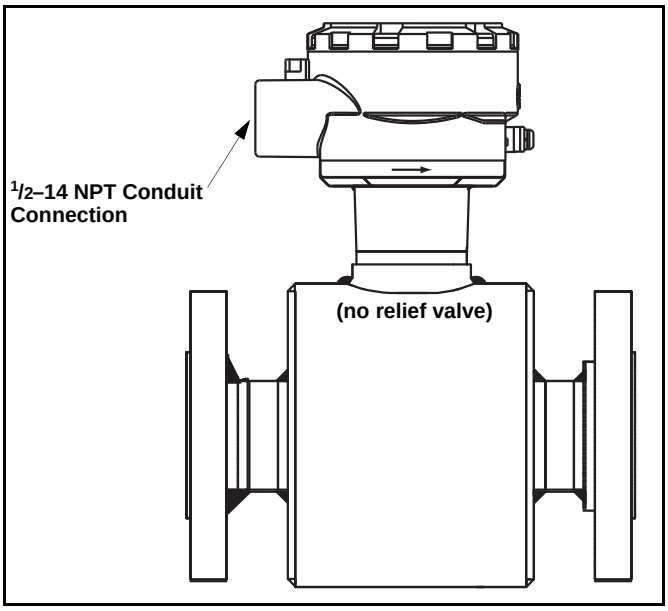
- **Code W0** — sealed, welded coil housing (standard configuration)
- **Code W1** — sealed, welded coil housing with a relief valve capable of venting fugitive emissions to a safe location (additional plumbing from the sensor to a safe area, installed by the user, is required to vent properly)
- **Code W3** — sealed, welded coil housing with separate electrode compartments capable of venting fugitive emissions (additional plumbing from the sensor to a safe area, installed by the user, is required to vent properly)

Standard Housing Configuration

The standard housing configuration is identified by a code W0 in the model number. This configuration does not provide separate electrode compartments with external electrode access. In the event of a process leak, these models will not protect the coils or other sensitive areas around the sensor from exposure to the pressure fluid (Figure 5-17).

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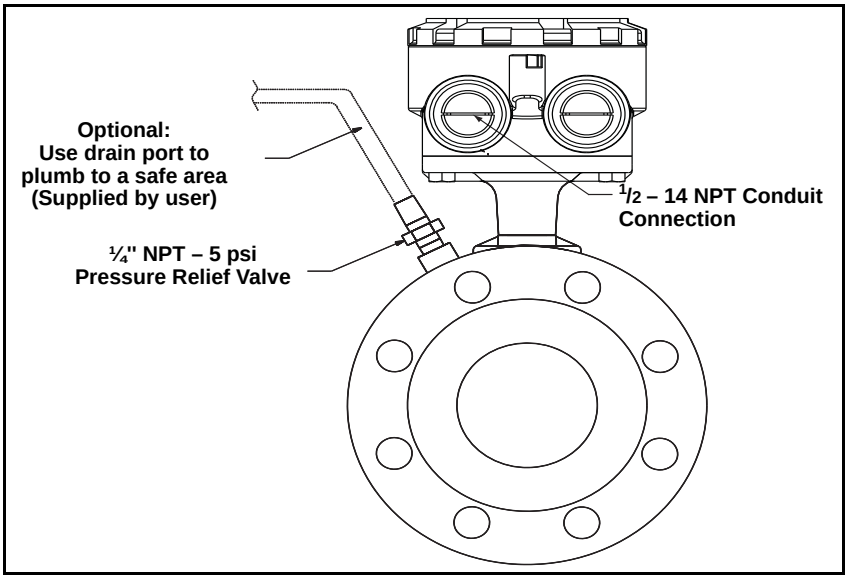
Figure 5-17. Standard Housing Configuration — Sealed Welded Housing (Option Code W0)



Relief Valves

The first optional configuration, identified by the W1 in the model number option code, uses a completely welded coil housing. This configuration does not provide separate electrode compartments with external electrode access. This optional housing configuration provides a relief valve in the housing to prevent possible overpressuring caused by damage to the lining or other situations that might allow process pressure to enter the housing. The relief valve will vent when the pressure inside the sensor housing exceeds 5 psi. Additional piping (provided by the user) may be connected to this relief valve to drain any process leakage to safe containment (see Figure 5-18).

Figure 5-18. Coil-Housing Configuration — Standard Welded Housing With Relief Valve (Option Code W1)



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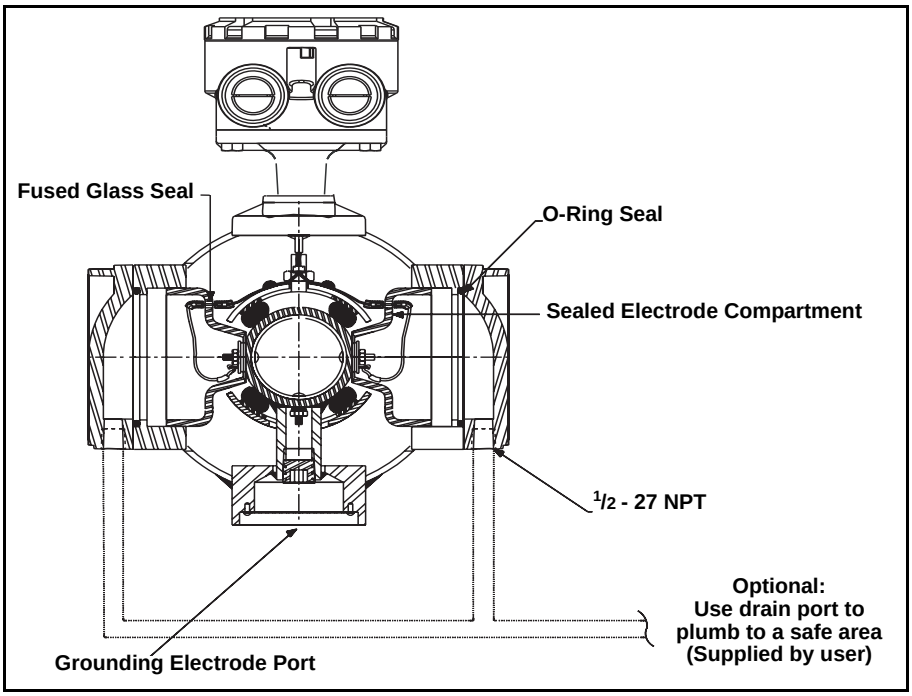
Process Leak Containment

The second optional configuration, identified as option code W3 in the model number, divides the coil housing into three compartments: one for each electrode and one for the coils. Should a damaged liner or electrode fault allow process fluid to migrate behind the electrode seals, the fluid is contained in the electrode compartment. The sealed electrode compartment prevents the process fluid from entering the coil compartment where it would damage the coils and other internal components.

The electrode compartments are designed to contain the process fluid at full line pressure. An o-ring sealed cover provides access to each of the electrode compartments from outside the sensor; drainports are provided in each cover for the removal of fluid.

NOTE
The electrode compartment could contain full line pressure and it must be depressurized before the cover is removed.

Figure 5-19. Housing Configuration — Sealed Electrode Compartment (Option Code W3)



If necessary, capture any process fluid leakage, connect the appropriate piping to the drainports, and provide for proper disposal (see Figure 5-19).

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Section 6 Maintenance and Troubleshooting

Safety Information . . . . . page 6-1
Installation Check and Guide . . . . . page 6-2
Diagnostic Messages . . . . . page 6-3
Transmitter Troubleshooting . . . . . page 6-6
Quick Troubleshooting . . . . . page 6-8

This section covers basic transmitter and sensor troubleshooting. Problems in the magnetic flowmeter system are usually indicated by incorrect output readings from the system, error messages, or failed tests. Consider all sources when identifying a problem in your system. If the problem persists, consult your local Rosemount representative to determine if the material should be returned to the factory. Emerson Process Management offers several diagnostics that aid in the troubleshooting process.

Instructions and procedures in this section may require special precautions to ensure the safety of the personnel performing the operations. Please read the following safety messages before performing any operation described in this section. Refer to these warnings when appropriate throughout this section.

SAFETY INFORMATION

⚠WARNING

Failure to follow these installation guidelines could result in death or serious injury:

Installation and servicing instructions are for use by qualified personnel only. Do not perform any servicing other than that contained in the operating instructions, unless qualified. Verify that the operating environment of the sensor and transmitter is consistent with the appropriate FM or CSA approval.

Do not connect a Rosemount 8712 to a non-Rosemount sensor that is located in an explosive atmosphere.

Mishandling products exposed to a hazardous substance may result in death or serious injury. If the product being returned was exposed to a hazardous substance as defined by OSHA, a copy of the required Material Safety Data Sheet (MSDA) for each hazardous substance identified must be included with the returned goods.

The 8712 performs self diagnostics on the entire magnetic flowmeter system: the transmitter, the sensor, and the interconnecting wiring. By sequentially troubleshooting each individual piece of the magmeter system, it becomes easier to pin point the problem and make the appropriate adjustments.

If there are problems with a new magmeter installation, see “Installation Check and Guide” on page 6-2 for a quick guide to solve the most common installation problems. For existing magmeter installations, Table 6-5 lists the most common magmeter problems and corrective actions.

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INSTALLATION CHECK AND GUIDE

Use this guide to check new installations of Rosemount magnetic flowmeter systems that appear to malfunction.

Before You Begin

Transmitter

Apply power to your system before making the following transmitter checks.

1. Verify that the correct sensor calibration number is entered in the transmitter. The calibration number is listed on the sensor nameplate.
2. Verify that the correct sensor line size is entered in the transmitter. The line size value is listed on the sensor nameplate.
3. Verify that the analog range of the transmitter matches the analog range in the control system.
4. Verify that the forced analog output and forced pulse output of the transmitter produces the correct output at the control system.

Sensor

Be sure that power to your system is removed before beginning sensor checks.

1. **For horizontal flow installations**, ensure that the electrodes remain covered by process fluid.

   For vertical or inclined installations, ensure that the process fluid is flowing up into the sensor to keep the electrodes covered by process fluid.
2. Ensure that the grounding straps on the sensor are connected to grounding rings, lining protectors, or the adjacent pipe flanges. Improper grounding will cause erratic operation of the system.

Wiring

1. The signal wire and coil drive wire must be twisted shielded cable. Emerson Process Management, Rosemount division. recommends 20 AWG twisted shielded cable for the electrodes and 14 AWG twisted shielded cable for the coils.
2. The cable shield must be connected at both ends of the electrode and coil drive cables. Connection of the signal wire shield at both ends is necessary for proper operation. It is recommended that the coil drive wire shield also be connected at both ends for maximum flowmeter performance
3. The signal and coil drive wires must be separate cables, unless Emerson Process Management specified combo cable is used. See Table 2-3 on page 2-14.
4. The single conduit that houses both the signal and coil drive cables should not contain any other wires.

Process Fluid

1. The process fluid conductivity should be 5 microsiemens (5 micro mhos) per centimeter minimum.
2. The process fluid must be free of air and gasses.
3. The sensor should be full of process fluid.

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DIAGNOSTIC MESSAGES

Problems in the magnetic flowmeter system are usually indicated by incorrect output readings from the system, error messages, or failed tests. Consider all sources in identifying a problem in your system.

Table 6-1. Rosemount 8712 Basic Diagnostic Messages

Message	Potential Cause	Corrective Action
"Empty Pipe"	Empty Pipe	None - message will clear when pipe is full
	Wiring Error	Check that wiring matches appropriate wiring diagrams - see Appendix E: Universal Sensor Wiring Diagrams
	Electrode Error	Perform sensor tests C and D (see Table 6-6 on page 6-9)
	Conductivity less than 5 microsiemens per cm	Increase Conductivity to greater than or equal to 5 microsiemens per cm
	Intermittent Diagnostic	Adjust tuning of Empty Pipe parameters
"Coil Open Circuit"	Improper wiring	Check coil drive wiring and sensor coils Perform sensor test A - Sensor Coil
	Other manufacturer's sensor	Change coil current to 75 mA Perform a Universal Auto Trim to select the proper coil current
	Circuit Board Failure	Replace Rosemount 8712 Electronics
	Verify the transmitter is not a Rosemount 8712H	Replace Rosemount 8712H with Rosemount 8712C/U/H/D
	Coil Circuit OPEN Fuse	Return to factory for fuse replacement
"Auto Zero Failure"	Flow is not set to zero	Force flow to zero, perform autozero
	Unshielded cable in use	Change wire to shielded cable
	Moisture problems	See moisture problems in "Accuracy Section"
"Auto-Trim Failure"	No flow in pipe while performing Universal Auto Trim	Establish a known flow in tube, and perform Universal Auto-Trim calibration
	Wiring error	Check that wiring matches appropriate wiring diagrams - see "Universal Sensor Wiring Diagrams" on page E-1
	Flow rate is changing in pipe while performing Universal Auto-Trim routine	Establish a constant flow in tube, and perform Universal Auto-Trim calibration
	Flow rate through sensor is significantly different than value entered during Universal Auto-Trim routine	Verify flow in tube and perform Universal Auto-Trim calibration
	Incorrect calibration number entered into transmitter for Universal Auto-Trim routine	Replace sensor calibration number with 1000005010000001
	Wrong tube size selected	Correct tube size setting - See "Line Size" on page 3-10
	Sensor failure	Perform sensor tests C and D (see Table 6-6 on page 6-9)
"Electronics Failure"	Electronics self check failure	Replace Electronics
"Electronics Temp Fail"	Ambient temperature exceeded the electronics temperature limits	Move transmitter to a location with an ambient temperature range of -40 to 165 °F (-40 to 74 °C)
"Reverse Flow"	Electrode or coil wires reverse	Verify wiring between sensor and transmitter
	Flow is reverse	Turn ON Reverse Flow Enable to read flow
	Sensor installed backwards	Re-install sensor correctly, or switch either the electrode wires (18 and 19) or the coil wires (1 and 2)
"PZR Activated" (Positive Zero Return)	External voltage applied to terminals 5 and 6	Remove voltage to turn PZR off
"Pulse Out of Range"	The transmitter is trying to generate a frequency greater than 11,000 Hz	Increase pulse scaling to prevent pulse output going above 11,000 Hz Verify the sensor calibration number is correctly entered in the electronics
"Analog Out of Range"	Flow rate is greater than analog output Range	Reduce flow, adjust URV and LRV values Verify the sensor calibration number is correctly entered in the electronics

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Table 6-1. Rosemount 8712 Basic Diagnostic Messages

Message	Potential Cause	Corrective Action
"Flowrate > 43 ft/sec"	Flow rate is greater than 43 ft/sec	Lower flow velocity, increase pipe diameter
	Improper wiring	Check coil drive wiring and sensor coils Perform sensor test A - Sensor Coil (see Table 6-6 on page 6-9)
"Digital Trim Failure" (Cycle power to clear messages, no changes were made)	The calibrator (8714B/C/D) is not connected properly	Review calibrator connections
	Incorrect calibration number entered into transmitter	Replace sensor calibration number with 1000005010000001
	Calibrator is not set to 30 FPS	Change calibrator setting to 30 FPS
	Bad calibrator	Replace calibrator

Table 6-2. Rosemount 8712 Advanced Diagnostic Messages (Suite 1 - Option Code DA1)

Message	Potential Cause	Corrective Action
Grounding/Wiring Fault	Improper installation of wiring	See "Sensor to Remote Mount Transmitter Connections" on page 2-15
	Coil/Electrode shield not connected	See "Flowtube Sensor Connections" on page 2-17
	Improper process grounding	See "Grounding" on page 5-12
	Faulty ground connection	Check wiring for corrosion, moisture in the terminal block, and refer to "Grounding" on page 5-12
	Sensor not full	Verify sensor is full
High Process Noise	Slurry flows - mining/pulp stock	Decrease the flow rate below 10 ft/s (3 m/s) Complete the possible solutions listed under "Step 2: Process Noise" on page 6-8
	Chemical additives upstream of the sensor	Move injection point downstream of the sensor, or move the sensor Complete the possible solutions listed under "Step 2: Process Noise" on page 6-8
	Electrode not compatible with the process fluid	Refer to the Rosemount Magnetic Flowmeter Material Selection Guide (00816-0100-3033)
	Air in line	Move the sensor to another location in the process line to ensure that it is full under all conditions
	Electrode coating	Use bulletnose electrodes Downsize sensor to increases flow rate above 3 ft/s (1 m/s) Periodically clean sensor
	Styrofoam or other insulating particles	Complete the possible solutions listed under "Step 2: Process Noise" on page 6-8 Consult factory
	Low conductivity fluids (below 10 microsiemens/cm)	Trim electrode and coil wires - refer to "Installation" on page 2-1

Table 6-3. Rosemount 8712 Advanced Diagnostic Messages (Suite 2 - Option Code DA2)

Message	Potential Cause	Corrective Action
8714i Failed	Transmitter Calibration Verification test failed	Verify pass/fail criteria Rerun 8714i Meter Verification under no flow conditions Verify calibration using 8714D Calibration Standard Perform digital trim Replace electronics board
	Sensor Calibration test failed	Verify pass/fail criteria Perform sensor test - see Table 6-6 on page 6-9
	Sensor Coil Circuit test failed	Verify pass/fail criteria Perform sensor test - see Table 6-6 on page 6-9
	Sensor Electrode Circuit test failed	Verify pass/fail criteria Perform sensor test - see Table 6-6 on page 6-9

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Table 6-4. Basic Troubleshooting–Rosemount 8712

Symptom	Potential Cause	Corrective Action
Output at 0 mA	No power to transmitter	Check power source and connections to the transmitter
	Blown fuse	Check the fuse and replace with an appropriately rated fuse, if necessary
	Electronics failure	Verify transmitter operation with an 8714 Calibration Standard or replace the electronic board
	Analog output improperly configured	Check the analog power switch position
Output at 4 mA	Open coil drive circuit	Check coil drive circuit connections at the sensor and at the transmitter
	Transmitter in multidrop mode	Configure Poll Address to 0 to take transmitter out of multidrop mode
	Low Flow Cutoff set too high	Configure Low Flow Cutoff to a lower setting or increase flow to a value above the low flow cutoff
	PZR Activated	Open PZR switch at terminals 5 and 6 to deactivate the PZR
	Flow is in reverse direction	Enable Reverse Flow function
	Shorted coil	Coil check – perform sensor test
	Empty pipe	Fill pipe
	Electronics failure	Verify transmitter operation with an 8714 Calibration Standard or replace the electronic board
Output will not reach 20 mA	Loop resistance is greater than 600 ohms	Reduce loop resistance to less than 600 ohms Perform analog loop test
Output at 20.8 mA	Transmitter not ranged properly	Reset the transmitter range values – see “PV URV (Upper Range Value)” on page 3-11; Check tube size setting in transmitter and make sure it matches your actual tube size – see “Line Size” on page 3-10
Output at alarm level	Electronics failure	Cycle power. If alarm is still present, verify transmitter operation with an 8714 Calibration Standard or replace the electronic board
Pulse output at zero, regardless of flow	Wiring error	Check pulse output wiring at terminals 3 and 4. Refer to wiring diagram for your sensor and pulse output
	PZR activated	Remove signal at terminals 5 and 6 to deactivate the PZR.
	No power to transmitter	Check pulse output wiring at terminals 3 and 4. Refer to wiring diagram for your sensor and pulse output Power the transmitter
	Reverse flow	Enable Reverse Flow function
	Electronics failure	Verify transmitter operation with an 8714 Calibration Standard or replace the electronic board
	Pulse output incorrectly configured	Review configuration and correct as necessary
Communication problems with the Handheld Communicator	4–20 mA output configuration	Check analog power switch (internal/external). The Handheld Communicator requires a 4–20 mA output to function
	Communication interface wiring problems	Incorrect load resistance (250 Ω minimum, 600 ohm maximum); Check appropriate wiring diagram
	Low batteries in the Handheld Communicator	Replace the batteries in the Handheld Communicator – see the communicator manual for instructions
	Old revision of software in the Handheld Communicator	Consult your local sales office about updating to the latest revision of software
Error Messages on LOI or Handheld Communicator	Many possible causes depending upon the message	See the Figure 3-1 on page 3-3 for the LOI or Handheld Communicator messages.
Digital input does not register	Input signal does not provide enough counts	Verify that the digital input provided meets the requirements of Figure 2-13 on page 2-15

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TRANSMITTER TROUBLESHOOTING

Table 6-5. Advanced Troubleshooting–Rosemount 8712

Symptom	Potential Cause	Corrective Action
Does not appear to be within rated accuracy	Transmitter, control system, or other receiving device not configured properly	Check all configuration variables for the transmitter, sensor, communicator, and/or control system Check these other transmitter settings: •Sensor calibration number •Units •Line size Perform a loop test to check the integrity of the circuit – see "Quick Troubleshooting" on page 6-8
	Electrode Coating	Use bulletnose electrodes; Downsize sensor to increase flow rate above 3 ft/s; Periodically clean sensor
	Air in line	Move the sensor to another location in the process line to ensure that it is full under all conditions.
	Moisture problem	Perform the sensor Tests A, B, C, and D (see Table 6-6 on page 6-9)
	Improper wiring	If electrode shield and signal wires are switched, flow indication will be about half of what is expected. Check wiring diagrams for your application.
	Flow rate is below 1 ft/s (specification issue)	See accuracy specification for specific transmitter and sensor
	Auto zero was not performed when the coil drive frequency was changed from 5 Hz to 37 Hz	Set the coil drive frequency to 37 Hz, verify the sensor is full, verify there is no flow, and perform the auto zero function.
	Sensor failure–Shorted electrode	Perform the sensor Tests C and D (see Table 6-6 on page 6-9)
	Sensor failure–Shorted or open coil	Perform the sensor Tests A and B (see Table 6-6 on page 6-9)
	Transmitter failure	Verify transmitter operation with an 8714 Calibration Standard or replace the electronic board
Noisy Process	Chemical additives upstream of magnetic flowmeter	Complete the Noisy Process Basic procedure. Move injection point downstream of magnetic flowmeter, or move magnetic flowmeter.
	Sludge flows–Mining/Coal/ Sand/Slurries (other slurries with hard particles)	Decrease flow rate below 10 ft/s
	Styrofoam or other insulating particles in process	Complete the Noisy Process Basic procedure; Consult factory
	Electrode coating	Use replaceable electrodes in Rosemount 8705. Use a smaller sensor to increase flow rate above 3 ft/s. Periodically clean sensor.
	Air in line	Move the sensor to another location in the process line to ensure that it is full under all conditions.
	Low conductivity fluids (below 10 microsiemens/cm)	• Trim electrode and coil wires – see "Conduit Cables" on page 2-6 • Keep flow rate below 3 FPS • Integral mount transmitter • Use 8712-0752-1,3 cable • Use N0 approval sensor

Advanced Troubleshooting continued on next page

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Table 6-5. Advanced Troubleshooting–Rosemount 8712

Symptom	Potential Cause	Corrective Action
Meter output is unstable	Medium to low conductivity fluids (10–25 microsiemens/cm) combined with cable vibration or 60 Hz interference	Eliminate cable vibration: • Integral mount • Move cable to lower vibration run • Tie down cable mechanically • Trim electrode and coil wires • See “Conduit Cables” on page 2-6 • Route cable line away from other equipment powered by 60 Hz • Use 8712-0752-1,3 cable
	Electrode incompatibility	Check the Technical Data Sheet, Magnetic Flowmeter Material Selection Guide (document number 00816-0100-3033), for chemical compatibility with electrode material.
	Improper grounding	Check ground wiring – see “Mount the Transmitter” on page 2-3 for wiring and grounding procedures
	High local magnetic or electric fields	Move magnetic flowmeter (20–25 ft away is usually acceptable)
	Control loop improperly tuned	Check control loop tuning
	Sticky valve (look for periodic oscillation of meter output)	Service valve
	Sensor failure	Perform the sensor Tests A, B, C, and D (See Table 6-6 on page 6-9)
	Analog output loop problem	Check that the 4 to 20 mA loop matches the digital value. Perform analog output test.
Reading does not appear to be within rated accuracy	Transmitter, control system, or other receiving device not configured properly	Check all configuration variables for the transmitter, sensor, communicator, and/or control system Check these other transmitter settings: Sensor calibration number Units Line size
	Electrode coating	Use bulletnose electrodes in the Rosemount 8705 Sensor. Downsize the sensor to increase the flow rate above 3 ft/s. Periodically clean the sensor
	Air in line	Move the sensor to another location in the process line to ensure that it is full under all conditions
	Flow rate is below 1 ft/s (specification issue)	See the accuracy specification for specific transmitter and sensor
	Insufficient upstream/downstream pipe diameter	Move sensor to location where 5 pipe diameters upstream and 2 pipe diameters downstream is possible
	Cables for multiple magmeters run through same conduit	Run only one conduit cable between each sensor and transmitter
	Auto zero was not performed when the coil drive frequency was changed from 5 Hz to 37.5 Hz	Perform the auto zero function with full pipe and no flow
	Sensor failure—shorted electrode	See Table 6-6 on page 6-9
	Sensor failure—shorted or open coil	See Table 6-6 on page 6-9
	Transmitter failure	Replace the electronics board
	Transmitter wired to correct sensor	Check wiring

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QUICK TROUBLESHOOTING

Step 1: Wiring Errors

The most common magmeter problem is wiring between the sensor and the transmitter in remote mount installations. The signal wire and coil drive wire must be twisted shielded cable: 20 AWG twisted shielded cable for the electrodes and 14 AWG twisted shielded cable for the coils. Ensure that the cable shield is connected at both ends of the electrode and coil drive cables. Signal and coil drive wires must have their own cables. The single conduit that houses both the signal and coil drive cables should not contain any other wires. For more information on proper wiring practices, refer to “Transmitter to Flowtube Sensor Wiring” on page 2-17.

Step 2: Process Noise

In some circumstances, process conditions rather than the magmeter can cause the meter output to be unstable. Possible solutions for addressing a noisy process situation are given below. When the output attains the desired stability, no further steps are required.

Use the Auto Zero function to initialize the transmitter for use with the 37.5 Hz coil drive mode only. Run this function only with the transmitter and sensor installed in the process. The sensor must be filled with process fluid with zero flow rate. Before running the auto zero function, be sure the coil drive mode is set to 37.5 Hz.

Set the loop to manual if necessary and begin the auto zero procedure. The transmitter completes the procedure automatically in about 90 seconds. A symbol appears in the lower right-hand corner of the display to indicate that the procedure is running.

1. Change the coil drive to 37.5 Hz. Complete the Auto Zero function, if possible (see “Coil Drive Frequency” on page 4-16).
2. Turn on Digital Signal Processing (see “Signal Processing” on page 4-31)
3. Increase the damping (see “PV Damping” on page 3-12).

If the preceding steps fail to resolve the process noise symptoms, consult your Rosemount sales representative about using a high-signal magnetic flowmeter system.

Step 3: Installed Sensor Tests

If a problem with an installed sensor is identified, Table 6-6 can assist in troubleshooting the sensor. Before performing any of the sensor tests, disconnect or turn off power to the transmitter. To interpret the results, the hazardous location certification for the sensor must be known. Applicable codes for the Rosemount 8705 are N0, N5, and KD. Applicable codes for the Rosemount 8707 are N0 and N5. Applicable codes for the Rosemount 8711 are N0, N5, E5, and CD. Always check the operation of test equipment before each test.

If possible, take all readings from inside the sensor junction box. If the sensor junction box is inaccessible, take measurements as close as possible. Readings taken at the terminals of remote-mount transmitters that are more than 100 feet away from the sensor may provide incorrect or inconclusive information and should be avoided. A sensor circuit diagram is provided in Figure 6-1 on page 6-10.

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Table 6-6. Sensor Test

Test	Sensor Location	Required Equipment	Measuring at Connections	Expected Value	Potential Cause	Corrective Action
A. Sensor Coil	Installed or Uninstalled	Multimeter	1 and 2 = R	$2\Omega \le R \le 18\Omega$	• Open or Shorted Coil	• Remove and replace sensor
B. Shields to Case	Installed or Uninstalled	Multimeter	17 and ⏚ ⏚ and case ground 17 and case ground	$< 0.2\Omega$	• Moisture in terminal block • Leaky electrode • Process behind liner	• Clean terminal block • Remove sensor
C. Coil Shield to Coil	Installed or Uninstalled	Multimeter	1 and ⏚ 2 and ⏚	$\infty\Omega$ (< 1nS) $\infty\Omega$ (< 1nS)	• Process behind liner • Leaky electrode • Moisture in terminal block	• Remove sensor and dry • Clean terminal block • Confirm with sensor coil test
D. Electrode Shield to Electrode	Installed	LCR (Set to Resistance and 120 Hz)	18 and 17 = R_1 19 and 17 = R_2	R_1 and R_2 should be stable NO: $\lvert R_1 - R_2 \rvert \le 300\Omega$ N5, E5, CD, ED: $\lvert R_1 \ R_2 \rvert \le 1500\Omega$	• Unstable R_1 or R_2 values confirm coated electrode • Shorted electrode • Electrode not in contact with process • Empty Pipe • Low conductivity • Leaky electrode	• Remove coating from sensor wall • Use bulletnose electrodes • Repeat measurement • Pull tube, complete test in Table 6-7 and Table 6-8 on page 6-11 out of line.

To test the sensor, a multimeter capable of measuring conductance in nanosiemens is preferred. Nanosiemens is the reciprocal of resistance.

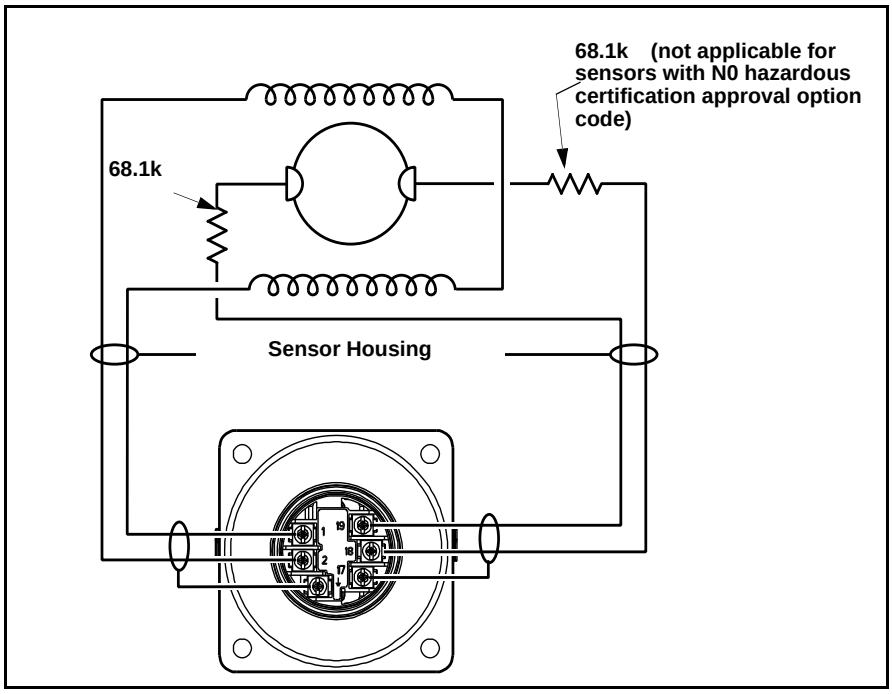
$$1 \text{ nanosiemens} = \frac{1}{1 \text{ gigaohm}}$$

or

$$1 \text{ nanosiemens} = \frac{1}{1 \times 10^9 \text{ ohm}}$$

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Figure 6-1. Sensor Circuit Diagram



Step 4: Uninstalled Sensor Tests

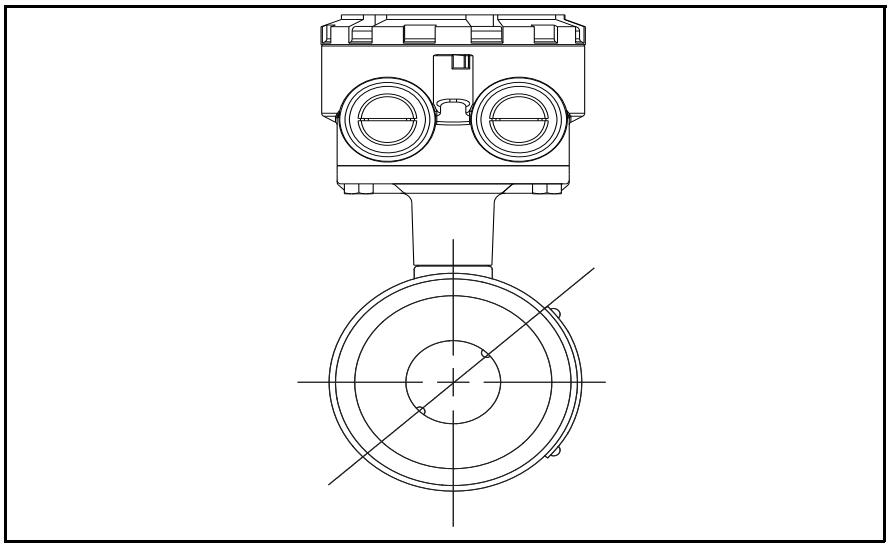
An uninstalled sensor can also be used for sensor troubleshooting. To interpret the results, the hazardous location certification for the sensor must be known. Applicable codes for the Rosemount 8705 are N0, N5, and KD. Applicable codes for the Rosemount 8707 are N0 and N5. Applicable codes for the Rosemount 8711 are N0, N5, E5, and CD.

A sensor circuit diagram is provided in Figure 6-1. Take measurements from the terminal block and on the electrode head inside the sensor. The measurement electrodes, 18 and 19, are on opposite sides in the inside diameter. If applicable, the third grounding electrode is in between the other two electrodes. On Rosemount 8711 sensors, electrode 18 is near the sensor junction box and electrode 19 is near the bottom of the sensor (Figure 6-2). The different sensor models will have slightly different resistance readings. Flanged sensor resistance readings are in Table 6-7 while wafer sensor resistance readings are in Table 6-8.

See “Safety Information” on page 6-1 for complete warning information.

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Figure 6-2. 45° Electrode Plane



To insure accuracy of resistance readings, zero out multimeter by shorting and touching the leads together.

Table 6-7. Uninstalled Rosemount 8705 / 8707 Flanged Sensor Tests

	Hazardous Location Certifications	
Measuring at Connections	**N0**	**N5, KD**
18 and Electrode(1)	≤ 275Ω	61kΩ ≤ R ≤ 75kΩ
19 and Electrode(1)	≤ 275Ω	61kΩ ≤ R ≤ 75kΩ
17 and Grounding Electrode	≤ 0.3Ω	≤ 0.3Ω
17 and Ground Symbol	≤ 0.3Ω	≤ 0.3Ω
17 and 18	Open	Open
17 and 19	Open	Open
17 and 1	Open	Open

(1) It is difficult to tell from visual inspection alone which electrode is wired to which number terminal in the terminal block. Measure both electrodes. One electrode should result in an open reading, while the other electrode should be less than 275Ω.

Table 6-8. Uninstalled Rosemount 8711 Wafer Sensor Tests

	Hazardous Location Certification	
Measuring at Connections	**N0**	**N5, E5, CD**
18 and Electrode(1)	≤ 0.3Ω	61kΩ ≤ R ≤ 75kΩ
19 and Electrode(2)	≤ 275Ω	61kΩ ≤ R ≤ 75kΩ
17 and Grounding Electrode	≤ 0.3Ω	≤ 0.3Ω
17 and Grounding Symbol	≤ 0.3Ω	≤ 0.3Ω
17 and 18	Open	Open
17 and 19	Open	Open
17 and 1	Open	Open

(1) Measure the electrode closest to the junction box
(2) Measure the electrode farthest away from the junction box.

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Appendix A Reference Data

Functional Specifications . . . . . page A-1
Performance Specifications . . . . . page A-6
Physical Specifications . . . . . page A-8
Rosemount 8712E Ordering Information . . . . . page A-9

NOTE
Detailed information for all Rosemount Magnetic Flowmeter Products can be found in the latest revision of the 8700 Series Product Data Sheet (p/n 00813-0100-4727).

FUNCTIONAL SPECIFICATIONS

Sensor Compatibility

Compatible with Rosemount 8705, 8711, 8721, and 570TM sensors.
Compatible with Rosemount 8707 sensor with D2 Dual calibration option.
Compatible with AC and DC powered sensors of other manufacturers.

Sensor Coil Resistance

350 Ω maximum

Transmitter Coil Drive Current

500 mA

Flow Rate Range

Capable of processing signals from fluids that are traveling between 0.01 and 39 ft/s (0 to 12 m/s) for both forward and reverse flow in all sensor sizes. Full scale continuously adjustable between –39 and 39 ft/s (–12 to 12 m/s).

Conductivity Limits

Process liquid must have a conductivity of 5 microsiemens/cm (5 micromhos/cm) or greater for Rosemount 8712E. Excludes the effect of interconnecting cable length in remote mount transmitter installations.

Power Supply

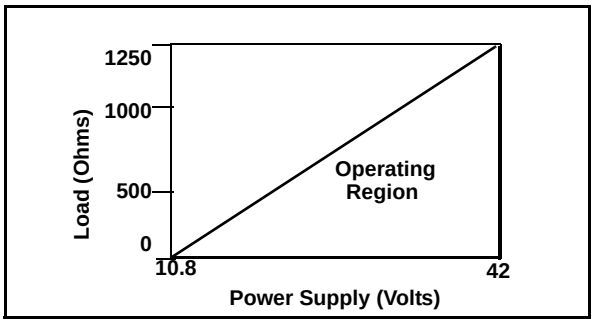
90-250 V AC, 50–60 Hz or 12–42 V DC

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DC Load Limitations (Analog Output)

Maximum loop resistance is determined by the voltage level of the external power supply, as described by:

FIGURE 1. DC Load Limitations



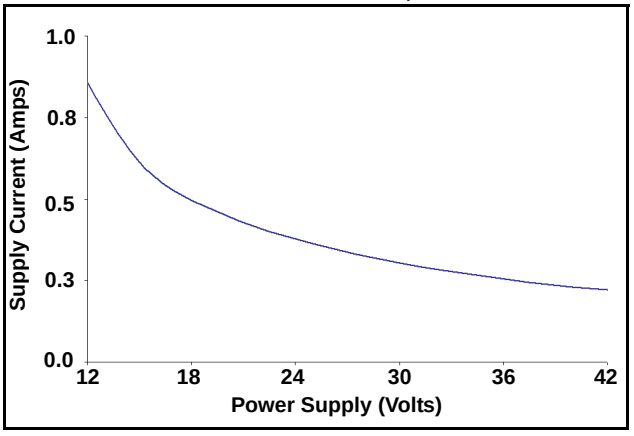
R_{max} = $41.7(V_{ps} – 10.8)$
V_{ps} = Power Supply Voltage (Volts)
R_{max} = Maximum Loop Resistance (Ohms)

NOTE
Field Communication requires a minimum loop resistance of 250 ohms.

Supply Current Requirements

Units powered by 12-42 V DC power supply may draw up to 1 amp of current steady state.

FIGURE 2. DC Current Requirements



Power Consumption

10 watts maximum

Ambient Temperature Limits

Operating
-20 to 140 °F (-29 to 60 °C) with local operator interface

-40 to 165 °F (-40 to 74 °C) without local operator interface

Storage
–40 to 176 °F (–40 to 80 °C)

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Humidity Limits

0–100% RH to 120 °F (49 °C), decreases linearly to 10% RH at 130 °F (54 °C)

Enclosure Rating

Type 4X, IP66

Output Signals

Analog Output Adjustment(1)
4–20 mA, switch-selectable as internally or externally powered 5 to 24 V DC; 0 to 1000 Ω load.

Engineering units—lower and upper range values are user-selectable.

Output automatically scaled to provide 4 mA at lower range value and 20 mA at upper range value. Full scale continuously adjustable between -39 and 39 ft/s (-12 to 12 m/sec), 1 ft/s (0.3 m/s) minimum span.

Field Communications, digital flow signal, superimposed on 4–20 mA signal, available for control system interface. 250 Ω required for Field Communications.

Scalable Frequency Adjustment(1)
0-10,000 Hz, switch-selectable as internally or externally powered 5 to 24 V DC, transistor switch closure up to 2 W for frequencies up to 4,000 Hz and 5 V DC at 0.1 W at maximum frequency of 10,000 Hz. Pulse value can be set to equal desired volume in selected engineering units. Pulse width adjustable from 1.5 to 500 msec, below 1.5 msec pulse width automatically switches to 50% duty cycle. Local operator interface automatically calculates and displays maximum allowable output frequency.

Totalizer
Non-volatile totalizer for net, gross, forward and reverse totals.

Optional Digital Output Function (AX option)

Externally powered at 5 to 24 V DC, transistor switch closure up to 3 W to indicate either:

Reverse Flow:
Activates switch closure output when reverse flow is detected. The reverse flow rate is displayed.

Zero Flow:
Activates switch closure output when flow goes to 0 ft/s.

Empty Pipe:
Activates switch closure output when an empty pipe condition is detected.

Transmitter Faults:
Activates switch closure output when a transmitter fault is detected.

(1) For transmitters with intrinsically safe outputs, power must be supplied externally.

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Flow Limits (2):
Activates switch closure output when the transmitter measures a flow rate that meets the conditions established for this alert. There are two independent flow limit alerts that can be configured as discrete outputs.

Totalizer Limit:
Activates switch closure output when the transmitter measures a total flow that meets the conditions established for this alert.

Diagnostic Status:
Activates switch closure output when the transmitter detects a condition that meets the configured criteria of this output.

Optional Digital Input Function (AX option)

Externally powered at 5 to 24 V DC, transistor switch closure up to 3 W to indicate either:

Net Total Reset:
Resets the net totalizer value to zero.

Positive Zero Return (PZR):
Forces outputs of the transmitter to zero flow. Activated by applying a contact closure.

Security Lockout

Security lockout jumper on the electronics board can be set to deactivate all LOI and HART-based communicator functions to protect configuration variables from unwanted or accidental change.

Output Testing

Analog Output Test
Transmitter may be commanded to supply a specified current between 3.75 and 23.25 mA

Pulse Output Test
Transmitter may be commanded to supply a specified frequency between 1 pulse/ day and 10,000 Hz

Turn-on Time
5 minutes to rated accuracy from power up, 5 seconds from power interruption

Start-up Time

0.2 seconds from zero flow

Low Flow Cutoff

Adjustable between 0.01 and 38.37 ft/s (0.003 and 11.7 m/s). Below selected value, output is driven to the zero flow rate signal level.

Overrange Capability

Signal output will remain linear until 110% of upper range value. The signal output will remain constant above these values. Out of range message displayed on LOI and the HART Communicator.

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Damping

Adjustable between 0.0 and 256 seconds

Sensor Compensation

Rosemount sensors are flow-calibrated and assigned a calibration factor at the factory. The calibration factor is entered into the transmitter, enabling interchangeability of sensors without calculations or a compromise in accuracy.

8712E transmitters and other manufacturers' sensors can be calibrated at known process conditions or at the Rosemount NIST-Traceable Flow Facility. Transmitters calibrated on site require a two-step procedure to match a known flow rate. This procedure can be found in the Operations Manual 00809-0100-4664.

Diagnostics

Basic
Self test
Transmitter faults
Analog output test
Pulse output test
Tunable empty pipe
Reverse flow
Coil circuit fault
Electronics temperature

Advanced (DA1 Suite)
Ground/wiring fault
High process noise

Advanced (DA2 Suite)
8714i Meter Verification

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PERFORMANCE SPECIFICATIONS

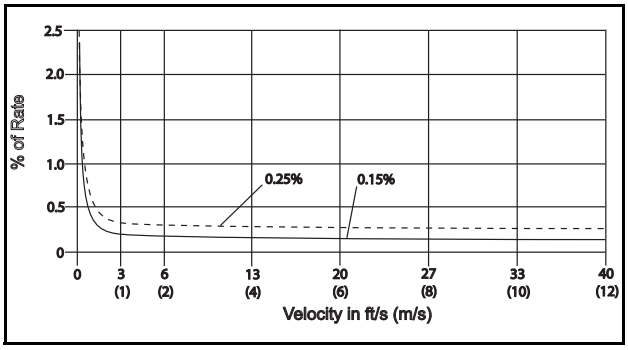
(System specifications are given using the frequency output and with the unit at referenced conditions.)

Accuracy

Includes the combined effects of linearity, hysteresis, repeatability, and calibration uncertainty.

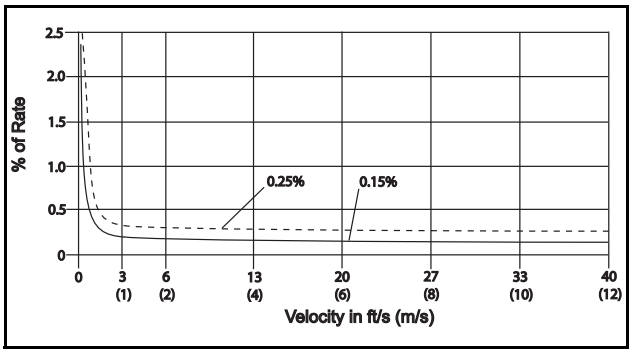
Rosemount 8712E with 8705/8707 Sensor:
Standard system accuracy is ±0.25% of rate ±1.0 mm/sec from 0.04 to 6 ft/s (0.01 to 2 m/s); above 6 ft/s (2 m/s), the system has an accuracy of ±0.25% of rate ±1.5 mm/sec.

Optional high accuracy is ±0.15% of rate ±1.0 mm/sec from 0.04 to 13 ft/s (0.01 to 4 m/s); above 13 ft/s (4 m/s), the system has an accuracy of ±0.18% of rate.(1)



Rosemount 8712E with 8711 Sensor:
Standard system accuracy is ±0.25% of rate ±2.0 mm/sec from 0.04 to 39 ft/s (0.01 to 12 m/s).

Optional high accuracy is ±0.15% of rate ±1.0 mm/sec from 0.04 to 13 ft/s (0.01 to 4 m/s); above 13 ft/s (4 m/s), the system has an accuracy of ±0.18% of rate.

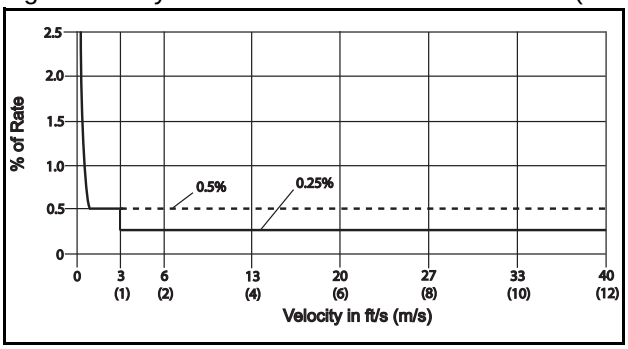


Rosemount 8712E with 8721 Sensor:
Standard system accuracy is ±0.5% of rate from 1 to 39 ft/s (0.3 to 12 m/s); between 0.04 and 1.0 ft/s (0.01 and 0.3 m/s), the system has an accuracy of ±0.005 ft/s (0.0015 m/s).

(1) For sensor sizes greater than 12 in. (300 mm) the high accuracy is ±0.25% of rate from 3 to 40 ft/sec (1 to 12 m/sec).

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Optional high accuracy is ±0.25% of rate from 3 to 39 ft/s (1 to 12 m/s).



Rosemount 8712E with Legacy 8705 Sensors:
Standard system accuracy is ±0.5% of rate from 1 to 39 ft/s (0.3 to 12 m/s); between 0.04 and 1.0 ft/s (0.01 and 0.3 m/s), the system has an accuracy of ±0.005 ft/s (0.0015 m/s).

Rosemount 8712E with Legacy 8711 Sensors:
Standard system accuracy is ±0.5% of rate from 3 to 39 ft/s (1 to 12 m/s); between 0.04 and 3.0 ft/s (0.01 and 1 m/s), the system has an accuracy of ±0.015 ft/s (0.005 m/s).

Rosemount 8712E with Other Manufacturers' Sensors:
When calibrated in the Rosemount Flow Facility, system accuracies as good as 0.5% of rate can be attained.

There is no accuracy specification for other manufacturers' sensors calibrated in the process line.

Analog Output Effect

Analog output has the same accuracy as frequency output plus an additional 0.05% of span.

Vibration Effect

±0.1% of span per SAMA PMC 31.1, Level 2

Repeatability

±0.1% of reading

Response Time

0.2 seconds maximum response to step change in input

Stability

±0.1% of rate over six months

Ambient Temperature Effect

0.25% over operating temperature range

EMC Compliance

EN61326-1 : 2006 (Industrial) electromagnetic compatibility (EMC) for process and laboratory apparatus.

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PHYSICAL SPECIFICATIONS

Materials of Construction

Housing
Low-copper aluminum, Type 4X and IEC 60529 IP66

Paint
Polyurethane

Cover Gasket
Rubber

Electrical Connections

Four 1/2–14 NPT connections provided on the base of the transmitter. Screw terminals provided for all of the connections. Power wiring connected to the transmitter only. Remote mounted transmitters require only a single conduit connection to the sensor.

NOTE
If 3/4 - 14 NPT connections are required, 1/2 to 3/4 in. adapter kits are available for order.

Line Power Fuses

90–250 V ac systems
2 amp, Quick-acting Bussman AGCI or equivalent

12–42 V DC systems
3 amp, Quick-acting Bussman AGCI or equivalent

Transmitter Weight

Transmitter approximately 9 lb (4 kg). Add 1 lb (0.5 kg) for local operator interface.

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ROSEMOUNT 8712E ORDERING INFORMATION

Model	Product Description
8712E	Remote Magnetic Flowmeter Transmitter
Code	**Transmitter Style**
S	Standard
Code	**Transmitter Mount**
R	Remote Mount for 2 in. pipe or panel (includes CS mounting bolts and 316L SST bracket)
Code	**Transmitter Power Supply**
1	AC Power Supply (90 to 250 V AC, 50-60Hz)
2	DC Power Supply (12 to 42 V DC)
Code	**Outputs**
A	4-20 mA Digital Electronics (HART Protocol)
Code	**Conduit Entry**
1	1/2 - 14 NPT, 4 Conduit Entries
2	CM20, 4 Conduit Entries(1)
3	PG 13.5, 4 Conduit Entries(2)
Code	**Safety Approvals(2)**
NA	CE Marking, no hazardous location approval
	FM & CSA
N0	FM Class 1 Div 2 for non-flammable: CSA Class 1 Div 2
N5	FM Class 1 Div 2 for flammable fluids
	ATEX
N1	ATEX Type n Ex nA nL IIC and ATEX Dust Approval(3)
ND	ATEX Dust Approval
	IECEx
N7	IECEx Type n Ex nA nL IIC and IECEx Dust Approval(3)
NF	IECEx Dust Approval
Code	**Options**
	PlantWeb Product/Process Diagnostics
DA1	Magmeter HART Diagnostic Suite 1: Includes High Process Noise and Ground/Wiring Fault Detection
DA2	Magmeter HART Diagnostic Suite 2: Includes 8714i Meter Verification
	Other Options
C1	Custom Configuration (CDS Required)
D1	High Accuracy Calibration (0.15% of rate for matched sensor and transmitter)(4)
DT	Heavy Duty Tagging
M4	Local Operator Interface
B6	316L Stainless Steel 4-bolt Kit for 2-in. Remote Pipe Mount
GE	M12, 4-Pin, Male Connector (Eurofast)
GM	A Size Mini, 4-Pin, Male Connector (Minifast)

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	QIG Language
YA	Danish
YD	Dutch
YF	French
YG	German
YH	Finnish
YI	Italian
YN	Norwegian
YP	Portuguese
YS	Spanish
YR	Russian
YW	Swedish

Typical Model Number: 8712E S R 1 A 1 N0 DA1 DA2 M4

(1) Adapter are used for this conduit entry type
(2) All product, ordered with or without Safety approvals, is compliant with local CE Marking and C-tick requirements unless specifically noted as a special
(3) For DC Transmitter Power Supply (Code = 2) Only
(4) D1 Option Code must be ordered with sensor and transmitter

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Appendix B Approval Information

Product Certifications . . . . . page B-1
Approved Manufacturing Locations . . . . . page B-1

PRODUCT CERTIFICATIONS

APPROVED MANUFACTURING LOCATIONS

Rosemount Inc. — Eden Prairie, Minnesota, USA

Fisher-Rosemount Technologias de Flujo, S.A. de C.V. — Chihuahua Mexico

Emerson Process Management Flow — Ede, The Netherlands

Asia Flow Technology Center — Nanjing, China

European Directive Information

The EC declaration of conformity can be found in document number 00825-0100-4664. The most recent revision can be found at www.rosemount.com.

Type n protection type in accordance with EN 50021, EN 60079-15

- Closing of entries in the device must be carried out using the appropriate EEx e or EEx n metal cable gland and metal blanking plug or any appropriate ATEX approved cable gland and blanking plug with IP66 rating certified by an EU approved certification body.

CE Marking

C-Tick Marking

Hazardous Locations Certifications

North American Certifications

FM Approvals

N0 Non-incendive for Class I, Division 2, Groups A, B, C, and D non-flammable fluids (T4 at 40 °C), and Dust-ignition proof Class II/III, Division 1, Groups E, F, and G (T4 at 40 °C) Hazardous locations; Enclosure Type 4X

N5 Non-incendive for Class I, Division 2, Groups A, B, C, and D flammable fluids (T4 at 40 °C), and Dust-ignition proof Class II/III, Division 1, Groups E, F, and G (T4 at 40 °C) Hazardous locations; Enclosure Type 4X
Requires sensors with N5 Approval

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Canadian Standards Association (CSA)

N0 Non-incendive for Class I, Division 2, Groups A, B, C, and D non-flammable fluids (T4 at 40 °C), and Dust-ignition proof Class II/III, Division 1, Groups E, F, and G (T4 at 40 °C) Hazardous locations; Enclosure Type 4X

European Certifications

N1 ATEX Type n
ATEX Certificate No: BASEEFA 05ATEX0170X
EEx nA nL IIC T4 (Ta = -40 °C to + 60 °C)
V_{max} = 42 V DC
CE 0575

Special Conditions for Safe Use (x)

The apparatus is not capable of withstanding the 500V insulation test required by Clause 8.1of EN 60079-15: 2003. This must be taken into account when installing the apparatus.

International Certifications

IECEx

N7 IECEx Type n
Certificate No: IECEx BAS 07.0036X
Ex nA nL IIC T4 (Ta = -40 °C to + 60 °C)
V_{max} = 42 V DC

Special Conditions for Safe Use (x)

The apparatus is not capable of withstanding the 500V insulation test required by Clause 6.8.1of IEC 60079-15: 2005. This must be taken into account when installing the apparatus.

Sensor Approval Information

Approval Codes	Rosemount 8705 Sensor		Rosemount 8707 Sensor		Rosemount 8711 Sensor		Rosemount 8721 Sensors
	For Non-flammable Fluids	For Flammable Fluids	For Non-flammable Fluids	For Flammable Fluids	For Non-flammable Fluids	For Flammable Fluids	For Non-flammable Fluids
NA	•						•
N0	•		•		•		
ND	•	•			•	•	
N1	•	•			•	•	
N5	•	•	•	•	•	•	
N7	•	•			•	•	
ND	•	•			•	•	
NF	•	•			•	•	
E1	•	•			•	•	
E5[1]	•	•			•	•	
KD[2]	•	•			•	•	

(1) Available in line sizes up to 8 in. (200 mm) only.
(2) Refer to Table B-2 on page B-4 for relation between ambient temperature, process temperature, and temperature class.

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North American Certifications

Factory Mutual (FM)

N0 Non-incendive for Class I, Division 2, Groups A, B, C, and D non-flammable fluids (8705/8711 T5 at 60 °C; 8707 T3C at 60 °C), and Dust-ignition proof Class II/III, Division 1, Groups E, F, and G (8705/8711 T6 at 60 °C; 8707 T3C at 60 °C) Hazardous locations; Enclosure Type 4X

N0 8721 Hygienic Sensor
Factory Mutual (FM) Ordinary Location;
CE Marking; 3-A Symbol Authorization #1222;
EHEDG Type EL

N5 Non-incendive for Class I, Division 2, Groups A, B, C, and D; with intrinsically safe electrodes for use on flammable fluids (8705/8711 T5 at 60 °C; 8707 T3C at 60 °C), and Dust-ignition proof Class II/III, Division 1, Groups E, F, and G (8705/8711 T6 at 60 °C; 8707 T3C at 60 °C) Hazardous locations; Enclosure Type 4X

E5 Explosion proof for Class I, Division 1, Groups C and D (8705/8711 T6 at 60 °C), and Dust-ignition proof Class II/III, Division 1, Groups E, F, and G (8705/8711 T6 at 60 °C), and non-incendive for Class I, Division 2, Groups A, B, C, and D flammable fluids (8705/8711 T5 at 60 °C) Hazardous locations; Enclosure Type 4X

Canadian Standards Association (CSA)

N0 Non-incendive for Class I, Division 2, Groups A, B, C, and D non-flammable fluids (8705/8711 T5 at 60 °C; 8707 T3C at 60 °C), and Dust-ignition proof Class II/III, Division 1, Groups E, F, and G (8705/8711 T6 at 60 °C; 8707 T3C at 60 °C) Hazardous locations; Enclosure Type 4X

N0 8721 Hygienic Sensor
Canadian Standards Association (CSA) Ordinary Location;
CE Marking; 3-A Symbol Authorization #1222;
EHEDG Type EL

European Certifications

ND ATEX Dust Certificate No.: KEMA 06ATEX0006
⟨Ex⟩ II 1D max. DT = 40 K IP66
Amb. Temp. Limits: (-20 °C = Ta = +65 °C)
CE 0575

Installation Instructions

The cable and conduit entry devices and blanking elements shall be of a certified IP66 type, suitable for the conditions of use and correctly installed.
At maximum ambient temperatures, or at process temperatures above 60 °C, heat resistant cables with a temperature rating of at least 90 °C shall be used.

N1 ATEX Non-Sparking/Non-incendive
Certificate No: KEMA02ATEX1302X
⟨Ex⟩ II 3G EEx nA [L] IIC T3... T6
Ambient Temperature Limits -20 to 65 °C

SPECIAL CONDITIONS FOR SAFE USE (X):

The relation between ambient temperature, process temperature and temperature class is to be taken from Table B-3 on page B-5. The electrical data is to be taken from Table B-1 on page B-4.

KD, E1
ATEX Zone 1 Increased Safety with IS Electrodes
Certificate No. KEMA 03ATEX2052X
⟨Ex⟩ II 1/2G EEx e ia IIC T3...T6
Ambient Temperature Limits -20 to 65 °C (See Table B-2)
CE 0575
V_{max} = 40 V

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SPECIAL CONDITIONS FOR SAFE USE (X):

The relation between ambient temperature, process temperature and temperature class is to be taken from Table B-3 on page B-5. The electrical data is to be taken from Table B-1 on page B-4.

Installation Instructions

At ambient temperatures above 50 °C, heat resistant cables with a temperature rating of at least 90 °C shall be used.

A fuse with a rating of maximum 0,7 A according to IEC 60127-1 shall be included in the coil excitation circuit if the sensors are used with other flow transmitters.

Table B-1. Electrical Data

Rosemount 8705 and 8711 Sensors	
Coil excitation circuit:	40 V, 0,5 A, 20 W maximum
Electrode circuit:	in type of explosion protection intrinsic safety EEx ia IIC, U_i = 5 V, I_i = 0.2 mA, P_i = 1 mW, U_m = 250 V

Table B-2. Relation between ambient temperature, process temperature, and temperature class(1)

Meter Size (Inches)	Maximum Ambient Temperature	Maximum Process Temperature	Temperature Class
1/2	115°F (65°C)	239°F (115°C)	T3
1	149°F (65°C)	248°F (120°C)	T3
1	95°F (35°C)	95°F (35°C)	T4
1 1/2	149°F (65°C)	257°F (125°C)	T3
1 1/2	122°F (50°C)	148°F (60°C)	T4
2	149°F (65°C)	257°F (125°C)	T3
2	149°F (65°C)	167°F (75°C)	T4
2	104°F (40°C)	104°F (40°C)	T5
3 - 36	149°F (65°C)	266°F (130°C)	T3
3 - 36	149°F (65°C)	194°F (90°C)	T4
3 - 36	131°F (55°C)	131°F (55°C)	T5
3 - 36	104°F (40°C)	104°F (40°C)	T6
6	115°F (65°C)	275°F(135°C)	T3
6	115°F (65°C)	230°F (110°C)	T4
6	115°F (65°C)	167°F (75°C)	T5
6	140°F (60°C)	140°F (60°C)	T6
8-60	115°F (65°C)	284°F (140°C)	T3
8-60	115°F (65°C)	239°F (115°C)	T4
8-60	115°F (65°C)	176°F (80°C)	T5
8-60	115°F (65°C)	156°F (69°C)	T6

(1) This table is applicable for KD approval codes only.

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Table B-3. Relation between the maximum ambient temperature, the maximum process temperature, and the temperature class[1]

Maximum Ambient Temperature	Maximum process temperature °F (°C) per temperature class			
	T3	T4	T5	T6
0.5 in. sensor size				
149°F (65°C)	297°F (147°C)	138°F (59°C)	54°F (12°C)	18°F (-8°C)
140°F (60°C)	309°F (154°C)	151°F (66°C)	66°F (19°C)	28°F (-2°C)
131°F (55°C)	322°F (161°C)	163°F (73°C)	79°F (26°C)	41°F (5°C)
122°F (50°C)	334°F (168°C)	176°F (80°C)	90°F (32°C)	54°F (12°C)
113°F (45°C)	347°F (175°C)	189°F (87°C)	102°F (39°C)	66°F (19°C)
104°F (40°C)	351°F (177°C)	199°F (93°C)	115°F (46°C)	79°F (26°C)
95°F (35°C)	351°F (177°C)	212°F (100°C)	127°F (53°C)	90°F (32°C)
86°F (30°C)	351°F (177°C)	225°F (107°C)	138°F (59°C)	102°F (39°C)
77°F (25°C)	351°F (177°C)	237°F (114°C)	151°F (66°C)	115°F (46°C)
68°F (20°C)	351°F (177°C)	248°F (120°C)	163°F (73°C)	127°F (53°C)
1.0 in. sensor size				
149°F (65°C)	318°F (159°C)	158°F (70°C)	72°F (22°C)	34°F (1°C)
140°F (60°C)	331°F (166°C)	171°F (77°C)	84°F (29°C)	46°F (8°C)
131°F (55°C)	343°F (173°C)	183°F (84°C)	97°F (36°C)	59°F (15°C)
122°F (50°C)	351°F (177°C)	196°F (91°C)	109°F (43°C)	72°F (22°C)
113°F (45°C)	351°F (177°C)	207°F (97°C)	122°F (50°C)	84°F (29°C)
104°F (40°C)	351°F (177°C)	219°F (104°C)	135°F (57°C)	97°F (36°C)
95°F (35°C)	351°F (177°C)	232°F (111°C)	145°F (63°C)	109°F (43°C)
86°F (30°C)	351°F (177°C)	244°F (118°C)	158°F (70°C)	122°F (50°C)
77°F (25°C)	351°F (177°C)	257°F (125°C)	171°F (77°C)	135°F (57°C)
68°F (20°C)	351°F (177°C)	270°F (132°C)	183°F (84°C)	145°F (63°C)
1.5 in. sensor size				
149°F (65°C)	297°F (147°C)	160°F (71°C)	88°F (31°C)	55°F (13°C)
140°F (60°C)	307°F (153°C)	171°F (77°C)	97°F (36°C)	66°F (19°C)
131°F (55°C)	318°F (159°C)	181°F (83°C)	108°F (42°C)	77°F (25°C)
122°F (50°C)	329°F (165°C)	192°F (89°C)	118°F (48°C)	88°F (31°C)
113°F (45°C)	340°F (171°C)	203°F (95°C)	129°F (54°C)	97°F (36°C)
104°F (40°C)	351°F (177°C)	214°F (101°C)	140°F (60°C)	108°F (42°C)
95°F (35°C)	351°F (177°C)	223°F (106°C)	151°F (66°C)	118°F (48°C)
86°F (30°C)	351°F (177°C)	234°F (112°C)	160°F (71°C)	129°F (54°C)
77°F (25°C)	351°F (177°C)	244°F (118°C)	171°F (77°C)	140°F (60°C)
68°F (20°C)	351°F (177°C)	255°F (124°C)	181°F (83°C)	151°F (66°C)

Continued on Next Page

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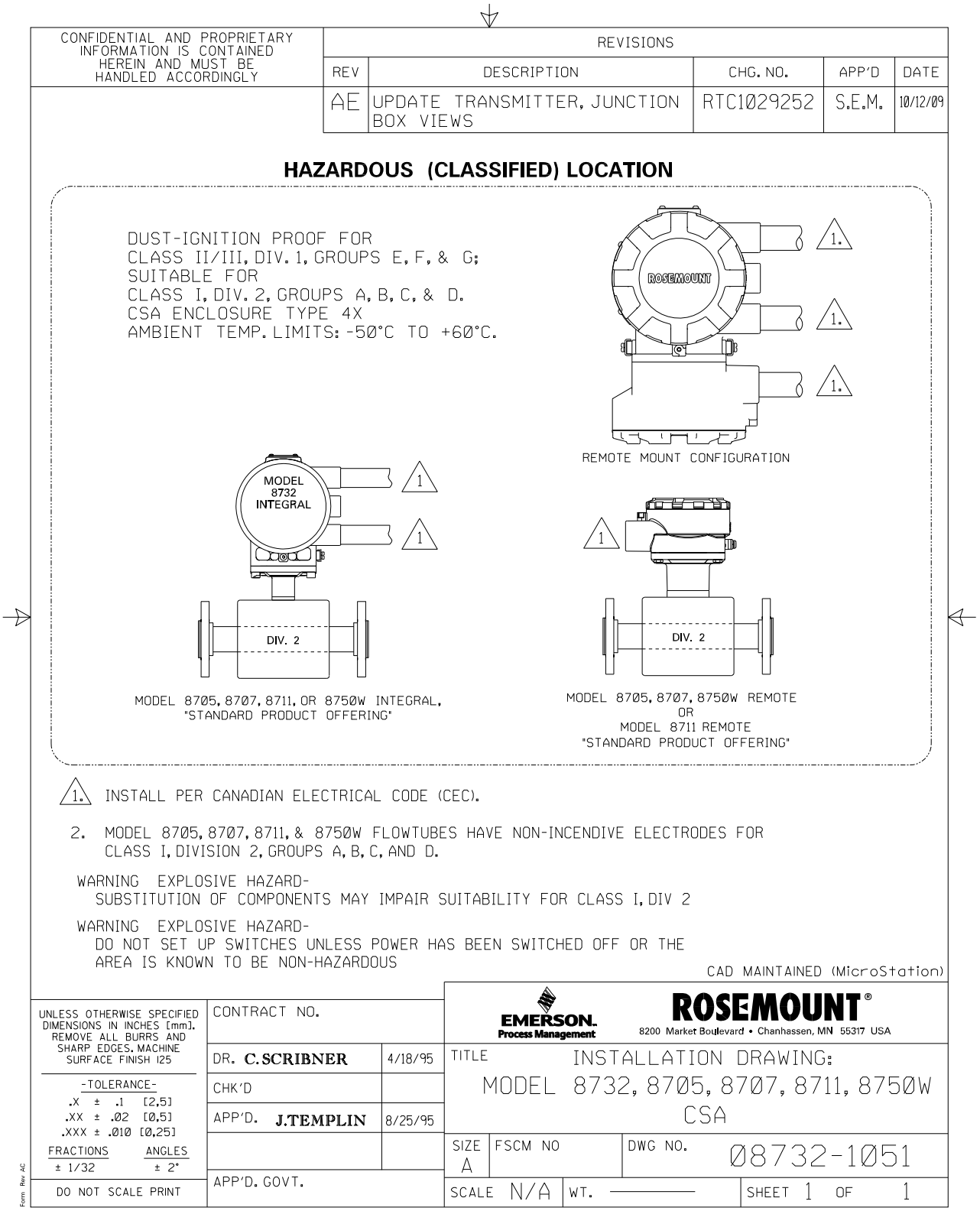
Table B-3. Relation between the maximum ambient temperature, the maximum process temperature, and the temperature class(1)

Maximum Ambient Temperature	Maximum process temperature °F (°C) per temperature class			
	T3	T4	T5	T6
2.0 in. sensor size				
149°F (65°C)	289°F (143°C)	163°F (73°C)	95°F (35°C)	66°F (19°C)
140°F (60°C)	300°F (149°C)	172°F 78(°C)	104°F (40°C)	75°F (24°C)
131°F (55°C)	309°F (154°C)	183°F (84°C)	115°F (46°C)	84°F (29°C)
122°F (50°C)	318°F (159°C)	192°F (89°C)	124°F (51°C)	95°F (35°C)
113°F (45°C)	329°F (165°C)	201°F (94°C)	135°F (57°C)	104°F (40°C)
104°F (40°C)	338°F (170°C)	212°F (100°C)	144°F (62°C)	115°F (46°C)
95°F (35°C)	349°F (176°C)	221°F (105°C)	153°F (67°C)	124°F (51°C)
86°F (30°C)	351°F (177°C)	232°F (111°C)	163°F (73°C)	135°F (57°C)
77°F (25°C)	351°F (177°C)	241°F (116°C)	172°F (78°C)	144°F (62°C)
68°F (20°C)	351°F (177°C)	252°F (122°C)	183°F (84°C)	153°F (67°C)
3 to 60 in. sensor size				
149°F (65°C)	351°F (177°C)	210°F (99°C)	117°F (47°C)	75°F (24°C)
140°F (60°C)	351°F (177°C)	223°F (106°C)	129°F (54°C)	90°F (32°C)
131°F (55°C)	351°F (177°C)	237°F (114°C)	144°F (62°C)	102°F (39°C)
122°F (50°C)	351°F (177°C)	250°F (121°C)	156°F (69°C)	117°F (47°C)
113°F (45°C)	351°F (177°C)	264°F (129°C)	171°F (77°C)	129°F (54°C)
104°F (40°C)	351°F (177°C)	266°F (130°C)	183°F (84°C)	144°F (62°C)
95°F (35°C)	351°F (177°C)	266°F (130°C)	198°F (92°C)	156°F (69°C)
86°F (30°C)	351°F (177°C)	266°F (130°C)	203°F (95°C)	171°F (77°C)
77°F (25°C)	351°F (177°C)	266°F (130°C)	203°F (95°C)	176°F (80°C)
68°F (20°C)	351°F (177°C)	266°F (130°C)	203°F (95°C)	176°F (80°C)

(1) This table is applicable for N1 option codes only.

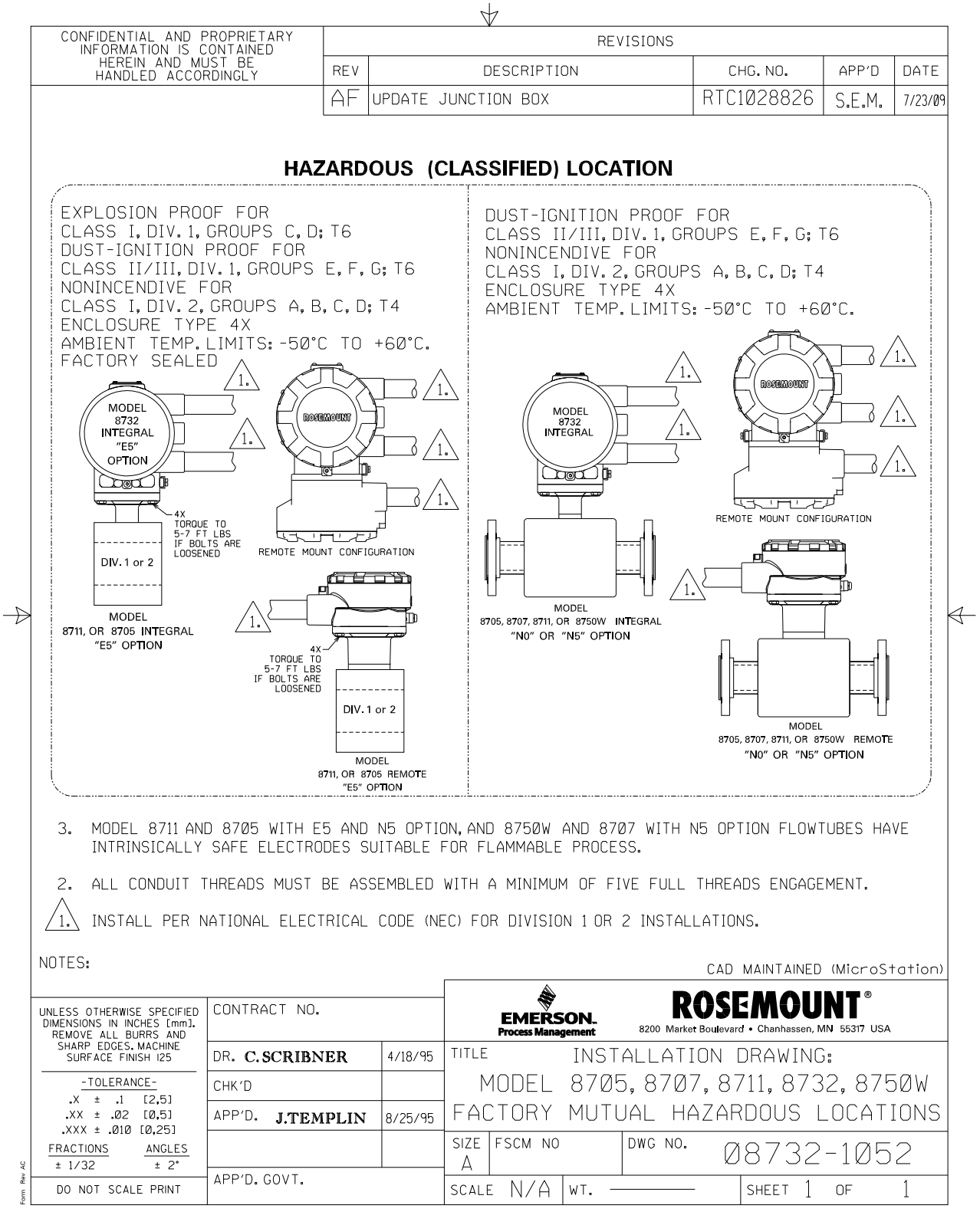
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Figure B-1. CSA Installation



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Figure B-2. Factory Mutual
Hazardous Locations



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Appendix C Diagnostics

Diagnostic Availability . . . . . page C-1
Licensing and Enabling . . . . . page C-2
Tunable Empty Pipe Detection . . . . . page C-2
Ground/Wiring Fault Detection . . . . . page C-4
High Process Noise Detection . . . . . page C-5
8714i Meter Verification . . . . . page C-8
Rosemount Magnetic Flowmeter Calibration Verification Report . . . . . page C-16

DIAGNOSTIC AVAILABILITY

Rosemount Magmeters provide device diagnostics that powers PlantWeb and informs the user of abnormal situations throughout the life of the meter - from installation to maintenance and meter verification. With Rosemount Magmeter diagnostics enabled, users can change their practices to improve plant availability and output, and reduce costs through simplified installation, maintenance and troubleshooting.

Diagnostics	Mag User Practice	8712 HART
Basic		
Empty Pipe	Process Management	•
Electronics Temperature	Maintenance	•
Coil Fault	Maintenance	•
Transmitter Faults	Maintenance	•
Reverse Flow	Process Management	•
Advanced (Suite 1)		DA1 Option
High Process Noise	Process Management	•
Grounding/Wiring Fault	Installation	•
Advanced (Suite 2)		DA2 Option
8714i Meter Verification	Calibration Verification	•

Options for Accessing Diagnostics

Rosemount magmeter diagnostics can be accessed through the Local Operator Interface (LOI), the 375 Handheld Communicator, and AMS Device Manager.

Access Diagnostics through the LOI for quicker installation, maintenance, and meter verification

Rosemount magmeter diagnostics are available through the LOI to make maintenance of every magmeter easier.

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Access Diagnostics through AMS Intelligent Device Manager for the Ultimate Value

The value of the Diagnostics increases significantly when AMS is used. Now the user gets a simplified screen flow and procedures for how to respond to the Diagnostic messages.

LICENSING AND ENABLING

All non-basic diagnostics must be licensed by ordering option code DA1, DA2, or both. In the event that a diagnostic option is not ordered, advanced diagnostics can be licensed in the field through the use of a license key. To obtain a license key, contact your local Rosemount Representative. Each transmitter has a unique license key specific to the diagnostic option code. See the detailed procedures below for entering the license key and enabling the advanced diagnostics.

Licensing the 8712 Diagnostics

For licensing the advanced diagnostics, follow the steps below.

1. Power-up the 8712 transmitter
2. Verify that you have 5.3.1 software or later

HART Fast Keys	1, 4, 6, 10, 3
LOI Key	AUX. FUNCTION
AMS Tab	License

3. Determine the Device ID

HART Fast Keys	1, 4, 6, 6
LOI Key	AUX. FUNCTION
AMS Tab	License

4. Obtain a License Key from your local Rosemount Representative.
5. Enter License Key

HART Fast Keys	1, 2, 3, 5, 2, 2
LOI Key	AUX. FUNCTION
AMS Tab	License

6. Enable Advanced Diagnostics

HART Fast Keys	1, 2, 1
LOI Key	AUX. FUNCTION
AMS Tab	Diagnostics

TUNABLE EMPTY PIPE DETECTION

The Tunable Empty Pipe detection provides a means of minimizing issues and false readings when the pipe is empty. This is most important in batching applications where the pipe may run empty with some regularity.

If the pipe is empty, this diagnostic will activate, set the flow rate to 0, and deliver a PlantWeb alert.

Turning Empty Pipe On/Off

HART Fast Keys	1, 2, 1, 1
LOI Key	AUX. FUNCTION
AMS Tab	Diagnostics

The Empty Pipe diagnostic can be turned on or off as required by the application. If the advanced diagnostics suite 1 (DA1 Option) was ordered, then the Empty Pipe diagnostic will be turned on. If DA1 was not ordered, the default setting is off.

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Tunable Empty Pipe Parameters

The Tunable Empty Pipe diagnostic has one read-only parameter, and two parameters that can be custom configured to optimize the diagnostic performance.

Empty Pipe Value

HART Fast Keys	1, 2, 2, 4, 1
LOI Key	XMTR INFO
AMS Tab	Diagnostics

Reads the current Empty Pipe Value. This is a read-only value. This number is a unitless number and is calculated based on multiple installation and process variables such as sensor type, line size, process fluid properties, and wiring. If the Empty Pipe Value exceeds the Empty Pipe Trigger Level for a specified number of updates, then the Empty Pipe diagnostic alert will activate.

Empty Pipe Trigger Level

HART Fast Keys	1, 2, 2, 4, 2
LOI Key	AUX. FUNCTION
AMS Tab	Diagnostics

Limits: 3 to 2000

This value configures the threshold limit that the Empty Pipe Value must exceed before the Empty Pipe diagnostic alert activates. The default setting from the factory is 100.

Empty Pipe Counts

HART Fast Keys	1, 2, 2, 4, 3
LOI Key	AUX. FUNCTION
AMS Tab	Diagnostics

Limits: 5 to 50

This value configures the number of consecutive updates that the Empty Pipe Value must exceed the Empty Pipe Trigger Level before the Empty Pipe diagnostic alert activates. The default setting from the factory is 5.

Optimizing Tunable Empty Pipe

The Tunable Empty Pipe diagnostic is set at the factory to properly diagnose most applications. If this diagnostic unexpectedly activates, the following procedure can be followed to optimize the Empty Pipe diagnostic for the application.

1. Record the Empty Pipe Value with a full pipe condition.

Example

Full reading = 0.2

2. Record the Empty Pipe Value with an empty pipe condition.

Example

Empty reading = 80.0

3. Set the Empty Pipe Trigger Level to a value between the full and empty readings. For increased sensitivity to empty pipe conditions, set the trigger level to a value closer to the full pipe value.

Example

Set the trigger level to 25.0

4. Set the Empty Pipe Counts to a value corresponding to the desired sensitivity level for the diagnostic. For applications with entrained air or potential air slugs, less sensitivity may be desired.

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Example

Set the counts to 10

Troubleshooting Empty Pipe

The following actions can be taken if Empty Pipe detection is unexpected.

1. Verify the sensor is full.
2. Verify that the sensor has not been installed with a measurement electrode at the top of the pipe.
3. Decrease the sensitivity by setting the Empty Pipe Trigger Level to a value above the Empty Pipe Value read with a full pipe.
4. Decrease the sensitivity by increasing the Empty Pipe Counts to compensate for process noise. The Empty Pipe Counts is the number of consecutive Empty Pipe Value readings above the Empty Pipe Trigger Level required to set the Empty Pipe diagnostic. The count range is 5-50, with factory default set at 5.
5. Increase process fluid conductivity above 50 microsiemens/cm.
6. Properly connect the wiring between the sensor and the transmitter. Corresponding terminal block numbers in the sensor and transmitter must be connected.
7. Perform the sensor electrical resistance tests. Confirm the resistance reading between coil ground (ground symbol) and coil (1 and 2) is infinity, or open. Confirm the resistance reading between electrode ground (17) and an electrode (18 or 19) is greater than 2 kohms and rises. For more detailed information, consult Table 6-6 on page 6-9.

GROUND/WIRING FAULT DETECTION

The Ground/Wiring Fault Detection diagnostic provides a means of verifying installations are done correctly. If the installation is not wired or grounded properly, this diagnostic will activate and deliver a PlantWeb alert. This diagnostic can also detect if the grounding is lost over-time due to corrosion or another root cause.

Turning Ground/Wiring Fault On/Off

HART Fast Keys	1, 2, 1, 3
LOI Key	AUX. FUNCTION
AMS Tab	Diagnostics

The Ground/Wiring Fault diagnostic can be turned on or off as required by the application. If the advanced diagnostics suite 1 (DA1 Option) was ordered, then the Ground/Wiring Fault diagnostic will be turned on. If DA1 was not ordered or licensed, this diagnostic is not available.

Ground/Wiring Fault Parameters

The Ground/Wiring Fault diagnostic has one read-only parameter. It does not have any configurable parameters.

Line Noise

HART Fast Keys	1, 2, 4, 3
LOI Key	XMTR INFO
AMS Tab	Diagnostics

Reads the current amplitude of the Line Noise. This is a read-only value. This number is a measure of the signal strength at 50/60 Hz. If the Line Noise value exceeds 5 mV, then the Ground/Wiring Fault diagnostic alert will activate.

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Troubleshooting Ground/Wiring Fault

The transmitter detected high levels of 50/60 Hz noise caused by improper wiring or poor process grounding.

1. Verify that the transmitter is earth grounded.
2. Connect ground rings, grounding electrode, lining protector, or grounding straps. Grounding diagrams can be found in “Grounding” on page 5-12.
3. Verify sensor is full.
4. Verify wiring between sensor and transmitter is prepared properly. Shielding should be stripped back less than 1 in. (25 mm).
5. Use separate shielded twisted pairs for wiring between sensor and transmitter.
6. Properly connect the wiring between the sensor and the transmitter. Corresponding terminal block numbers in the sensor and transmitter must be connected.

Ground/Wiring Fault Functionality

The transmitter continuously monitors signal amplitudes over a wide range of frequencies. For the Ground/Wiring Fault diagnostic, the transmitter specifically looks at the signal amplitude at frequencies of 50 Hz and 60 Hz which are the common AC cycle frequencies found throughout the world. If the amplitude of the signal at either of these frequencies exceeds 5 mV, that is an indication that there is a ground or wiring issue and that stray electrical signals are getting into the transmitter. The diagnostic alert will activate indicating that the ground and wiring of the installation should be carefully reviewed.

HIGH PROCESS NOISE DETECTION

The High Process Noise diagnostic detects if there is a process condition causing unstable or noisy readings, but the noise is not real flow variation. One common cause of high process noise is slurry flow, like pulp stock or mining slurries. Other conditions that cause this diagnostic to activate are high levels of chemical reaction or entrained gas in the liquid. If unusual noise or variation is seen, this diagnostic will activate and deliver a PlantWeb alert. If this situation exists and is left without remedy, it will add additional uncertainty and noise to the flow reading.

Turning High Process Noise On/Off

HART Fast Keys	1, 2, 1, 2
LOI Key	AUX. FUNCTION
AMS Tab	Diagnostics

The High Process Noise diagnostic can be turned on or off as required by the application. If the advanced diagnostics suite 1 (DA1 Option) was ordered, then the High Process Noise diagnostic will be turned on. If DA1 was not ordered or licensed, this diagnostic is not available.

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High Process Noise Parameters

The High Process Noise diagnostic has two read-only parameters. It does not have any configurable parameters. This diagnostic requires that flow be present in the pipe and the velocity be > 1 ft/s.

5 Hz Signal to Noise Ratio

HART Fast Keys	1, 2, 4, 4
LOI Key	XMTR INFO
AMS Tab	Diagnostics

Reads the current value of the signal to noise ratio at the coil drive frequency of 5 Hz. This is a read-only value. This number is a measure of the signal strength at 5 Hz relative to the amount of process noise. If the transmitter is operating in 5 Hz mode, and the signal to noise ratio remains below 25 for one minute, then the High Process Noise diagnostic alert will activate.

37 Hz Signal to Noise Ratio

HART Fast Keys	1, 2, 4, 5
LOI Key	XMTR INFO
AMS Tab	Diagnostics

Reads the current value of the signal to noise ratio at the coil drive frequency of 37 Hz. This is a read-only value. This number is a measure of the signal strength at 37 Hz relative to the amount of process noise. If the transmitter is operating in 37 Hz mode, and the signal to noise ratio remains below 25 for one minute, then the High Process Noise diagnostic alert will activate.

Troubleshooting High Process Noise

The transmitter detected high levels of process noise. If the signal to noise ratio is less than 25 while operating in 5 Hz mode, proceed with the following steps:

1. Increase transmitter coil drive frequency to 37 Hz (refer to “Coil Drive Frequency” on page 4-16) and, if possible, perform Auto Zero function (refer to “Auto Zero” on page 4-15).
2. Verify sensor is electrically connected to the process with grounding electrode, grounding rings with grounding straps, or lining protector with grounding straps.
3. If possible, redirect chemical additions downstream of the magmeter.
4. Verify process fluid conductivity is above 10 microsiemens/cm.

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If the signal to noise ratio is less than 25 while operating in 37 Hz mode, proceed with the following steps:

1. Turn on the Digital Signal Processing (DSP) technology and follow the setup procedure (refer to Appendix D: Digital Signal Processing). This will minimize the level of damping in the flow measurement and control loop while also stabilizing the reading to minimize valve actuation.
2. Increase damping to stabilize the signal (refer to “PV Damping” on page 3-12). This will add dead-time to the control loop.
3. Move to a Rosemount High-Signal flowmeter system. This flowmeter will deliver a stable signal by increasing the amplitude of the flow signal by ten times to increase the signal to noise ratio. For example if the signal to noise ratio (SNR) of a standard magmeter is 5, the High-Signal would have a SNR of 50 in the same application. The Rosemount High-Signal system is comprised of the 8707 sensor which has modified coils and magnetics and the 8712H High-Signal transmitter.

NOTE
In applications where very high levels of noise are a concern, it is recommended that a dual-calibrated Rosemount High-Signal 8707 sensor be used. These sensors can be calibrated to run at lower coil drive current supplied by the standard Rosemount transmitters, but can also be upgraded by changing to the 8712H High-Signal transmitter.

High Process Noise Functionality

The High Process Noise diagnostic is useful for detecting situations where the process fluid may be causing electrical noise resulting in a poor measurement from the magnetic flowmeter. There are three basic types of process noise that can affect the performance of the magnetic flowmeter system.

1/f Noise

This type of noise has higher amplitudes at lower frequencies, but generally degrades over increasing frequencies. Potential sources of 1/f noise include chemical mixing and the general background noise of the plant.

Spike Noise

This type of noise generally results in a high amplitude signal at specific frequencies which can vary depending on the source of the noise. Common sources of spike noise include chemical injections directly upstream of the flowmeter, hydraulic pumps, and slurry flows with low concentrations of particles in the stream. The particles bounce off of the electrode generating a “spike” in the electrode signal. An example of this type of flow stream would be a recycle flow in a paper mill.

White Noise

This type of noise results in a high amplitude signal that is relatively constant over the frequency range. Common sources of white noise include chemical reactions or mixing that occurs as the fluid passes through the flowmeter and high concentration slurry flows where the particulates are constantly passing over the electrode head. An example of this type of flow stream would be a basis weight stream in a paper mill.

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The transmitter continuously monitors signal amplitudes over a wide range of frequencies. For the high process noise diagnostic, the transmitter specifically looks at the signal amplitude at frequencies of 2.5 Hz, 7.5 Hz, 32.5 Hz, and 42.5 Hz. The transmitter uses the values from 2.5 and 7.5 Hz and calculates an average noise level. This average is compared to the amplitude of the signal at 5 Hz. If the signal amplitude is not 25 times greater than the noise level, and the coil drive frequency is set at 5 Hz, the High Process Noise diagnostic will trip indicating that the flow signal may be compromised. The transmitter performs the same analysis around the 37.5 Hz coil drive frequency using the 32.5 Hz and 42.5 Hz values to establish a noise level.

8714I METER VERIFICATION

The 8714i Meter Verification diagnostic provides a means of verifying the flowmeter is within calibration without removing the sensor from the process. This is a manually initiated diagnostic test that provides a review of the transmitter and sensors critical parameters as a means to document verification of calibration. The results of running this diagnostic provide the deviation amount from expected values and a pass/fail summary against user-defined criteria for the application and conditions.

Initiating 8714i Meter Verification

HART Fast Keys	1, 2, 3, 3, 1
LOI Key	AUX. FUNCTION
AMS Tab	Context Menu, Diagnostics and Tests, 8714i Meter Verification

The 8714i Meter Verification diagnostic can be initiated as required by the application. If the advanced diagnostic suite (DA2) was ordered, then the 8714i Meter Verification diagnostic will be available. If DA2 was not ordered or licensed, this diagnostic will not be available.

Sensor Signature Parameters

The sensor signature describes the magnetic behavior of the sensor. Based on Faraday's law, the induced voltage measured on the electrodes is proportional to the magnetic field strength. Thus, any changes in the magnetic field will result in a calibration shift of the sensor.

Establishing the baseline sensor signature

The first step in running the 8714i Meter Verification test is establishing the reference signature that the test will use as the baseline for comparison. This is accomplished by having the transmitter take a signature of the sensor.

HART Fast Keys	1, 2, 3, 3, 3, 2
LOI Key	AUX. FUNCTION
AMS Tab	Context Menu, Diagnostics and Tests,

Having the transmitter take an initial sensor signature when first installed will provide the baseline for the verification tests that are done in the future. The sensor signature should be taken during the start-up process when the transmitter is first connected to the sensor, with a full line, and ideally with no flow in the line. Running the sensor signature procedure when there is flow in the line is permissible, but this may introduce some noise into the signature measurements. If an empty pipe condition exists, then the sensor signature should only be run for the coils.

Once the sensor signature process is complete, the measurements taken during this procedure are stored in non-volatile memory to prevent loss in the event of a power interruption to the meter.

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8714i Meter Verification Test Parameters

The 8714i has a multitude of parameters that set the test criteria, test conditions, and scope of the calibration verification test.

Test Conditions for the 8714i Meter Verification

There are three possible test conditions that the 8714i Meter Verification test can be initiated under. This parameter is set at the time that the Sensor Signature or 8714i Meter Verification test is initiated.

No Flow

Run the 8714i Meter Verification test with a full pipe and no flow in the line. Running the 8714i Meter Verification test under this condition provides the most accurate results and the best indication of magnetic flowmeter health.

Flowing, Full

Run the 8714i Meter Verification test with a full pipe and flow in the line. Running the 8714i Meter Verification test under this condition provides the ability to verify the magnetic flowmeter health without shutting down the process flow in applications where a shutdown is not possible. Running the calibration verification under flowing conditions can cause false fails if the flow rate is not at a steady flow, or if there is process noise present.

Empty Pipe

Run the 8714i Meter Verification test with an empty pipe. Running the 8714i Meter Verification test under this condition provides the ability to verify the magnetic flowmeter health with an empty pipe. Running the calibration verification under empty pipe conditions will not check the electrode circuit health.

8714i Meter Verification Test Criteria

The 8714i Meter Verification diagnostic provides the ability for the user to define the test criteria that the verification must test to. The test criteria can be set for each of the flow conditions discussed above.

HART Fast Keys	1, 2, 3, 3, 4
LOI Key	AUX. FUNCTION
AMS Tab	8714i

No Flow

Set the test criteria for the No Flow condition. The factory default for this value is set to two percent with limits configurable between one and ten percent.

HART Fast Keys	1, 2, 3, 3, 4, 1
AMS Tab	8714i

Flowing, Full

Set the test criteria for the Flowing, Full condition. The factory default for this value is set to three percent with limits configurable between one and ten percent.

HART Fast Keys	1, 2, 3, 3, 4, 2
AMS Tab	8714i

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Empty Pipe

Set the test criteria for the Empty Pipe condition. The factory default for this value is set to three percent with limits configurable between one and ten percent.

HART Fast Keys	1, 2, 3, 3, 4, 3
AMS Tab	8714i

8714i Meter Verification Test Scope

The 8714i Meter Verification can be used to verify the entire flowmeter installation, or individual parts such as the transmitter or sensor. This parameter is set at the time that the 8714i Meter Verification test is initiated.

All

Run the 8714i Meter Verification test and verify the entire flowmeter installation. This parameter results in the calibration verification performing the transmitter calibration verification, tube calibration verification, coil health check, and electrode health check. Transmitter calibration and tube calibration are verified to the percentage associated with the test condition selected when the test was initiated.

HART Fast Keys	1, 2, 3, 3, 1, 1
AMS	Context Menu, Diagnostics and Tests, 8714i Meter Verification

Transmitter

Run the 8714i Meter Verification test on the transmitter only. This results in the verification test only checking the transmitter calibration to the limits of the test criteria selected when the 8714i Meter Verification test was initiated.

HART Fast Keys	1, 2, 3, 3, 1, 2
AMS	Context Menu, Diagnostics and Tests, 8714i Meter Verification

Sensor

Run the 8714i Meter Verification test on the sensor only. This results in the verification test checking the sensor calibration to the limits of the test criteria selected when the 8714i Meter Verification test was initiated, verifying the coil circuit health, and the electrode circuit health.

HART Fast Keys	1, 2, 3, 3, 1, 3
AMS	Context Menu, Diagnostics and Tests, 8714i Meter Verification

8714i Meter Verification Test Results Parameters

Once the 8714i Meter Verification test is initiated, the transmitter will make several measurements to verify the transmitter calibration, tube calibration, coil circuit health, and electrode circuit health. The results of these tests can be reviewed and recorded on the calibration verification report found on page C-16. This report can be used to validate that the meter is within the required calibration limits to comply with governmental regulatory agencies such as the Environmental Protection Agency or Food and Drug Administration.

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Viewing the 8714i Meter Verification Results

Depending on the method used to view the results, they will be displayed in either a menu structure, as a method, or in the report format. When using the HART Field Communicator, each individual component can be viewed as a menu item. When using the LOI, the parameters are viewed as a method using the left arrow key to cycle through the results. In AMS the calibration report is populated with the necessary data eliminating the need to manually complete the report found on page C-16.

NOTE
When using AMS there are two possible methods that can be used to print the report.

Method one involves taking a PrntScrn picture of the 8714i Report tab on the status screen and pasting it into a word processing program. The PrntScrn button will capture all items on the screen so the image will need to be cropped and resized in order to get only the report.

Method two involves using the print feature within AMS while on the status screen. This will result in a printout of all of the information stored on the status tabs. Page two of the report will contain all of the necessary calibration verification result data.

The results are displayed in the following order:

Test Condition

Review the test condition that the 8714i Meter Verification test was performed under.

HART Fast Keys	1, 2, 3, 3, 2, 1
LOI Key	XMTR INFO
AMS	Context Menu, Device Diagnostics, 8714i Report

Test Criteria

Review the test criteria used to determine the results of the calibration verification tests.

HART Fast Keys	1, 2, 3, 3, 2, 2
LOI Key	XMTR INFO
AMS	Context Menu, Device Diagnostics, 8714i Report

8714i Result

Displays the overall result of the 8714i Meter Verification test as either a Pass or Fail.

HART Fast Keys	1,2,3,3,2,3
LOI Key	XMTR INFO
AMS	Context Menu, Device Diagnostics, 8714i Report

Simulated Velocity

Displays the simulated velocity used to verify the transmitter calibration.

HART Fast Keys	1,2,3,3,2,4
LOI Key	XMTR INFO
AMS	Context Menu, Device Diagnostics, 8714i Report

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Actual Velocity

Displays the velocity measured by the transmitter during the transmitter calibration verification process.

HART Fast Keys	1,2,3,3,2,5
LOI Key	XMTR INFO
AMS	Context Menu, Device Diagnostics, 8714i Report

Velocity Deviation

Displays the deviation in the actual velocity compared to the simulated velocity in terms of a percentage. This percentage is then compared to the test criteria to determine if the transmitter is within calibration limits.

HART Fast Keys	1,2,3,3,2,5
LOI Key	XMTR INFO
AMS	Context Menu, Device Diagnostics, 8714i Report

Transmitter Calibration Verification

Displays the results of the transmitter calibration verification test as either a Pass or Fail.

HART Fast Keys	1,2,3,3,2,6
LOI Key	XMTR INFO
AMS	Context Menu, Device Diagnostics, 8714i Report

Sensor Calibration Deviation

Displays the deviation in the sensor calibration. This value tells how much the sensor calibration has shifted from the original baseline signature. This percentage is compared to the test criteria to determine if the sensor is within calibration limits.

HART Fast Keys	1,2,3,3,2,7
LOI Key	XMTR INFO
AMS	Context Menu, Device Diagnostics, 8714i Report

Sensor Calibration Verification

Displays the results of the sensor calibration verification test as either a Pass or Fail.

HART Fast Keys	1,2,3,3,2,8
LOI Key	XMTR INFO
AMS	Context Menu, Device Diagnostics, 8714i Report

Coil Circuit Verification

Displays the results of the coil circuit health check as either a Pass or Fail.

HART Fast Keys	1,2,3,3,2,9
LOI Key	XMTR INFO
AMS	Context Menu, Device Diagnostics, 8714i Report

Electrode Circuit Verification

Displays the results of the electrode circuit health check as either a Pass or Fail.

HART Fast Keys	1,2,3,3,2,10 (To get to this value, the down arrow must be used to scroll through the menu list)
LOI Key	XMTR INFO
AMS	Context Menu, Device Diagnostics, 8714i Report

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Optimizing the 8714i Meter Verification

The 8714i Meter Verification diagnostic can be optimized by setting the test criteria to the desired levels necessary to meet the compliance requirements of the application. The following examples below will provide some guidance on how to set these levels.

Example

An effluent meter must be certified every year to comply with Environmental Protection Agency and Pollution Control Agency standards. These governmental agencies require that the meter be certified to five percent accuracy.

Since this is an effluent meter, shutting down the process may not be viable. In this instance the 8714i Meter Verification test will be performed under flowing conditions. Set the test criteria for Flowing, Full to five percent to meet the requirements of the governmental agencies.

Example

A pharmaceutical company requires bi-annual verification of meter calibration on a critical feed line for one of their products. This is an internal standard, but plant requirements require a calibration record be kept on-hand. Meter calibration on this process must meet one percent. The process is a batch process so it is possible to perform the calibration verification with the line full and with no flow.

Since the 8714i Meter Verification test can be run under no flow conditions, set the test criteria for No Flow to one percent to comply with the necessary plant standards.

Example

A food and beverage company requires an annual calibration of a meter on a product line. The plant standard calls for the accuracy to be three percent or better. They manufacture this product in batches, and the measurement cannot be interrupted when a batch is in process. When the batch is complete, the line goes empty.

Since there is no means of performing the 8714i Meter Verification test while there is product in the line, the test must be performed under empty pipe conditions. The test criteria for Empty Pipe should be set to three percent, and it should be noted that the electrode circuit health cannot be verified.

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Troubleshooting the 8714i Meter Verification Test

In the event that the 8714i Meter Verification test fails, the following steps can be used to determine the appropriate course of action. Begin by reviewing the 8714i results to determine the specific test that failed.

Figure C-1. Troubleshooting the 8714i Meter Verification Test Table

Test	Potential Causes of Failure	Steps to Correct
Transmitter Calibration Verification Test Failed	• Unstable flow rate during the verification test • Noise in the process • Transmitter drift • Faulty electronics	• Perform the test with no flow in the pipe • Check calibration with an external standard like the 8714D • Perform a digital trim • Replace the electronics
Sensor Calibration Verification Failed	• Moisture in the terminal block of the sensor • Calibration shift caused by heat cycling or vibration	• Remove the sensor and send back for recalibration.
Coil Circuit Health Failed	• Moisture in the terminal block of the sensor • Shorted Coil	• Perform the sensor checks detailed on page C-16.
Electrode Circuit Health Failed	• Moisture in the terminal block of the sensor • Coated Electrodes • Shorted Electrodes	• Perform the sensor checks detailed on page C-16.

8714i Meter Verification Functionality

The 8714i Meter Verification diagnostic functions by taking a baseline sensor signature and then comparing measurements taken during the verification test to these baseline results.

Sensor Signature Values

The sensor signature describes the magnetic behavior of the sensor. Based on Faraday's law, the induced voltage measured on the electrodes is proportional to the magnetic field strength. Thus, any changes in the magnetic field will result in a calibration shift of the sensor. Having the transmitter take an initial sensor signature when first installed will provide the baseline for the verification tests that are done in the future. There are three specific measurements that are stored in the transmitter's non-volatile memory that are used when performing the calibration verification.

Coil Circuit Resistance

The Coil Circuit Resistance is a measurement of the coil circuit health. This value is used as a baseline to determine if the coil circuit is still operating correctly when the 8714i Meter Verification diagnostic is initiated.

HART Fast Keys	1,2,3,3,3,1,1
LOI Key	XMTR INFO
AMS Tab	Config/Setup, 8714i

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Coil Signature

The Coil Signature is a measurement of the magnetic field strength. This value is used as a baseline to determine if a sensor calibration shift has occurred when the 8714i Meter Verification diagnostic is initiated.

HART Fast Keys	1,2,3,3,3,1,2
LOI Key	XMTR INFO
AMS Tab	Config/Setup, 8714i

Electrode Circuit Resistance

The Electrode Circuit Resistance is a measurement of the electrode circuit health. This value is used as a baseline to determine if the electrode circuit is still operating correctly when the 8714i Meter Verification diagnostic is initiated.

HART Fast Keys	1,2,3,3,3,1,3
LOI Key	XMTR INFO
AMS Tab	Config/Setup, 8714i

8714i Meter Verification Measurements

The 8714i Meter Verification test will make measurements of the coil resistance, coil signature, and electrode resistance and compare these values to the values taken during the sensor signature process to determine the sensor calibration deviation, the coil circuit health, and the electrode circuit health. In addition, the measurements taken by this test can provide additional information when troubleshooting the meter.

Coil Circuit Resistance

The Coil Circuit Resistance is a measurement of the coil circuit health. This value is compared to the coil circuit resistance baseline measurement taken during the sensor signature process to determine coil circuit health.

HART Fast Keys	1,2,3,3,5,1
LOI Key	XMTR INFO
AMS Tab	Config/Setup, 8714i

Coil Signature

The Coil Signature is a measurement of the magnetic field strength. This value is compared to the coil signature baseline measurement taken during the sensor signature process to determine tube calibration deviation.

HART Fast Keys	1,2,3,3,5,2
LOI Key	XMTR INFO
AMS Tab	Config/Setup, 8714i

Electrode Circuit Resistance

The Electrode Circuit Resistance is a measurement of the electrode circuit health. This value is compared to the electrode circuit resistance baseline measurement taken during the sensor signature process to determine electrode circuit health.

HART Fast Keys	1,2,3,3,5,3
LOI Key	XMTR INFO
AMS Tab	Config/Setup, 8714i

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ROSEMOUNT MAGNETIC FLOWMETER CALIBRATION VERIFICATION REPORT

Calibration Verification Report Parameters

User Name: _____

Calibration Conditions: ☐ Internal ☐ External

Tag #:_____

Test Conditions: ☐ Flowing ☐ No Flow, Full Pipe ☐ Empty Pipe

Flowmeter Information and Configuration

Software Tag:_____

PV URV (20 mA scale):_____

Calibration Number:_____

PV LRV (4 mA scale):_____

Line Size:_____

PV Damping:_____

Transmitter Calibration Verification Results

Simulated Velocity:_____

Actual Velocity:_____

Deviation %:_____

Transmitter: PASS / FAIL / NOT TESTED

Sensor Calibration Verification Results

Sensor Deviation %:_____

Sensor: PASS / FAIL / NOT TESTED

Coil Circuit Test: PASS / FAIL / NOT TESTED

Electrode Circuit Test: PASS / FAIL / NOT TESTED

Summary of Calibration Verification Results

Verification Results: The result of the flowmeter verification test is: PASSED / FAILED

Verification Criteria: This meter was verified to be functioning within _____ % of deviation from the original test parameters.

Signature:_____

Date:_____

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Appendix D Digital Signal Processing

Safety Messages . . . . . page D-1
Procedures . . . . . page D-2

SAFETY MESSAGES

Instructions and procedures in this section may require special precautions to ensure the safety of the personnel performing the operations. Please read the following safety messages before performing any operation described in this section.

Warnings

⚠WARNING

Explosions could result in death or serious injury:

- Verify that the operating atmosphere of the sensor and transmitter is consistent with the appropriate hazardous locations certifications.
- Do not remove the transmitter cover in explosive atmospheres when the circuit is alive.
- Before connecting a HART-based communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- Both transmitter covers must be fully engaged to meet explosion-proof requirements.

⚠WARNING

Failure to follow safe installation and servicing guidelines could result in death or serious injury:

- Make sure only qualified personnel perform the installation.
- Do not perform any service other than those contained in this manual unless qualified.

Process leaks could result in death or serious injury:

- The electrode compartment may contain line pressure; it must be depressurized before the cover is removed.

⚠WARNING

High voltage that may be present on leads could cause electrical shock:

- Avoid contact with leads and terminals.

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PROCEDURES

If the output of your Rosemount 8712 is unstable, first check the wiring and grounding associated with the magnetic flowmeter system. Ensure that the following conditions are met:

- Ground straps are attached to the adjacent flange or ground ring?
- Grounding rings, lining protectors, or grounding electrodes are being used in lined or nonconductive piping?
- Both of the shields attached at both ends?

The causes of unstable transmitter output can usually be traced to extraneous voltages on the measuring electrodes. This “process noise” can arise from several causes including electrochemical reactions between the fluid and the electrode, chemical reactions in the process itself, free ion activity in the fluid, or some other disturbance of the fluid/electrode capacitive layer. In such noisy applications, an analysis of the frequency spectrum reveals process noise that typically becomes significant below 15 Hz.

In some cases, the effects of process noise may be sharply reduced by elevating the coil drive frequency above the 15 Hz region. The Rosemount 8712 coil drive mode is selectable between the standard 5 Hz and the noise-reducing 37 Hz. See “Coil Drive Frequency” on page 4-33 for instructions on how to change the coil drive mode to 37 Hz.

Auto Zero

To ensure optimum accuracy when using 37 Hz coil drive mode, there is an auto zero function that must be initiated during start-up. The auto zero operation is also discussed in the start-up and configuration sections. When using 37 Hz coil drive mode it is important to zero the system for the specific application and installation.

The auto zero procedure should be performed only under the following conditions:

- With the transmitter and sensor installed in their final positions. This procedure is not applicable on the bench.
- With the transmitter in 37 Hz coil drive mode. Never attempt this procedure with the transmitter in 5 Hz coil drive mode.
- With the sensor full of process fluid at zero flow.

These conditions should cause an output equivalent to zero flow.

Signal Processing

If the 37 Hz coil drive mode has been set, and the output is still unstable, the damping and signal processing function should be used. It is important to set the coil drive mode to 37 Hz first, so the loop response time is not increased.

The 8712 provides for a very easy and straightforward start-up, and also incorporates the capability to deal with difficult applications that have previously manifested themselves in a noisy output signal. In addition to selecting a higher coil drive frequency (37 Hz vs. 5 Hz) to isolate the flow signal from the process noise, the 8712 microprocessor can actually scrutinize each input based on three user-defined parameters to reject the noise specific to the application.

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This software technique, known as signal processing, “qualifies” individual flow signals based on historic flow information and three user-definable parameters, plus an on/off control. These parameters are:

1. Number of samples: The number of samples function sets the amount of time that inputs are collected and used to calculate the average value. Each second is divided into tenths ($^1/_{10}$) with the number of samples equaling the number of $^1/_{10}$ second increments used to calculate the average. Factory Preset Value = 90 samples.

   For example, a value of:

   1 averages the inputs over the past $^1/_{10}$ second

   10 averages the inputs over the past 1 second

   100 averages the inputs over the past 10 seconds

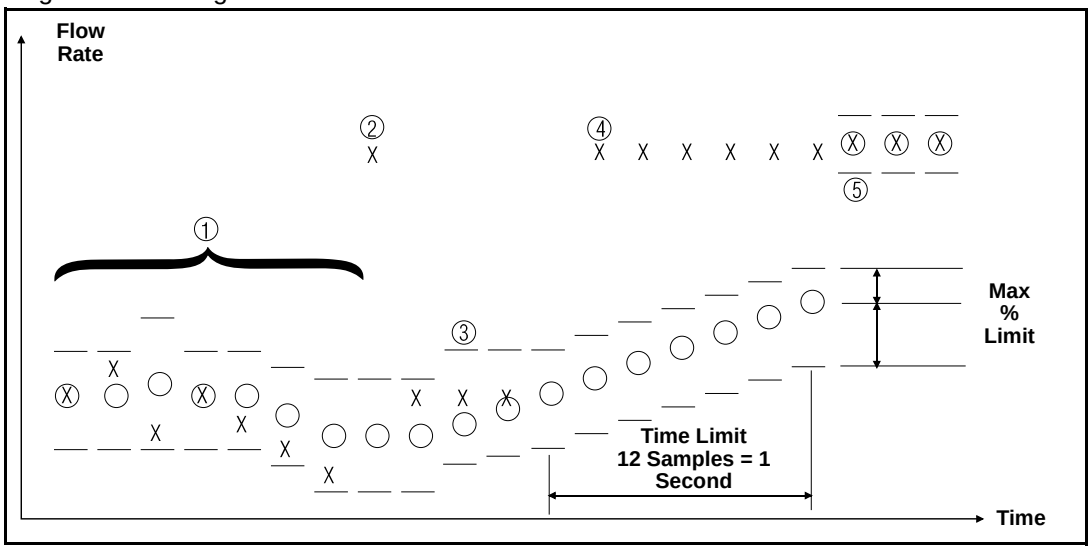
   125 averages the inputs over the past 12.5 seconds
2. Maximum Percent Limit: The tolerance band set up on either side of the running average, referring to percent deviation from the average. Values within the limit are accepted while value outside the limit are scrutinized to determine if they are a noise spike or an actual flow change. Factory Preset Value = 2 percent.
3. Time Limit: Forces the output and running average values to the new value of an actual flow rate change that is outside the percent limit boundaries, thereby limiting response time to real flow changes to the time limit value rather than the length of the running average. Factory Preset Value = 2 seconds.

How Does It Really Work?

The best way to explain this is with the help of an example, plotting flow rate versus time

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Figure D-1. Signal Processing



X: Input flow signal from sensor.

O: Average flow signals and transmitter output, determined by the “number of samples” parameter.

Tolerance band, determined by the “percent limit” parameter.
– Upper value = average flow + [(percent limit/100) average flow]
– Lower value = average flow – [(percent limit/100) average flow]

1. This scenario is that of a typical non-noisy flow. The input flow signal is within the percent limit tolerance band, therefore qualifying itself as a good input. In this case the new input is added directly into the running average and is passed on as a part of the average value to the output.
2. This signal is outside the tolerance band and therefore is held in memory until the next input can be evaluated. The running average is provided as the output.
3. The previous signal currently held in memory is simply rejected as a noise spike since the next flow input signal is back within the tolerance band. This results in complete rejection of noise spikes rather than allowing them to be “averaged” with the good signals as occurs in the typical analog damping circuits.
4. As in Number 2 above, the input is outside the tolerance band. This first signal is held in memory and compared to the next signal. The next signal is also outside the tolerance band (in the same direction), so the stored value is added to the running average as the next input and the running average begins to slowly approach the new input level.
5. To avoid waiting for the slowly incrementing average value to catch up to the new level input, a shortcut is provided. This is the “time limit” parameter. The user can set this parameter to eliminate the slow ramping of the output toward the new input level.

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When Should Signal Processing Be Used?

The Rosemount 8712 offers three separate functions that can be used in series for improving a noisy output. The first step is to toggle the coil drive to the 37 Hz mode and initialize with an auto zero. If the output is still noisy at this stage, signal processing should be actuated and, if necessary, tuned to match the specific application. Finally, if the signal is still too unstable, the traditional damping function can be used.

NOTE
Failure to complete an Auto Zero will result in a small (<1%) error in the output. While the output level will be offset by the error, the repeatability will not be affected.

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Appendix E Universal Sensor Wiring Diagrams

Rosemount Sensors . . . . . **page E-3**
ABB Sensors . . . . . **page E-7**
Brooks Sensors . . . . . **page E-9**
Endress And Hauser Sensors . . . . . **page E-11**
Fischer And Porter Sensors . . . . . **page E-15**
Foxboro Sensors . . . . . **page E-22**
Kent Sensors . . . . . **page E-28**
Krohne Sensors . . . . . **page E-30**
Siemens Sensors . . . . . **page E-33**
Taylor Sensors . . . . . **page E-34**
Yokogawa Sensors . . . . . **page E-38**
Generic Manufacturer Sensors . . . . . **page E-39**

The wiring diagrams in this section illustrate the proper connections between the Rosemount 8712 and most sensors currently on the market. Specific diagrams are included for most models, and where information for a particular model of a manufacturer is not available, a generic drawing pertaining to that manufacturers' sensors is provided. If the manufacturer for your sensor is not included, see the drawing for generic connections.

Any trademarks used herein regarding sensors not manufactured by Rosemount are owned by the particular manufacturer of the sensor.

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Rosemount Transmitter	Sensor Manufacturer	Page Number
Rosemount		
Rosemount 8712	Rosemount 8705, 8707, 8711, 8721	page E-3
Rosemount 8712	Rosemount 8701	page E-4
Brooks		
Rosemount 8712	Model 5000	page E-9
Rosemount 8712	Model 7400	page E-10
Endress and Hauser		page E-6
Rosemount 8712	Generic Wiring for Sensor	page E-11
Fischer and Porter		page E-15
Rosemount 8712	Model 10D1418	page E-15
Rosemount 8712	Model 10D1419	page E-16
Rosemount 8712	Model 10D1430 (Remote)	page E-17
Rosemount 8712	Model 10D1430	page E-18
Rosemount 8712	Model 10D1465, 10D1475 (Integral)	page E-20
Rosemount 8712	Generic Wiring for Sensors	page E-21
Foxboro		
Rosemount 8712	Series 1800	page E-22
Rosemount 8712	Series 1800 (Version 2)	page E-23
Rosemount 8712	Series 2800	page E-24
Rosemount 8712	Generic Wiring for Sensors	page E-27
Kent		
Rosemount 8712	Veriflux VTC	page E-28
Rosemount 8712	Generic Wiring for Sensors	page E-39
Krohne		
Rosemount 8712	Generic Wiring for Sensors	page E-30
Taylor		
Rosemount 8712	Series 1100	page E-35
Rosemount 8712	Generic Wiring for Sensors	page E-35
Yamatake Honeywell		
Rosemount 8712	Generic Wiring for Sensors	page E-36
Yokogawa		
Rosemount 8712	Generic Wiring for Sensors	page E-38
Generic Manufacturer Wiring		page E-39
Rosemount 8712	Generic Wiring for Sensors	page E-39

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ROSEMOUNT SENSORS

Rosemount 8705/8707/8711/8721 Sensors to Rosemount 8712 Transmitter

Connect coil drive and electrode cables as shown in Figure E-1.

Figure E-1. Wiring Diagram to a Rosemount 8712 Transmitter

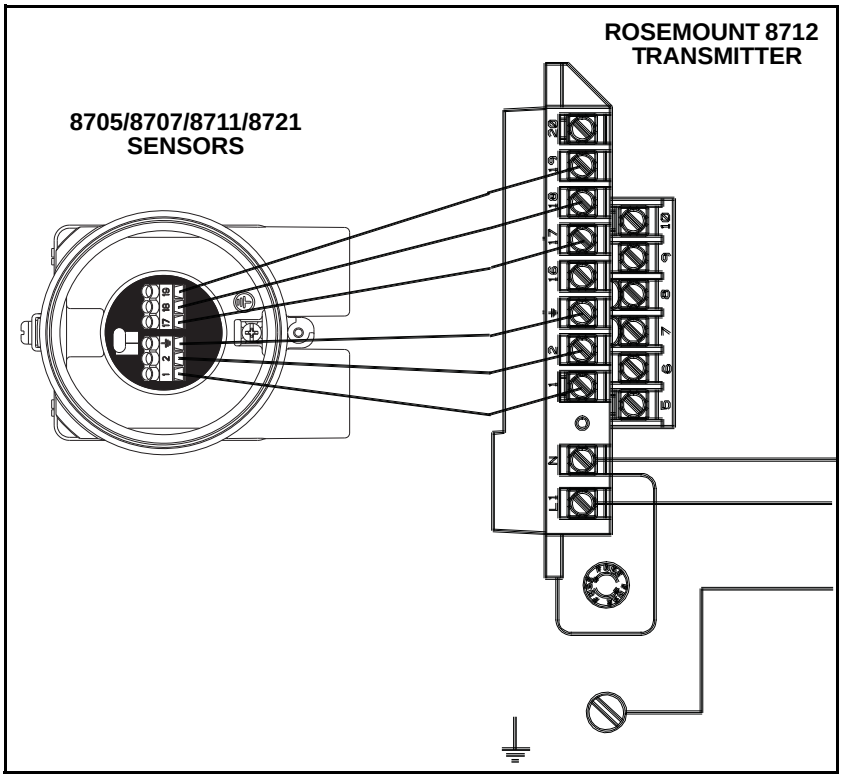
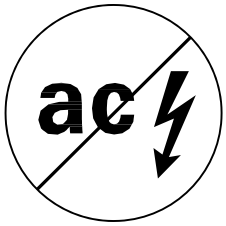


Table E-1. Rosemount 8705/8707/8711/8721 Sensor Wiring Connections

Rosemount 8712 Transmitters	Rosemount 8705/8707/8711/8721 Sensors
1	1
2	2
⏚	⏚
17	17
18	18
19	19

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



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Rosemount 8701 Sensor to Rosemount 8712 Transmitter

Connect coil drive and electrode cables as shown in Figure E-2 on page E-4.

Figure E-2. Wiring Diagram for Rosemount 8701 Sensor and Rosemount 8712 Transmitter

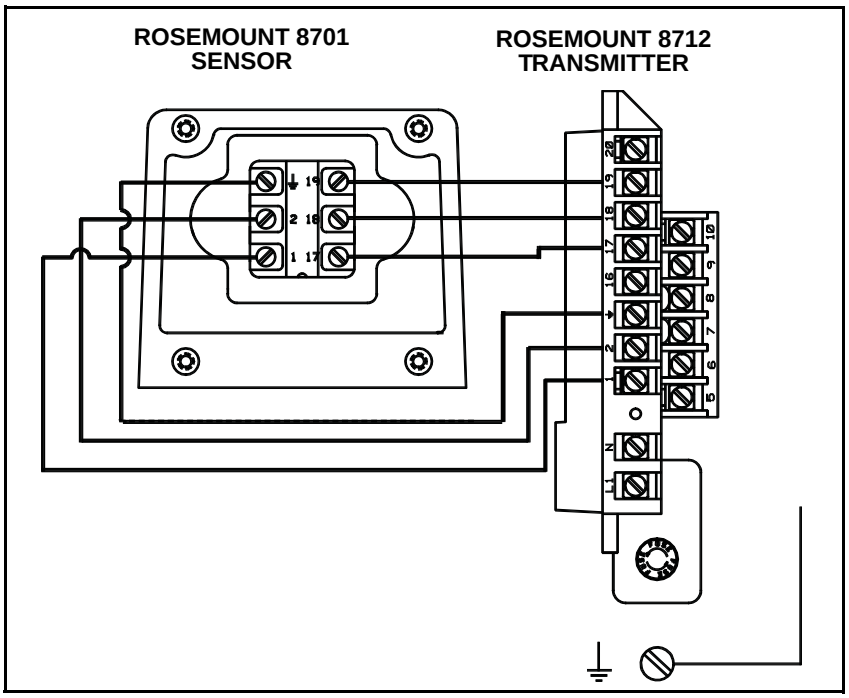
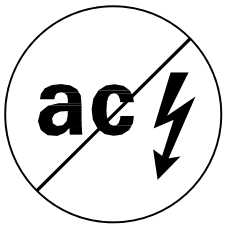


Figure E-3. Rosemount 8701 Sensor Wiring Connections

Rosemount 8712	Rosemount 8701 Sensors
1	1
2	2
⏚	⏚
17	17
18	18
19	19

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



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Rosemount 8711 Sensor to Rosemount 8712 Transmitter

Connect coil drive and electrode cables as shown in Figure E-4.

Figure E-4. Wiring Diagram for Rosemount 8711 Sensor and Rosemount 8712 Transmitter

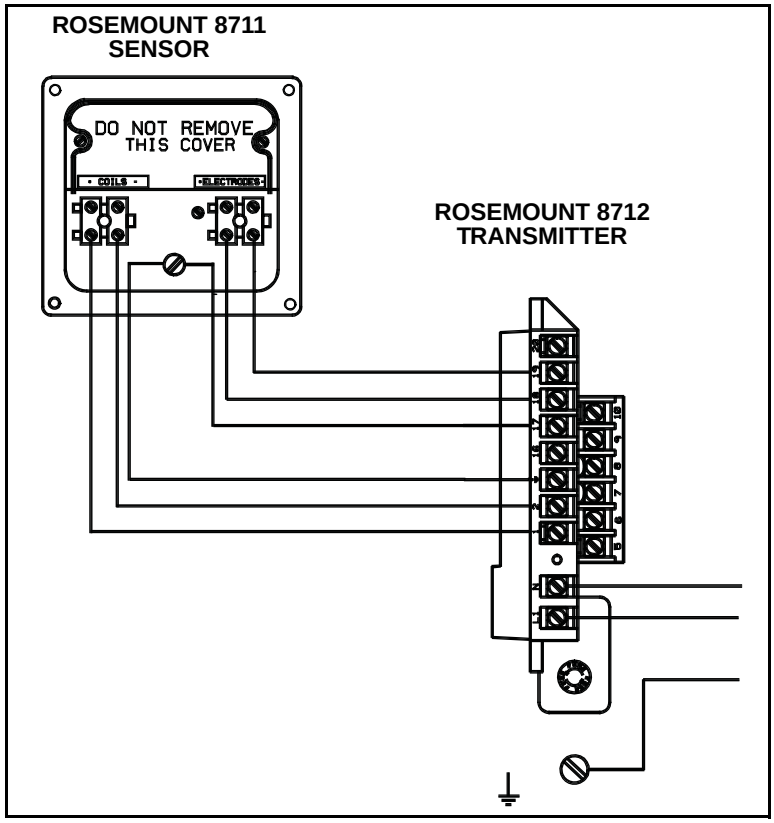
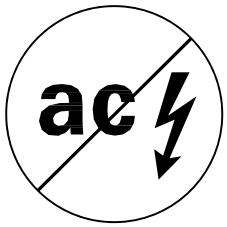


Table E-2. Rosemount 8711 Sensor Wiring Connections

Rosemount 8712	Rosemount 8711 Sensors
1	Coils +
2	Coils –
⏚	⏚
17	Shield
18	Electrode +
19	Electrode –

⚠CAUTION

This is a pulsed dc magnetic flowmeter. **Do not connect ac power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



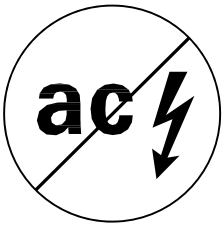
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Connecting Sensors of Other Manufacturers

Before connecting another manufacturer's sensor to the Rosemount 8712 transmitter, it is necessary to perform the following functions.

⚠

1. Turn off the AC power to the sensor and transmitter. Failure to do so could result in electrical shock or damage to the transmitter.
2. Verify that the coil drive cables between the sensor and the transmitter are not connected to any other equipment.
3. Label the coil drive cables and electrode cables for connection to the transmitter.
4. Disconnect the wires from the existing transmitter.
5. Remove the existing transmitter. Mount the new transmitter. See "Mount the Transmitter" on page 2-3.
6. Verify that the sensor coil is configured for series connection. Other manufacturers sensors may be wired in either a series or parallel circuit. All Rosemount magnetic sensors are wired in a series circuit. (Other manufacturers AC sensors (AC coils) wired for 220V operation are typically wired in parallel and must be rewired in series.)
7. Verify that the sensor is in good working condition. Use the manufacturer's recommended test procedure for verification of sensor condition. Perform the basic checks:
   a. Check the coils for shorts or open circuits.
   b. Check the sensor liner for wear or damage.
   c. Check the electrodes for shorts, leaks, or damage.
8. Connect the sensor to the transmitter in accordance with reference wiring diagrams. See Appendix E: Universal Sensor Wiring Diagrams for specific drawings.
9. Connect and verify all connections between the sensor and the transmitter, then apply power to the transmitter.
10. Perform the Universal Auto Trim function.

⚠CAUTION	
This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.	

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ABB SENSORS

ABB Magmaster MFE and MFF Sensors (Old Version) to Rosemount 8712 Transmitter

Connect coil drive and electrode cables as shown in Figure E-5.

Figure E-5. Wiring Diagram for ABB Magmaster MFE and MFF Sensors (Old Version) and Rosemount 8712

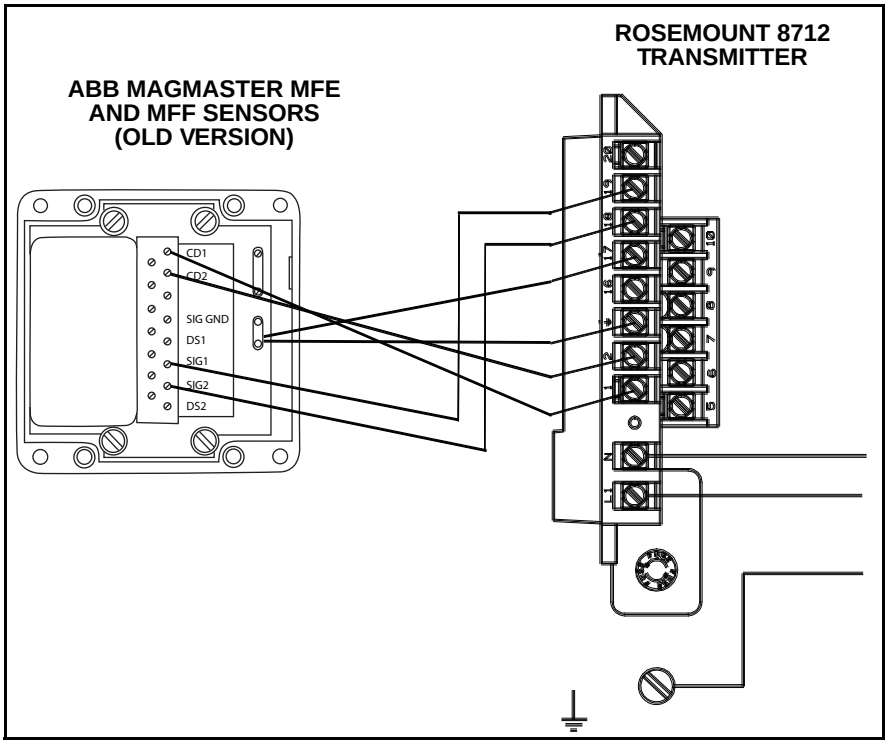
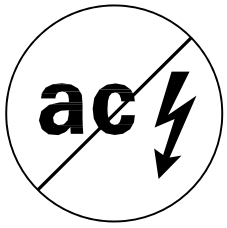


Table E-3. ABB Magmaster MFE and MFF Sensors (Old Version) Wiring Connections

Rosemount 8712	ABB Magmaster MFE and MFF Sensors (Old Version)
1	CD1
2	CD2
⏚	⏚
17	⏚
18	SIG2
19	SIG1

⚠CAUTION

This is a pulsed dc magnetic flowmeter. **Do not connect ac power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



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ABB Magmaster MFE and MFF Sensors (New Version) to Rosemount 8712 Transmitter

Connect coil drive and electrode cables as shown in Figure E-6.

Figure E-6. Wiring Diagram for ABB Magmaster MFE and MFF Sensors (New Version) and Rosemount 8712

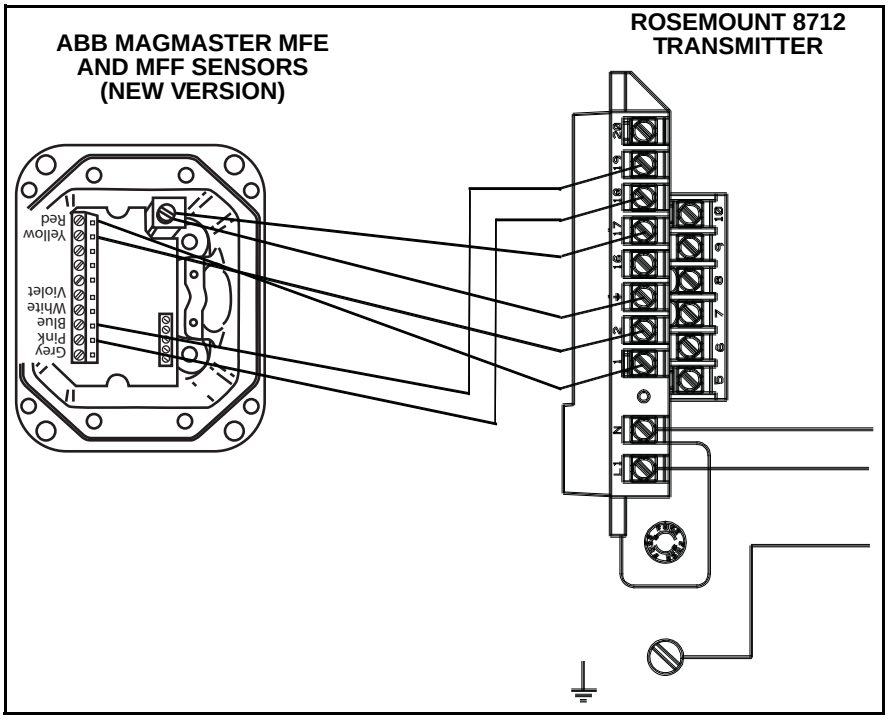
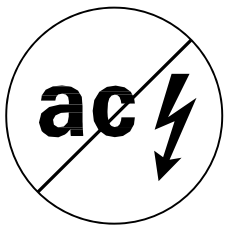


Table E-4. ABB Magmaster MFE and MFF Sensors (New Version) Wiring Connections

Rosemount 8712	ABB Magmaster MFE and MFF Sensors (New Version)
1	Red
2	Yellow
⏚	⏚
17	⏚
18	Pink
19	Blue

⚠CAUTION

This is a pulsed dc magnetic flowmeter. **Do not connect ac power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



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BROOKS SENSORS

Model 5000 Sensor to Rosemount 8712 Transmitter

Connect coil drive and electrode cables as shown in Figure E-7.

Figure E-7. Wiring Diagram for Brooks Sensor Model 5000 and Rosemount 8712

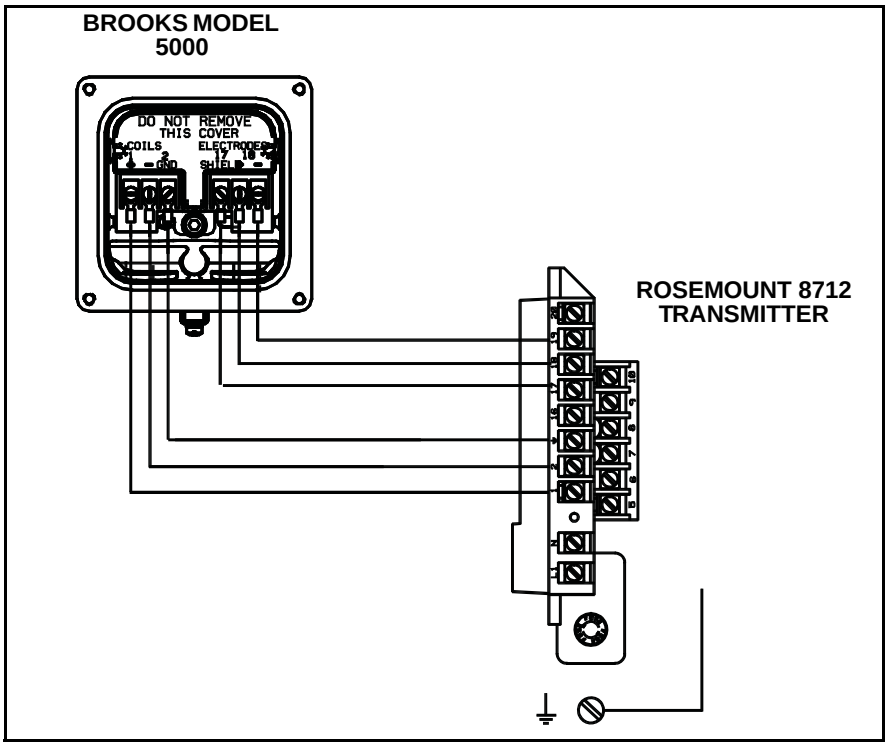
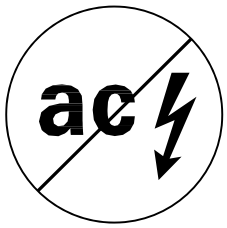


Table E-5. Brooks Model 5000 Sensor Wiring Connections

Rosemount 8712	Brooks Model 5000 Sensors
1	1
2	2
⏚	⏚
17	17
18	18
19	19

⚠CAUTION

This is a pulsed dc magnetic flowmeter. **Do not connect ac power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



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Model 7400 Sensor to Rosemount 8712 Transmitter

Connect coil drive and electrode cables as shown in Figure E-8.

Figure E-8. Wiring Diagram for Brooks Sensor Model 7400 and Rosemount 8712

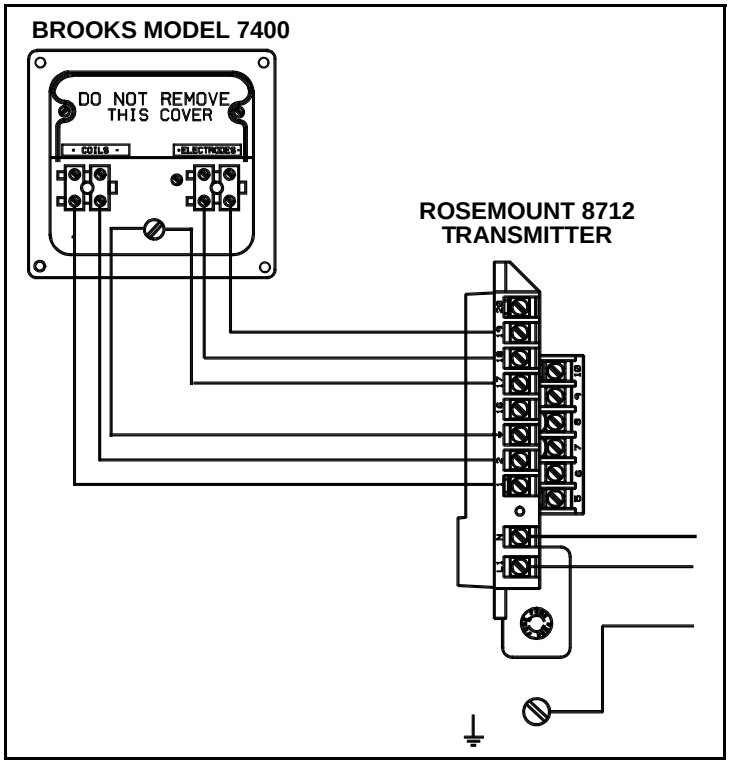
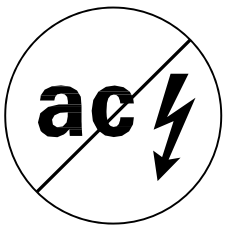


Table E-6. Brooks Model 7400 Sensor Wiring Connections

Rosemount 8712	Brooks Model 7400 Sensors
1	Coils +
2	Coils –
⏚	⏚
17	Shield
18	Electrode +
19	Electrode –

⚠CAUTION

This is a pulsed dc magnetic flowmeter. **Do not connect ac power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



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ENDRESS AND HAUSER SENSORS

Endress and Hauser Promag 10/50/53/55 H/P/WS Sensors

Connect coil drive and electrode cables as shown in Figure E-9.

Figure E-9. Wiring Diagram for Endress and Hauser Sensors and Rosemount 8712

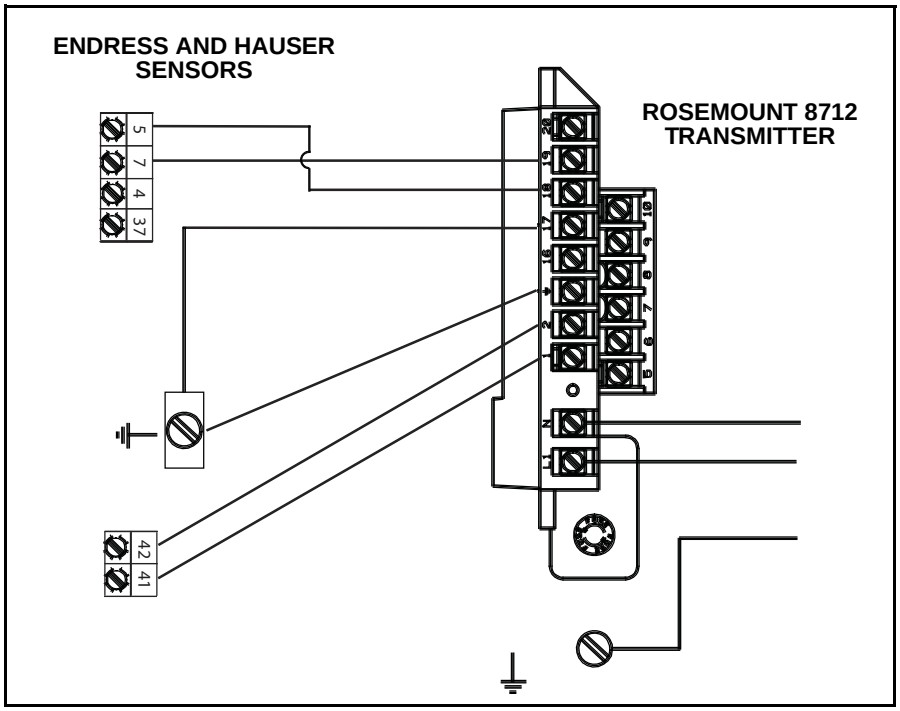
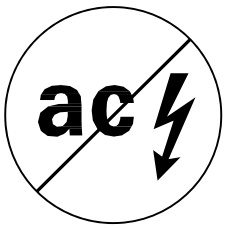


Table E-7. Endress and Hauser Sensor Wiring Connections

Rosemount 8712	Endress and Hauser Sensors
1	41
2	42
17	⏚
18	5
19	7

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



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Endress and Hauser Promag 30/33/39 D/H/F Sensors (FS Versions)

Connect coil drive and electrode cables as shown in Figure E-10.

Figure E-10. Wiring Diagram for Endress and Hauser Sensors and Rosemount 8712

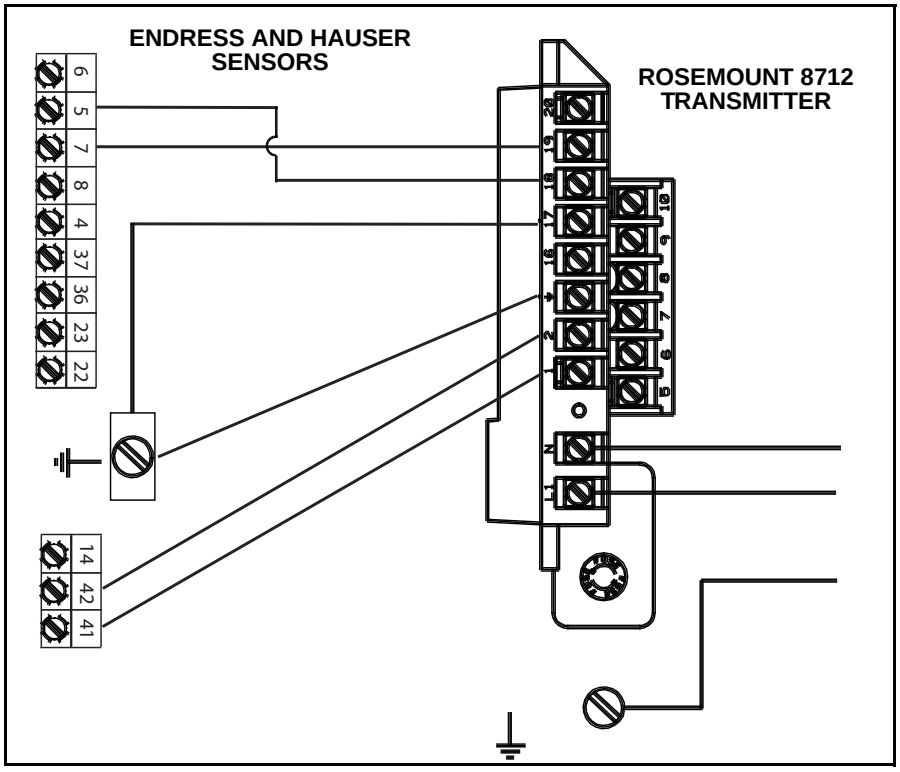


Table E-8. Endress and Hauser Promag 30/33/39 D/H/F Sensors (FS Versions) Wiring Connections

Rosemount 8712	Endress and Hauser Promag 30/33/39 D/H/F Sensors (FS Versions)
1	41
2	42
17	⏚
18	5
19	7

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



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Endress and Hauser Promag 30/33/39 A Sensors (FS Versions)

Connect coil drive and electrode cables as shown in Figure E-11.

Figure E-11. Wiring Diagram for Endress and Hauser Sensors and Rosemount 8712

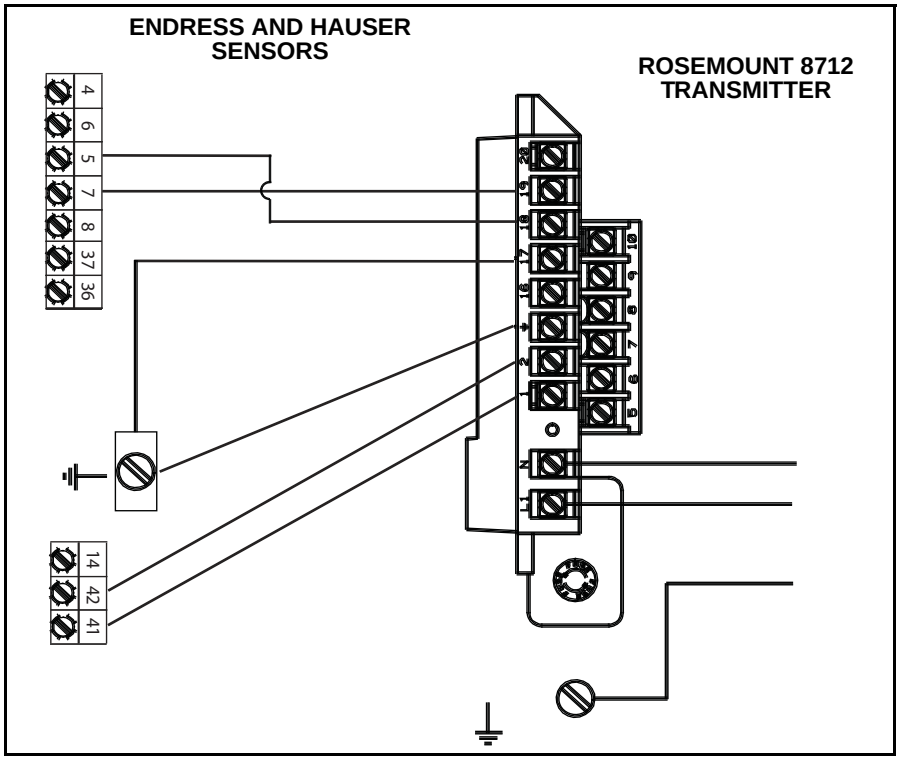
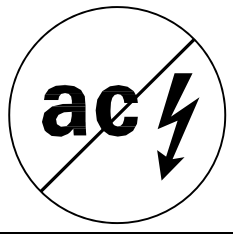


Table E-9. Endress and Hauser Promag 30/33/39 A Sensor (FS Versions) Wiring Connections

Rosemount 8712	Endress and Hauser Promag 30/33/39 A Sensors (FS Versions)
1	41
2	42
17	⏚
18	5
19	7

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



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Endress and Hauser Generic Sensor to Rosemount 8712 Transmitter

Connect coil drive and electrode cables as shown in Figure E-12.

Figure E-12. Wiring Diagram for Endress and Hauser Sensors and Rosemount 8712

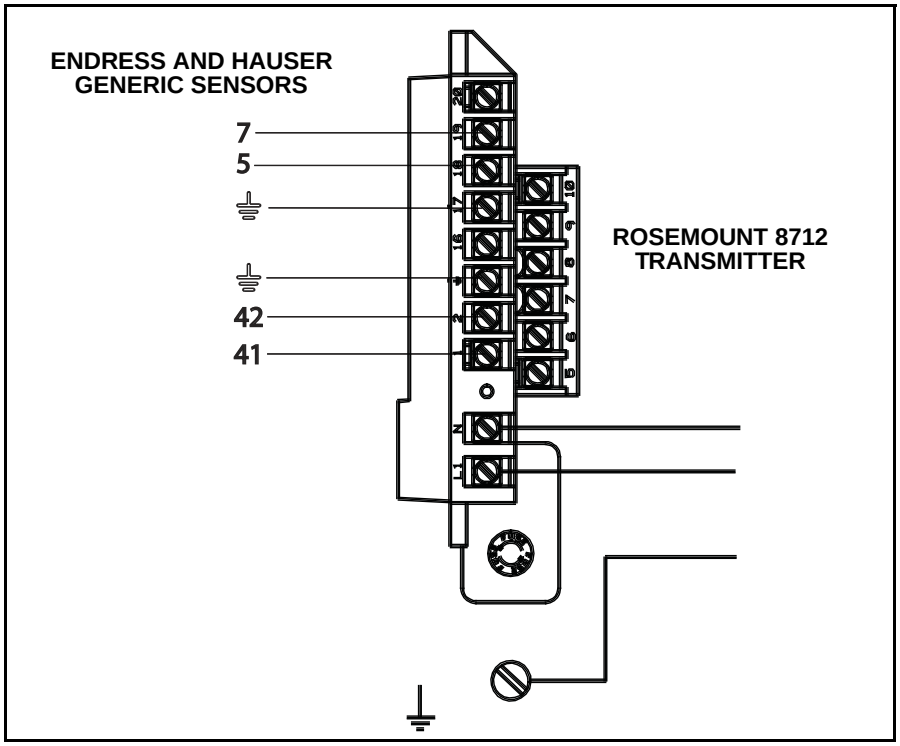
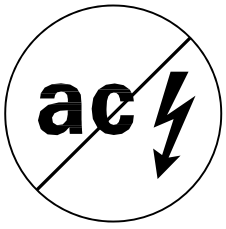


Table E-10. Endress and Hauser Generic Sensor Wiring Connections

Rosemount 8712	Endress and Hauser Generic Sensors
1	41
2	42
⏚	14
17	4
18	5
19	7

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



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FISCHER AND PORTER SENSORS

Model 10D1418 Sensor to Rosemount 8712 Transmitter

Connect coil drive and electrode cables as shown in Figure E-13.

Figure E-13. Wiring Diagram for Fischer and Porter Sensor Model 10D1418 and Rosemount 8712

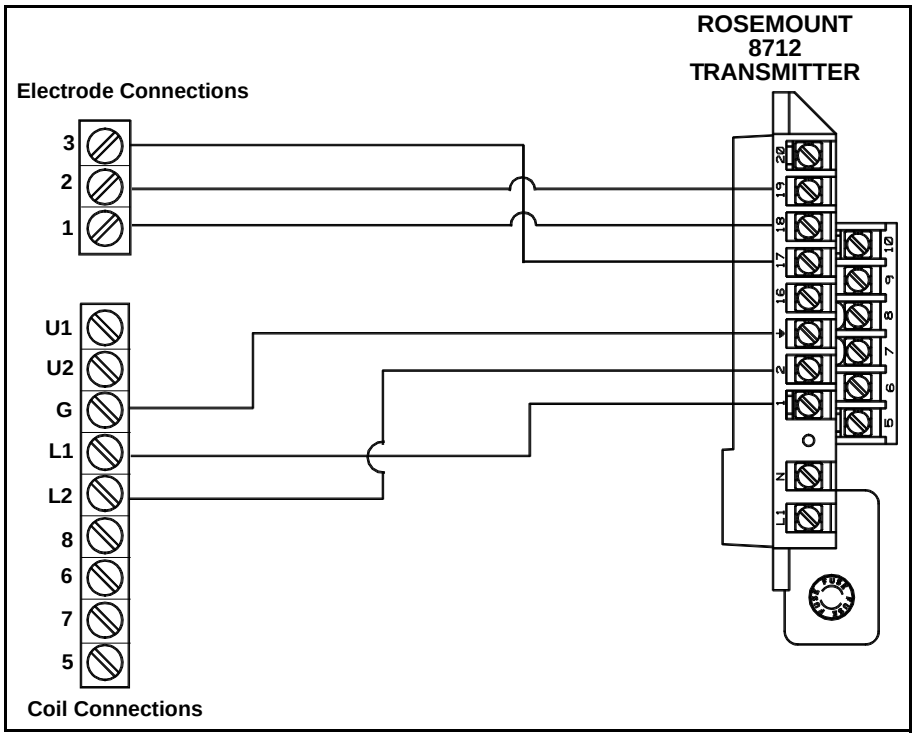
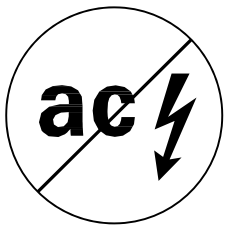


Table E-11. Fischer and Porter Model 10D1418 Sensor Wiring Connections

Rosemount 8712	Fischer and Porter Model 10D1418 Sensors
1	L1
2	L2
⏚	Chassis Ground
17	3
18	1
19	2

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



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Model 10D1419 Sensor to Rosemount 8712 Transmitter

Connect coil drive and electrode cables as shown in Figure E-14.

Figure E-14. Wiring Diagram for Fischer and Porter Sensor Model 10D1419 and Rosemount 8712

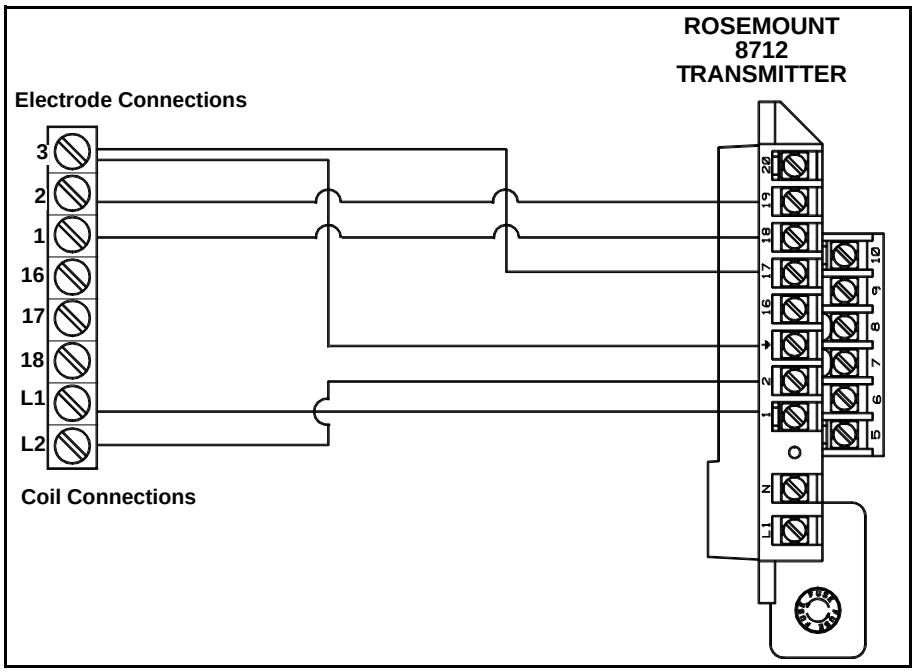
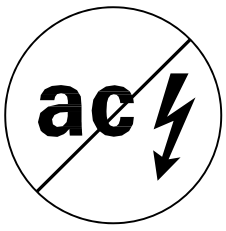


Table E-12. Fischer and Porter Model 10D1419 Sensor Wiring Connections

Rosemount 8712	Fischer and Porter Model 10D1419 Sensors
1	L1
2	L2
⏚	3
17	3
18	1
19	2

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



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Model 10D1430 Sensor (Remote) to Rosemount 8712 Transmitter

Connect coil drive and electrode cables as shown in Figure E-15.

Figure E-15. Wiring Diagram for Fischer and Porter Sensor Model 10D1430 (Remote) and Rosemount 8712

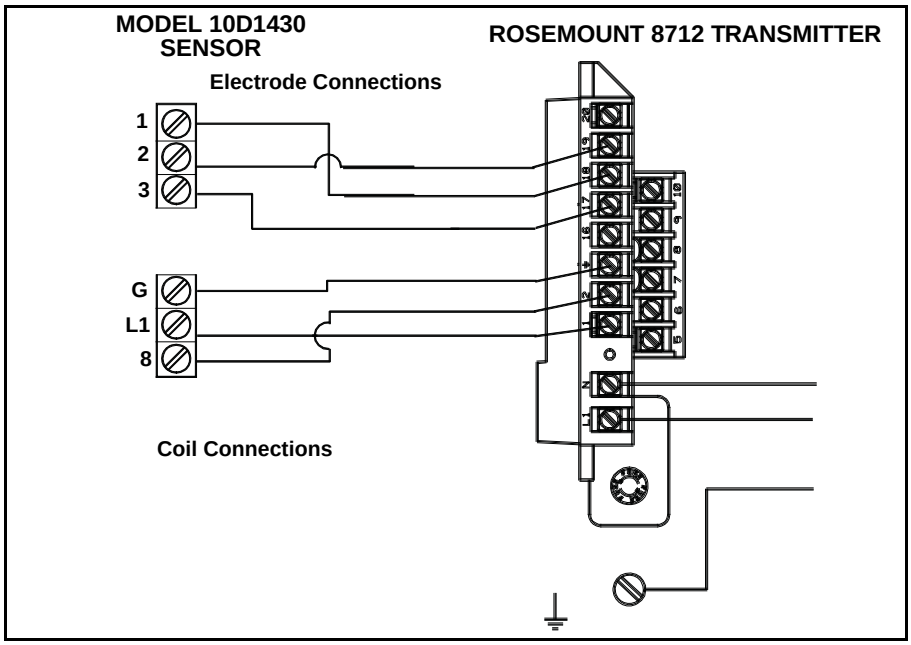
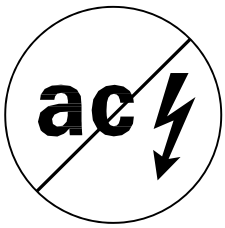


Table E-13. Fischer and Porter Model 10D1430 (Remote) Sensor Wiring Connections

Rosemount 8712	Fischer and Porter Model 10D1430 (Remote) Sensors
1	L1
2	8
⏚	G
17	3
18	1
19	2

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



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Model 10D1430 Sensor (Integral) to Rosemount 8712 Transmitter

Connect coil drive and electrode cables as shown in Figure E-16.

Figure E-16. Wiring Diagram for Fischer and Porter Sensor Model 10D1430 (Integral) and Rosemount 8712

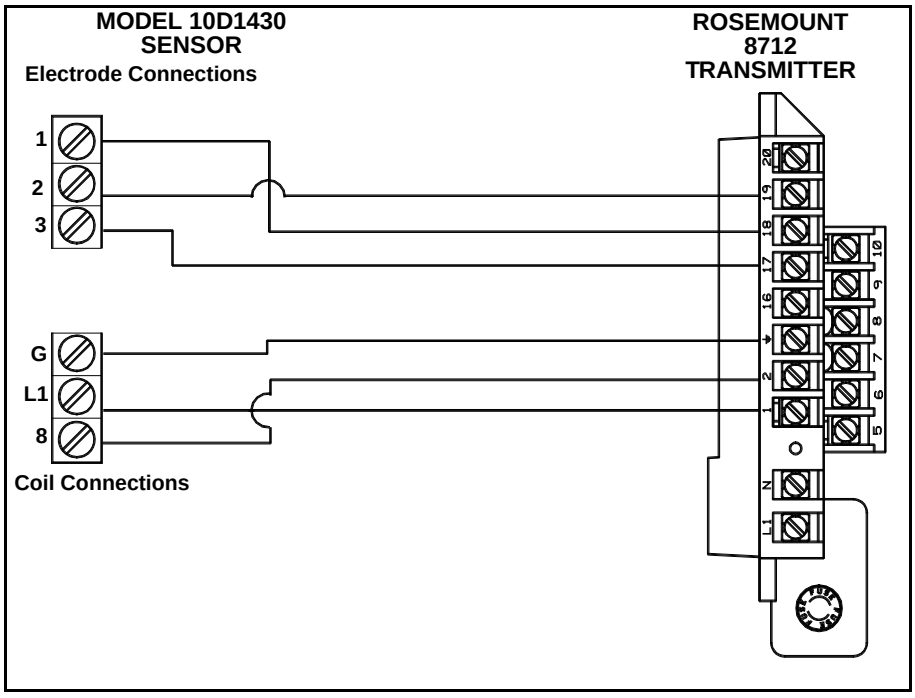
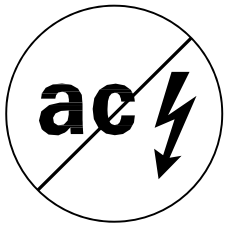


Table E-14. Fischer and Porter Model 10D1430 (Integral) Sensor Wiring Connections

Rosemount 8712	Fischer and Porter Model 10D1430 (Integral) Sensors
1	L1
2	L2
⏚	G
17	3
18	1
19	2

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



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Model 10D1435 Sensor (Integral) to Rosemount 8712 Transmitter

Connect coil drive and electrode cables as shown in Figure E-17.

Figure E-17. Wiring Diagram for Fischer and Porter Sensor Model 10D1430 (Integral) and Rosemount 8712

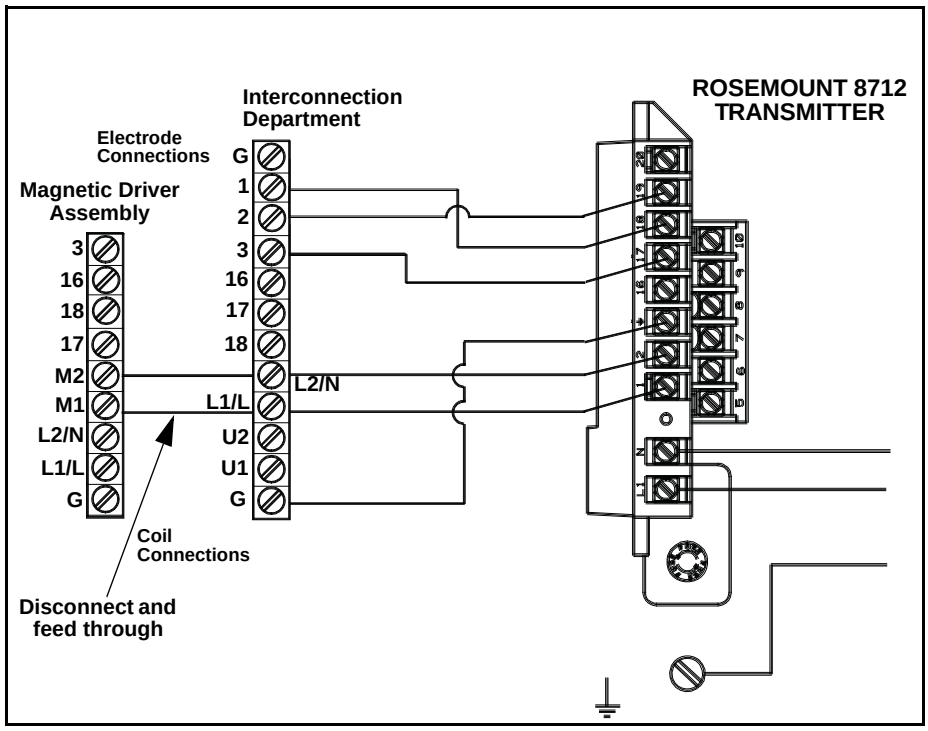


Table E-15. Fischer and Porter Model 10D1435 Sensor (Integral) Wiring Connections

Rosemount 8712	Fischer and Porter Model 10D1435 Sensors (Integral)
1	M1
2	M2
⏚	G
17	3
18	1
19	2

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



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Model 10D1465 and Model 10D1475 Sensors (Integral) to 8712 Transmitter

Connect coil drive and electrode cables as shown in Figure E-18.

Figure E-18. Wiring Diagram for Fischer and Porter Sensor Model 10D1465 and Model 10D1475 (Integral) and Rosemount 8712

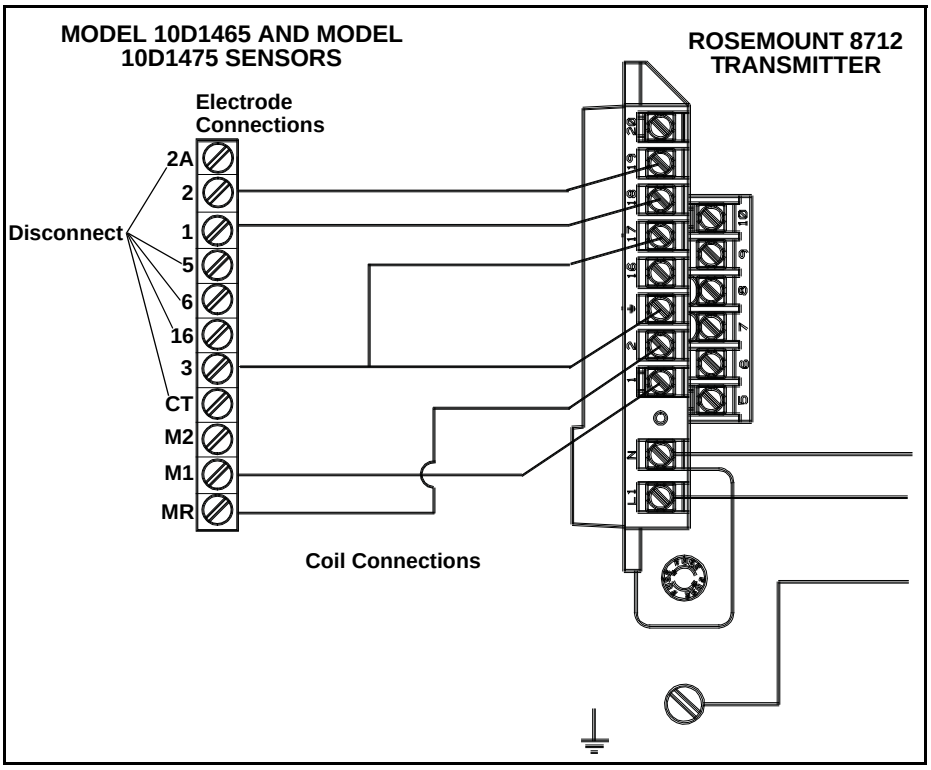
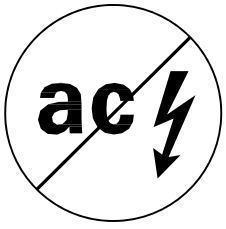


Table E-16. Fischer and Porter Model 10D1465 and 10D1475 Sensor Wiring Connections

Rosemount 8712	Fischer and Porter Model 10D1465 and 10D1475 Sensors
1	MR
2	M1
⏚	3
17	3
18	1
19	2

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



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Fischer and Porter Generic Sensor to Rosemount 8712 Transmitter

Connect coil drive and electrode cables as shown in Figure E-19.

Figure E-19. Generic Wiring Diagram for Fischer and Porter Sensors and Rosemount 8712

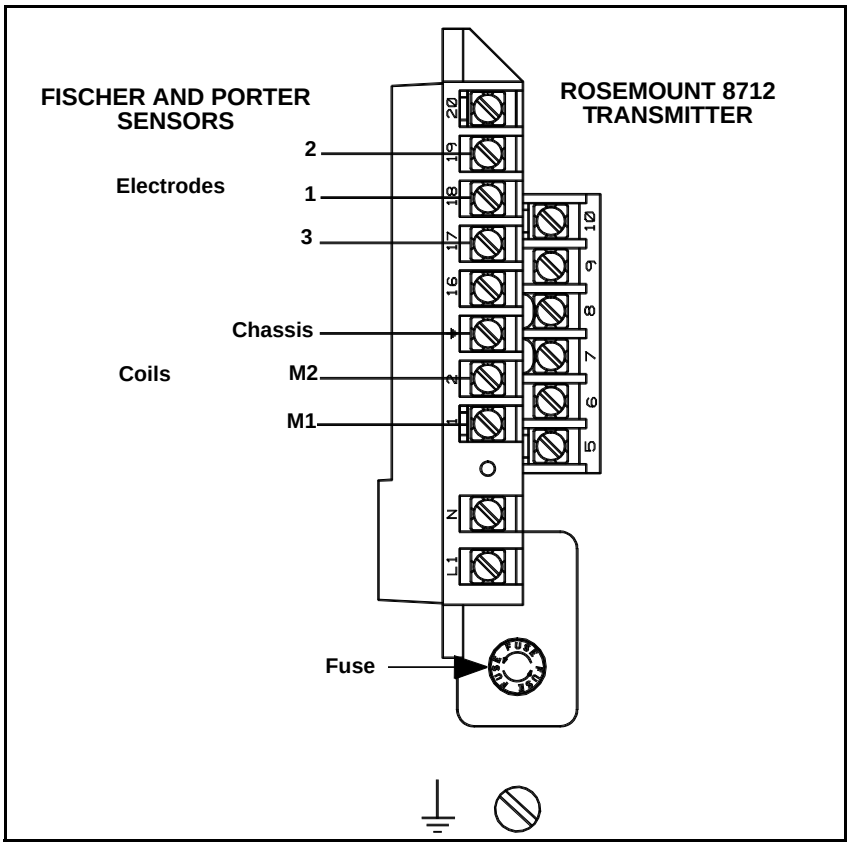
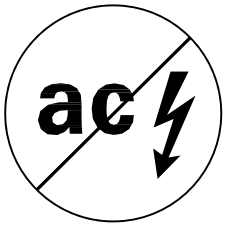


Table E-17. Fischer and Porter Generic Sensor Wiring Connections

Rosemount 8712	Fischer and Porter Generic Sensors
1	M1
2	M2
⏚	Chassis Ground
17	3
18	1
19	2

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



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FOXBORO SENSORS

Series 1800 Sensor to Rosemount 8712 Transmitter

Connect coil drive and electrode cables as shown in Figure E-20.

Figure E-20. Wiring Diagram for Foxboro Series 1800 and Rosemount 8712

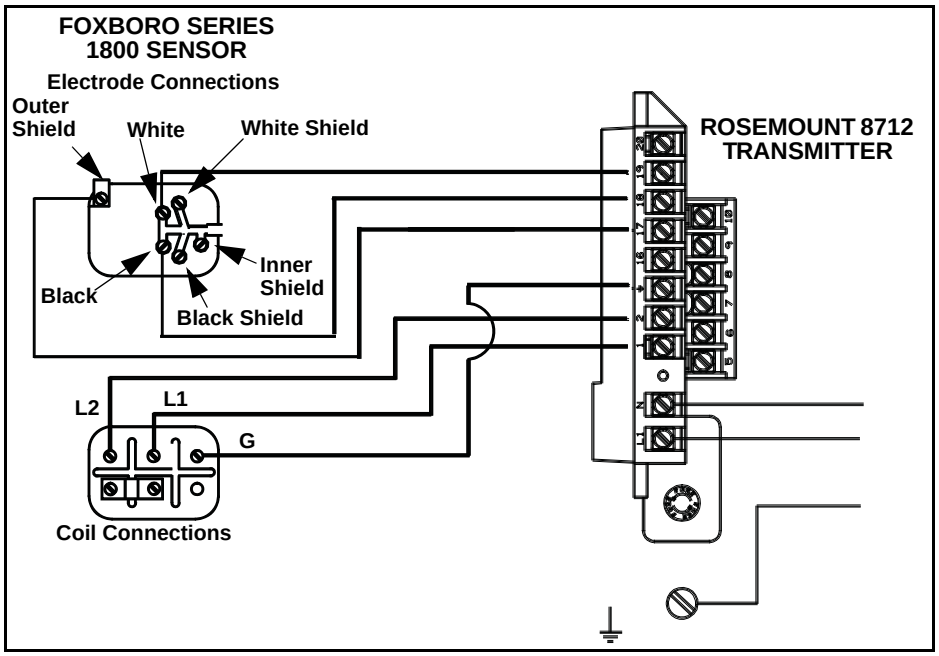
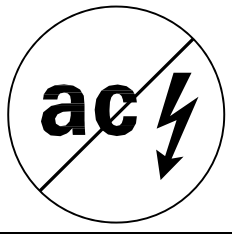


Table E-18. Foxboro Series 1800 Sensor Wiring Connections

Rosemount 8712	Foxboro Series 1800 Sensors
1	L1
2	L2
⏚	Chassis Ground
17	Any Shield
18	Black
19	White

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



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Series 1800 (Version 2) Sensor to Rosemount 8712 Transmitter

Connect coil drive and electrode cables as shown in Figure E-21.

Figure E-21. Wiring Diagram for Foxboro Series 1800 (Version 2) and Rosemount 8712

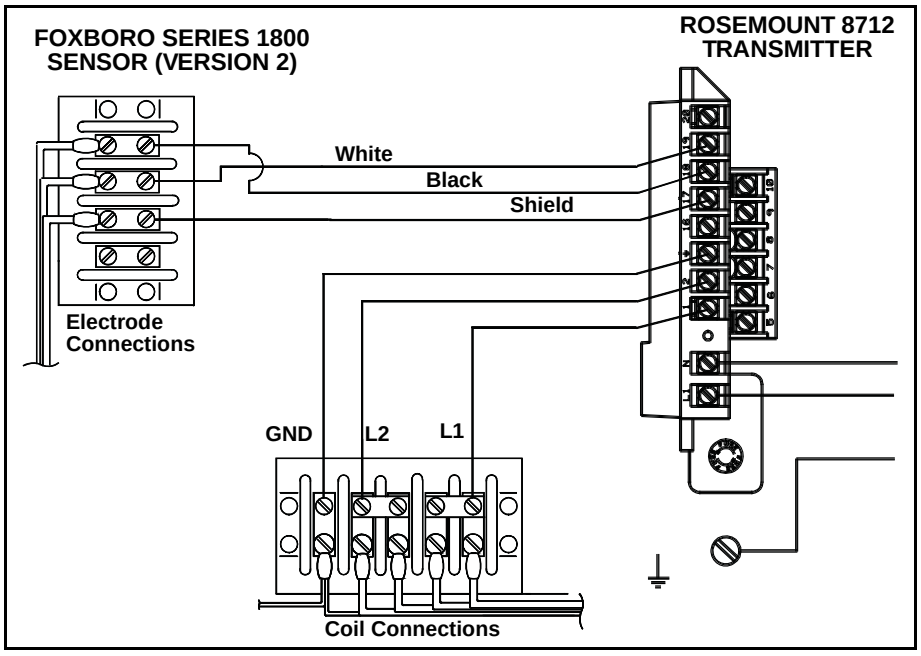
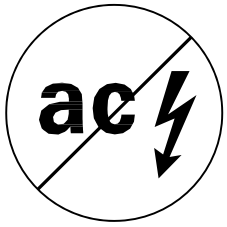


Table E-19. Foxboro 1800 Version 2 Sensor Wiring Connections

Rosemount 8712	Foxboro Series 1800 Version 2 Sensors
1	L1
2	L2
⏚	Chassis Ground
17	Any Shield
18	Black
19	White

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



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Series 2800/8300 Sensor to 8712 Transmitter

Connect coil drive and electrode cables as shown in Figure E-22.

Figure E-22. Wiring Diagram for Foxboro Series 2800 and Rosemount 8712

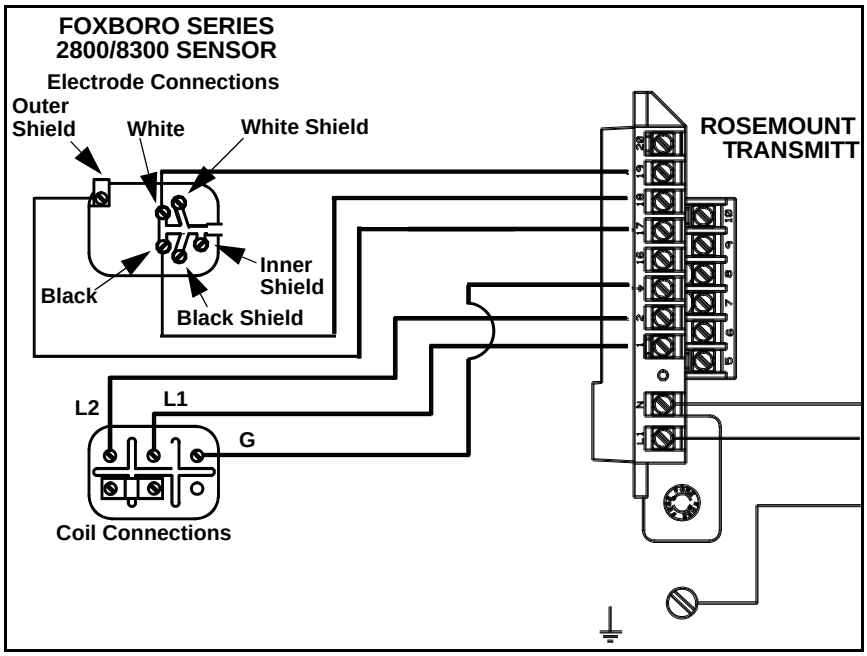
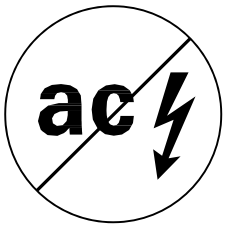


Table E-20. Foxboro Series 2800/8300 Sensor Wiring Connections

Rosemount 8712	Foxboro Series 2800/8300 Sensors
1	1
2	2
⏚	Chassis Ground
17	Any Shield
18	Black
19	White

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



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Series 8000A/9300A Sensor to 8712 Transmitter

Connect coil drive and electrode cables as shown in Figure E-23.

Figure E-23. Wiring Diagram for Foxboro Series 2800 and Rosemount 8712

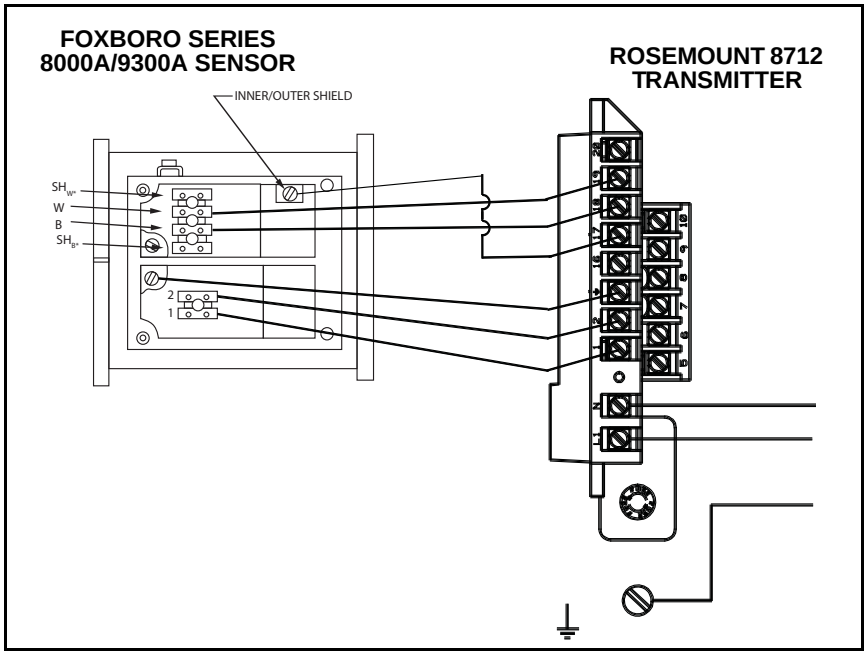
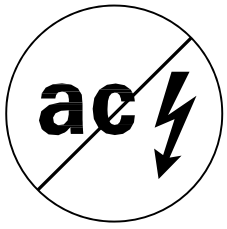


Table E-21. Foxboro Series 8000A/9300A Sensor Wiring Connections

Rosemount 8712	Foxboro Series 8000A/9300A Sensors
1	1
2	2
⏚	Chassis Ground
17	Any Shield
18	Black
19	White

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



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Series 9100A/9200A Sensors to 8712 Transmitter

Connect coil drive and electrode cables as shown in Figure E-24.

Figure E-24. Wiring Diagram for Foxboro Series 9100A/9200A and Rosemount 8712

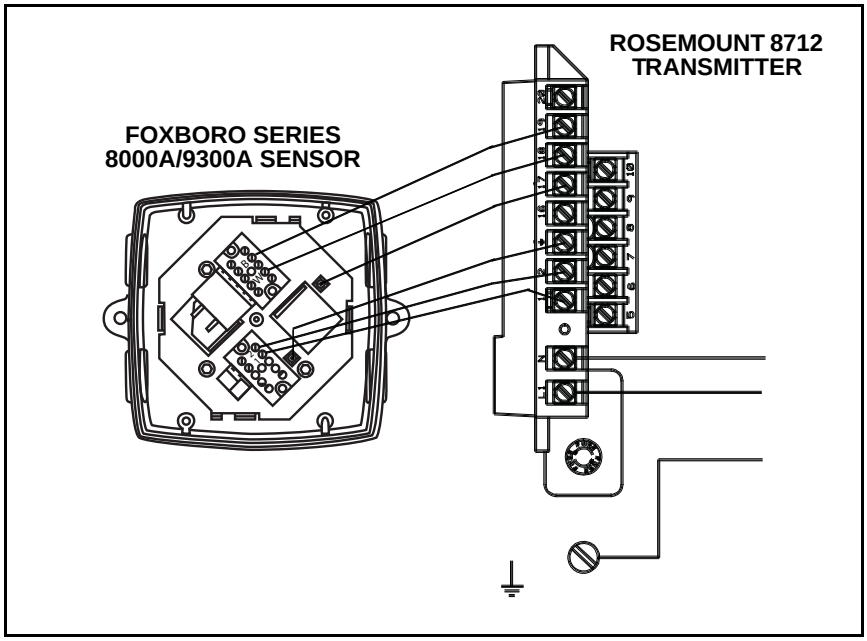
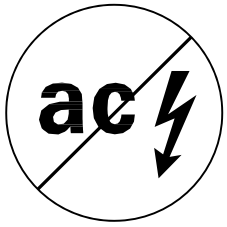


Table E-22. Foxboro Series 9100A/9200A Sensor Wiring Connections

Rosemount 8712	Foxboro Series 9100A/9200A Sensors
1	1
2	2
⏚	Chassis Ground
17	Chassis Ground
18	White (W)
19	Black (B)

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



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Foxboro Generic Sensor to 8712 Transmitter

Connect coil drive and electrode cables as shown in Figure E-25.

Figure E-25. Generic Wiring Diagram for Foxboro Sensors and Rosemount 8712

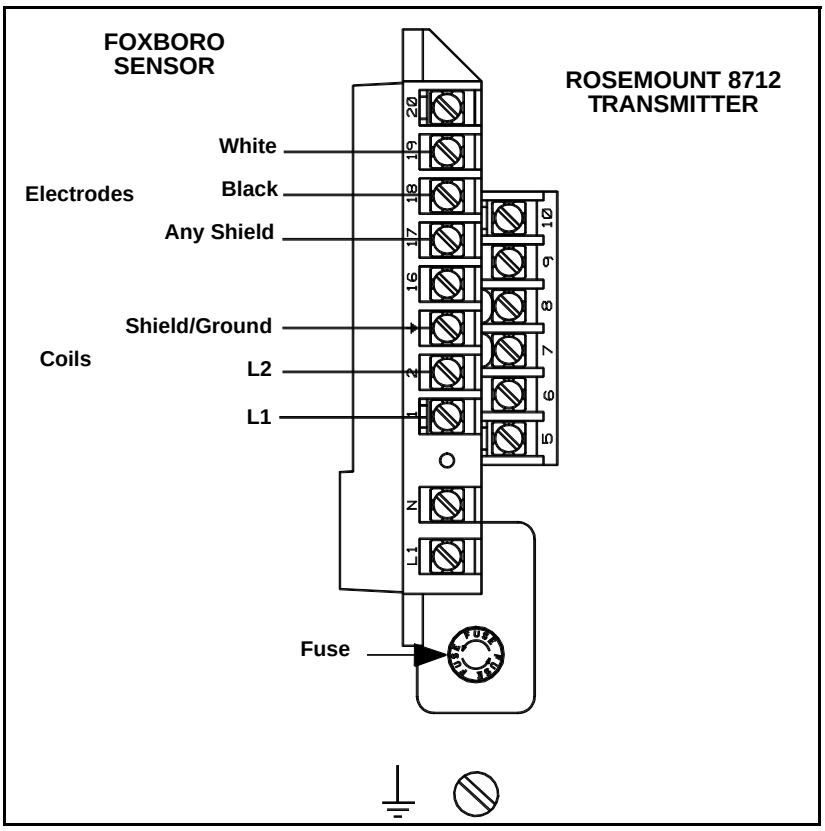
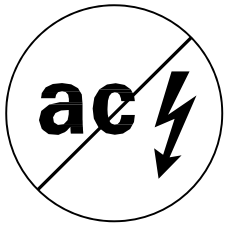


Table E-23. Foxboro Generic Sensor Wiring Connections

Rosemount 8712	Foxboro Generic Sensors
1	L1
2	L2
⏚	Chassis Ground
17	Any Shield
18	Black
19	White

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



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KENT SENSORS

Veriflux VTC Sensor to 8712 Transmitter

Connect coil drive and electrode cables as shown in Figure E-26.

Figure E-26. Wiring Diagram for Kent Veriflux VTC Sensor and Rosemount 8712

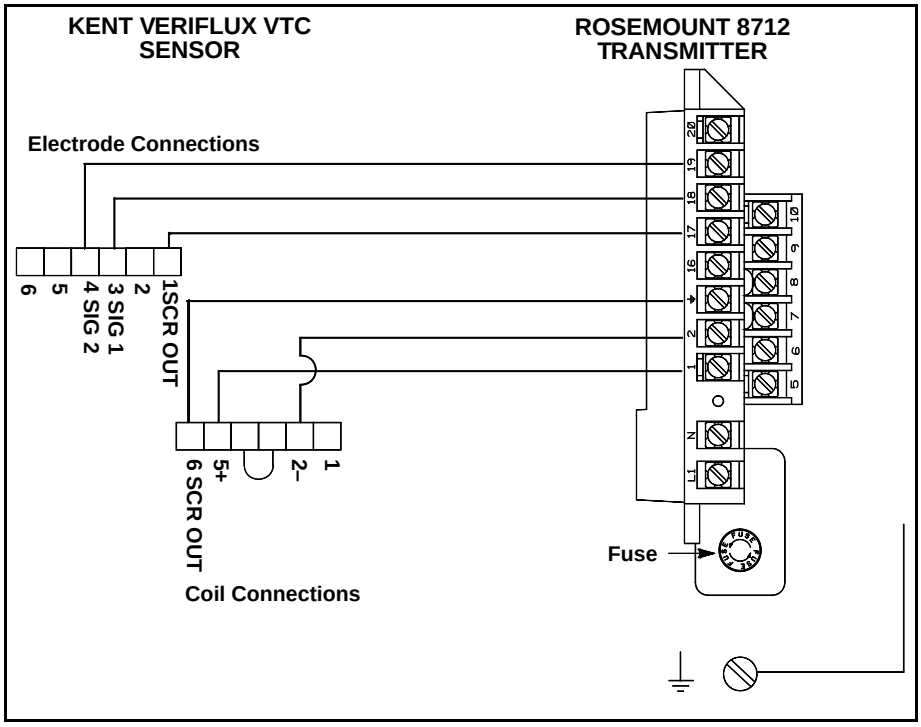
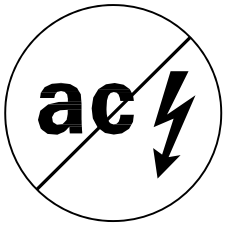


Table E-24. Kent Veriflux VTC Sensor Wiring Connections

Rosemount 8712	Kent Veriflux VTC Sensors
1	5
2	2
⏚	SCR OUT
17	SCR OUT
18	SIG1
19	SIG2

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



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Kent Generic Sensor to Rosemount 8712 Transmitter

Connect coil drive and electrode cables as shown in Figure E-27.

Figure E-27. Generic Wiring Diagram for Kent Sensors and Rosemount 8712

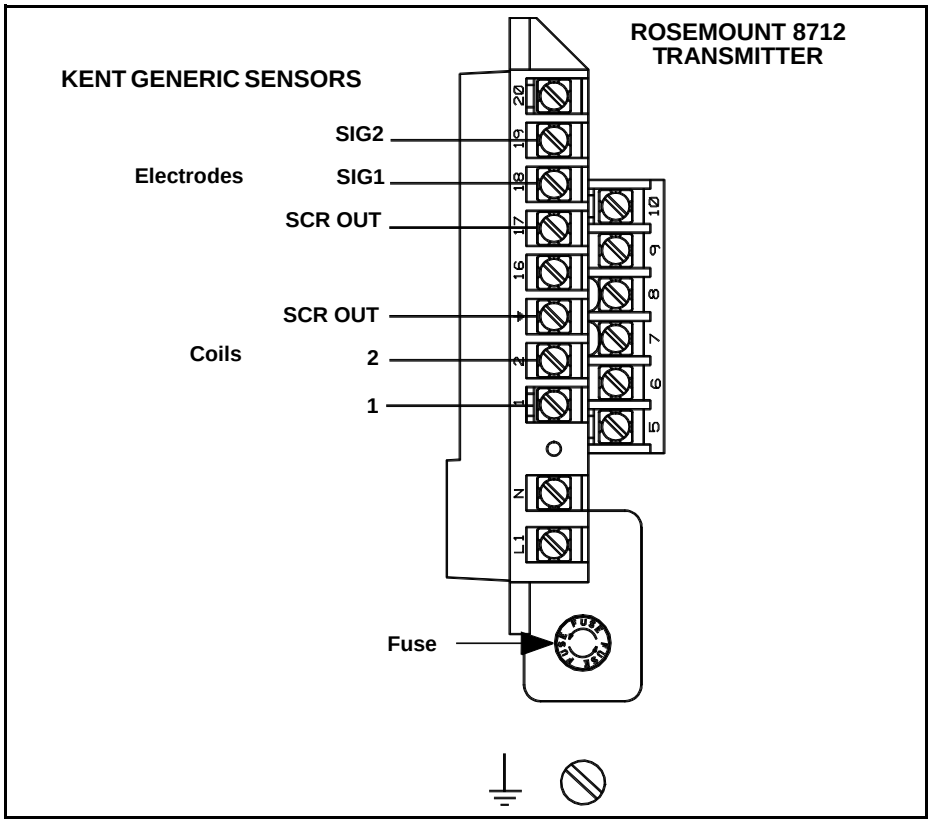
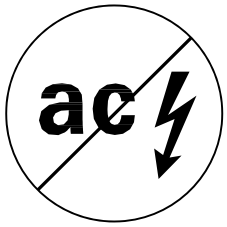


Table E-25. Kent Generic Sensor Wiring Connections

Rosemount 8712	Kent Generic Sensors
1	5
2	2
⏚	SCR OUT
17	SCR OUT
18	SIG1
19	SIG2

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



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KROHNE SENSORS

Krohne Autoflux Sensor to Rosemount 8712 Transmitter

Connect coil drive and electrode cables as shown in Figure E-28.

Figure E-28. Wiring Diagram for Krohne Autoflux Sensors and Rosemount 8712

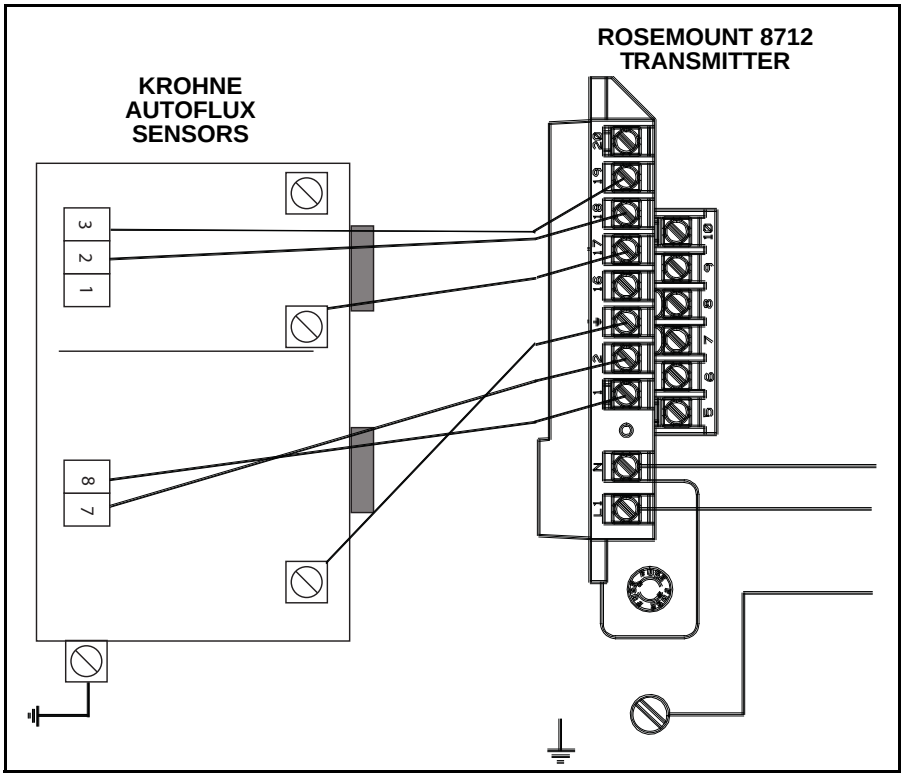
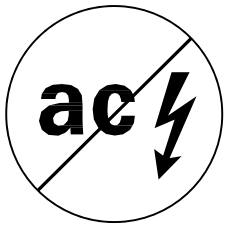


Table E-26. Krohne Autoflux Sensor Wiring Connections

Rosemount 8712	Krohne Autoflux Sensors
1	8
2	7
⏚	Coil Shield
17	Electrode Shield
18	2
19	3

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



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Krohne Optiflux Sensor to Rosemount 8712 Transmitter

Connect coil drive and electrode cables as shown in Figure E-29.

Figure E-29. Wiring Diagram for Krohne Optiflux Sensors and Rosemount 8712

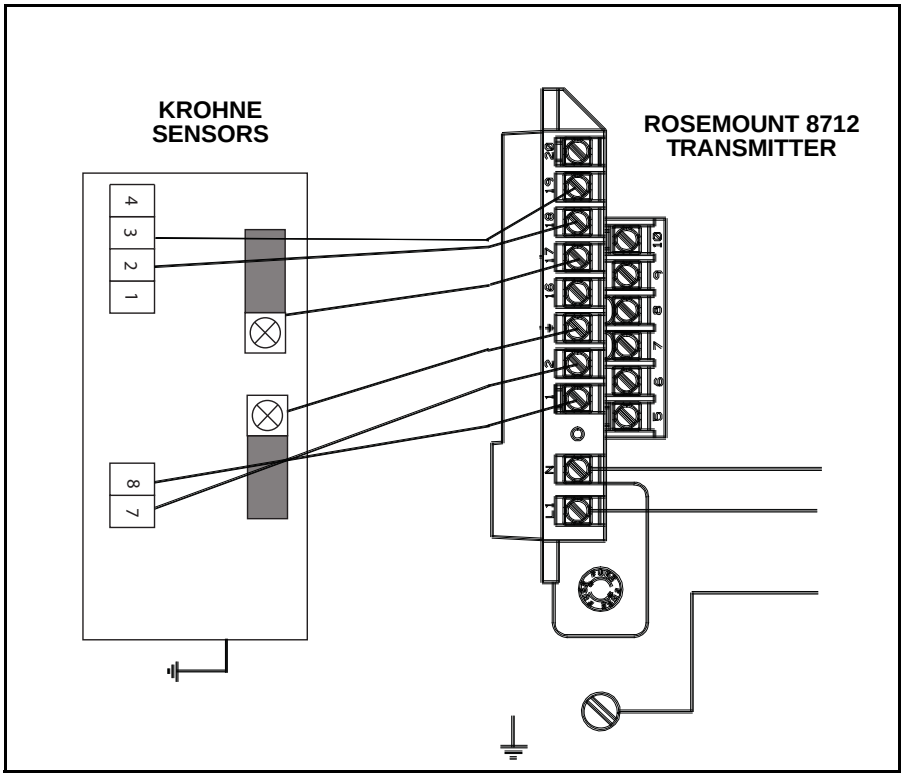
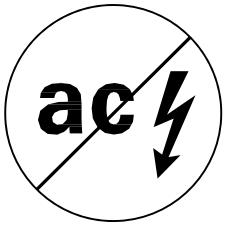


Table E-27. Krohne Optiflux Sensor Wiring Connections

Rosemount 8712	Krohne Optiflux Sensor Sensors
1	8
2	7
⏚	Coil Shield
17	Electrode Shield
18	2
19	3

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



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Krohne Generic Sensor to Rosemount 8712 Transmitter

Connect coil drive and electrode cables as shown in Figure E-30.

Figure E-30. Generic Wiring Diagram for Krohne Sensors and Rosemount 8712

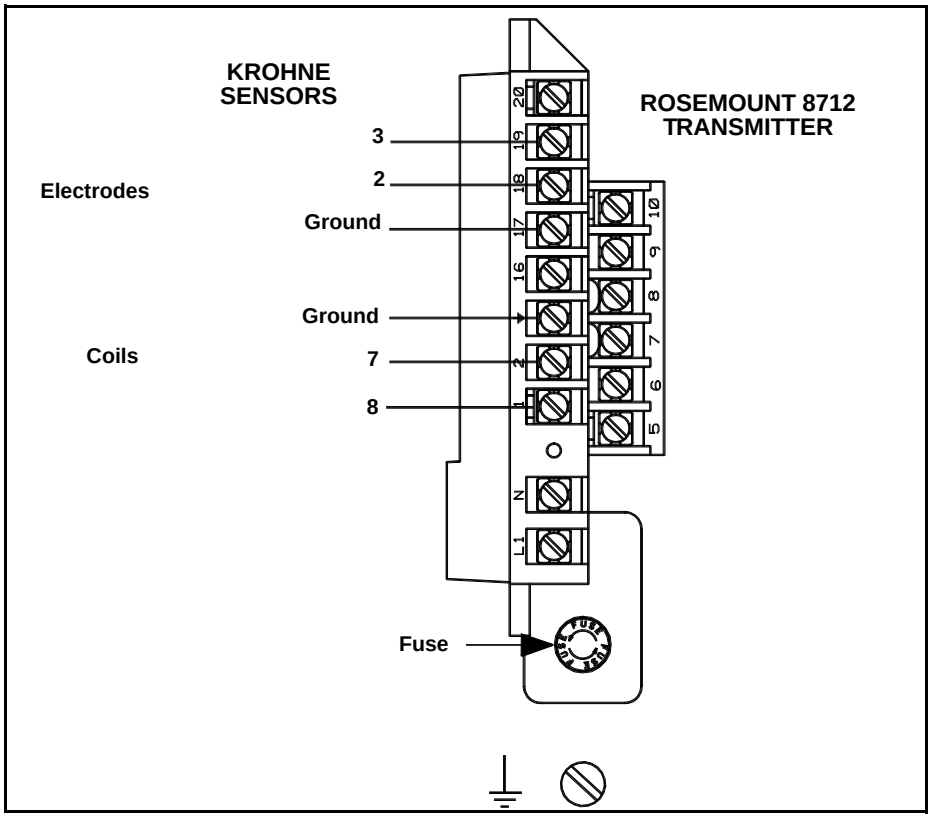
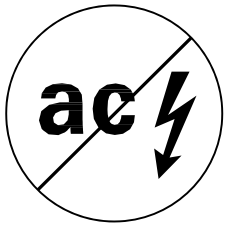


Table E-28. Krohne Generic Sensor Wiring Connections

Rosemount 8712	Krohne Generic Sensors
1	8
2	7
⏚	Coil Shield
17	Electrode Shield
18	2
19	3

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



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SIEMENS SENSORS

Siemens Sitrans F M Mag 3100/5100 Sensors to Rosemount 8712 Transmitter

Connect coil drive and electrode cables as shown in Figure E-31.

Figure E-31. Wiring Diagram for Siemens Sitrans F M Mag 3100/5100 Sensors and Rosemount 8712

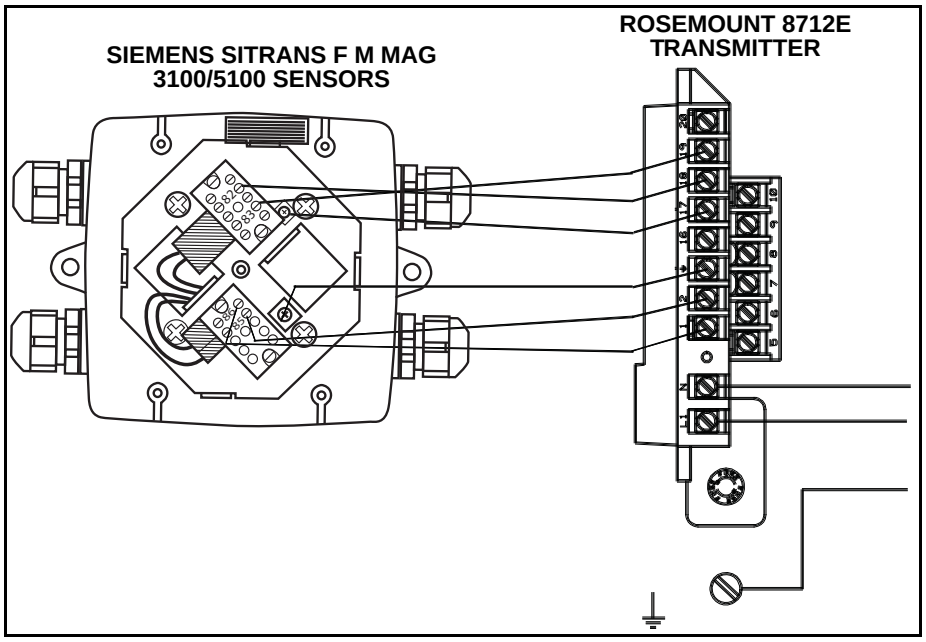
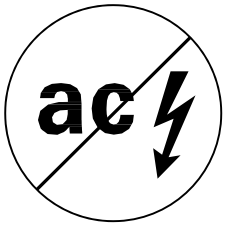


Table E-29. Siemens Sitrans F M Mag 3100/5100 Sensors Wiring Connections

Rosemount 8712	Siemens Sitrans F M Mag 3100/5100 Sensors
1	86
2	85
⏚	⏚
17	⏚
18	82
19	83

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



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TAYLOR SENSORS

Series 1100 Sensor to Rosemount 8712 Transmitter

Connect coil drive and electrode cables as shown in Figure E-32.

Figure E-32. Wiring Diagram for Taylor Series 1100 Sensors and Rosemount 8712

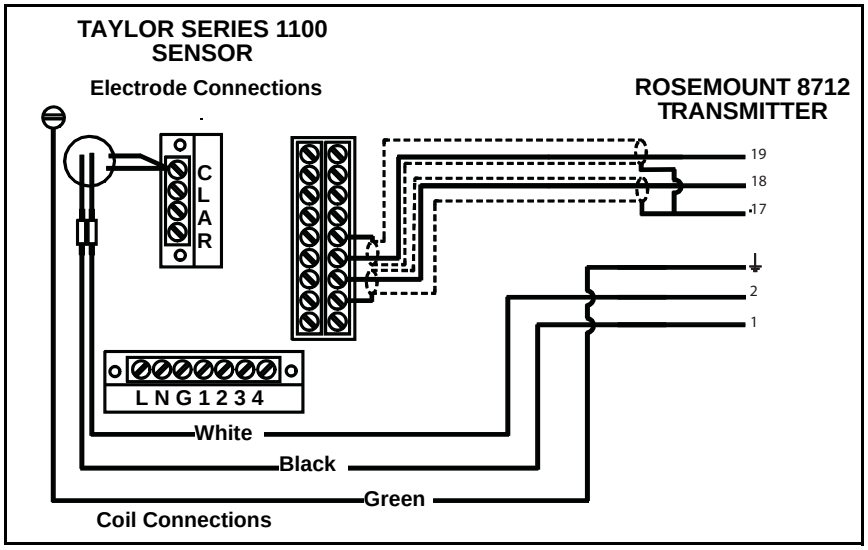
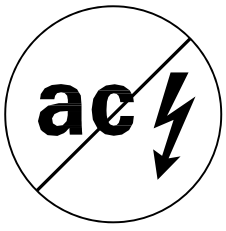


Table E-30. Taylor Series 1100 Sensor Wiring Connections

Rosemount 8712	Taylor Series 1100 Sensors
1	Black
2	White
⏚	Green
17	S1 and S2
18	E1
19	E2

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



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Taylor Generic Sensor to Rosemount 8712 Transmitter

Connect coil drive and electrode cables as shown in Figure E-33.

Figure E-33. Generic Wiring Diagram for Taylor Sensors and Rosemount 8712

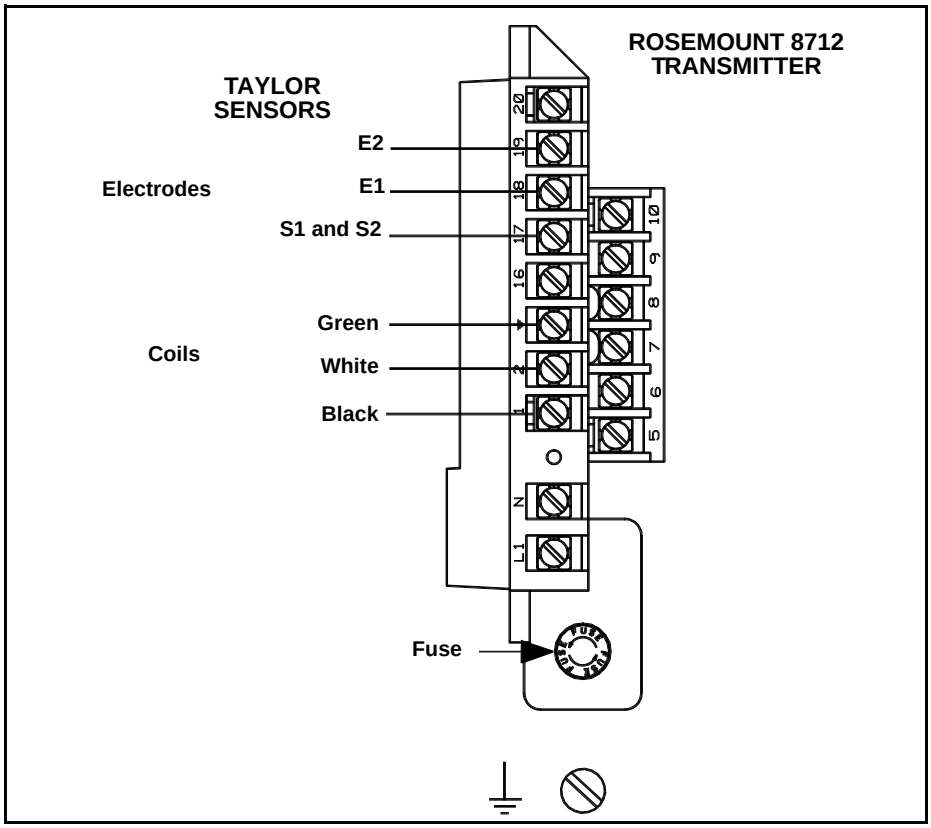
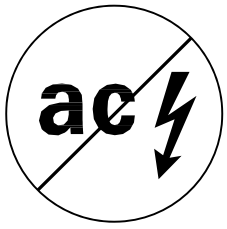


Table E-31. Taylor Generic Sensor Wiring Connections

Rosemount 8712	Taylor Generic Sensors
1	Black
2	White
⏚	Green
17	S1 and S2
18	E1
19	E2

⚠CAUTION

This is a pulsed DCDC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



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TOSHIBA SENSORS

Toshiba LF430 and LF434 Sensor to Rosemount 8712 Transmitter

Connect coil drive and electrode cables as shown in Figure E-34.

Figure E-34. Generic Wiring Diagram for Toshiba LF430 and LF434 Sensor and Rosemount 8712

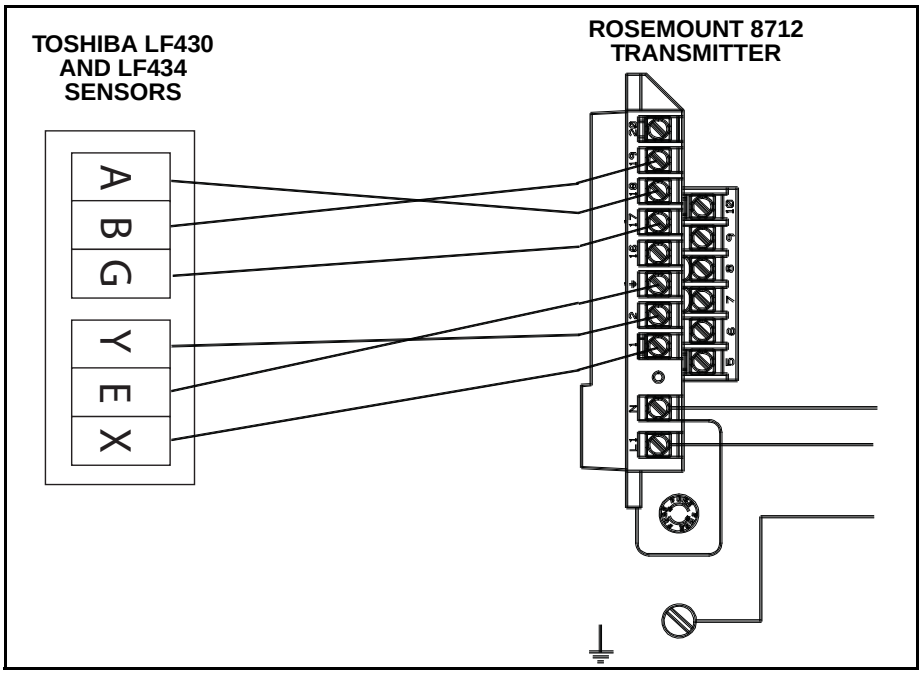
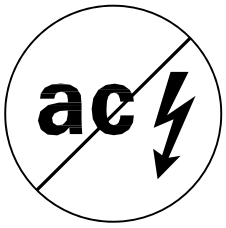


Table E-32. Toshiba LF430 and LF434 Sensor Wiring Connections

Rosemount 8712	Toshiba LF430 and LF434 Sensors
1	X
2	Y
⏚	E
17	G
18	A
19	B

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



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YAMATAKE HONEYWELL SENSORS

Yamatake Honeywell Sensor to Rosemount 8712 Transmitter

Connect coil drive and electrode cables as shown in Figure E-35.

Figure E-35. Generic Wiring Diagram for Yamatake Honeywell Sensors and Rosemount 8712

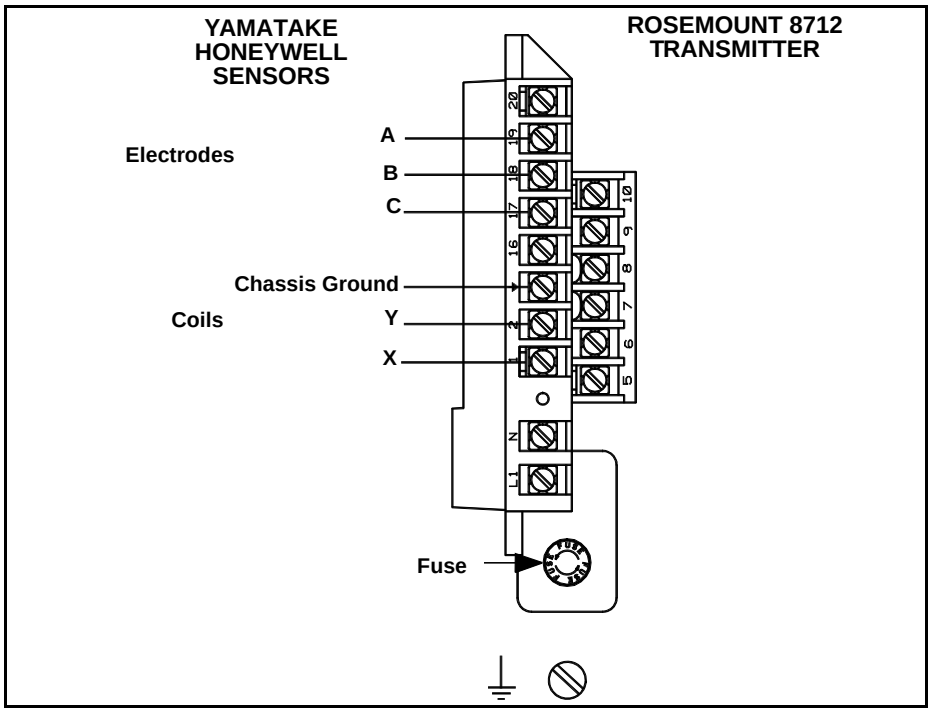
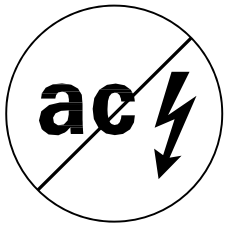


Table E-33. Yamatake Honeywell Sensor Wiring Connections

Rosemount 8712	Yamatake Honeywell Sensors
1	X
2	Y
⏚	Chassis Ground
17	C
18	B
19	A

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



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YOKOGAWA SENSORS

Yokogawa Sensor to Rosemount 8712 Transmitter

Connect coil drive and electrode cables as shown in Figure E-36.

Figure E-36. Generic Wiring Diagram for Yokogawa Sensors and Rosemount 8712

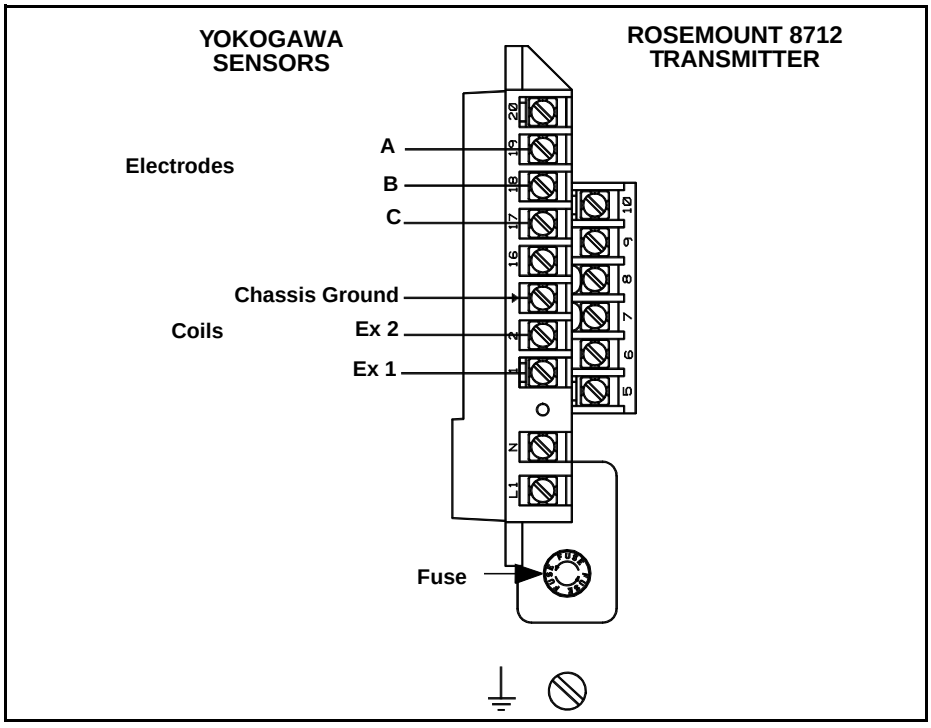
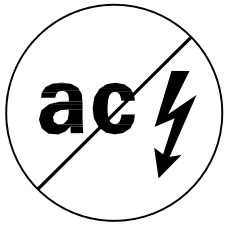


Table E-34. Yokogawa Sensor Wiring Connections

Rosemount 8712	Yokogawa Sensors
1	EX1
2	EX2
⏚	Chassis Ground
17	C
18	B
19	A

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



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GENERIC MANUFACTURER SENSORS

Generic Manufacturer Sensor to Rosemount 8712 Transmitter

Identify the Terminals

First check the sensor manufacturer's manual to identify the appropriate terminals. Otherwise, perform the following procedure.

Identify coil and electrode terminals

1. Select a terminal and touch an ohmmeter probe to it.
2. Touch the second probe to each of the other terminals and record the results for each terminal.
3. Repeat the process and record the results for every terminal.

Coil terminals will have a resistance of approximately 3-300 ohms.

Electrode terminals will have an open circuit, if the sensor is empty. With a full sensor, the electrode terminals will have a resistance of approximately 1000 ohms.

Identify a chassis ground

1. Touch one probe of an ohmmeter to the sensor chassis.
2. Touch the other probe to the each sensor terminal and the record the results for each terminal.

The chassis ground will have a resistance value of one ohm or less.

Wiring Connections

Connect the electrode terminals to Rosemount 8712 terminals 18 and 19. The electrode shield should be connected to terminal 17.

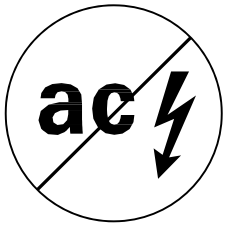
Connect the coil terminals to Rosemount 8712 terminals 1, 2, and ⏚.

If the Rosemount 8712 Transmitter indicates a reverse flow condition, switch the electrode wires connected to terminals 8 and 19.

Generic Sensor	Rosemount 8712E/8732E
Coil Circuit Connections	
Coil Positive	1
Coil Negative	2
Case Ground	⏚
Electrode Circuit Connections	
Electrode Positive	18
Electrode Negative	19
Case Ground	17

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



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Appendix F HART Field Communicator Operation

HandHeld Communicator . . . . . page F-1
Connections and Hardware . . . . . page F-2
Basic Features . . . . . page F-3
Menus and Functions . . . . . page F-5

HANDHELD COMMUNICATOR

NOTE
Please refer to the Handheld Communicator manual for detailed instructions on the use, features, and full capabilities of the Handheld Communicator.

⚠WARNING

Explosions can result in death or serious injury.

Do not make connections to the serial port or NiCad recharger jack in an explosive atmosphere.

Before connecting the Handheld Communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.

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CONNECTIONS AND HARDWARE

⚠ The HART Field Communicator exchanges information with the transmitter from the control room, the instrument site, or any wiring termination point in the loop. Be sure to install the instruments in the loop in accordance with intrinsically safe or non-incendive field wiring practices. Explosions can result if connections to the serial port or NiCad recharger jack are made in an explosive situation. The Handheld Communicator should be connected in parallel with the transmitter. Use the loop connection ports on the rear panel of the Handheld Communicator (see Figure F-1). The connections are non-polarized.

Figure F-1. Rear Connection Panel

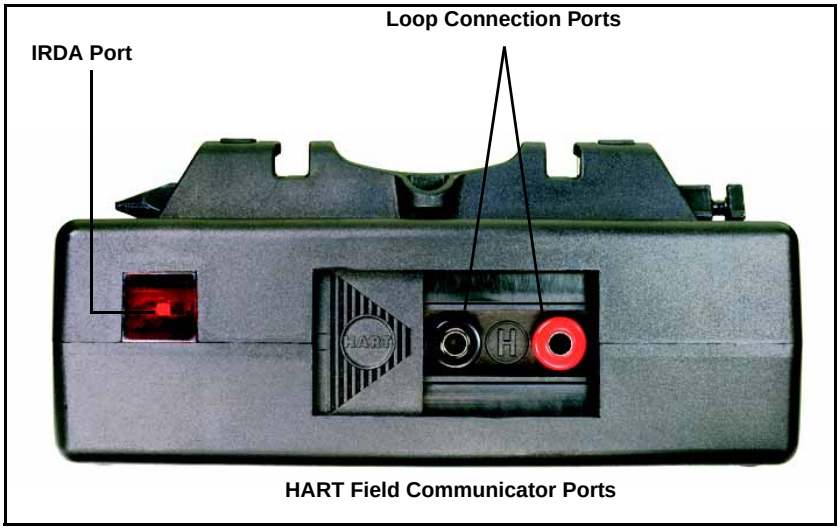
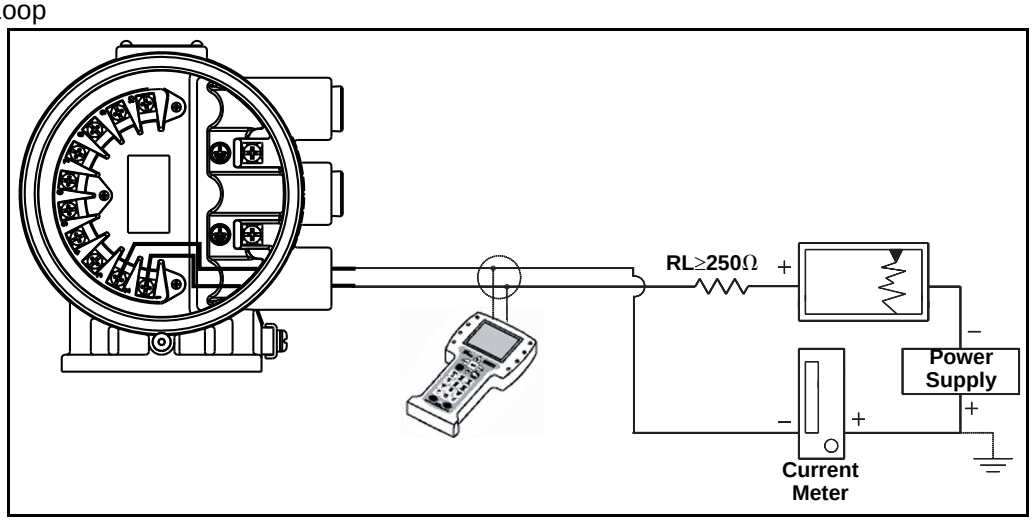


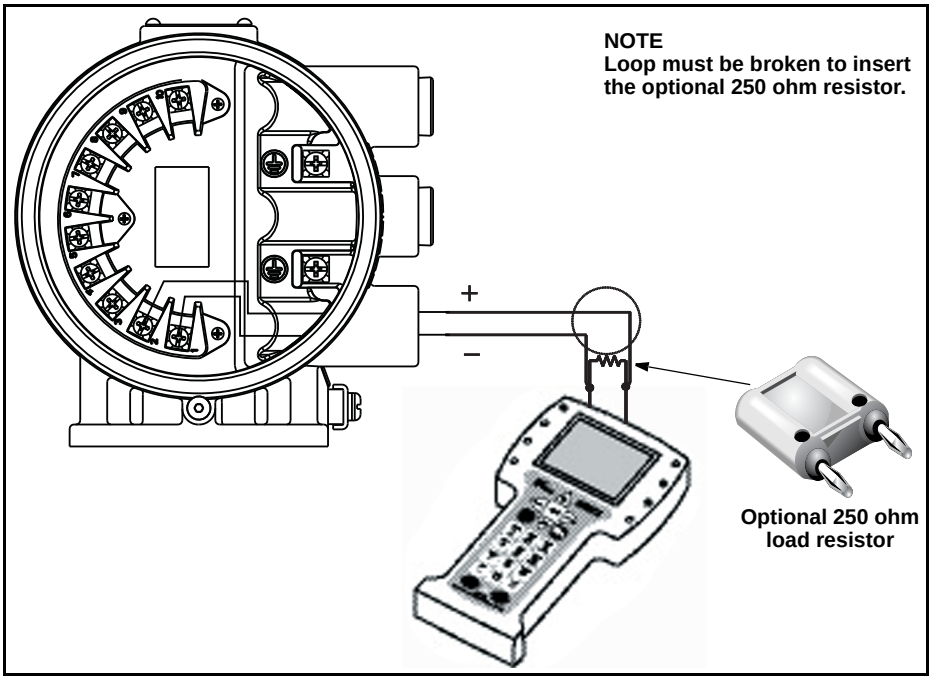
Figure F-2. Connecting the Handheld Communicator to a Transmitter Loop



NOTE
The Handheld Communicator needs a minimum of 250 ohms resistance in the loop to function properly. The Handheld Communicator does not measure loop current directly.

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Figure F-3. Connecting the HART Field Communicator with the Optional Load Resistor



BASIC FEATURES

The basic features of the Handheld Communicator include Action Keys, Function Keys, and Alphanumeric and Shift Keys.

Figure F-4. The Handheld Communicator



Action Keys

The Action Keys
As shown in Figure F-4, the action keys are the six blue, white, and black keys located above the alphanumeric keys. The function of each key is described as follows:

ON/OFF Key
Use this key to power the Handheld Communicator. When the communicator is turned on, it searches for a transmitter on the 4–20 mA loop. If a device is not found, the communicator displays the message, “No Device Found at Address O. Poll? YES NO.”

Select “YES” to poll for devices at other address (1-16).

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Select “NO” to go to the Main Menu.

If a HART-compatible device is found, the communicator displays the Online Menu with device ID (8712) and tag (TRANSMITTER).

Directional Keys

Use these keys to move the cursor up, down, left, or right. The right arrow key also selects menu options, and the left arrow key returns to the previous menu.

Tab Key

Use this key to quickly access important, user-defined options when connected to a HART-compatible device. Pressing the Hot Key turns the Handheld Communicator on and displays the Hot Key Menu. See Customizing the Hot Key Menu in the Handheld Communicator manual for more information.

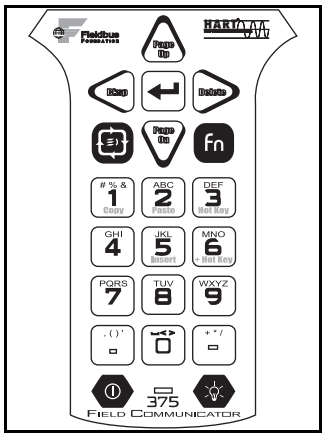
Function Key

Use the four software-defined function keys, located below the LCD, to perform software functions. On any given menu, the label appearing above a function key indicates the function of that key for the current menu. As you move among menus, different function key labels appear over the four keys. For example, in menus providing access to on-line help, the HELP label may appear above the F1 key. In menus providing access to the Home Menu, the HOME label may appear above the F3 key. Simply press the key to activate the function. See your Handheld Communicator manual for details on specific Function Key definitions.

Alphanumeric and Shift Keys

The Alphanumeric keys perform two functions: the fast selection of menu options and data entry.

Figure F-5. Handheld Communicator Alphanumeric and Shift Keys



Data Entry

Some menus require data entry. Use the Alphanumeric and Shift keys to enter all alphanumeric information into the Handheld Communicator. If you press an Alphanumeric key alone from within an edit menu, the bold character in the center of the key appears. These large characters include the numbers zero through nine, the decimal point (.), and the dash symbol (—).

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To enter an alphabetic character, first press the Shift key that corresponds to the position of the letter you want on the alphanumeric key. Then press the alphanumeric key. For example, to enter the letter R, first press the right Shift key, then the “6” key (see Figure F-5 on page F-4). Do not press these keys simultaneously, but one after the other.

Fast Key Feature

The Fast Key feature provides quick on-line access to transmitter variables and functions. Instead of stepping your way through the menu structure using the Action Keys, you can press a Fast Key Sequence to move from the Online Menu to the desired variable or function. On-screen instructions guide you through the rest of the screens.

Fast Key Example

The Fast Key sequences are made up of the series of numbers corresponding to the individual options in each step of the menu structure. For example, from the Online Menu you can change the **Date**. Following the menu structure, press 1 to reach **Device Setup**, press 4 for **Detailed Setup**, press 5 for **Device Info**, press 5 for **Date**. The corresponding Fast Key sequence is 1,4,5,5.

Fast Keys are operational only from the Online Menu. If you use them consistently, you will need to return to the Online Menu by pressing HOME (F3) when it is available. If you do not start at the Online Menu, the Fast Keys will not function properly.

Table F-2, is a listing of every on-line function with the corresponding Fast Keys. These codes are applicable only to the transmitter and the Handheld Communicator.

MENUS AND FUNCTIONS

The Handheld Communicator is a menu driven system. Each screen provides a menu of options that can be selected as outlined above, or provides direction for input of data, warnings, messages, or other instructions.

Main Menu

The Main Menu provides the following options:

- *Offline* - The Offline option provides access to offline configuration data and simulation functions.
- *Online* - The Online option checks for a device and if it finds one, brings up the Online Menu.
- *Transfer* - The Transfer option provides access to options for transferring data either from the Handheld Communicator (Memory) to the transmitter (Device) or vice versa. Transfer is used to move off-line data from the Handheld Communicator to the flowmeter, or to retrieve data from a flowmeter for off-line revision.

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NOTE
Online communication with the flowmeter automatically loads the current flowmeter data to the Handheld Communicator. Changes in on-line data are made active by pressing SEND (F2). The transfer function is used only for off-line data retrieval and sending.

- *Frequency Device* - The Frequency Device option displays the frequency output and corresponding flow output of flow transmitters.
- *Utility* - The Utility option provides access to the contrast control for the Handheld Communicator LCD screen and to the autopoll setting used in multidrop applications.

Once selecting a Main Menu option, the Handheld Communicator provides the information you need to complete the operation. If further details are required, consult the Handheld Communicator manual.

Online Menu

The Online Menu can be selected from the Main Menu as outlined above, or it may appear automatically if the Handheld Communicator is connected to an active loop and can detect an operating flowmeter.

NOTE
The Main Menu can be accessed from the Online Menu. Press the left arrow action key to deactivate the on-line communication with the flowmeter and to activate the Main Menu options.

When configuration variables are reset in the on-line mode, the new settings are not activated until the data are sent to the flowmeter.
Press SEND (F2) to update the process variables of the flowmeter.

On-line mode is used for direct evaluation of a particular meter, re-configuration, changing parameters, maintenance, and other functions.

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Diagnostic Messages

The following is a list of messages used by the Handheld Communicator (HC) and their corresponding descriptions.

Variable parameters within the text of a message are indicated with <*variable parameter*>.

Reference to the name of another message is identified by *[another message]*.

Table F-1. Handheld Communicator Diagnostic Messages

Message	Description
Add item for ALL device types or only for this ONE device type	Asks the user whether the hot key item being added should be added for all device types or only for the type of device that is connected.
Command Not Implemented	The connected device does not support this function.
Communication Error	Either a device sends back a response indicating that the message it received was unintelligible or the HC cannot understand the response from the device.
Configuration memory not compatible with connected device	The configuration stored in memory is incompatible with the device to which a transfer has been requested.
Device Busy	The connected device is busy performing another task.
Device Disconnected	Device fails to respond to a command
Device write protected	Device is in write-protect mode Data can not be written
Device write protected – do you still want to shut off?	Device is in write-protect mode – press YES to turn the HC off and lose the unsent data.
Display value of variable on hot key menu?	Asks whether the value of the variable should be displayed adjacent to its label on the hot key menu if the item being added to the hot key menu is a variable.
Download data from configuration memory to device	Prompts user to press SEND softkey to initiate a memory to device transfer.
Exceed field width	Indicates that the field width for the current arithmetic variable exceeds the device- specified description edit format
Exceed precision	Indicates that the precision for the current arithmetic variable exceeds the device- specified description edit form
Ignore next 50 occurrences of status?	Asked after displaying device status – softkey answer determines whether next 50 occurrences of device status will be ignored or displayed
Illegal character	An invalid character for the variable type was entered.
Illegal date	The day portion of the date is invalid.
Illegal month	The month portion of the date is invalid.
Illegal year	The year portion of the date is invalid.
Incomplete exponent	The exponent of a scientific notation floating point variable is incomplete.
Incomplete field	The value entered is not complete for the variable type.
Looking for a device	Polling for multidropped devices at addresses 1–15
Mark as read only variable on hot key menu?	Asks whether the user should be allowed to edit the variable from the hot key menu if the item being added to the hot key menu is a variable
No device configuration in configuration memory	There is no configuration saved in memory available to re-configure off-line or transfer to a device.
No Device Found	Poll of address zero fails to find a device, or poll of all addresses fails to find a device if auto-poll is enabled
No hot key menu available for this device	There is no menu named “hot key” defined in the device description for this device.
No off-line devices available	There are no device descriptions available to be used to configure a device off-line.
No simulation devices available	There are no device descriptions available to simulate a device.
No UPLOAD_VARIABLES in ddl for this device	There is no menu named “upload_variables” defined in the device description for this device – this menu is required for off-line configuration.

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Table F-1. Handheld Communicator Diagnostic Messages

Message	Description
No Valid Items	The selected menu or edit display contains no valid items.
OFF KEY DISABLED	Appears when the user attempts to turn the HC off before sending modified data or before completing a method
On-line device disconnected with unsent data – RETRY or OK to lose data	There is unsent data for a previously connected device. Press RETRY to send data, or press OK to disconnect and lose unsent data.
Out of memory for hot key configuration – delete unnecessary items	There is no more memory available to store additional hot key items. Unnecessary items should be deleted to make space available.
Overwrite existing configuration memory	Requests permission to overwrite existing configuration either by a device-to-memory transfer or by an off-line configuration; user answers using the softkeys
Press OK...	Press the OK softkey – this message usually appears after an error message from the application or as a result of Field Communications.
Restore device value?	The edited value that was sent to a device was not properly implemented. Restoring the device value returns the variable to its original value.
Save data from device to configuration memory	Prompts user to press SAVE softkey to initiate a device-to-memory transfer
Saving data to configuration memory	Data is being transferred from a device to configuration memory.
Sending data to device	Data is being transferred from configuration memory to a device.
There are write only variables which have not been edited. Please edit them.	There are write-only variables which have not been set by the user. These variables should be set or invalid values may be sent to the device.
There is unsent data. Send it before shutting off?	Press YES to send unsent data and turn the HC off. Press NO to turn the HC off and lose the unsent data.
Too few data bytes received	Command returns fewer data bytes than expected as determined by the device description
Transmitter Fault	Device returns a command response indicating a fault with the connected device
Units for <variable label> has changed – unit must be sent before editing, or invalid data will be sent	The engineering units for this variable have been edited. Send engineering units to the device before editing this variable.
Unsent data to on-line device – SEND or LOSE data	There is unsent data for a previously connected device which must be sent or thrown away before connecting to another device.
Use up/down arrows to change contrast. Press DONE when done.	Gives direction to change the contrast of the HC display
Value out of range	The user-entered value is either not within the range for the given type and size of variable or not within the min/max specified by the device.
<message> occurred reading/writing <variable label>	Either a read/write command indicates too few data bytes received, transmitter fault, invalid response code, invalid response command, invalid reply data field, or failed pre- or post-read method; or a response code of any class other than SUCCESS is returned reading a particular variable.
<variable label> has an unknown value – unit must be sent before editing, or invalid data will be sent	A variable related to this variable has been edited. Send related variable to the device before editing this variable.

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Table F-2. Handheld Fast Keys (HART Handheld Communicator) and LOI Keys

Function	HART Fast Keys
Process Variables	**1, 1**
Primary Variable (PV)	1, 1, 1
PV Percent of Range	1, 1,2
PV Analog Output (AO)	1, 1, 3
Totalizer Set-Up	1, 1, 4
Totalizer Units	1, 1, 4, 1
Gross Total	1,1,4,2
Net Total	1,1,4,3
Reverse Total	1,1,4,4
Start Totalizer	1,1,4,5
Stop Totalizer	1,1,4,6
Reset Totalizer	1,1,4,7
Pulse Output	1,1,5
Diagnostics	**1,2**
Diagnostic Controls	1,2,1
Basic Diagnostics	1,2,2
Self Test	1,2,2,1
AO Loop Test	1,2,2,2
Pulse Output Loop Test	1,2,2,3
Empty Pipe Limits	1,2,2,4
Empty Pipe (EP) Value	1,2,2,4,1
EP Trigger Level	1,2,2,4,2
EP Counts	1,2,2,4,3
Electronics Temp	1,2,2,5
Advanced Diagnostics	1,2,3
8714i Meter Verification	1,2,3,1
Run 8714i Verification	1,2,3,1,1
8714i Results	1,2,3,1,2
Test Condition	1,2,3,1,2,1
Test Criteria	1,2,3,1,2,2
8714i Test Result	1,2,3,1,2,3
Simulated Velocity	1,2,3,1,2,4
Actual Velocity	1,2,3,1,2,5
Velocity Deviation	1,2,3,1,2,6
Transmitter Calibration Test Result	1,2,3,1,2,7
Tube Calibration Deviation	1,2,3,1,2,8
Tube Calibration Test Result	1,2,3,1,2,9
Coil Circuit Test Result*	1,2,3,1,2,10
Electrode Circuit Test Result*	1,2,3,1,2,11
Sensor Signature	1,2,3,1,3
Signature Values	1,2,3,1,3,1
Re-Signature Meter	1,2,3,1,3,2

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Function	HART Fast Keys
Recall Last Saved Values	1,2,3,1,3,3
Set Pass/Fail Criteria	1,2,3,1,4
No Flow Limit	1,2,3,1,4,1
Flowing Limit	1,2,3,1,4,2
Empty Pipe Limit	1,2,3,1,4,3
Measurements	1,2,3,1,5
4-20 mA Verify	1,2,3,2
4-20 mA Verification	1,2,3,2,1
4-20 mA Verify Result	1,2,3,2,2
Licensing	1,2,3,3
License Status	1,2,3,3,1
License Key	1,2,3,3,2
Device ID	1,2,3,3,2,1
License Key	1,2,3,3,2,2
Diagnostic Variables	1,2,4
EP Value	1,2,4,1
Electronics Temp	1,2,4,2
Line Noise	1,2,4,3
5 Hz Signal to Noise Ratio (SNR)	1,2,4,4
37 Hz SNR	1,2,4,5
Signal Power	1,2,4,6
8714i results	1,2,4,7
Test Condition	1,2,4,7,1
Test Criteria	1,2,4,7,2
8714i Test Result	1,2,4,7,3
Simulated Velocity	1,2,4,7,4
Actual Velocity	1,2,4,7,5
Velocity Deviation	1,2,4,7,6
Transmitter Calibration Test Result	1,2,4,7,7
Tube Calibration Deviation	1,2,4,7,8
Tube Calibration Test Result	1,2,4,7,9
Coil Circuit Test Result*	1,2,4,7,--
Electrode Circuit Test Result*	1,2,4,7,--
Trims	1,2,5
D/A Trim\	1,2,5,1
Scaled D/A Trim	1,2,5,2
Digital Trim	1,2,5,3
Auto Zero	1,2,5,4
Universal Trim	1,2,5,5
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Basic Setup	**1,3**
Tag	1,3,1
Flow Units	1,3,2
PV Units	1,3,2,1
Special Units	1,3,2,2
Volume Unit	1,3,2,2,1
Base Volume Unit	1,3,2,2,2
Conversion Number	1,3,2,2,3
Base Time Unit	1,3,2,2,4
Flow Rate Unit	1,3,2,2,5
Line Size	1,3,3
PV Upper Range Value (URV)	1,3,4
PV Lower Range Value (LRV)	1,3,5
Calibration Number	1,3,6
PV Damping	1,3,7

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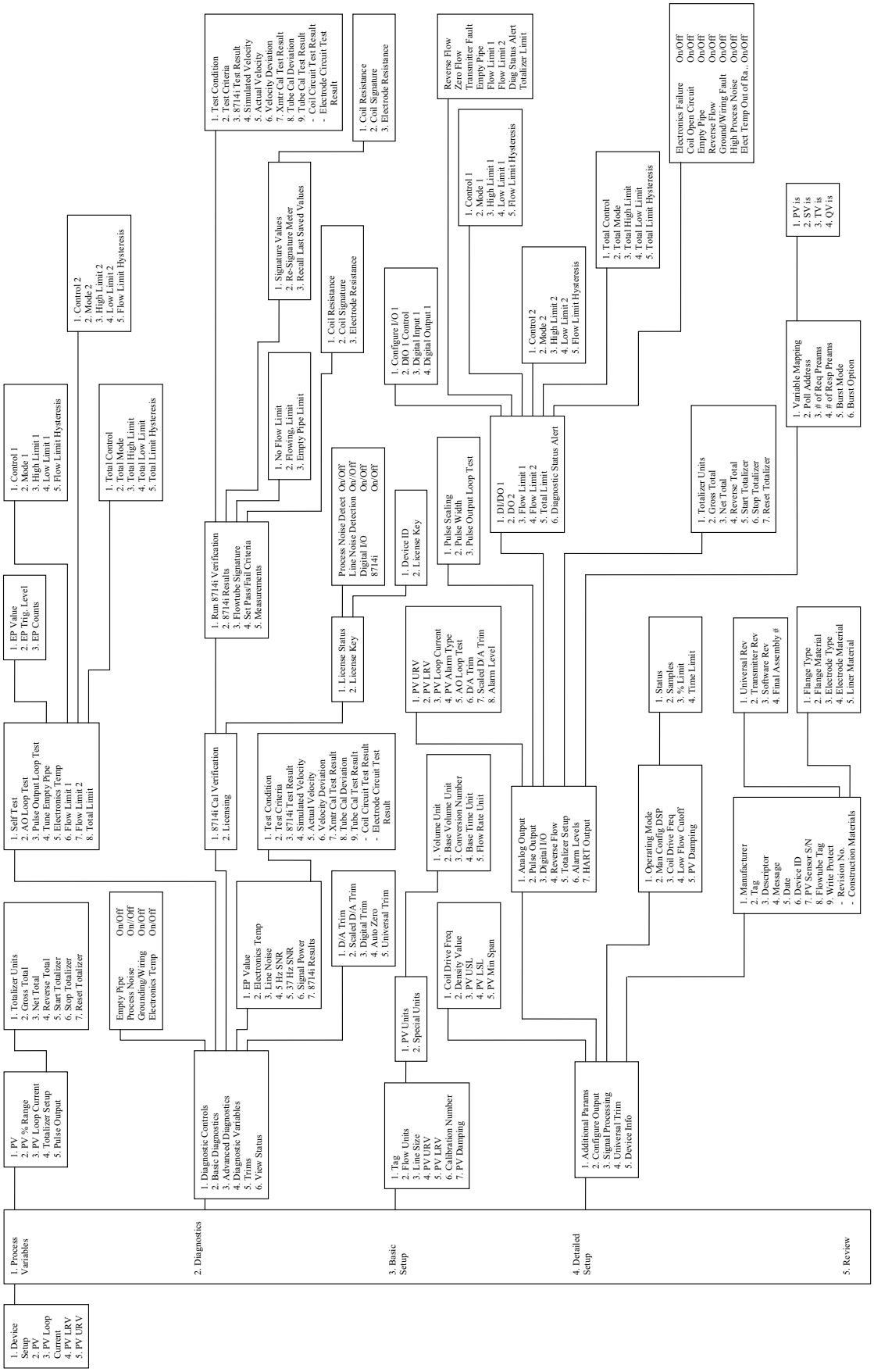
Function	HART Fast Keys
Detailed Setup	**1,4**
Additional Parameters	1,4,1
Coil Drive Frequency	1,4,1,1
Density Value	1,4,1,2
PV Upper Sensor Limit (USL)	1,4,1,3
PV Lower Sensor Limit (LSL)	1,4,1,4
PV Minimum Span	1,4,1,5
Configure Output	1,4,2
Analog Output	1,4,2,1
PV URV	1,4,2,1,1
PV LRV	1,4,2,1,2
PV AO	1,4,2,1,3
AO Alarm Type	1,4,2,1,4
AO Loop Test	1,4,2,1,5
D/A Trim	1,4,2,1,6
Scaled D/A Trim	1,4,2,1,7
Alarm Level	1,4,2,1,8
Pulse Output	1,4,2,2
Pulse Scaling	1,4,2,2,1
Pulse Width	1,4,2,2,2
Pulse Mode	1,4,2,2,3
Pulse Output Loop Test	1,4,2,2,4
DI/DO Output	1,4,2,3
Digital Input 1	1,4,2,3,1
Digital Output 2	1,4,2,3,2
Reverse Flow	1,4,2,4
Totalizer Set-Up	1,4,2,5
Totalizer Units	1,4,2,5,1
Gross Total	1,4,2,5,2
Net Total	1,4,2,5,3
Reverse Total	1,4,2,5,4
Start Totalizer	1,4,2,5,5
Stop Totalizer	1,4,2,5,6
Reset Totalizer	1,4,2,5,7
Alarm Level	1,4,2,6
HART Output	1,4,2,7
Variable Mapping	1,4,2,7,1
TV is	1,4,2,7,1,1
4V is	1,4,2,7,1,2
Poll Address	1,4,2,7,2
# of Req Preams	1,4,2,7,3
# of Resp Preams	1,4,2,7,4
Burst Mode	1,4,2,7,5
Burst Option	1,4,2,7,6
LOI Config	1,4,3
Language	1,4,3,1
Flowrate Display	1,4,3,2
Totalizer Display	1,4,3,3
Display Lock	1,4,3,4
Signal Processing	1,4,4
Operating Mode	1,4,4,1
Manual Configure DSP	1,4,4,2
Status	1,4,4,2,1
Samples	1,4,4,2,2
% Limit	1,4,4,2,3

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Function	HART Fast Keys
Time Limit	1,4,4,2,4
Coil Drive Frequency	1,4,4,3
Low Flow Cutoff	1,4,4,4
PV Damping	1,4,4,5
Universal Trim	1,4,5
Device Info	1,4,6
Manufacturer	1,4,6,1
Tag	1,4,6,2
Descriptor	1,4,6,3
Message	1,4,6,4
Date	1,4,6,5
Device ID	1,4,6,6
PV Sensor Serial Number	1,4,6,7
Sensor Tag	1,4,6,8
Write Protect	1,4,6,9
Revision No.*	1,4,6,10
Universal Rev	1,4,6,10,1
Transmitter Rev	1,4,6,10,2
Software Rev	1,4,6,10,3
Final Assembly #	1,4,6,10,4
Construction Materials*	1,4,6,11
Flange Type	1,4,6,11,1
Flange Material	1,4,6,11,2
Electrode Type	1,4,6,11,3
Electrode Material	1,4,6,11,4
Liner Material	1,4,6,11,5
Review	**1,5**

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Figure F-6. Field Communicator Menu Tree for the Rosemount 8712



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