Reference Manual
00809-0100-4661, Rev AB
November 2006

Rosemount 8712D Magnetic

Flowmeter Transmitter

HART® FIELD COMMUNICATIONS PROTOCOL

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Reference Manual
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Rosemount 8712D Magnetic Flowmeter Transmitter

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.

Within the United States, Rosemount Inc. has two toll-free assistance numbers:

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

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

North American Response Center
Equipment service needs.

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

Outside of the United States, contact your local Rosemount 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 Rosemount Sales Representative.

Table of Contents

SECTION 3 Configuration

Section 1 Introduction

SYSTEM DESCRIPTION

The Rosemount® 8700 Series Magnetic Flowmeter System consists of a flowtube 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 flowtubes:

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

There are three Rosemount magnetic flowmeter transmitters:

- Rosemount 8712
- Rosemount 8732
- Rosemount 8742

The flowtube is installed in-line with process piping — either vertically or horizontally. Coils located on opposite sides of the flowtube create a magnetic field. 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. The transmitter then amplifies and conditions the electrode signal to provide a flow signal. The transmitter is mounted remotely from the flowtube.

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

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, or Rosemount 8711 Magnetic Flowtubes with the Rosemount 8712, Rosemount 8732, or Rosemount 8742 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 Information” on page 4-1 for complete warning information.

Section 2 Installation

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 flowtube and transmitter is consistent with the appropriate hazardous area approval.

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

⚠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 8712D 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 flowtube liner is vulnerable to handling damage. Never place anything through the flowtube for the purpose of lifting or gaining leverage. Liner damage can render the flowtube useless.

To avoid possible damage to the flowtube 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 flowtube ends are often used for protection.

Correct flange bolt tightening is crucial for proper flowtube 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 flowtube lining and possible flowtube replacement.

TRANSMITTER SYMBOLS

Caution symbol — check product documentation for details ⚠

Protective conductor (grounding) terminal ⏚

PRE-INSTALLATION

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

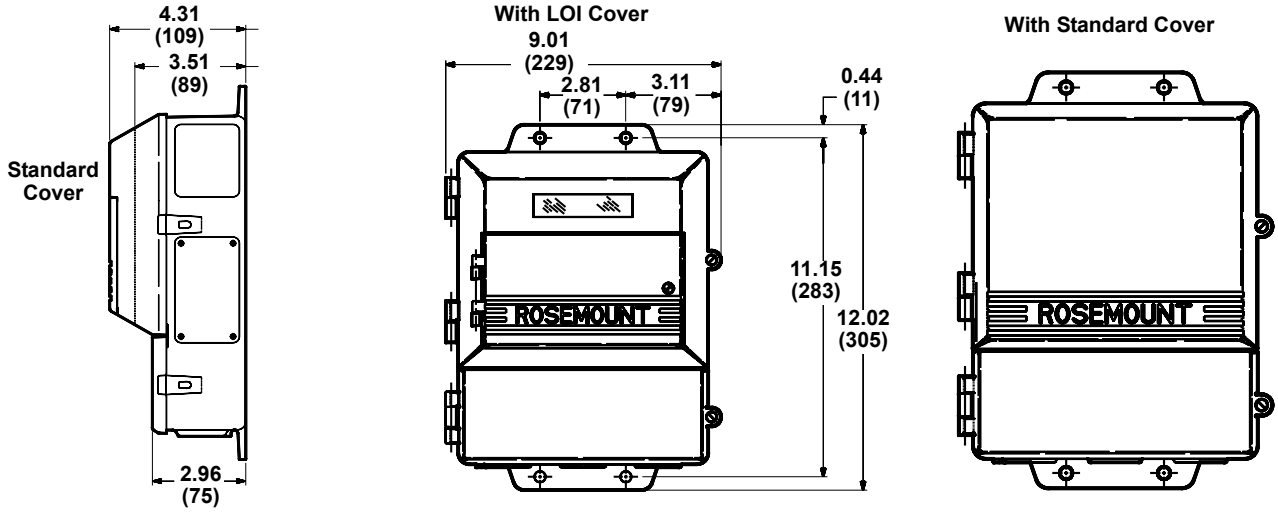
- Identify the options and configurations that apply to your application
- Set the hardware switches if necessary
- Consider mechanical, electrical, and environmental requirements

Mechanical Considerations

The mounting site for the Rosemount 8712D 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 conduit from collecting in the transmitter.

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

Figure 2-1. Rosemount 8712D Dimensional Drawing



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

INSTALLATION PROCEDURES

Rosemount 8712D 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 8712D to the mounting plate using the mounting screws.

Surface Mounting

To surface mount the transmitter:

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

Identify Options and Configurations

The standard application of the 8712D includes a 4–20 mA output and control of the flowtube 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 8712D 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

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 8712D 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 8712D 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 8712D 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.

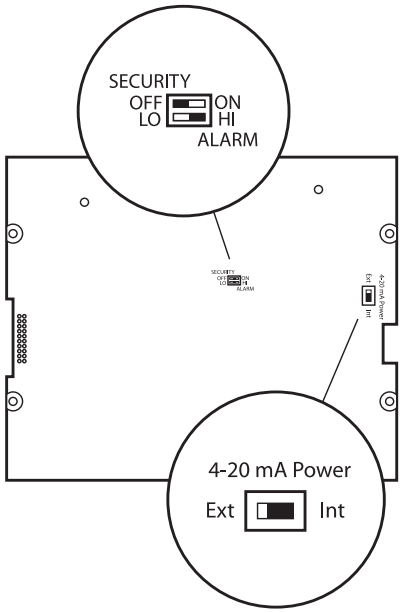
Changing Hardware Switch Settings

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.

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



8712/8712R01A.EPS

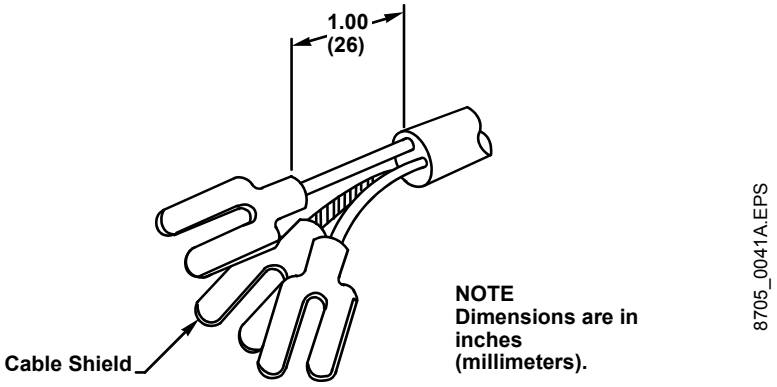
Conduit Ports and Connections

Both the flowtube and transmitter junction boxes have ports for ¾-inch 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 flowtube is required. Shielded cable must be used for best results in electrically noisy environments.

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.

Figure 2-3. Cable Preparation Detail



Electrical Considerations

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

Transmitter Input Power

The 8712D transmitter is designed to be powered by 90-250 V ac, 50–60 Hz or 12–42 V dc. The seventh and eighth digits in the transmitter model number designate the appropriate power supply requirement.

Model Number	Power Supply Requirement
03	12-42 V dc
12	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 2-8.

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:

$$\text{MaximumResistance} = \frac{\text{SupplyVoltage} - 12\text{Vdc}}{1\text{amp}}$$

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

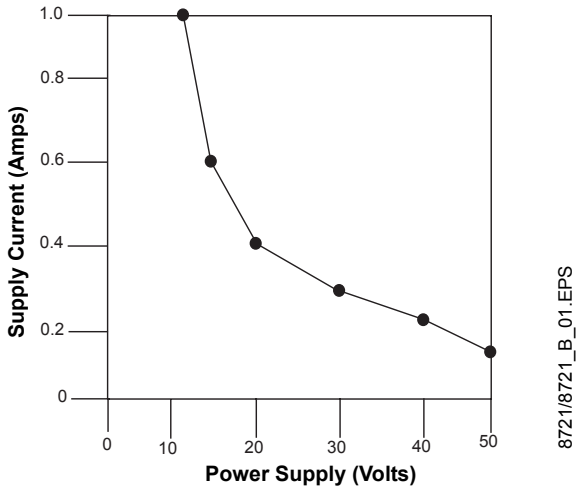
Table 2-1. Length of Annealed Copper (cu) Wires

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



Installation Category

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

Overcurrent Protection

The Rosemount 8712D 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	1 Amp, Quick Acting	Bussman AGCI or Equivalent
12-42 V dc	3 Amp, Quick Acting	Bussman AGC3 or Equivalent

OPTIONS, CONSIDERATIONS, AND PROCEDURES

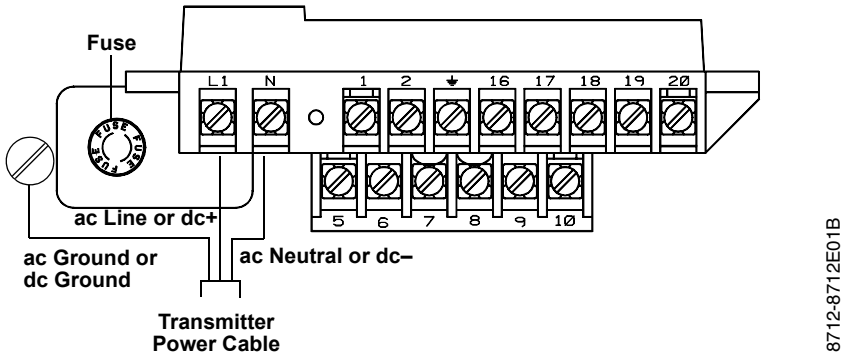
If your application of the 8712D includes the use of options such as multidrop communications, positive zero return (PZR), auxiliary output control, or pulse output, certain requirements may apply in addition to those previously listed. Be prepared to meet these requirements before attempting to install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

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 2-7.
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.

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.

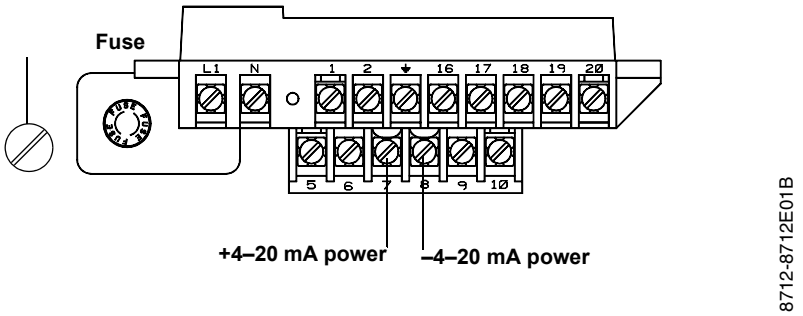
External
HART multidrop installations require a 10–30 V dc external power source (see Multidrop Communications on page 3-16). If a Handheld Communicator or control system is to be used, it must be connected across a minimum of 250 ohms resistance in the loop.

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 2-6.
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 flowtube. 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

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

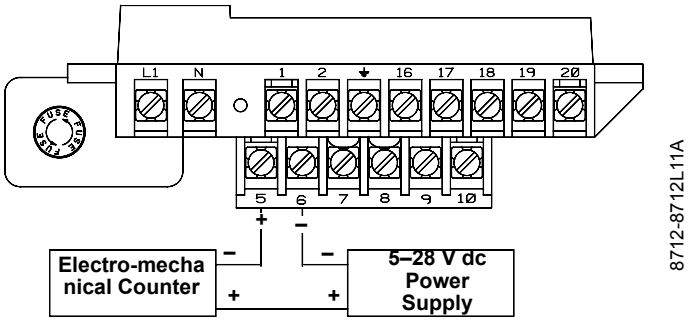
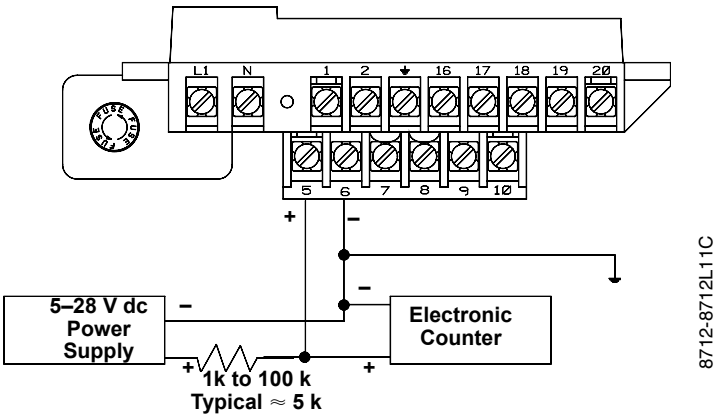


Figure 2-8. Connecting to a Electronic Totalizer/Counter without Integral Power Supply



Connect Digital Output 1

The auxiliary output control function allows you to externally signal a zero flow or reverse flow condition. The following requirements apply:

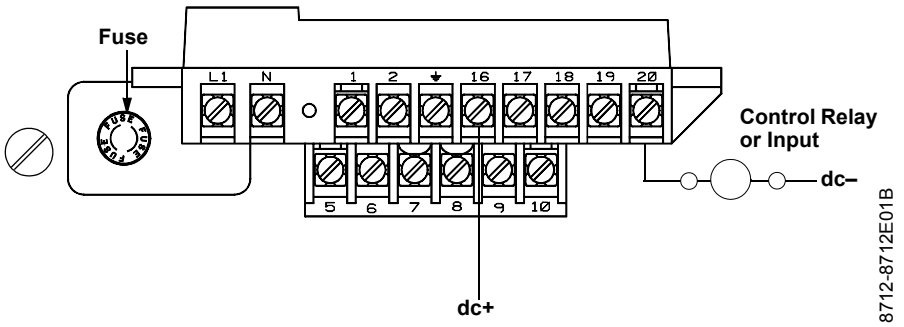
Supply Voltage:	5 to 28V dc
Maximum Power:	2 watts
Switch Closure:	optically isolated solid state switch

If you are using auxiliary output control, you need to connect the power source and control relay to the transmitter. To connect external power for auxiliary output control, complete the 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.

Refer to Figure 2-9.

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



Connect Digital Input 2

The Digital Input 2 can provide positive zero return (PZR) which allows the transmitter output to be forced to a zero flow rate signal. While in this state, the transmitter will not react to input changes. A zero flow rate signal appears until the PZR signal is removed.

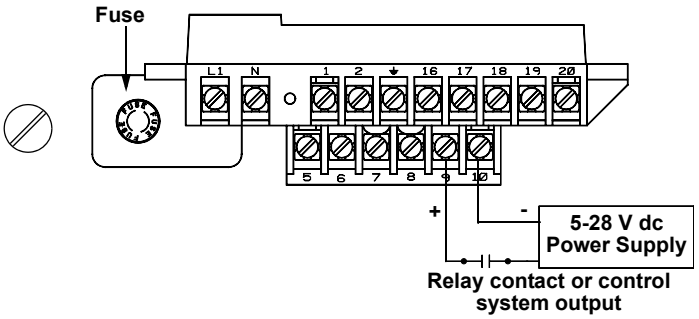
PZR is activated by supplying a 5-28 V dc signal to terminals 9 and 10.

To connect the PZR, complete the following steps.

1. Run the 5-28 V dc signal cable to the transmitter.
2. Connect the DC leads to Terminal 9 and 10.

Refer to Figure 2-10.

Figure 2-10. Connecting Digital Input 2



FLOWTUBE CONNECTIONS

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

Rosemount Flowtubes

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

Transmitter to Flowtube Wiring

Flanged and wafer flowtubes 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 flowtube 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

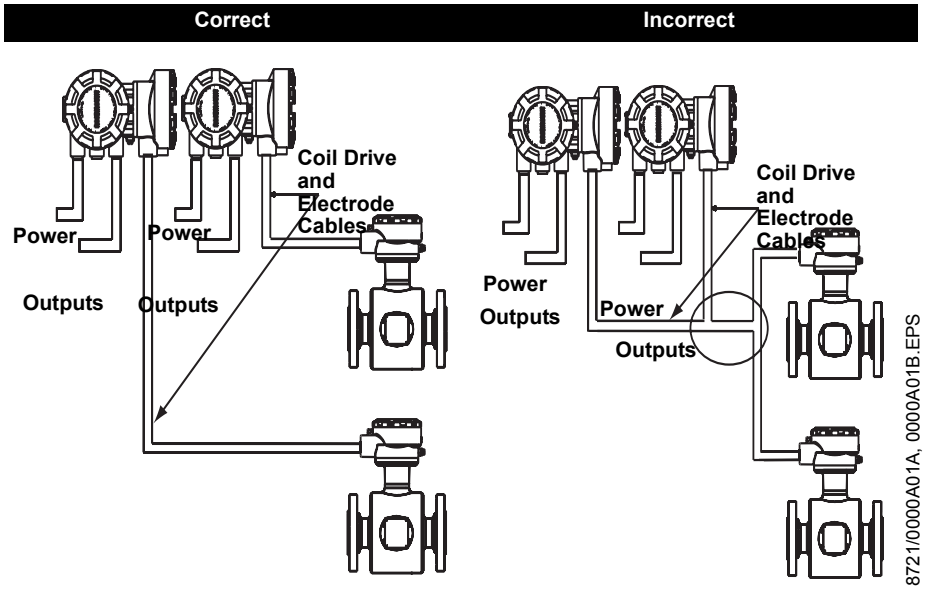


Table 2-3. Cable Requirements

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

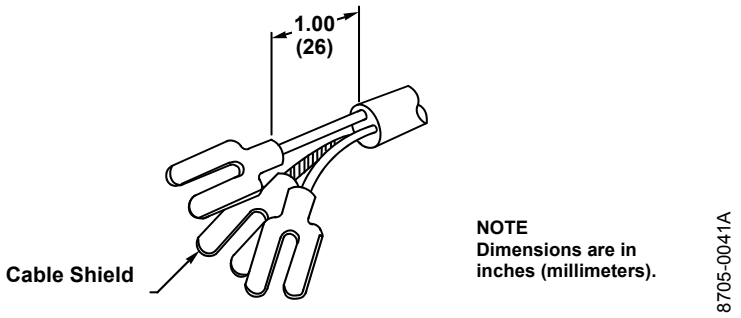
Conduit Cables

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

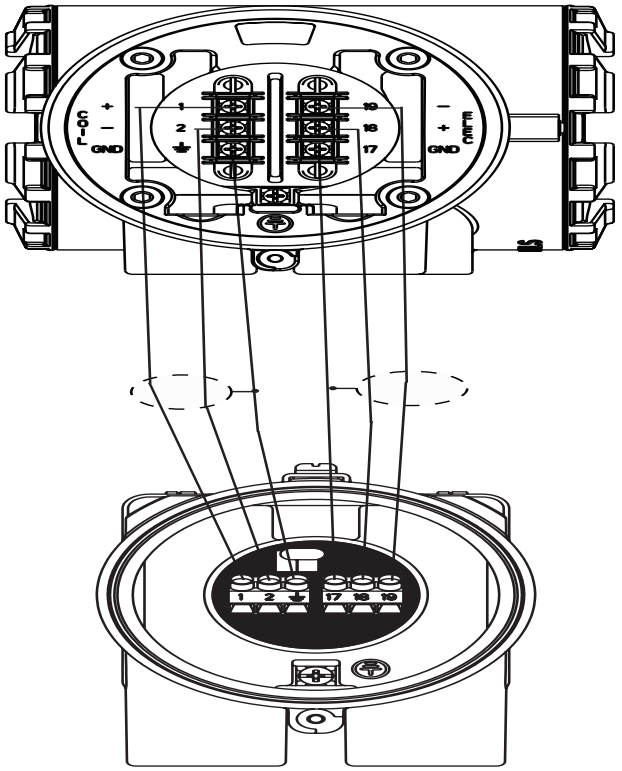


Flowtube to Remote Mount Transmitter Connections

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

⚠ **Do not connect ac power to the flowtube or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.

Figure 2-13. Wiring Diagram



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

Section 3 Configuration

INTRODUCTION

This section covers basic operation, software functionality, and configuration procedures for the Rosemount 8712D Magnetic Flowmeter Transmitter. For information on connecting another manufacturer's flowtube, refer to Appendix D: Wiring Diagrams.

The Rosemount 8712D 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 (see page 3-22), 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

Set-up Parameters	Page
Process Variables	page 3-6
Diagnostics and Service	page 5-6
Basic Setup	page 3-6
Detailed Setup	page 3-9
Review Variables	page 3-17
Miscellaneous Functions	page 3-17
Multidrop Communications	page 3-22

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 flowtube calibration number is entered in the transmitter. The calibration number is listed on the flowtube nameplate.
2. Verify that the correct flowtube line size is entered in the transmitter. The line size value is listed on the flowtube 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.

Flowtube

Be sure that power to your system is removed before beginning flowtube 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 flowtube to keep the electrodes covered by process fluid.
2. Ensure that the grounding straps on the flowtube 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. See Table 2-3 on page 2-13.
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 flowtube should be full of process fluid.

Refer to Section 5: Maintenance and Troubleshooting for further information.

LOCAL OPERATOR INTERFACE

The optional Local Operator Interface (LOI) provides an operator communications center for the 8712D. 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.

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.

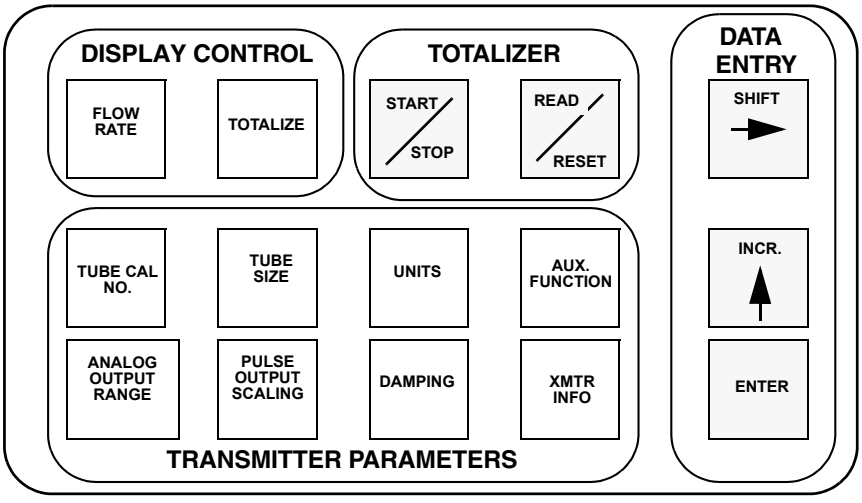
Data Entry Keys

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 8712D 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 ●,**&, +, -, *, /, $, @,%,** 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**.

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 TUBE SIZE:

1. Press **TUBE SIZE**.
2. Press **SHIFT** or **INCR.** to increase (incrementally) the tube 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	
Transmitter Parameters Keys	Function Performed	
Tube Calibration Number	Identifies the calibration number when using Rosemount flowtubes, or other manufacturers' flowtubes calibrated at the Rosemount factory	
Tube Size	Specifies the flowtube 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)	
Auxiliary Functions	**Function**	Options
	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
	Signal Processing	On/Off
	Special Units	Volume units, base volume units, conversion, timebase, rate units
	Aux. Output Control	Reverse Flow/Zero Flow
	Reverse Flow Enable	On/Off
	Universal Auto Trim	In-process Flowtube 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 Flow Tube for 37 Hz Coil Drive Operation
	Electronics Trim	Transmitter Calibration
Analog Output Range	Sets the desired 20 mA point – **must set the tube size first**	
Pulse Output Scaling	Sets one pulse to a selectable number of volume units – **must set the tube 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 flowtube	
Empty Pipe Tuning	Allowable range 3.0 - 2000.0	

DIAGNOSTIC MESSAGES

The following error messages may appear on the LOI screen. See Table 5-1 on page 5-2 for potential causes and corrective actions for these errors:

- Electronics Failure
- Coil open circuit
- Digital trim failure
- Auto zero failure
- Auto trim failure
- Flowrate >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)

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

Flow – The actual configured 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. Check the analog output value against the actual loop reading given by a milliameter. If it does not match, a 4–20 mA trim is required. (See “Analog Output Test” on page 5-6).

Totalizer – 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.

View Other Variables – Pulse Output provides the actual pulse reading from the flow transmitter.

BASIC SETUP

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 Rate Units

Fast Keys	1, 3, 2, 1
LOI Key	Units

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

Options for Flow Rate Units

- Gal/Min
- Liters/Min
- ImpGal/Min
- CuMeter/Hr
- Ft/Sec
- Meters/Sec
- Special (user defined, see page 3-12)

The maximum flow rate information is not updated as the available units appear, but only after the data is entered. The maximum flow rate on the second line of the display is for informational purposes and cannot be changed directly by the user.

If the transmitter is totalizing, the numerator of the unit of measure is used by the transmitter as the volumetric unit for totalization and pulse output scaling. For example, if gal/min is selected, the Rosemount 8712D totalizes and provides a pulse output in gallons.

URV (Upper Range Value)

Fast Keys	1, 3, 3, 2
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 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 must be selected prior to configuration of URV. If special units are configured before line size is selected, the communication interface may not display the correct flow rate.

LRV (Lower Range Value)

Fast Keys	1, 3, 4, 1
LOI Key	Aux. Function

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 becomes 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 of the 20 mA point. For example, if the URV is set to 15.67 ft/s and if the desired URV is greater than the LRV, then the highest allowable analog zero setting would be 14.67 ft/s. If the desired URV is less than the LRV, then the lowest allowable LRV would be 16.67 ft/s.

NOTE
Line size must be selected prior to configuration of LRV. If special units are configured before line size is selected, the communication interface may not display the correct flow rate.

Line Size

Fast Keys	1, 3, 5
LOI Key	Tube Size

The *line size* (tube size) must be set to match the actual flowtube 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 be rounded to match the nearest 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, 48, 54, 56, 60, 64, 72, 80

NOTE
The second line on the LOI screen, MAX FLOW, is strictly for informational purposes.

Calibration Number

Fast Keys	1, 3, 6
LOI Key	Tube Cal No.

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

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

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 flowtube is not a Rosemount flowtube and was not calibrated at the Rosemount factory, see “Universal Auto Trim” on page 3-21.

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

Damping

Fast Keys	1, 3, 7
LOI Key	Damping

Adjustable between 0.0 and 256 seconds

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. (When using a 275 / 375 handheld communicator, minimum value is 0.2 seconds).

DETAILED SETUP

Pulse Output Scaling

Fast Keys	1, 4, 3, 2, 1
LOI Key	Aux. Function

Transmitter may be commanded to supply a specified frequency between 1 pulse/ day at 39.37 ft/sec to 10,000 Hz at 1 ft/sec.

NOTE
Line size must be selected prior to configuration of pulse output scaling. If special units are configured before line size is selected, the communication interface may not display the correct flow rate.

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 electronics will not accept a conversion factor that would result in a pulse frequency outside that range. The minimum conversion factor value is found by dividing the upper range value (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 8712D to pulse every time 0.01 gallons pass through the flowtube, and the flow rate is 10,000 gal/min, you will exceed the 10,000 Hz full-scale limit:

$$\frac{10{,}000 \text{ gal/min}}{(60 \text{ sec/min}) \times (60 \text{ sec/min})} = 16666.7 \text{ Hz}$$

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 input frequency.

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

Pulse Width

Fast Keys	**1, 4, 3, 2, 2**
LOI Key	**Aux. Function**

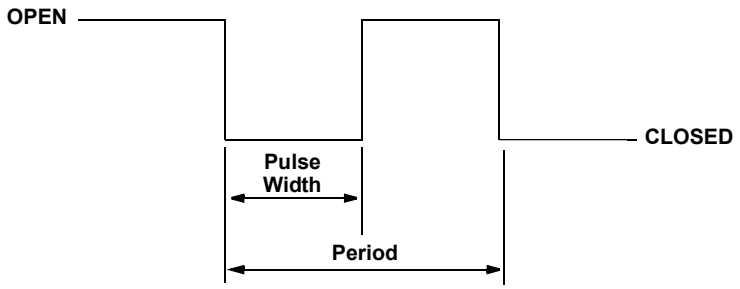
The factory default pulse width is 0.5 mS.

The width, or duration, of the *pulse width* can be adjusted to match the requirements of different counters or controllers (see Figure 3-2). These are typically lower frequency applications (≤1000 Hz). The transmitter will accept values from 0.5 mS to 500mS, with the actual minimum pulse width that can generated is 1.3 mS.

For frequencies higher than 1000 Hz, it is recommended that the pulse width is not set and the transmitter be allowed to set the width at 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 3-2. 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.

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.

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

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

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

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

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.

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

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

$$= 5.833 \text{ Hz}$$

Example

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

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

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

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

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

Special Units

Fast Keys	1, 3, 2, 2
LOI Key	Aux. Function

The Rosemount 8712D provides a selection of standard units configurations that meet the needs of most applications (see “Flow Rate Units” on page 3-7). If your application has special needs and the standard configurations do not apply, the Rosemount 8712D provides the flexibility to configure the transmitter in a custom-designed units format using the *special units* variable.

NOTE
Line size must be selected prior to configuration of special units. If special units are configured before line size is selected, the communication interface may not display the correct flow rate.

User-Defined Volume Unit

Fast Keys	1, 3, 2, 2, 1
LOI Key	Aux. Function

Special volume units enables you to display the volume unit format to which you have converted the base volume units. For example, if the special units are abc/min, the special volume variable is abc. The volume units variable is also used in totalizing the special units flow.

Base Volume Unit

Fast Keys	1, 3, 2, 2, 2
LOI Key	Aux. Function

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
LOI Key	Aux. Function

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 gallons to barrels and there are 31 gallons in a barrel, the conversion factor is 31.

Base Time Unit

Fast Keys	1, 3, 2, 2, 4
LOI Key	Aux. Function

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.

User-Defined Flow Unit

Fast Keys	1, 3, 2, 2, 5
LOI Key	Aux. Function

User-defined flow unit is a format variable that provides a record of the units to which you are converting. The Handheld Communicator and Rosemount 8712D 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.

Example

To display flow in barrels per hour, and one barrel of beer is equal to 31.0 gallons, the procedure would be:

Set the Volume Unit to BARL.
Set the Base Volume Unit to Gallons.
Set the Input Conversion Number to 31.
Set the Time Base to Hour.
Set the Rate Unit to BR/H.

Auxiliary Output

Fast Keys	1, 4, 3, 3
LOI Key	Aux. Function

The *auxiliary output* contacts (terminals 16 and 20) are software- selectable to indicate a reverse flow or zero flow condition. The two terminals are actually a transistor switch closure which must be externally powered.

Reverse Flow

Reverse flow activates the switch closure with a reverse flow. A forward flow is defined by the proper wiring polarity and the flow direction arrow on the flowtube.

Zero Flow

Zero flow activates the switch closure whenever the flow rate drops below the low flow cutoff.

NOTE
When Reverse Flow is selected from this digital output, Reverse Flow must be enabled under the Reverse Flow Enable Menu.

Reverse Flow Enable

Fast Keys	1, 4, 3, 4
LOI Key	Aux. Function

On / Off (LOI Command)

Enabled / Disabled (275 / 375 Handheld Communicator Command)

Reverse Flow Enable 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.

Empty Pipe

Fast Keys	1, 4, 1, 7
LOI Key	Aux. Function

On / Off (LOI Command)

The *Empty Pipe* feature can be turned ON to force the outputs to indicate zero flow, typically to the Lower Range Value (LRV) when an empty pipe condition is sensed.

Empty Pipe Value

Fast Keys	Not Accessible
LOI Key	Aux. Function

The read only *Empty Pipe Value* represents the level of the empty pipe signal. This unitless value is compared to the Empty Pipe Trigger level to determine if an Empty Pipe condition exists. The value is higher when the pipe is empty, and lower when the pipe is full.

Empty Pipe Trigger Level

Fast Keys	Not Accessible
LOI Key	Aux. Function

The *Empty Pipe Trigger Level* can be turned to actual process conditions. The range of this unitless level is 3-2000, with the factory default set at 100.

If the Empty Pipe Trigger Level is less then the Empty Pipe Value, the Empty Pipe output is turned ON.

If the Empty Pipe Trigger Level is greater than or equal to the Empty Pipe Value, the Empty Pipe output is turned OFF.

Empty Pipe Counts

Fast Keys	Not Accessible
LOI Key	Aux. Function

The *Empty Pipe Counts* sets the number of consecutive occurrences before the Empty Pipe output is turned ON or OFF. The count range is 5-50, with factory default set at 5.

Totalizer

Fast Keys	1, 1, 4
LOI Key	Totalizer

Totalizer tallies the total amount of process fluid that has passed through the flowmeter since the totalizer was last reset and enables you to change the settings of the totalizer.

Measure Gross Total

Fast Keys	1, 1, 4, 1
LOI Key	Totalizer

Measure 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

Start Totalizer

Fast Keys	1, 1, 4, 4
LOI Key	Totalizer

Start totalizer starts the totalizer counting from its current value.

Stop Totalizer

Fast Keys	1, 1, 4, 5
LOI Key	Totalizer

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, 6
LOI Key	Totalizer

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.

Alarm Level

Fast Keys	1, 4, 3, 6
LOI Key	Aux. Function

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 3-3. 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 3-4. 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

Low Flow Cutoff

Fast Keys	1, 4, 4, 1
LOI Key	Aux. Function

Low flow cutoff allows you to specify the flow rate, between 0.01 and 1.0 feet per second, 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 format selected. The low flow cutoff value applies to both forward and reverse flows.

Coil Drive Frequency

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

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

5 Hz

The standard coil pulse mode 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 pulse mode to 37 Hz. If the 37 Hz mode is selected, perform the auto zero function.

Control Status

LOI Key	Aux. Function

Normal Mode (LOI Command Only)

The normal mode uses 5 Hz coil drive mode and does not use the signal processing. Normal mode is usually sufficient and should be used whenever possible.

Filter Mode (LOI Command Only)

The filter 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. Either of the parameters, coil drive mode, or signal processing, may still be changed individually.

Turning signal processing off or changing the coil pulse mode to 5 Hz will automatically change the operating mode from filter mode to normal mode.

Signal Processing Control

Fast Keys	1, 4, 4
LOI Key	Aux. Function

On/Off

When *ON* is selected, the Rosemount 8712D 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.

Number of Samples

Fast Keys	1, 4, 4, 5
LOI Key	Aux. Function

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

Maximum Percent Limit

Fast Keys	1, 4, 4, 6
LOI Key	Aux. Function

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

Fast Keys	1, 4, 4, 7
LOI Key	Aux. Function

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.

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 8712D 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.

REVIEW VARIABLES

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

Review

Fast Keys	1, 5

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.

MISCELLANEOUS FUNCTIONS

The *miscellaneous functions* listed below are used in flowtube calibration and other procedures. The transmitter gain, flowtube gain, and coil current functions can be accessed only with the Rosemount 8712D transmitter.

Message

Fast Keys	1, 4, 5, 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

Fast Keys	1, 4, 5, 5
LOI Key	XMTR INFO

Date is a user-defined variable that provides a place to save the date of the last revision of configuration information.

Flowtube Tag

Fast Keys	1, 4, 5, 8
LOI Key	XMTR INFO

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

Flowtube Serial Number

Fast Keys	1, 4, 5, 7
LOI Key	XMTR INFO

The *flowtube serial number* is stored in the transmitter configuration for future reference. The number provides easy identification if the flowtube needs servicing or for other purposes.

Transmitter Tag

Fast Keys	1, 4, 5, 2
LOI Key	XMTR INFO

Transmitter 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.

Liner Material

Fast Keys	N/A
LOI Key	XMTR INFO

Liner Material enables you to select the liner material for the attached flowtube. This variable only needs to be changed if you have replaced your flowtube.

Liner Materials

- Teflon® (PTFE)
- Tefzel® (ETFE)
- Polyurethane
- Natural Rubber
- Neoprene
- Ryton®
- Other

Electrode Type

Fast Keys	N/A
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 flowtube.

Electrode Types

- Standard
- Std & Ground
- Bullet
- Other

Electrode Material

Fast Keys	N/A
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 flowtube.

Electrode Materials

- 316L SST
- Hastelloy® C-276
- Tantalum
- Plat–10% Ir
- Titanium
- Ryton
- Alloy 20
- Other

Flange Material

Fast Keys	N/A
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 flowtube.

- Carbon Steel
- 304 Stainless Steel
- 316 Stainless Steel

Flange Type

Fast Keys	N/A
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 flowtube.

- 150# ANSI
- 300# ANSI
- 600# ANSI
- 900# ANSI
- DN 10 - DN 40

D/A Trim and (4 20 mA Output Trim)

Fast Keys	1, 2, 4, 1
LOI Key	Aux. Function

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.

Simulate Alarm

Fast Keys	1, 2, 2, 3
LOI Key	Aux. Function

The *Simulate Alarm* function forces the transmitter analog output into an alarm condition according to the settings of the alarm level switch (page 2-5) and the alarm level setting (Rosemount or NAMUR) (page 3-15).

Scaled D/A Trim

Fast Keys	1, 2, 4, 2
LOI Key	N/A

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. Both non-scaled D/A trimming and scaled D/A trimming allow you to trim the 4-20mA output to approximately ±5% of the nominal 4mA end point and ±3% of the nominal 20mA end point. 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 (select CHANGE on the 275) 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.

Electronics Trim

Fast Keys	1, 2, 4, 3
LOI Key	Aux. Function

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

NOTE
Attempting an electronics trim without a Rosemount 8714 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 8712D to clear the message.

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

1. Tube Calibration Number—1000015010000000
2. Units—ft/s
3. Analog Output Range—20 mA = 30.00 ft/s
4. Analog Output Zero—4 mA = 0 ft/s
5. Coil Pulse Mode—6 Hz

The instructions for changing these parameters are located in the parameter descriptions 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 8714 flowtube simulator.
3. Power up the transmitter with the Rosemount 8714 connected and read the flow rate. The electronics need about a 5-minute warm-up time to stabilize.
4. The flow rate reading after warm-up should be between 29.97 and 30.03 ft/s.
5. If the reading is within the range, return the transmitter to the original configuration parameters.
6. If the reading is not within this range, initiate an electronics trim with the LOI or Handheld Communicator. The electronics trim takes about 90 seconds to complete. No transmitter adjustments are required.

Auto Zero Trim

Fast Keys	1, 2, 4, 4
LOI Key	Aux. Function

The *auto zero trim* function initializes the transmitter for use with the 37 Hz coil drive mode only. Run this function only with the transmitter and flowtube installed in the process. The flowtube 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.

Universal Auto Trim

Fast Keys	1, 2, 4, 5
LOI Key	Aux. Function

The *universal auto trim* function enables the Rosemount 8712D to calibrate flowtubes 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 flowtube has a 16-digit calibration number, in-process calibration is not required. If it does not, or if your flowtube is made by another manufacturer, complete the following steps for in-process calibration.

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

NOTE
The flow rate in the line can be determined by using another flowtube 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 flowtube is ready for use.

MULTIDROP COMMUNICATIONS

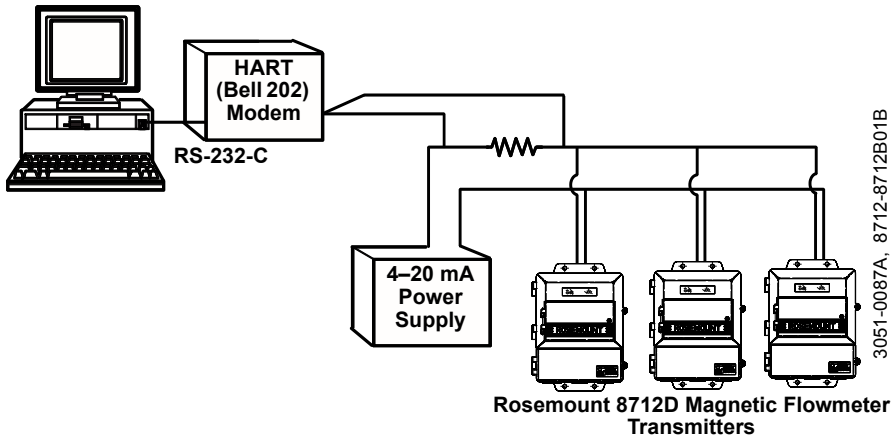
Multidrop configuration refers to the connection of several transmitters to a single communications transmission line. Communication between the Handheld Communicator and the transmitters takes place digitally with the analog output of the transmitters deactivated. Using the HART communications protocol, up to 15 transmitters can be connected on a single twisted pair of wires or over 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 HART (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 communication protocol.

Figure 3-3 shows a typical multidrop network. This figure is not an installation diagram. Contact Rosemount product support with specific requirements for multidrop applications.

The Handheld Communicator can test, configure, and format a Rosemount 8712D multidrop installation the same way as it can a 8712D in a standard point-to-point installation.

Figure 3-3. Typical Multidrop Network



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 nonincendive field wiring practices.

Figure 3-4. Handheld Communicator Menu Tree for Rosemount 8712D

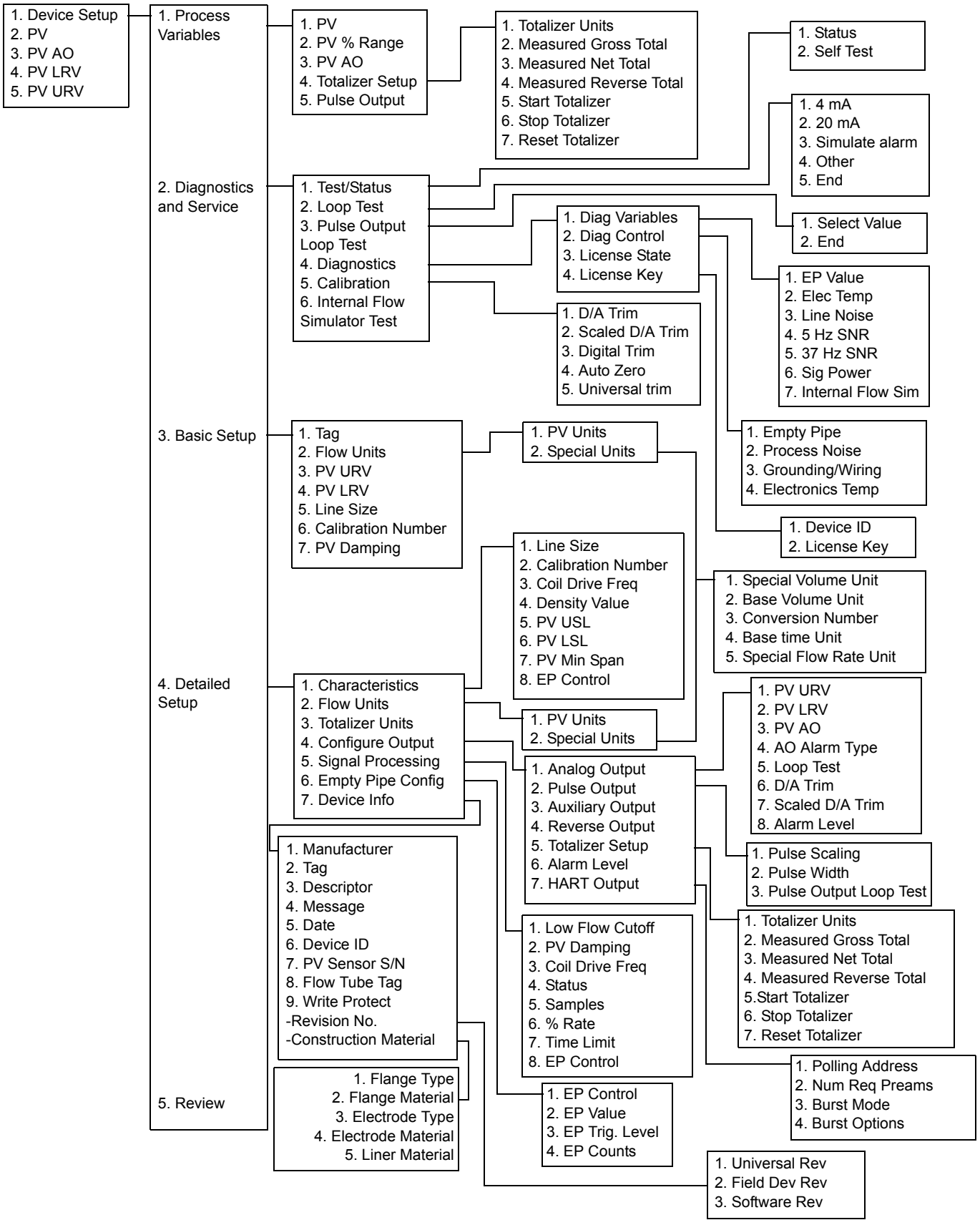


Table 3-5. Handheld Fast Keys (275 / 375 Handheld Communicator) and LOI Keys

Function	275 / 375 Fast Keys	LOI Key
Process Variables	1, 1	
DIAGNOSTICS AND SERVICE		
Analog Output Test	1, 2, 2	Aux. function
Pulse Output Test	1, 2, 3	Aux. Function
Self Test	1, 2, 1, 2	Aux. Function
D/A Trim and 4-20 mA Output Trim	1, 2, 4, 1	Aux. Function
Scaled D/A Trim	1, 2, 4, 2	
Electronics Trim	1, 2, 4, 3	Aux. Function
Auto Zero Trim	1, 2, 4, 4	Aux. Function
Universal Auto Trim	1, 2, 4, 5	Aux. Function
BASIC SETUP		
Tag	1, 3, 1	XMTR Info
Flow Rate Units	1, 3, 2, 1	Units
URV (Upper Range Value)	1, 3, 3, 2	Analog Output Range
LRV (Lower Range Value)	1, 3, 4, 1	Aux. Function
Line Size	1, 3, 5	Tube Size
Calibration Number	1, 3, 6	Tube Cal No.
Damping	1, 3, 7	Damping
DETAILED SETUP		
Pulse Output Scaling	1, 4, 3, 2, 1	Aux. Function
Pulse Width	1, 4, 3, 2, 2	Aux. Function
Special Units	1, 3, 2, 2	Aux. Function
User-Defined Volume Unit	1, 3, 2, 2, 1	Aux. Function
Base Volume Unit	1, 3, 2, 2, 2	Aux. Function
Conversion Number	1, 3, 2, 2, 3	Aux. Function
Base Tim Unit	1, 3, 2, 2, 4	Aux. Function
User-Defined Flow Unit	1, 3, 2, 2, 5	Aux. Function
Auxiliary Output	1, 4, 3, 3	Aux. Function
Totalizer	1, 1, 4	Totalizer
Measure Gross Total	1, 1, 4, 1	Totalizer
Start Totalizer	1, 1, 4, 4	Totalizer
Stop Totalizer	1, 1, 4, 5	Totalizer
Reset Totalizer	1, 1, 4, 6	Totalizer
Low Flow Cutoff	1, 4, 4, 1	Aux. Function
Coil Dive Frequency	1, 4, 1, 3	Aux. Function
Signal Process Control Status	1, 4, 4, 4	Aux. Function
Empty Pipe	1, 4, 1, 7	Aux. Function
Signal Processing Control	1, 4, 4	Aux. Function
Number of Samples	1, 4, 4, 5	Aux. Function
Maximum Percent Limit	1, 4, 4, 6	Aux. Function
Time Limit	1, 4, 4, 7	Aux. Function
REVIEW VARIABLES		
Review	1, 5	
MISCELLANEOUS FUNCTIONS		
Message	1, 4, 5, 4	XMTR Info
Date	1, 4, 5, 5	XMTR Info
Flowtube Tag	1, 4, 5, 8	XMTR Info
Flowtube Serial Number	1, 4, 5, 7	XMTR Info

CONNECTIONS AND HARDWARE

⚠ The Handheld 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 nonincendive 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 3-5). The connections are non-polarized.

Figure 3-5. Rear Connection Panel with Optional NiCad Recharger Jack

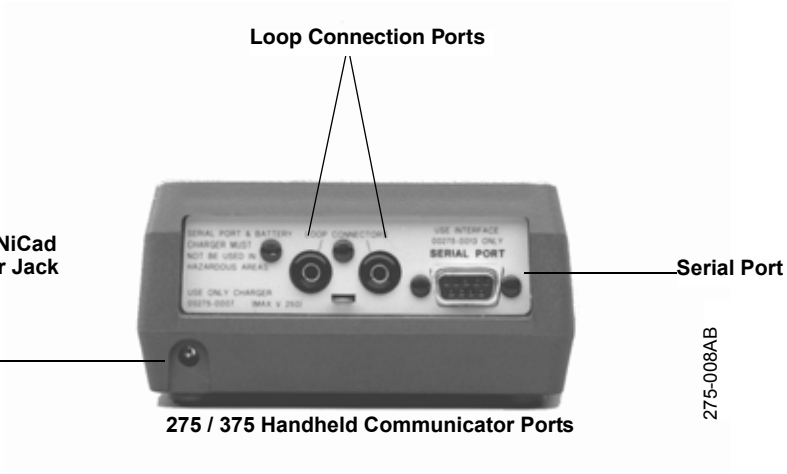
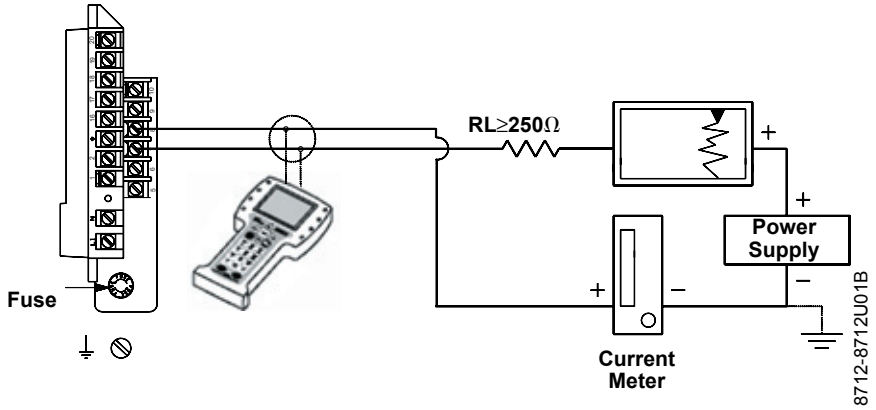


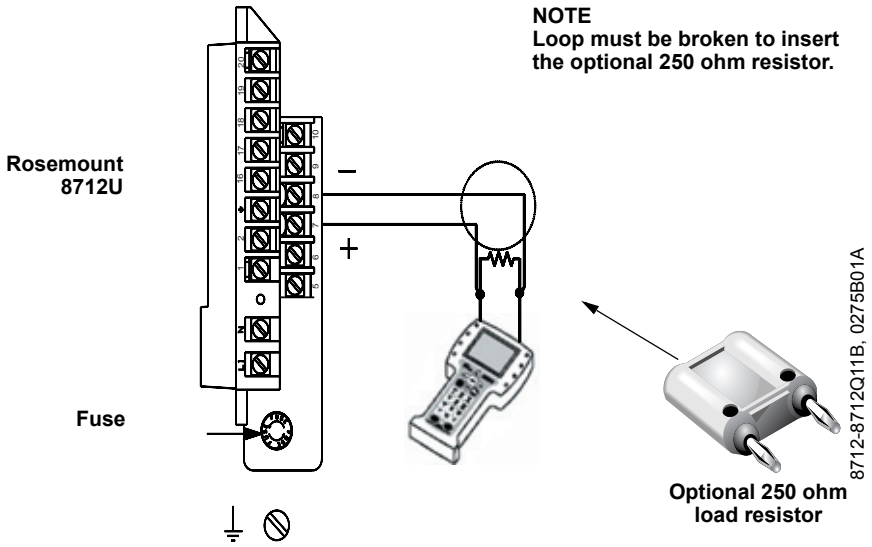
Figure 3-6. Connecting the Handheld Communicator to a Transmitter Loop



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.

⚠ **See page 3-22 for complete warning information.**

Figure 3-7. Connecting the Handheld 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 3-8. The Handheld Communicator

Action Keys

The Action Keys
As shown in Figure 3-8, 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).

Select “NO” to go to the Main Menu.

If a HART-compatible device is found, the communicator displays the Online Menu with device ID (8712D) 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.

HOT 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.

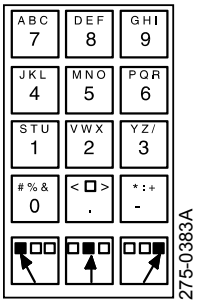
Function Keys

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 3-9. 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 (—).

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 3-10). Do not press these keys simultaneously, but one after the other.

Figure 3-10. Data Entry Key Sequence

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 3-5, 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.

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.

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 3-6. 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.

Table 3-6. 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 hart 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.

Section 4 Flowtube Installation

This section covers the steps required to physically install the magnetic flowtube. For electrical connections and cabling 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 flowtube and transmitter is consistent with the appropriate hazardous area approval.

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

⚠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 8712D 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 flowtube liner is vulnerable to handling damage. Never place anything through the flowtube for the purpose of lifting or gaining leverage. Liner damage can render the flowtube useless.

To avoid possible damage to the flowtube 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 flowtube ends are often used for protection.

Correct flange bolt tightening is crucial for proper flowtube 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 flowtube lining and possible flowtube replacement.

FLOWTUBE HANDLING

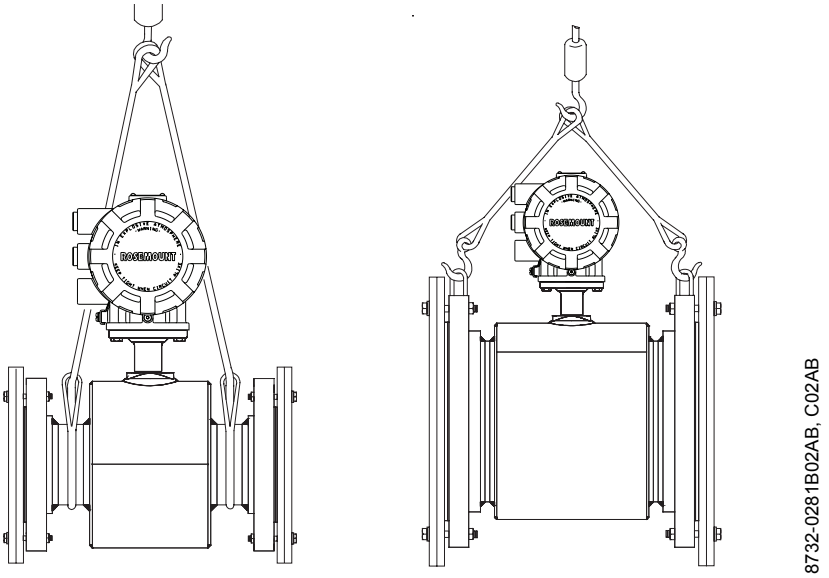
⚠ Handle all parts carefully to prevent damage. Whenever possible, transport the system to the installation site in the original shipping containers. Teflon®-lined flowtubes are shipped with end covers that protect it from both mechanical damage and normal unrestrained distortion. Remove the end covers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

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

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

Figure 4-1 shows flowtubes correctly supported for handling and installation. Notice the plywood end pieces are still in place to protect the flowtube liner during transportation.

Figure 4-1. Rosemount 8705 Flowtube Support for Handling



½- through 4-Inch Flowtubes

6-Inch and Larger Flowtubes

⚠ See ”Safety Messages” on pages 4-1 and 4-2 for complete warning information.

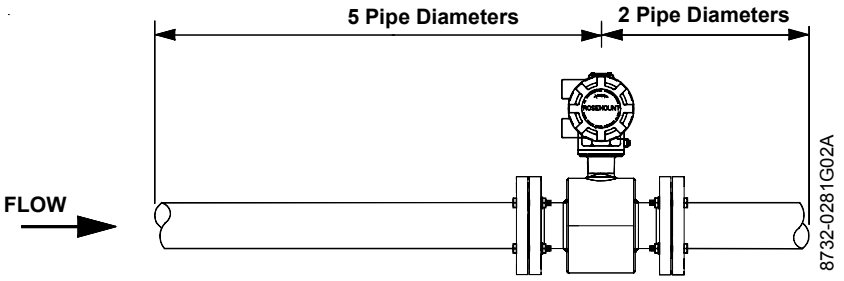
FLOWTUBE MOUNTING

Physical mounting of a flowtube 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 flowtube a minimum of five straight pipe diameters upstream and two pipe diameters downstream from the electrode plane (see Figure 4-2).

Figure 4-2. Upstream and Downstream Straight Pipe Diameters



Flowtube Orientation

The flowtube should be installed in a position that ensures the flowtube remains full during operation. Figures 4-3, 4-4, and 4-5 show the proper flowtube 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 4-3 and 4-4, avoid *downward* flows where back pressure does not ensure that the flowtube remains full at all times.

Figure 4-3. Vertical Flowtube Orientation

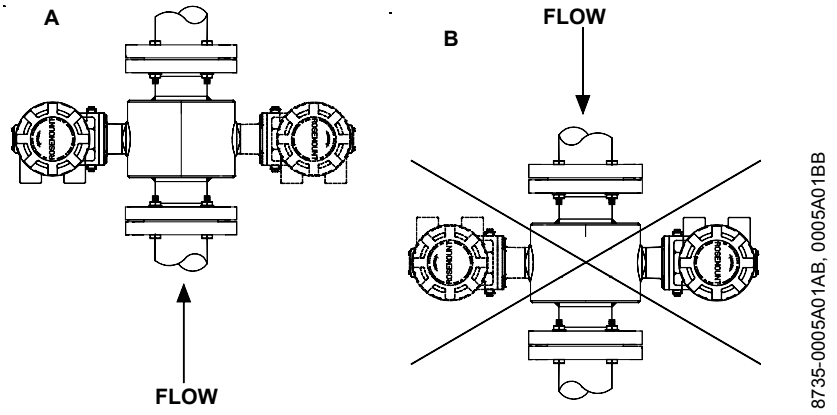
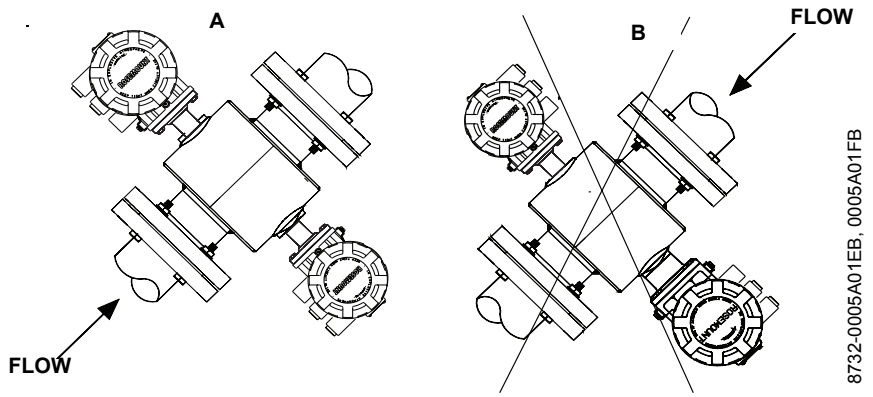
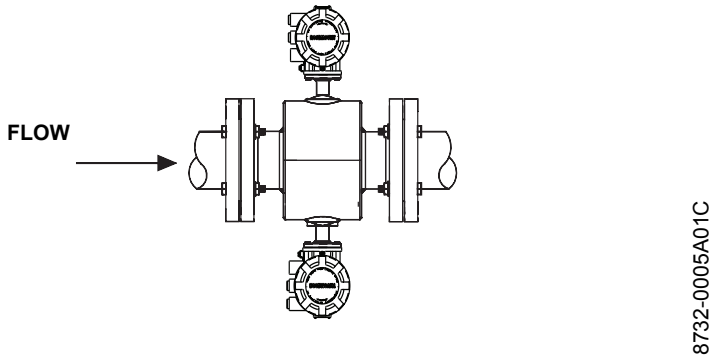


Figure 4-4. Incline or Decline Orientation



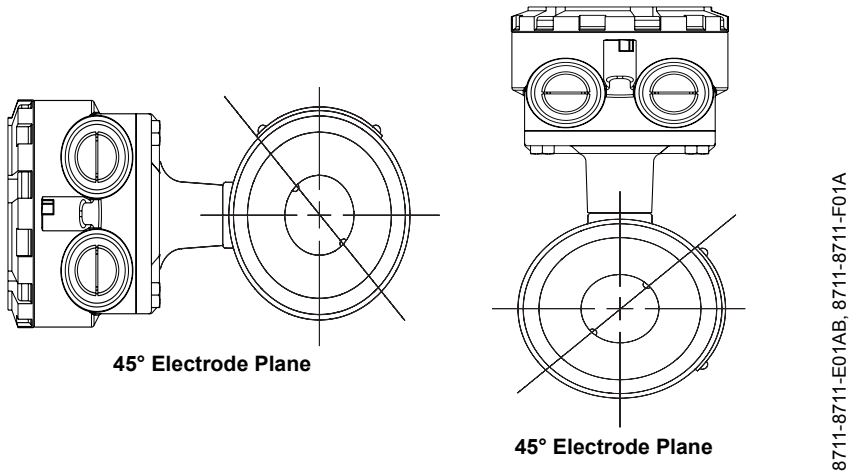
Horizontal installation should be restricted to low piping sections that are normally full. Orient the electrode plane to within 45 degrees of horizontal in horizontal installations. A deviation of more than 45 degrees of horizontal would place an electrode at or near the top of the flowtube thereby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

Figure 4-5. Horizontal Flowtube Orientation



The electrodes in the Rosemount 8711 are properly oriented when the top of the flowtube is either vertical or horizontal, as shown in Figure 4-6. Avoid any mounting orientation that positions the top of the flowtube at 45° from the vertical or horizontal position.

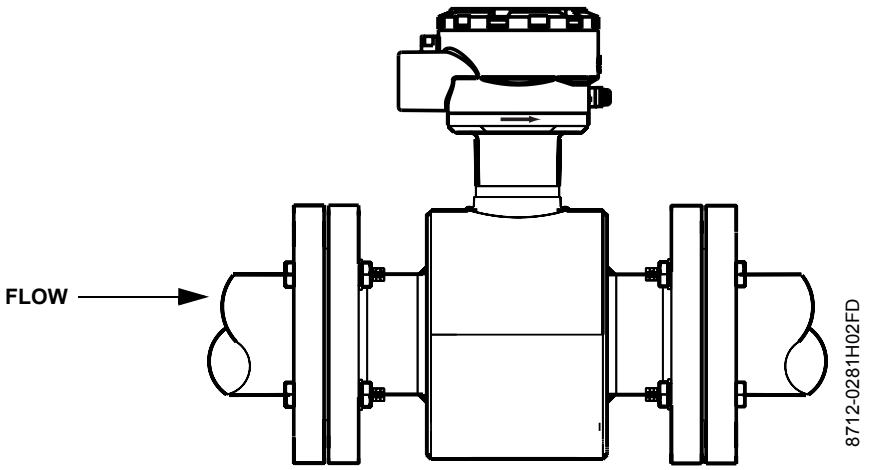
Figure 4-6. Rosemount 8711 Mounting Position



Flow Direction

The flowtube should be mounted so that the FORWARD end of the flow arrow, shown on the flowtube identification tag, points in the direction of flow through the tube (see Figure 4-7).

Figure 4-7. Flow Direction



INSTALLATION (FLANGED FLOWTUBE)

The following section should be used as a guide in the installation of the flange-type Rosemount 8705 and Rosemount 8707 High-Signal Flowtubes. Refer to page 4-10 for installation of the wafer-type Rosemount 8711 Flowtube.

Gaskets

⚠ The flowtube 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 flowtubes with lining protectors or a grounding electrode) require only one gasket on each end connection, as shown in Figure 4-8. If grounding rings are used, gaskets are required on each side of the grounding ring, as shown in Figure 4-9.

Figure 4-8. Gasket Placement

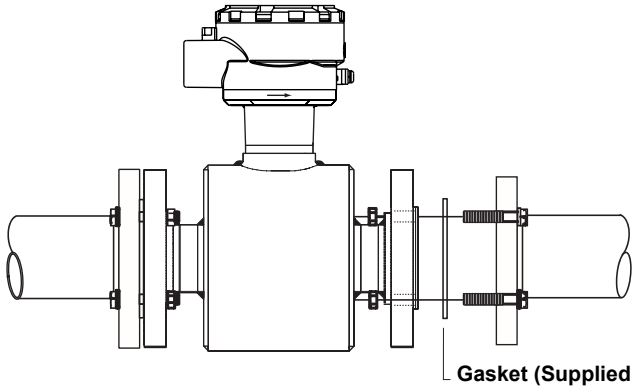
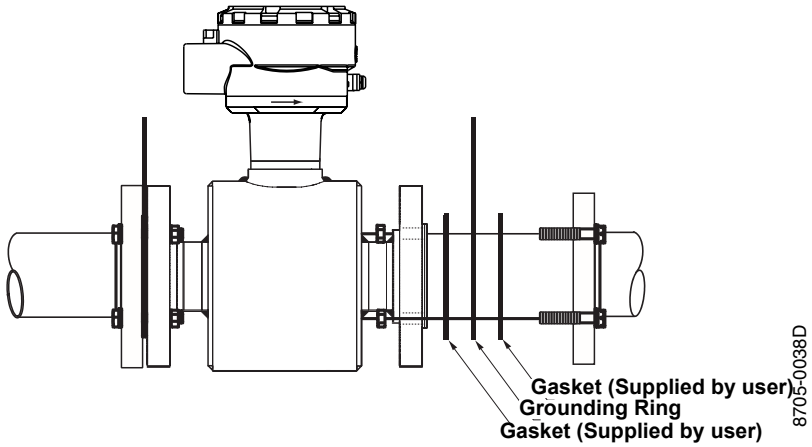


Figure 4-9. Gasket Placement with Non-attached Grounding Rings



Flange Bolts

Suggested torque values by flowtube line size and liner type are listed in Table 4-1 on page 4-8 for ASME B16.5 (ANSI) flanges and Table 4-2 and Table 4-3 for DIN flanges. Consult the factory for other flange ratings. Tighten flange bolts in the incremental sequence as shown in Figure 4-10. See Table 4-1 and Table 4-2 for bolt sizes and hole diameters.

⚠ See ”Safety Messages” on pages 4-1 and 4-2 for complete warning information.

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 left and then snug and tighten right. Failure to do so will 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 flowtubes require a second torquing twenty-four hours after initial flange bolt tightening.

Table 4-1. Flange Bolt Torque Specifications for Rosemount 8705 and 8707 High-Signal Flowtubes

		Teflon/Tefzel 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 4-1 and 4-2 for complete warning information.

Table 4-2. Flange Bolt Torque and Bolt Load Specifications for Rosemount 8705

		Teflon/Tefzel liner							
Size Code		PN10		PN 16		PN 25		PN 40	
	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 4-10. Flange Bolt Torquing Sequence

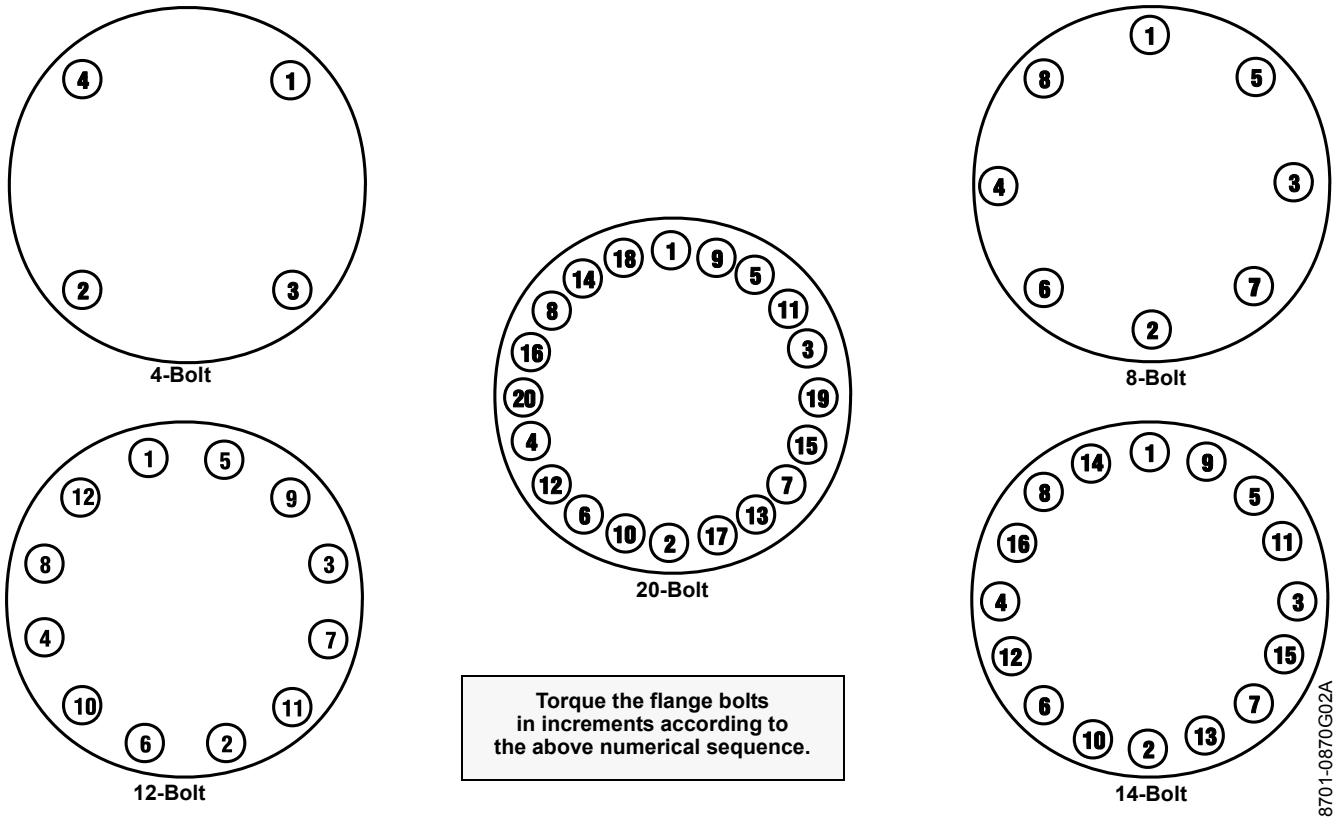


Table 4-3. Flange Bolt Torque and Bolt Load Specifications for Rosemount 8705

Size Code	Line Size	Polyurethane Liner							
		PN 10		PN 16		PN 25		PN 40	
		(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 FLOWTUBE)

The following section should be used as a guide in the installation of the Rosemount 8711 Flowtube. Refer to page 4-7 for installation of the flange-type Rosemount 8705 and 8707 High-Signal flowtube.

Gaskets

⚠ The flowtube 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 flowtube. 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 flowtube between the pipe flanges. Stud specifications are listed in Table 4-4. **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.**

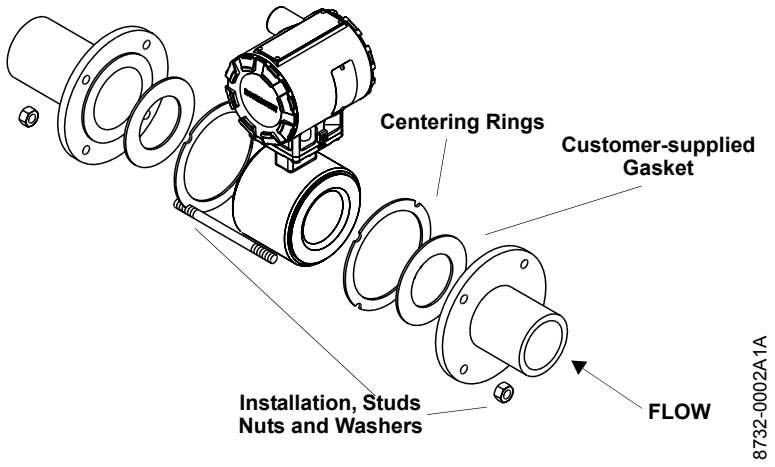
Table 4-4. Stud Specifications

Nominal Flowtube 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 flowtube 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 4-5. Do not overtighten the bolts or the liner may be damaged.

NOTE
On the 4- and 6-inch PN 10–16, insert the flowtube with rings first and then insert the studs. The slots on this ring scenario are located on the inside of the ring.

Figure 4-11. Gasket Placement with Centering Rings



Flange Bolts

Flowtube sizes and torque values for both Class 150 and Class 300 flanges are listed in Table 4-5. Tighten flange bolts in the incremental sequence, shown in Figure 4-10.

Always check for leaks at the flanges after tightening the flange bolts. All flowtubes require a second torquing 24 hours after initial flange bolt tightening.

Table 4-5. Flange bolt Torque Specifications of Rosemount 8711 Flowtubes

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 FLOWTUBE)

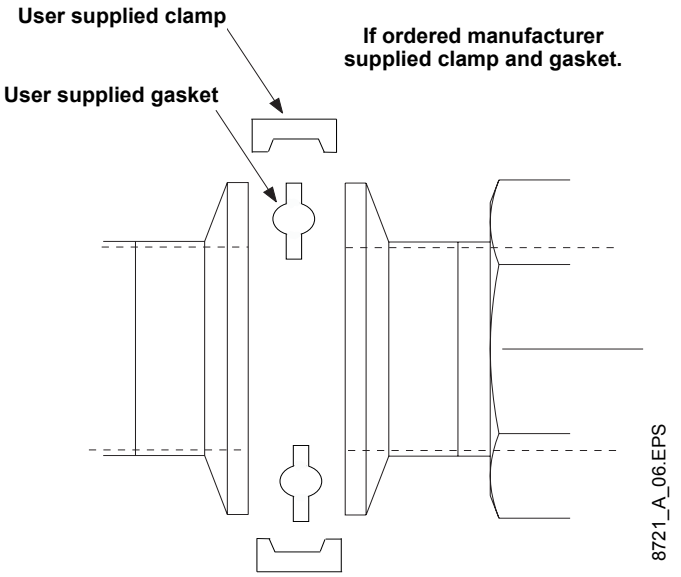
Gaskets

The flowtube 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 flowtubes 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 4-12. Rosemount 8721 Sanitary Installation



GROUNDING

Process grounding the flowtube is one the most important details of flowtube 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 4-6 to determine which grounding option to follow for proper installation.

NOTE
Consult factory for installations requiring cathodic protection or situations where there are high currents or high potential in the process.

The flowtube 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 flowtube 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 4-6. Grounding Installation

	Grounding Options			
Type of Pipe	**No Grounding Options**	**Grounding Rings**	**Grounding Electrodes**	**Lining Protectors**
Conductive Unlined Pipe	See Figure 4-13	Not Required	Not Required	See Figure 4-14
Conductive Lined Pipe	Insufficient Grounding	See Figure 4-14	See Figure 4-13	See Figure 4-14
Non-Conductive Pipe	Insufficient Grounding	See Figure 4-15	See Figure 4-16	See Figure 4-15

Figure 4-13. No Grounding Options or Grounding Electrode in Lined Pipe

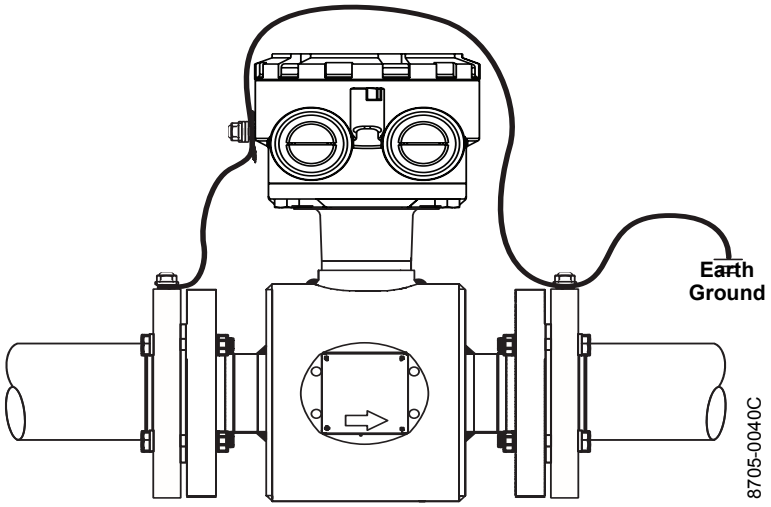


Figure 4-14. Grounding with Grounding Rings or Lining Protectors

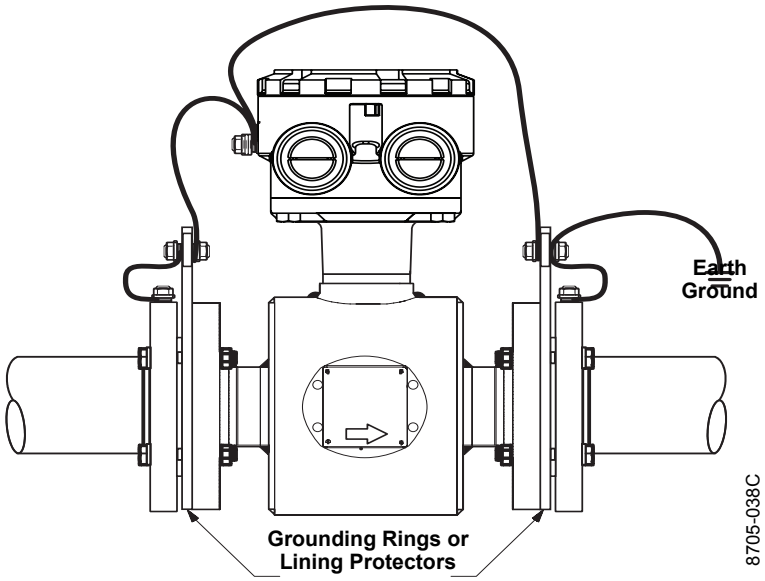


Figure 4-15. Grounding with Grounding Rings or Lining Protectors

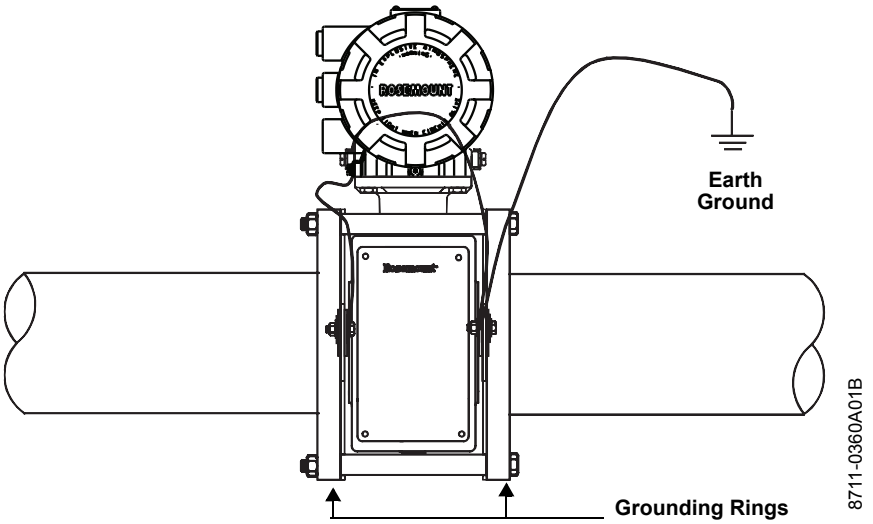
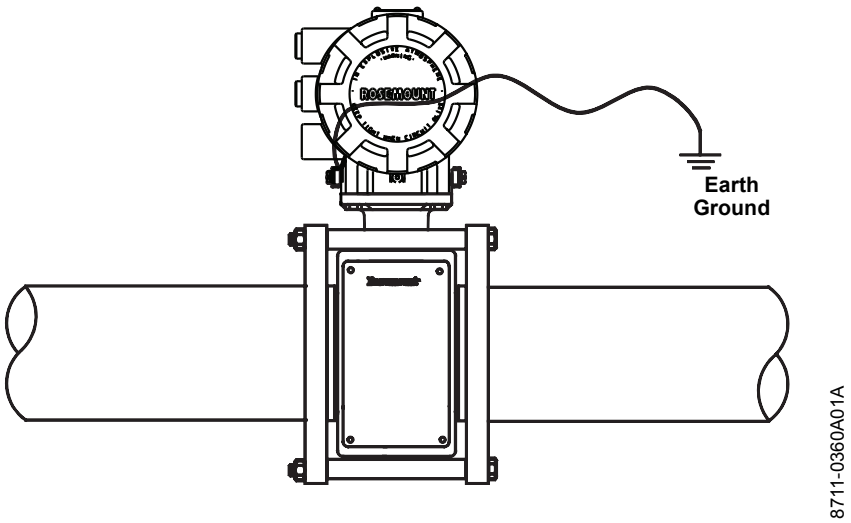


Figure 4-16. Grounding with Grounding Electrodes



PROCESS LEAK PROTECTION (OPTIONAL)

The Rosemount 8705 Flowtube housing is fabricated from carbon steel to perform two separate functions. First, it provides shielding for the flowtube 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.

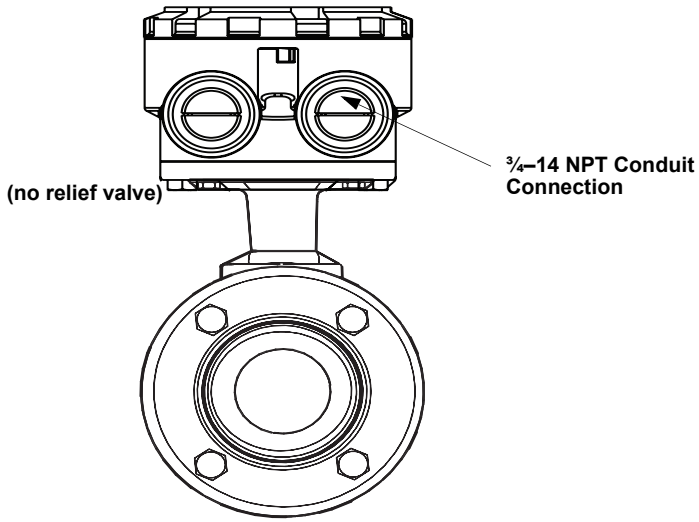
The three housing configurations are identified by the W0, W1, or W3 in the model number option code when ordering. Below are brief descriptions of each housing configuration, which are followed by a more detailed overview.

- **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 flowtube 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 flowtube 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 flowtube from exposure to the pressure fluid (Figure 4-17).

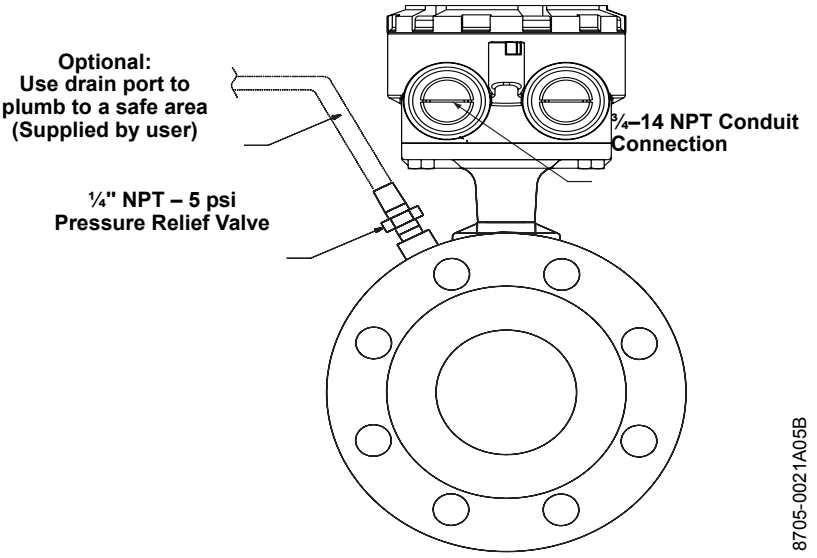
Figure 4-17. Standard Housing — Configuration Sealed Welded Housing (Option Code W0)



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 flowtube 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 4-18).

Figure 4-18. Coil-Housing Configuration — Standard Welded Housing With Relief Valve (Option Code W1)



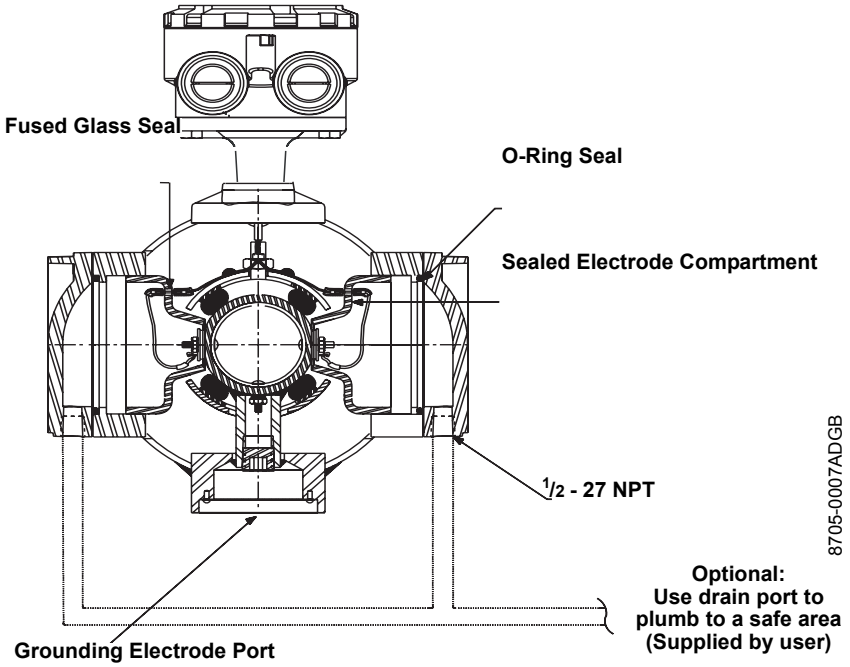
Process Leak Containment

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 flowtube; 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 4-19. 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 4-19).

Section 5 Maintenance and Troubleshooting

This section covers basic transmitter and flowtube 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.

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 flowtube and transmitter is consistent with the appropriate FM or CSA approval.

Do not connect a Rosemount 8712D to a non-Rosemount flowtube 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 Magnetic Flowmeter Transmitter performs self diagnostics on the entire magnetic flowmeter system: the transmitter, the flowtube, 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 3-2 for a quick guide to solve the most common installation problems. For existing magmeter installations, Table 5-3 lists the most common magmeter problems and corrective actions.

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 5-1. Rosemount 8712D Diagnostic Messages

Symptom	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 D: Wiring Diagrams
	Electrode Error	Perform flowtube tests C and D (see Table 5-4 on page 5-8)
	Conductivity less than 5 microhms per cm	Increase Conductivity to less or equal than 5 microhms per cm
"Coil Open Circuit"	Improper wiring	Check coil drive wiring and flowtube coils Perform flowtube test A - Flowtube Coil
	Other manufacturer's flowtube	Change coil current to 75 mA
	Circuit Board Failure	Replace Rosemount 8712D 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 Appendix D: Wiring Diagrams
	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 flowtube 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 flowtube calibration number with 1000005010000001
	Wrong tube size selected	Correct tube size setting - See "Line Size" on page 3-8
	Flowtube failure	Perform flowtube tests C and D (see Table 5-4 on page 5-8)
"Electronics Failure"	Electronics self check failure	Replace Electronics
"Reverse Flow"	Electrode or coil wires reverse	Verify wiring between flowtube and transmitter
	Flow is reverse	Turn ON Reverse Flow Enable to read flow
	Flowtube installed backwards	Re-install flowtube 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 9 and 10	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
"Analog Out of Range"	Flow rate is greater than analog output Range	Reduce flow, increase Analog Output Range
"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 flowtube coils Perform flowtube test A - Flowtube Coil (see Table 5-4 on page 5-8)

Table 5-1. Rosemount 8712D Diagnostic Messages

Symptom	Potential Cause	Corrective Action
"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 flowtube calibration number with 1000005010000001
	Calibrator is not set to 30 FPS	Change calibrator setting to 30 FPS
	Bad calibrator	Replace calibrator

Table 5-2. Basic Troubleshooting–Rosemount 8712D

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 Field Calibrator or replace the electronic board
	Analog output improperly configured	Check the analog power switch
Output at 4 mA	Open coil drive circuit	Check coil drive circuit connections at the flowtube 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 9 and 10 to deactivate the PZR
	Flow is in reverse direction	Enable Reverse Flow function
	Shorted coil	Coil check – perform flowtube test
	Empty pipe	Fill pipe
	Electronics failure	Verify transmitter operation with an 8714 Field Calibrator or replace the electronic board
Output at 21.6 mA	Transmitter not ranged properly	Reset the transmitter range values – see "LRV (Lower Range Value)" on page 3-8; Check tube size setting in transmitter and make sure it matches your actual tube size – see "Line Size" on page 3-8
Output at alarm level	Electronics failure	Cycle power by removing and installing the power fuse. If alarm is still present, verify transmitter operation with an 8714 Field Calibrator or replace the electronic board
Pulse output at zero, regardless of flow	Wiring error	Check pulse output wiring at terminals 5 and 6. Refer to wiring diagram for your flowtube and pulse output
	PZR activated	Remove signal at terminals 9 and 10 to deactivate the PZR.
	No power to transmitter	Check pulse output wiring at terminals 5 and 6. Refer to wiring diagram for your flowtube and pulse output
	Reverse flow	Enable Reverse Flow function
	Electronics failure	Verify transmitter operation with an 8714 Field Calibrator or replace the electronic board
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); 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 Table 3-2 for the LOI or Handheld Communicator messages.

TRANSMITTER TROUBLESHOOTING

Table 5-3. Advanced Troubleshooting–Rosemount 8712D

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, flowtube, communicator, and/or control system Check these other transmitter settings: •Flowtube calibration number •Units •Line size Perform a loop test to check the integrity of the circuit – see "Analog Output Test" on page 5-6
	Electrode Coating	Use bulletnose electrodes; Downsize flowtube to increase flow rate above 3 ft/s; Periodically clean flowtube
	Air in line	Move the flowtube to another location in the process line to ensure that it is full under all conditions.
	Moisture problem	Perform the flowtube Tests A, B, C, and D (see Table 5-4 on page 5-8)
	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 flowtube
	Auto zero was not performed when the coil drive frequency was changed from 5 Hz to 37 Hz	Perform the auto zero function
	Flowtube failure–Shorted electrode	Perform the flowtube Tests C and D (see Table 5-4 on page 5-8)
	Flowtube failure–Shorted or open coil	Perform the flowtube Tests A and B (see Table 5-4 on page 5-8)
	Transmitter failure	Verify transmitter operation with an 8714 Field Calibrator 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 flowtube to increase flow rate above 3 ft/s. Periodically clean flowtube.
	Air in line	Move the flowtube to another location in the process line to ensure that it is full under all conditions.
	Low conductivity fluids (below 10 micromhos/cm)	• Trim electrode and coil wires – see "Conduit Cables" on page 2-14 • Keep flow rate below 3 FPS • Integral mount transmitter • Use 8712-0752-1,3 cable • Use N0 approval flowtube

Advanced Troubleshooting continued on next page

Table 5-3. Advanced Troubleshooting–Rosemount 8712D

Symptom	Potential Cause	Corrective Action
Meter output is unstable	Medium to low conductivity fluids (10–25 micromhos/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 2-14 • 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
	Flowtube failure	Perform the flowtube Tests A, B, C, and D (See Table 5-4 on page 5-8)
	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, flowtube, communicator, and/or control system Check these other transmitter settings: Flowtube calibration number Units Line size
	Electrode coating	Use bulletnose electrodes in the Rosemount 8705 Flowtube. Downsize the flowtube to increase the flow rate above 3 ft/s. Periodically clean the flowtube
	Air in line	Move the flowtube 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 flowtube
	Insufficient upstream/downstream pipe diameter	Move flowtube 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 flowtube 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
	Flowtube failure—shorted electrode	See Table 5-4 on page 5-8
	Flowtube failure—shorted or open coil	See Table 5-4 on page 5-8
	Transmitter failure	Replace the electronics board
	Transmitter wired to correct flowtube	Check wiring

Advanced Troubleshooting continued on next page

Table 5-3. Advanced Troubleshooting–Rosemount 8712D

Symptom	Potential Cause	Corrective Action
Noisy process	Chemical additives upstream of magnetic flowmeter	Complete the possible solutions listed under "Step 2: Process Noise" on page 5-7 Move the injection point downstream of the magnetic flowmeter, or move the magnetic flowmeter
	Sludge flows—mining/coal/sand/ slurries (other slurries with hard particles)	Decrease the flow rate below 10 ft/s
	Styrofoam or other insulating particles in the process	Complete the possible solutions listed under "Step 2: Process Noise" on page 5-7 Consult the factory.
	Electrode coating	Use bulletnose electrodes in the Rosemount 8705 Flowtube Use a smaller flowtube to increase the flow rate above 3 ft/s Periodically clean the flowtube
	Air in the line	Move the flowtube to another location in the process line to ensure that it is full under all conditions
Meter output is unstable	Electrode incompatibility	Check the Magnetic Flowmeter Material Selection Guide (00816-0100-3033) for chemical compatibility with electrode material located on www.rosemount.com
	Improper grounding	See "Grounding" on page 4-12
	High local magnetic or electric fields	Move the magnetic flowmeter (5 ft away is usually acceptable)
	Sticky valve (Look for periodic oscillation of meter output)	Service valve

DIAGNOSTICS AND SERVICE

Analog Output Test

Fast Keys	1, 2, 2
LOI Key	Aux. Function

The *analog output test* allows you to drive the transmitter output to a desired electrical current output on terminals 7 and 8. 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.

Pulse Output Test

Fast Keys	1, 2, 3
LOI Key	Aux. Function

The *pulse output test* allows you to drive the frequency output at terminals 5 and 6 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.

Self Test

Fast Keys	1, 2, 1, 2
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.

QUICK TROUBLESHOOTING

Step 1: Wiring Errors

The most common magmeter problem is wiring between the flowtube 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 Section 2: Installation, “Transmitter to Flowtube Wiring” on page 2-12.

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 flowtube installed in the process. The flowtube 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 3-15).
2. Increase the damping (see “Damping” on page 3-9).

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 Flowtube Tests

If a problem with an installed flowtube is identified, Table 5-4 can assist in troubleshooting the flowtube. Before performing any of the flowtube tests, disconnect or turn off power to the transmitter. To interpret the results, the hazardous location certification for the flowtube 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 flowtube junction box. If the flowtube 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 flowtube may provide incorrect or inconclusive information and should be avoided. A flowtube circuit diagram is provided in Figure 5-1 on page 5-9.

Table 5-4. Flowtube Test

Test	Flowtube Location	Required Equipment	Measuring at Connections	Expected Value	Potential Cause	Corrective Action
A. Flowtube Coil	Installed or Uninstalled	Multimeter	1 and 2 = R	$2\Omega \leq R \leq 18\Omega$	• Open or Shorted Coil	• Remove and replace flowtube
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 flowtube
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 flowtube and dry • Clean terminal block • Confirm with flowtube 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: $\lvert R_1 - R_2 \rvert \leq 300\Omega$ N5, E5, CD, ED: $\lvert R_1 - R_2 \rvert \leq 1500\Omega$	• 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 flowtube wall • Use bulletnose electrodes • Repeat measurement • Pull tube, complete test in Table 5-5 and Table 5-6 on page 5-10 out of line.

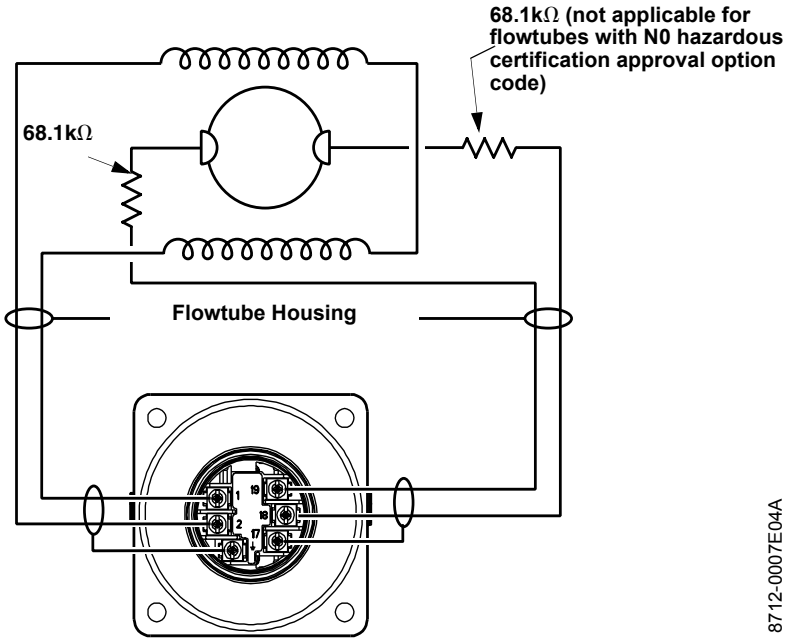
To test the flowtube, a multimeter capable of measuring conductance in nanosiemens is preferred. Nanosiemens is the reciprocal of resistance.

$$1\text{nanosiemens} = \frac{1}{1\text{gigaohm}}$$

or

$$1\text{nanosiemens} = \frac{1}{1 \times 10^{9}\text{ohm}}$$

Figure 5-1. Flowtube Circuit Diagram

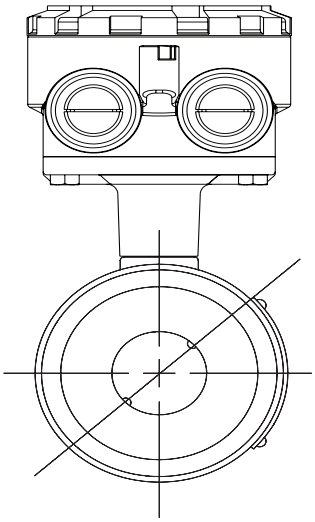


Step 4: Uninstalled Flowtube Tests

⚠ An uninstalled flowtube can also be used for flowtube troubleshooting. To interpret the results, the hazardous location certification for the flowtube 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 flowtube circuit diagram is provided in Figure 5-1. Take measurements from the terminal block and on the electrode head inside the flowtube. 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 flowtubes, electrode 18 is near the flowtube junction box and electrode 19 is near the bottom of the flowtube (Figure 5-2). The different flowtube models will have slightly different resistance readings. Flanged flowtube resistance readings are in Table 5-5 while wafer flowtube resistance readings are in Table 5-6.

Figure 5-2. 45° Electrode Plane



8711-8711f01a

To insure accuracy of resistance readings, zero out multimeter by shorting and touching the leads together.

Table 5-5. Uninstalled Rosemount 8705 / 8707 Flanged Flowtube Tests

Measuring at Connections	Hazardous Location Certifications	
	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 5-6. Uninstalled Rosemount 8711 Wafer Flowtube Tests

Measuring at Connections	Hazardous Location Certification	
	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.

Appendix A Reference Data

SPECIFICATIONS

Functional Specifications

Flowtube Compatibility
Rosemount 8712D is compatible with all Rosemount flowtubes: 8705, 8707, 8711, 8721, and 570TM. The 8712D is also compatible with AC and DC powered flowtubes of other manufacturers.

Flowtube Coil Resistance
2.25 Ω to 500 Ω

Flowtube Coil Inductance
11mH to 1500mH

Flow Rate Range
Capable of processing signals from fluids that are traveling between 0.01 and 39.3 ft/s (0.003 to 12 m/s) for both forward and reverse flow in all flowtube sizes. Full scale continuously adjustable between –39.3 and 39.3 ft/s (–12 to 12 m/s).

Conductivity Limits

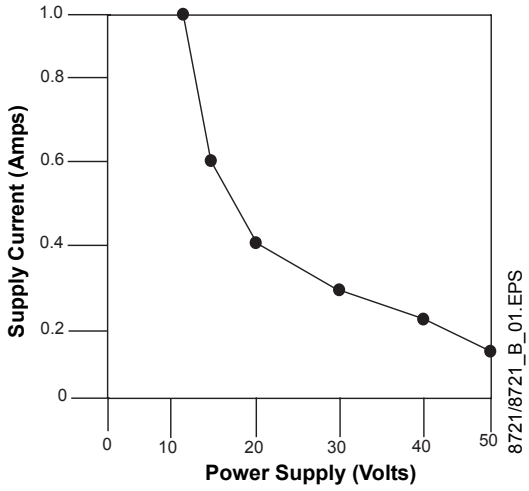
Process liquid must have a conductivity of 5 microsiemens/cm (5 micromhos/cm) or greater. Excludes the effect of interconnecting cable length in remote mount transmitter installations. For best performance, keep cable lengths as short as possible in low conductivity fluids.

Power Supply

90-250 V ac, 50–60 Hz or 12–42 V dc

Supply Current Requirements

Units powered by 12-42 V dc power supply may draw up to 1 amp of current.



Installation Coordination

Installation (overvoltage) Category II

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)

Humidity Limits

0–95% RH at 120 °F (49 °C)

Enclosure Ratings

NEMA 4X, CSA Enclosure Type 4X, IEC 529, IP65, Pollution Degree II

Input/Output Signals

Analog Output Adjustment

4–20 mA, switch-selectable as internally or externally powered 5 to 30 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 -39.3 and 39.3 ft/s (-12 to 12 m/sec), 1 ft/s (0.3 m/s) minimum span.

HART Communications, digital flow signal, superimposed on 4–20 mA signal, available for control system interface. A minimum of 250 Ω required for HART communications. Analog output will remain linear to 105% of span. (Maximum output value of 20.8 mA.)

Scalable Frequency Adjustment

0-10,000Hz, externally powered at 5 to 24 V dc, solid state switch closure supports loads up to 2W for frequencies up to 4000Hz, and 5 V dc loads at 0.1 W at maximum frequency of 10,000 Hz. Pulse can be set to equal desired velocity or volume in user selectable engineering units. Pulse width is adjustable from 1.5 to 500 msec. Below 1.5 msec pulse width the pulse automatically switches to 50% duty cycle. Pulse output will remain linear to 11,000 Hz.

Auxiliary Output Function

Externally powered at 5 to 28 V dc, solid state switch closure up to 2 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.

Positive Zero Return (PZR)

Externally powered at 5 to 28 V dc, solid state input up to 2 W, requests that the transmitter forces outputs to the zero flow rate signal level.

Software Lockout

Security lockout switch on the electronics board can be set to deactivate all LOI and HART-based communicator functions, protecting configuration variables from unwanted or accidental change. The Totalizer is not locked out when the security lockout switch is in the “ON” position (see “Hardware Switches” on page 2-4 for more information).

Output Testing

Analog Output Test

Transmitter may be set to supply a specified current between 3.50 and 23.25 mA

Pulse Output Test

Transmitter may be set to supply a specified frequency between 1 Hz and 10,000 Hz

Turn-on Time
5 minutes to rated accuracy from power up, 5 seconds from power interruption

Start-up Time
50 milliseconds from zero flow

Low Flow Cutoff
Adjustable between 0.01 and 1 ft/s (0.003 and 0.3 m/s). Below selected value, output is driven to the zero flow rate signal level.

Damping
Adjustable between 0.0 and 256 seconds from the LOI. Adjustable between 0.2 and 256 seconds from the 275 / 375 Handheld Communicators.

Flowtube Compensation
Rosemount flowtubes are flow-calibrated and assigned a calibration factor at the factory. The calibration factor is entered into the transmitter, enabling interchangeability of flowtubes without calculations or a compromise in accuracy.

8712D transmitters and other manufacturer's flowtubes 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 known flow rate.

Performance Specifications

(System specifications are given using the frequency output and with the unit at referenced conditions.)

Accuracy

Rosemount 8712D with 8705 and 8721 Flowtube
System accuracy is ±0.5% of rate from 1 to 39.3ft/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. Analog output has the same accuracy as frequency output plus an additional 0.10% of span.

Rosemount 8712D with 8711 Flowtube
System accuracy is ±0.5% of rate from 3 to 39.3 ft/s (0.9 to 12 m/s); below 3 ft/s (0.9 m/s), the system has an accuracy of ±0.015 ft/s (0.005 m/s). Analog output has the same accuracy as frequency output plus an additional 0.10% of span.

Rosemount 8712D with Other Manufacturers' Flowtubes
When calibrated in the Rosemount Flow Facility, system accuracies as good as 0.5% of rate can be attained. Analog output has the same accuracy as frequency output, plus an additional 0.10% of span.
There is no accuracy specification for other manufacturers' flowtubes calibrated in the process line.

Vibration Effect
±0.1% of minimum span
IEC 770-1984, Section 6.2.14, Extreme vibration levels (3Gs)

Repeatability
±0.1% of reading

Response Time (Analog Output)
50 milliseconds maximum response to step change in input

Stability
±0.1% of rate over six months

Ambient Temperature Effect
0.25% of rate over operating temperature range

RFI Effect
EN 61326 / 1997, NAMUR NE21 / 1997, CISPR 11 Class B Level

Supply Voltage Effect
Voltage Effect: 0.05% of span for 90 to 250 V AC rms
Frequency Effect: 0.1% of span for 47 to 64 Hz

Dead Time
At 5 Hz, up to 100 mS
At 37Hz, up to 13.3 mS

Physical Specifications

Materials of Construction

Housing
Low-copper aluminum

Paint
Polyurethane

Cover Gasket
Rubber

Electrical Connections

Three ¾–14 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 flowtube.

Line Power Fuses

90–250 V ac systems (8712D)
1 amp, Quick-acting Bussman AGC1 or equivalent

12-42 V dc systems
3 amp, Quick-acting Bussman AGC3 or equivalent

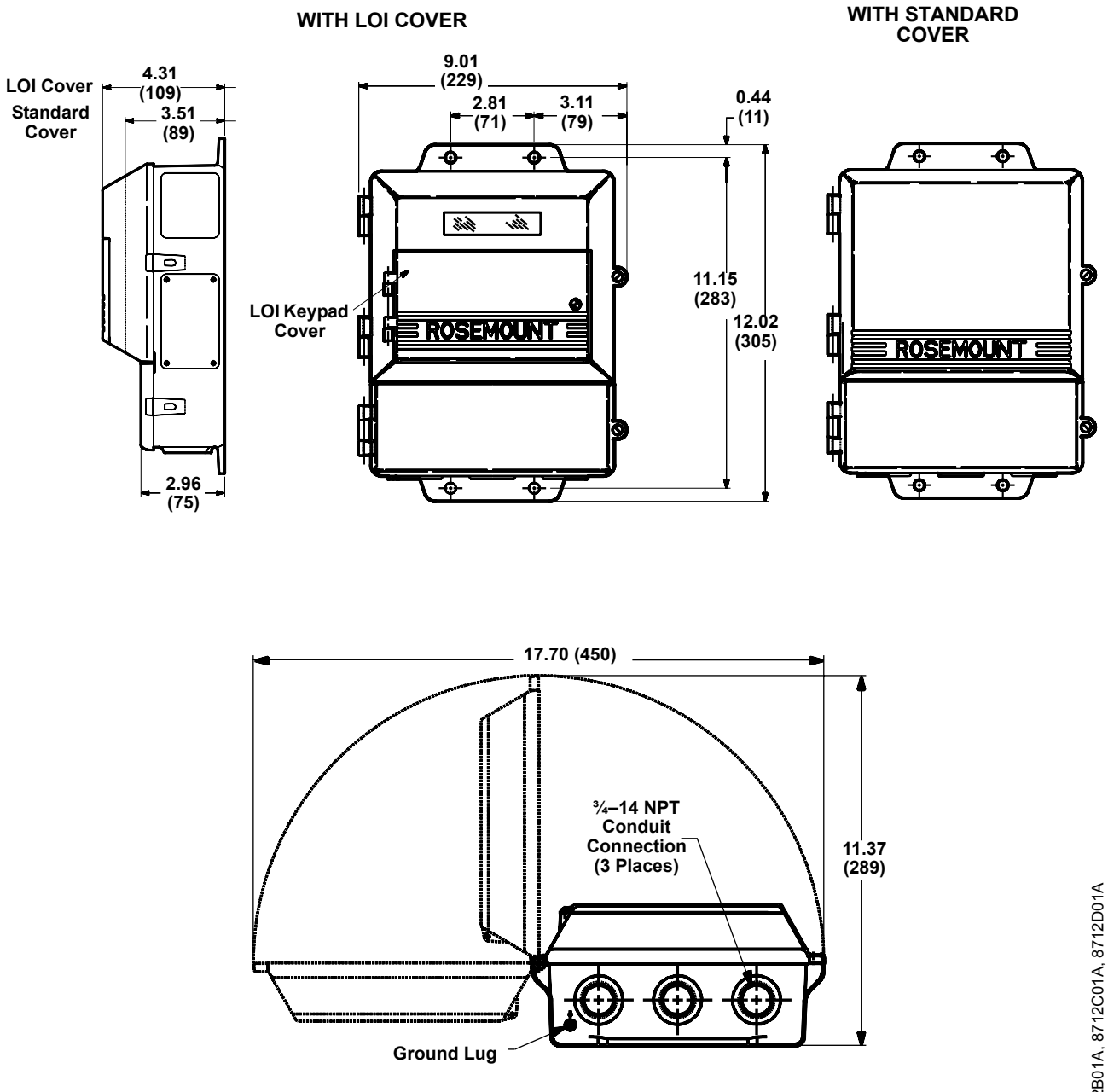
Transmitter Weight

Transmitter approximately: 6.74 lbs. (3.06 kg)

Transmitter with local operator interface: 7.34 lbs. (3.33 kg)

DIMENSIONAL DRAWINGS

Figure A-1. Rosemount 8712D Transmitter



NOTE
Dimensions are in inches (millimeters)

8712-12A01A, 8712B01A, 8712C01A, 8712D01A

ORDERING INFORMATION

Model	Product Description	Availability
8712D [1]	Magnetic Flowmeter Transmitter	•
Code	**Transmitter Style**	
R	Remote (2-inch pipe or surface mounting)	•
Code	**Power Supply Voltage**	
03	12–42 V dc	•
12	90-250 V ac, 50–60 Hz	•
Code	**Product Certifications**	
N0	Factory Mutual (FM) Class I, Division 2 Approval for nonflammable fluids; Canadian Standards Association (CSA) Class I, Division 2 Approval; CE Marking	•
N5	Factory Mutual (FM) Class I, Division 2 Approval for flammable fluids; CE Marking	•
Code	**Options**	
B6	Stainless Steel 4-bolt Kit for 2-inch Pipe Mount	•
C1	Custom Configuration (Completed CDS required with order)	•
C4	Analog Output Levels Compliant with NAMUR recommendations NE43, 18-January-1994, and high alarm level[2]	•
CN	Analog Output Levels Compliant with NAMUR recommendations NE43, 18-January-1994, and low alarm level[2]	•
D1	High Accuracy Calibration [0.25% of rate from 3 to 39.3 ft/s (0.9 to 12 m/s)] matched flowtube and transmitter system[3]	•
M4	Local Operator Interface (LOI)	•
J1	CM 20 conduit adapter	•
J2	PG 13.5 conduit adapter	•
Typical Model Number: 8712D R 12 N0 M4		

(1) Totalizer standard on all 8712D transmitters.
(2) NAMUR compliant operation and the Alarm latch options are preset at the factory and can not be changed to standard operation in the field.
(3) Option Code must be selected for both flowtube and transmitter.

Appendix B Approval Information

Approved Manufacturing Locations

Rosemount Inc. — Chanhassen, Minnesota, USA

Fisher-Rosemount Technologias de Flujo, S.A. de C.V. — Chihuahua, Chihuahua, Mexico

EUROPEAN DIRECTIVE INFORMATION

The EC declaration of conformity for all applicable European directives for this product can be found on our website at www.rosemount.com. A hard copy may be obtained by contacting our local sales office.

ATEX Directive

Rosemount Inc. complies with the ATEX Directive.

Type n protection type in accordance with EN50 021

⚠ • Closing of entries in the device must be carried out using the appropriate EExe or EExn 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.

European Pressure Equipment Directive (PED) (97/23/EC)

Model 8705 Magnetic Flowmeter flowtubes in line size and flange combinations:

Line Size: 1 1/2 inch - 3 inch with all flanges available.
QS Certificate of Assessment - EC No. PED-H-20
Module H Conformity Assessment

Line Size: 4 inch - 24 inch with all DIN flanges and ANSI 150 and ANSI 300 flanges.
QS Certificate of Assessment - EC No. PED-H-20
Module H Conformity Assessment

Line Size: 30 inch - 36 inch with AWWA 125 flanges
QS Certificate of Assessment - EC No. PED-H-20
Module H Conformity Assessment

Model 8711 Magnetic Flowmeter Flowtubes
Line Sizes: 1.5, 2, 3, 4, 6, and 8 inch
QS Certificate of Assessment - EC No. PED-H-20
Module H Conformity Assessment

Model 8721 Sanitary Magmeter Flowtubes
in line sizes of 1½ inch and larger:
Module A Conformity Assessment

All other Model 8705/8711/8721 Flowtubes —
Sound Engineering Practice

Flowtubes that are SEP are outside the scope of PED and cannot be marked for compliance with PED.

Mandatory CE-marking for flowtubes in accordance with Article 15 of the PED can be found on the flowtube body (CE 0575).

Flowtubes in category I are assessed for conformity per module A procedures.

Flowtubes in categories II – IV, use module H for conformity assessment procedures.

Electro Magnetic Compatibility (EMC) (89/336/EEC)

EN 50081-1: 1992, EN 50082-2: 1995,
EN 61326: 1997/ A1:1998 / A2: 2001

Installed signal wiring should not be run together and should not be in the same cable tray as AC power wiring.

Device must be properly grounded or earthed according to local electric codes.

To improve protection against signal interference, shielded cable is recommended, see Section 2: Installation for more information.

Low Voltage Directive (93/68/EEC)

EN 61010-1: 1995

Other important guidelines

Only use new, original parts.

To prevent the process medium escaping, do not unscrew or remove process flange bolts, adapter bolts or bleed screws during operation.

Maintenance shall only be done by qualified personnel.

CE Marking is a standard on 8712D.

Compliance with European Union EMC and Low Voltage Directives.

Hazardous Location Certifications

Remote-mounted systems do not require matched hazardous location certification option codes on tube and transmitter.

Transmitter Approval Information

Table B-1. Transmitter Option Codes

Approval Codes	Rosemount 8712D
N0	•
N5	•

North American Certifications

Factory Mutual (FM)

N0 Division 2 Approval (All transmitters)

Class I, Division 2, Groups A, B, C, D
Temp Codes – T4 (at 40°C),

Dust-ignition proof Class II/III, Division 1, Groups E, F, G
Temp Codes – T4 (at 40°C),

Enclosure Type 4X

N5 Division 2 Approval for flowtubes with IS electrodes only

Class I, Division 2, Groups A, B, C, D
Temp Codes – T4 (at 40°C),

Dust-ignition proof Class II/III, Division 1, Groups E, F, G
Temp Codes – T4

Enclosure Type 4X

Canadian Standard Association (CSA)

N0 Division 2 Approval

Class I, Division 2, Groups A, B, C, D
Temp Codes – T4 (at 60°C),

Dust-ignition proof Class II/III, Division 1, Groups E, F, G
Temp Codes – T4 (at 60°C),

Enclosure Type 4X

Flowtube Approval Information

Table B-2. Flowtube Option Codes [1]

Approval Codes	Rosemount 8705 Flowtube		Rosemount 8707 Flowtube		Rosemount 8711 Flowtube	
	For Non-flammable Fluids	For Flammable Fluids	For Non-flammable Fluids	For Flammable Fluids	For Non-flammable Fluids	For Flammable Fluids
N0	•		•		•	
N5	•	•	•	•	•	•
E5					•	•
CD[2]					•	•
KD[2]	•	•				

(1) CE Marking is standard on Model 8705 and 8711. No hazardous location certifications are available on the Model 570TM.
(2) Refer to Table B-3 on page B-6 for relation between ambient temperature, process temperature, and temperature class.

Factory Mutual (FM)

N0 Division 2 Approval for Non-Flammable Fluids (All Flowtubes)

Class I, Division 2, Groups A, B, C, D
Temp Code – T5 (8705/8711 at 60°C)
Temp Code – T3C (8707 at 60°C)

Dust-Ignition proof Class II/III, Division 1, Groups E, F, G
Temp Code – T6 (8705/8711 at 60°C)
Temp Code – T5 (8707 at 60°C)

Enclosure Type 4X

N5 Division 2 Approval for Flammable Fluids (All Flowtubes)

Class I, Division 2, Groups A, B, C, D
Temp Code – T5 (8705/8711 at 60°C)
Temp Code – T3C (8707 at 60°C)

Dust-Ignition proof Class II/III, Division 1, Groups E, F, G
Temp Code – T6 (8705/8711 at 60°C)
Temp Code – T5 (8707 at 60°C)

Enclosure Type 4X

E5 Explosion-Proof (8711 Only)

Explosion-Proof for Class I, Division 1, Groups C, D
Temp Code – T6 at 60°C

Dust-Ignition proof Class II/III, Division 1, Groups E, F, G
Temp Code – T6 at 60°C

Class I, Division 2, Groups A, B, C, D
Temp Code – T5 at 60°C

Enclosure Type 4X

Canadian Standards Association (CSA)

N0 Suitable for Class I, Division 2, Groups A, B, C, D
Temp Code – T5 (8705/8711 at 60°C)
Temp Code – T3C (8707 at 60°C)

Dust-Ignition proof Class II/III, Division 1, Groups E, F, G

Enclosure Type 4X

European Certifications

N1 ATEX Non-Sparking/Non-incendive (8705/8711 Only)

Certificate No: KEMA02ATEX1302X ⟨Ex⟩ II 3G
EEx nA [L] IIC T3... T6

SPECIAL CONDITIONS FOR SAFE USE:
The relation between ambient temperature, process temperature and temperature class is to be taken from the tables under 15 - description) above. (See Table B-5 on page B-7).

The electrical data is to be taken from the summary under (15 - electrical data) above. (See Table B-6 on page B-8).

CD CENELEC Increased Safety (Zone 1) with IS Electrodes (8711 only)

Certificate No: KEMA03ATEX2052X ⟨Ex⟩ II 1/2G
EEx e ia IIC T3... T6 (Ta = -20 to +65°) (See Table B-3)
CE 0575

KD CENELEC Increased Safety (Zone 1) with IS Electrodes (8705 only)

Certificate No. KEMA 03ATEX2052X ⟨Ex⟩ II 1/2G

EEx e ia IIC T3... T6 (Ta = -20 to 65°C) (See Table B-3)

CE 0575

SPECIAL CONDITIONS FOR SAFE USE:
The relation between ambient temperature, process temperature and temperature class is to be taken from the table under (15 - description) above. (See Table B-3).

The electrical data is to be taken from the summary under (15 - electrical data) above. (See Table B-4).

Table B-3. Relation between ambient temperature, process temperature, and temperature class(1)

Meter Size (Inches)	Maximum Ambient Temperature	Maximum Process Temperature	Temperature Class
1/2	149°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	140°F (60°C)	140°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 - 4	149°F (65°C)	266°F (130°C)	T3
3 - 4	149°F (65°C)	194°F (90°C)	T4
3 - 4	131°F (55°C)	131°F (55°C)	T5
3 - 4	104°F (40°C)	104°F (40°C)	T6
6	149°F (65°C)	275°F (135°C)	T3
6	149°F (65°C)	230°F (110°C)	T4
6	149°F (65°C)	167°F (75°C)	T5
6	140°F (60°C)	140°F (60°C)	T6
8 - 36	149°F (65°C)	284°F (140°C)	T3
8 - 36	149°F (65°C)	239°F (115°C)	T4
8 - 36	149°F (65°C)	176°F (80°C)	T5
8 - 36	149°F (65°C)	149°F (65°C)	T6

(1) This table is applicable for CD and KD option codes only.

Table B-4. Electrical Data for Rosemount 8705 and 8711 Flowtubes (1)

Coil excitation circuit	40 V dc (pulsed), 0.5 A, 10 W maximum
Electrode circuit:	in type of explosion protection intrinsic safety EEx ia IIC, 5 V 1 mW maximum, U_m = 250 V

(1) This table is applicable for CD and KD option codes only.

Table B-5. 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 inch flowtube 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 inch flowtube 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 inch flowtube 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)
2.0 inch flowtube 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)

Table B-5. 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
3 to 60 inch flowtube 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.

Table B-6. Electrical Data for Rosemount 8705 and 8711 Flowtubes (1)

Coil excitation circuit	40 V dc (pulsed), 0.5 A, 20 W maximum
Electrode circuit:	U_i=5 V, I_i = 0.2 mA, P_i = mW; C_i and L_i are negligibly small. Under normal operating conditions, the electrical data of the associated flow transmitter shall not exceed the values mentioned above.

(1) This table is applicable for N1 option codes only.

Appendix C Digital Signal Processing

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 flowtube 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.

PROCEDURES

If the output of your Rosemount 8712D 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 8712D coil drive mode is selectable between the standard 5 Hz and the noise-reducing 37 Hz. See “Coil Drive Frequency” on page 3-15 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 flowtube 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 flowtube 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 8712D 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 8712D microprocessor can actually scrutinize each input based on three user-defined parameters to reject the noise specific to the application.

This software technique, known as signal processing, “qualifies” individual flow signals based on historic flow information and three user-definable parameters, plus and 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.

   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

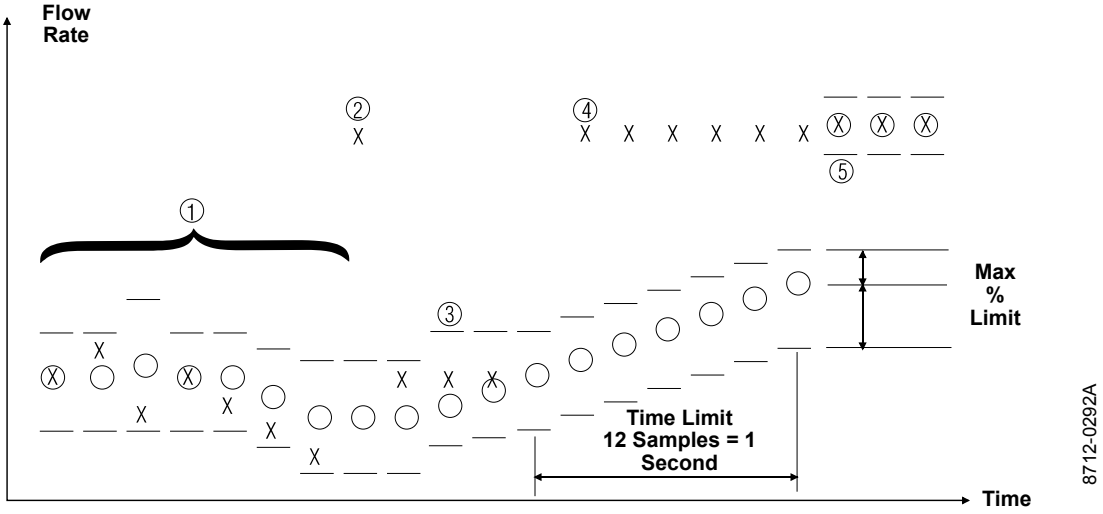
   125 averages the inputs over the past 12.5 seconds

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

Figure C-1. Signal Processing



x: Input flow signal from flowtube.

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 ②above, 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.

When Should Signal Processing Be Used?

The Rosemount 8712D 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.

Appendix D Wiring Diagrams

The wiring diagrams in this section illustrate the proper connections between the Rosemount 8712D and most flowtubes 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' flowtubes is provided. If the manufacturer for your flowtube is not included, see the drawing for generic connections.

ROSEMOUNT FLOWTUBES

Rosemount 8705/8707/8711 Flowtubes to Rosemount 8712D Transmitter

Connect coil drive and electrode cables as shown in Figure D-1.

Figure D-1. Wiring Diagram to a Rosemount 8712D Transmitter

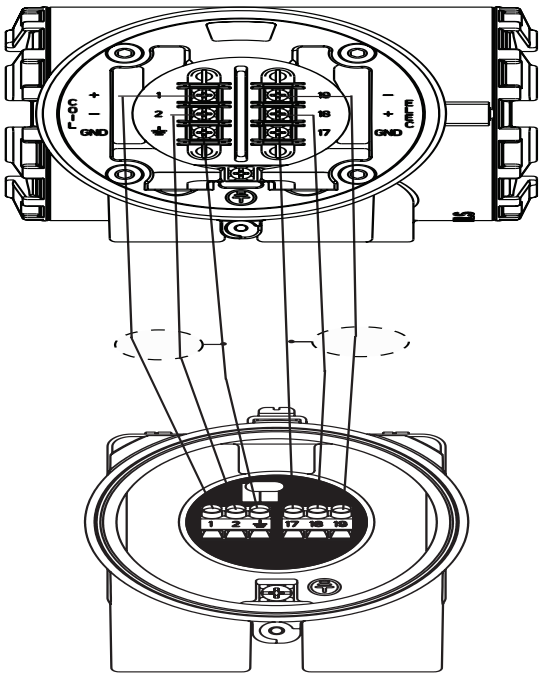
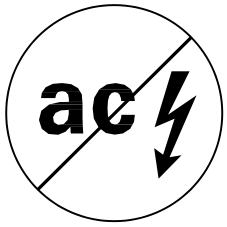


Table D-1. Rosemount 8705/8707/8711 Flowtube Wiring Connections

Rosemount 8712D Transmitters	Rosemount 8705/8707/8711 Flowtubes
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 flowtube or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



Rosemount 8701 Flowtube to Rosemount 8712D Transmitter

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

Figure D-2. Wiring Diagram for Rosemount 8701 Flowtube and Rosemount 8712D Transmitter

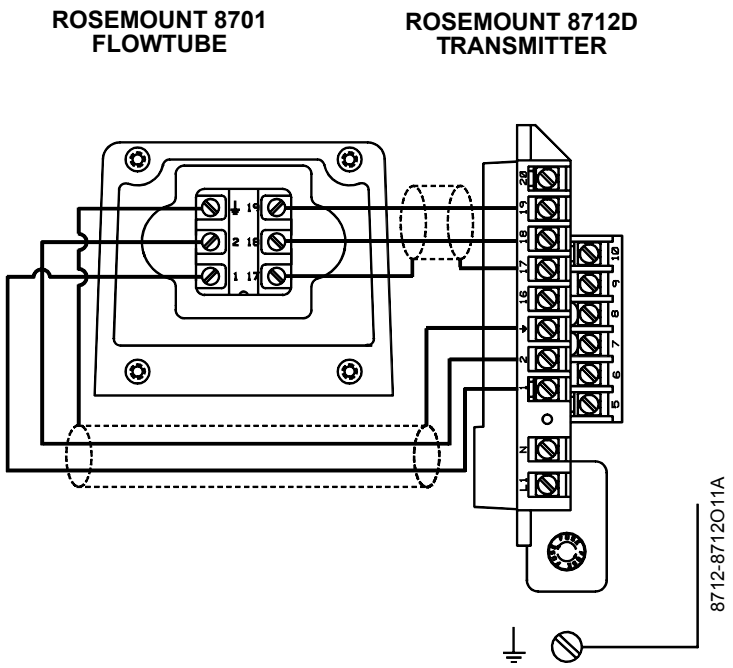
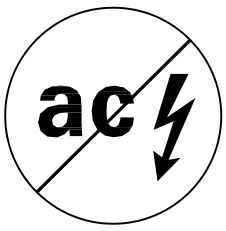


Table D-2. Rosemount 8701 Flowtube Wiring Connections

Rosemount 8712D	Rosemount 8701 Flowtubes
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 flowtube or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



Rosemount 8711 Flowtube to Rosemount 8712D Transmitter

Connect coil drive and electrode cables as shown in Figure D-3.

Figure D-3. Wiring Diagram for Rosemount 8711 Flowtube and Rosemount 8712D Transmitter

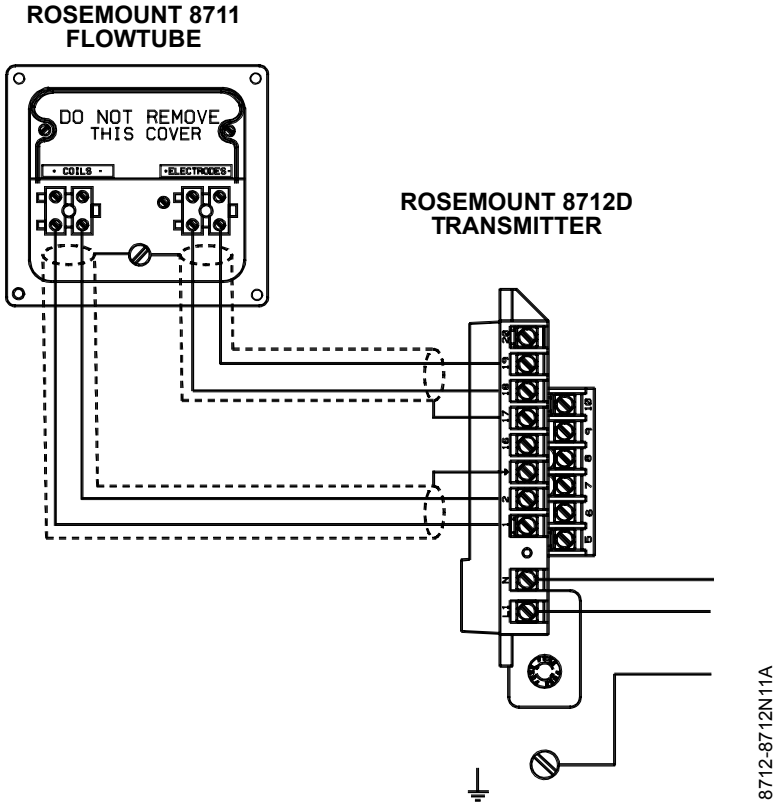
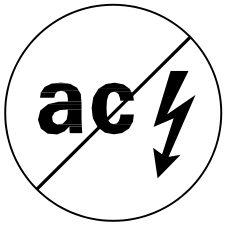


Table D-3. Rosemount 8711 Flowtube Wiring Connections

Rosemount 8712D	Rosemount 8711 Flowtubes
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 flowtube or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



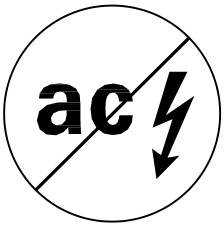
Connecting Flowtubes of Other Manufacturers

Before connecting another manufacturer's flowtube to the Rosemount 8712D transmitter, it is necessary to perform the following functions.

1. Turn off the ac power to the flowtube 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 flowtube 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 flowtube coil is configured for series connection. Other manufacturers flowtubes may be wired in either a series or parallel circuit. All Rosemount magnetic flowtubes are wired in a series circuit. (Other manufacturers AC flowtubes (AC coils) wired for 220V operation are typically wired in parallel and must be rewired in series.)
7. Verify that the flowtube is in good working condition. Use the manufacturer's recommended test procedure for verification of flowtube condition. Perform the basic checks:
   a. Check the coils for shorts or open circuits.
   b. Check the flowtube liner for wear or damage.
   c. Check the electrodes for shorts, leaks, or damage.
8. Connect the flowtube to the transmitter in accordance with reference wiring diagrams. See Appendix D: Wiring Diagrams for specific drawings.
9. Connect and verify all connections between the flowtube 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 flowtube or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



BROOKS FLOWTUBES

Model 5000 Flowtube to Rosemount 8712D Transmitter

Connect coil drive and electrode cables as shown in Figure D-4.

Figure D-4. Wiring Diagram for Brooks Flowtube Model 5000 and Rosemount 8712D

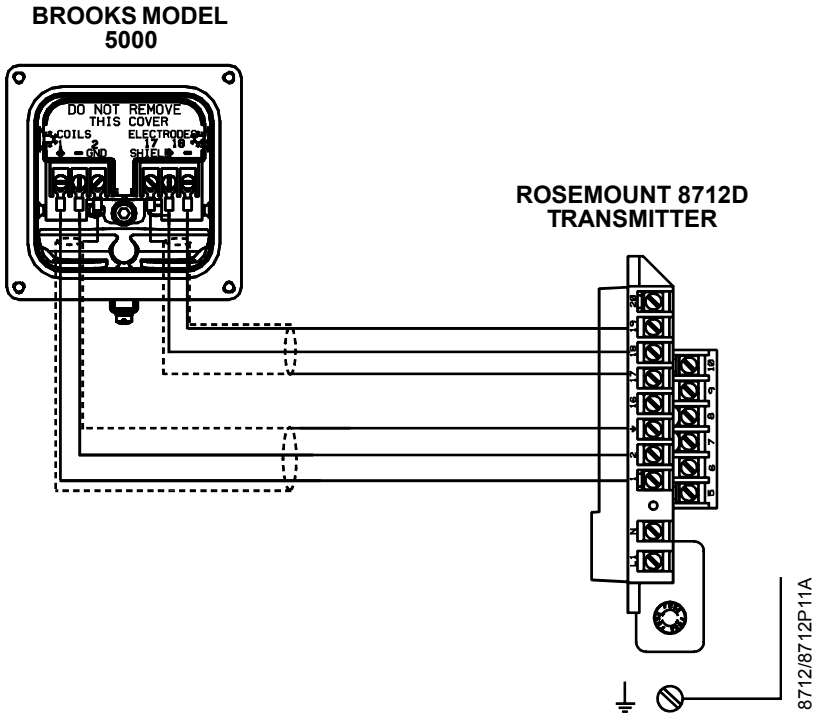
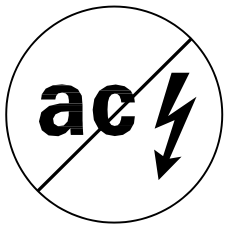


Table D-4. Brooks Model 5000 Flowtube Wiring Connections

Rosemount 8712D	Brooks Flowtubes Model 5000
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 flowtube or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



Model 7400 Flowtube to Rosemount 8712D Transmitter

Connect coil drive and electrode cables as shown in Figure D-5.

Figure D-5. Wiring Diagram for Brooks Flowtube Model 7400 and Rosemount 8712D

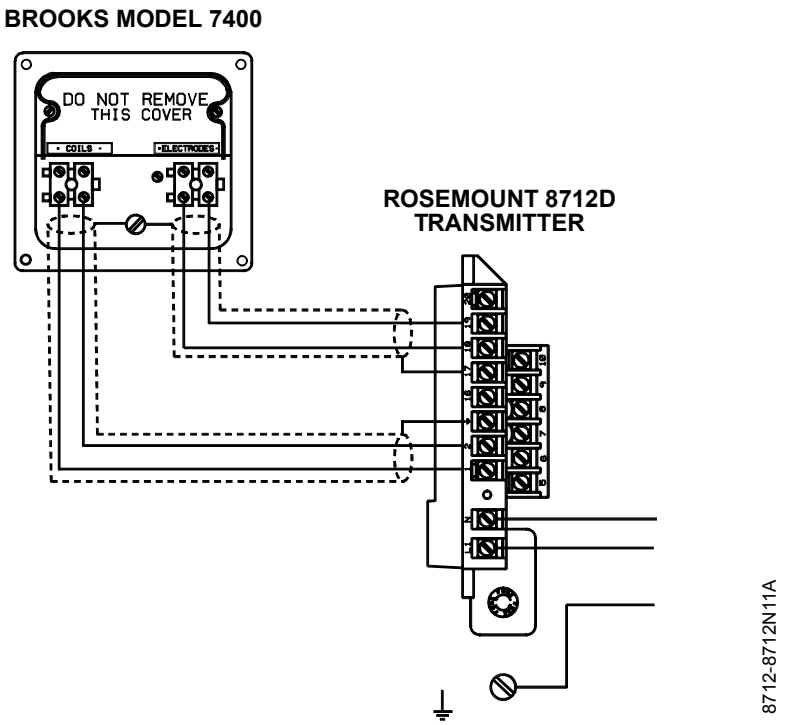
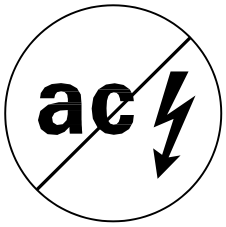


Table D-5. Brooks Model 7400 Flowtube Wiring Connections

Rosemount 8712D	Brooks Flowtubes Model 7400
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 flowtube or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



ENDRESS AND HAUSER FLOWTUBES

Endress and Hauser Flowtube to Rosemount 8712D Transmitter

Connect coil drive and electrode cables as shown in Figure D-6.

Figure D-6. Wiring Diagram for Endress and Hauser Flowtubes and Rosemount 8712D

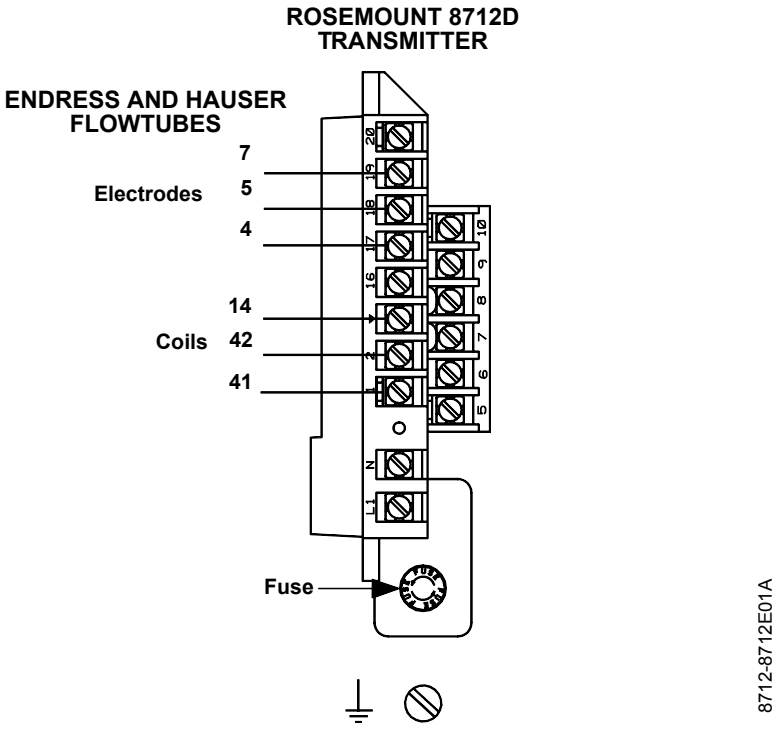
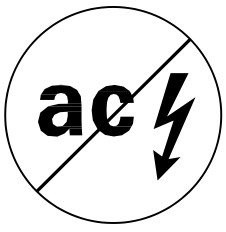


Table D-6. Endress and Hauser Flowtube Wiring Connections

Rosemount 8712D	Endress and Hauser Flowtubes
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 flowtube or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



FISCHER AND PORTER FLOWTUBES

Model 10D1418 Flowtube to Rosemount 8712D Transmitter

Connect coil drive and electrode cables as shown in Figure D-7.

Figure D-7. Wiring Diagram for Fischer and Porter Flowtube Model 10D1418 and Rosemount 8712D

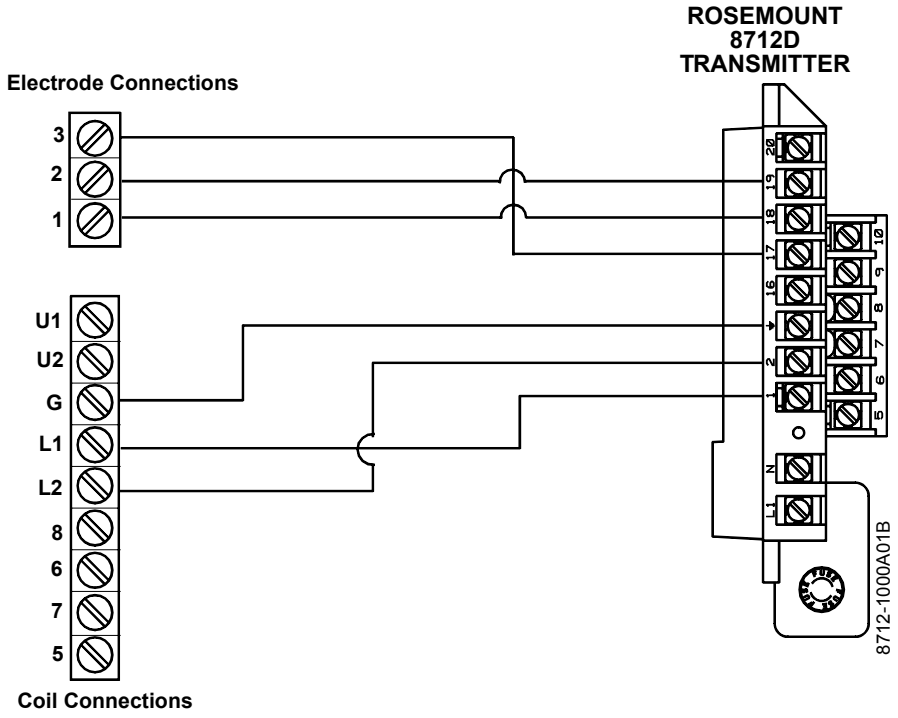
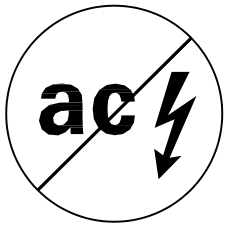


Table D-7. Fischer and Porter Model 10D1418 Flowtube Wiring Connections

Rosemount 8712D	Fischer and Porter Model 10D1418 Flowtubes
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 flowtube or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



Model 10D1419 Flowtube to Rosemount 8712D Transmitter

Connect coil drive and electrode cables as shown in Figure D-8.

Figure D-8. Wiring Diagram for Fischer and Porter Flowtube Model 10D1419 and Rosemount 8712D

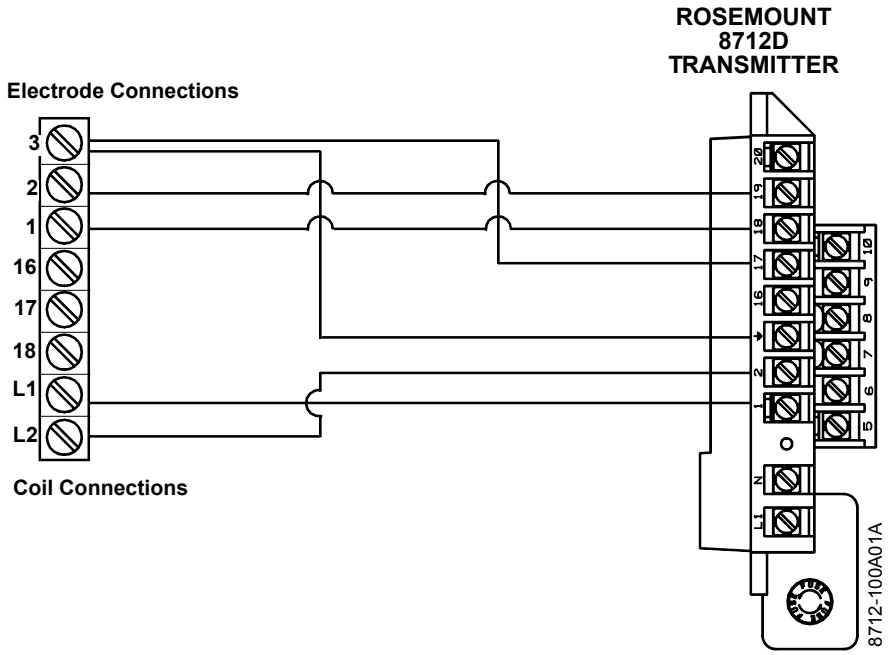
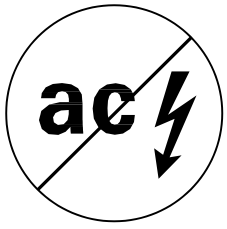


Table D-8. Fischer and Porter Model 10D1419 Flowtube Wiring Connections

Rosemount 8712D	Fischer and Porter Model 10D1419 Flowtubes
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 flowtube or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



Model 10D1430 Flowtube (Remote) to Rosemount 8712D Transmitter

Connect coil drive and electrode cables as shown in Figure D-9.

Figure D-9. Wiring Diagram for Fischer and Porter Flowtube Model 10D1430 (Remote) and Rosemount 8712D

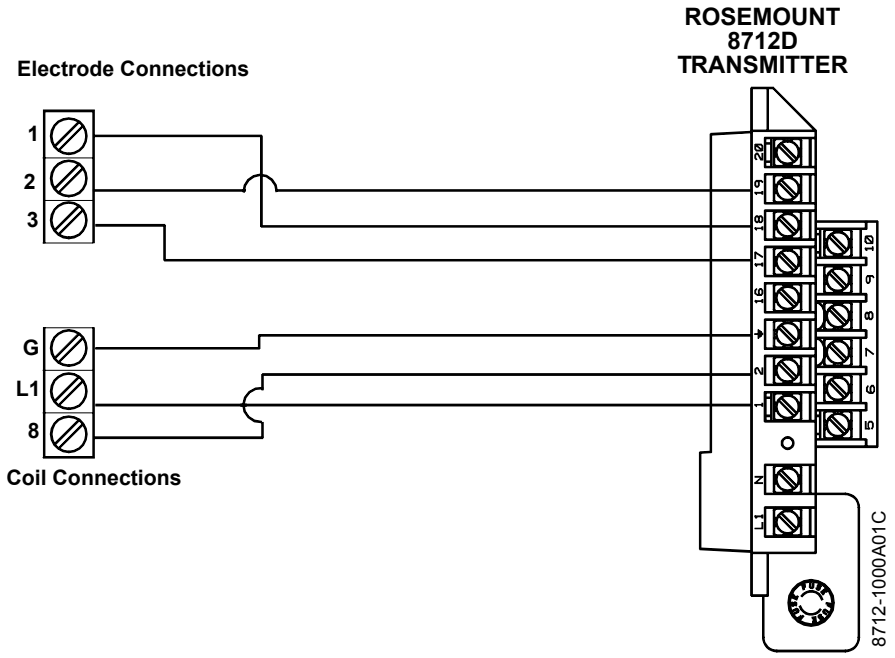
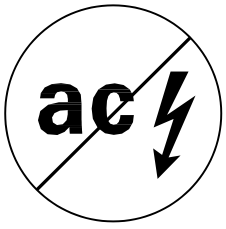


Table D-9. Fischer and Porter Model 10D1430 (Remote) Flowtube Wiring Connections

Rosemount 8712D	Fischer and Porter Model 10D1430 (Remote) Flowtubes
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 flowtube or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



Model 10D1430 Flowtube (Integral) to Rosemount 8712D Transmitter

Connect coil drive and electrode cables as shown in Figure D-10.

Figure D-10. Wiring Diagram for Fischer and Porter Flowtube Model 10D1430 (Integral) and Rosemount 8712D

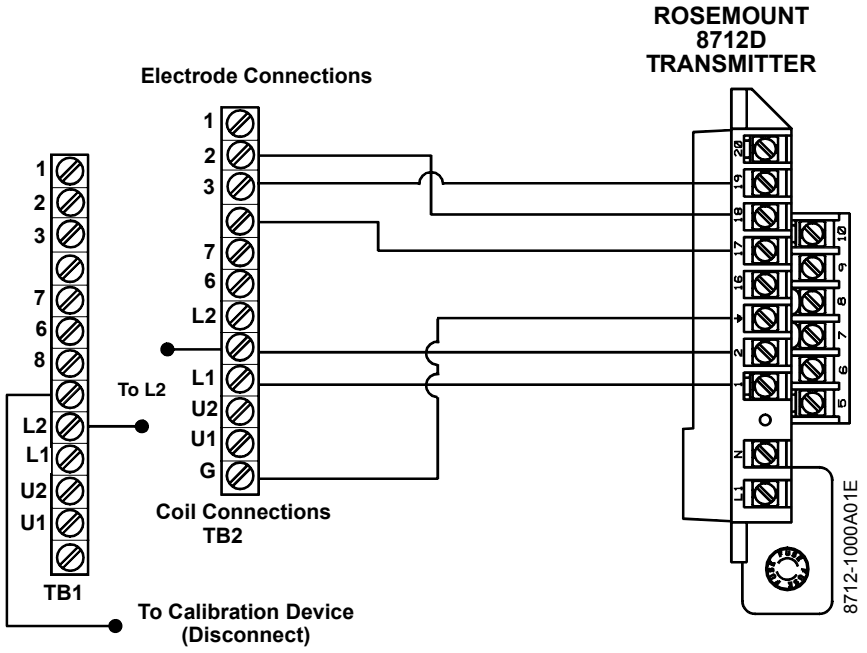
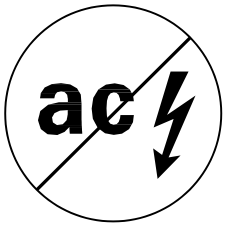


Table D-10. Fischer and Porter Model 10D1430 (Integral) Flowtube Wiring Connections

Rosemount 8712D	Fischer and Porter Model 10D1430 (Integral) Flowtubes
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 flowtube or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



Model 10D1465 and Model 10D1475 Flowtubes (Integral) to 8712D Transmitter

Connect coil drive and electrode cables as shown in Figure D-11.

Figure D-11. Wiring Diagram for Fischer and Porter Flowtube Model 10D1465 and Model 10D1475 (Integral) and Rosemount 8712D

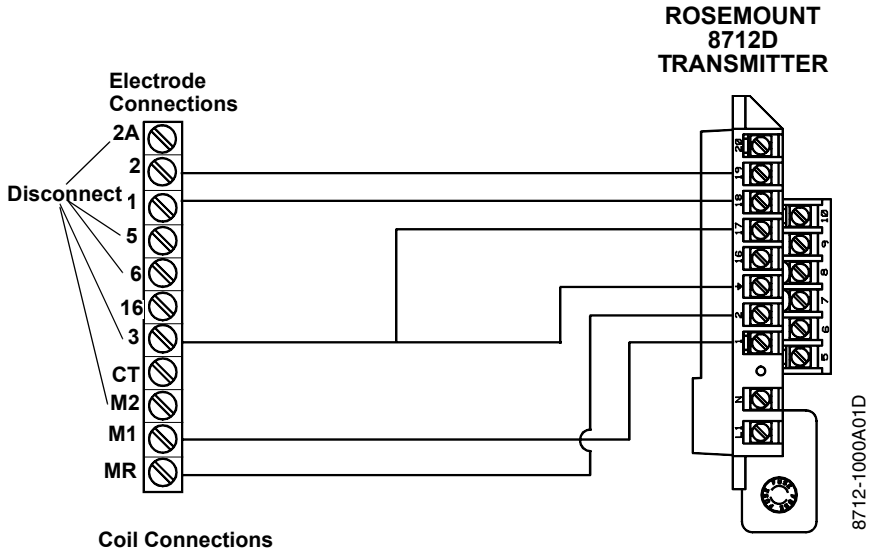
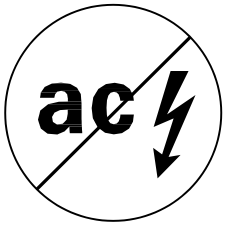


Table D-11. Fischer and Porter Model 10D1465 and 10D1475 Flowtube Wiring Connections

Rosemount 8712D	Fischer and Porter Model 10D1465 and 10D1475 Flowtubes
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 flowtube or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



Fischer and Porter Flowtube to Rosemount 8712D Transmitter

Connect coil drive and electrode cables as shown in Figure D-12.

Figure D-12. Generic Wiring Diagram for Fischer and Porter Flowtubes and Rosemount 8712D

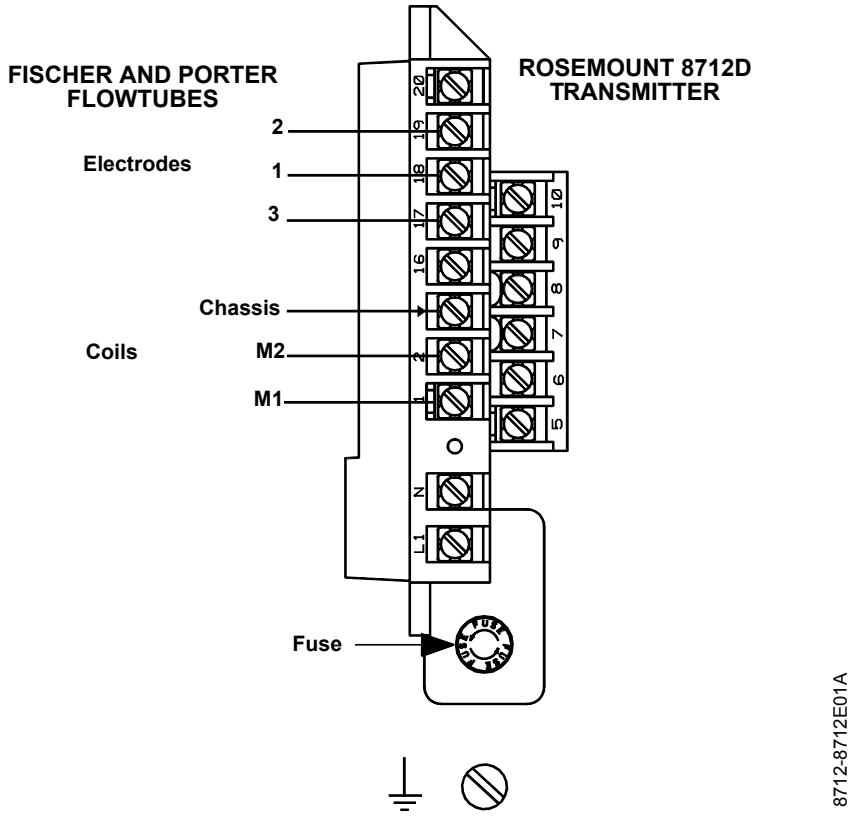
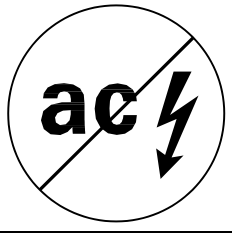


Table D-12. Fischer and Porter Generic Flowtube Wiring Connections

Rosemount 8712D	Fischer and Porter Flowtubes
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 flowtube or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



FOXBORO FLOWTUBES

Series 1800 Flowtube to Rosemount 8712D Transmitter

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

Figure D-13. Wiring Diagram for Foxboro Series 1800 and Rosemount 8712D

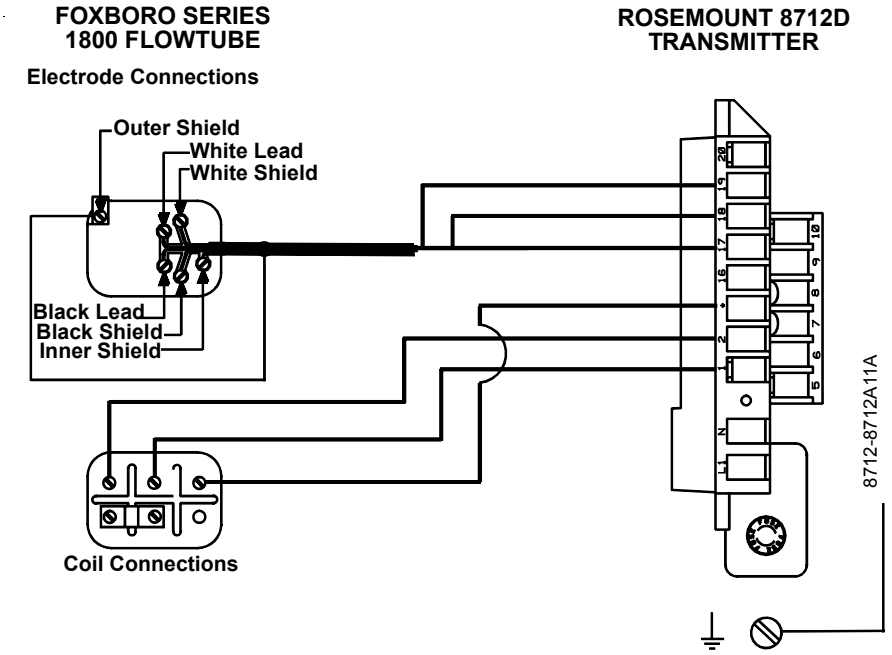
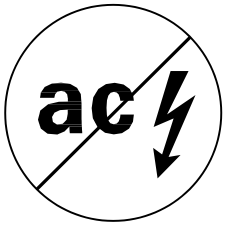


Table D-13. Foxboro Generic Flowtube Wiring Connections

Rosemount 8712D	Foxboro Series 1800 Flowtubes
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 flowtube or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



Series 1800 (Version 2) Flowtube to Rosemount 8712D Transmitter

Connect coil drive and electrode cables as shown in Figure D-14.

Figure D-14. Wiring Diagram for Foxboro Series 1800 (Version 2) and Rosemount 8712D

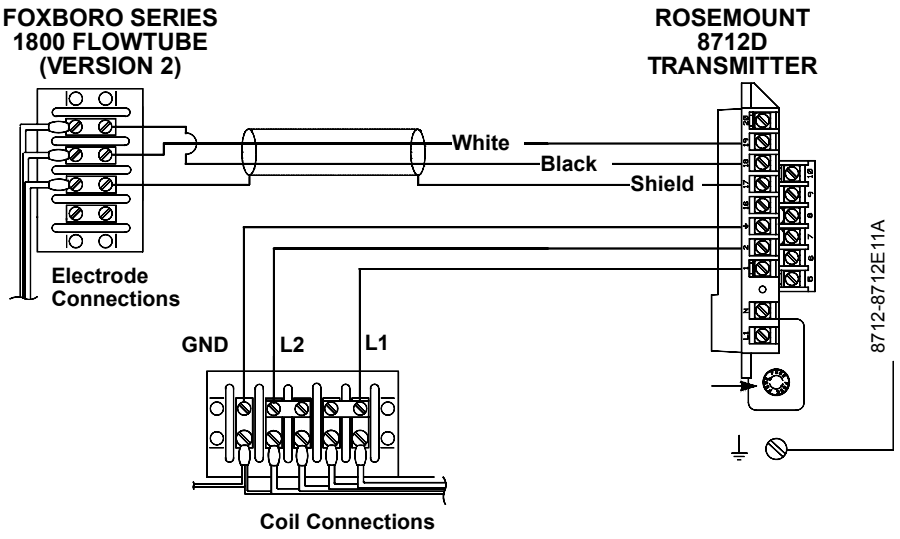
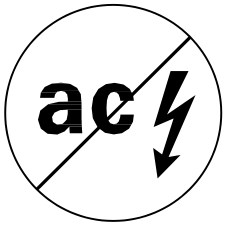


Table D-14. Foxboro Generic Flowtube Wiring Connections

Rosemount 8712D	Foxboro Series 1800 Flowtubes
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 flowtube or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



Series 2800 Flowtube to 8712D Transmitter

Connect coil drive and electrode cables as shown in Figure D-15.

Figure D-15. Wiring Diagram for Foxboro Series 2800 and Rosemount 8712D

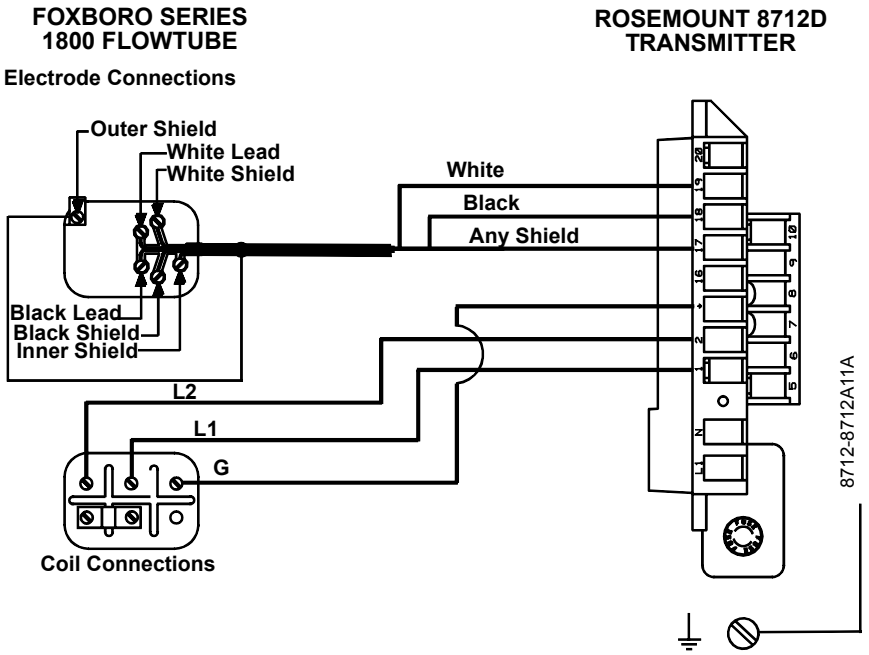
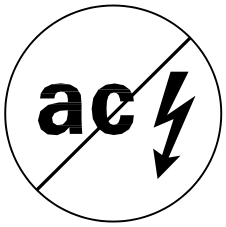


Table D-15. Foxboro Series 2800 Flowtube Wiring Connections

Rosemount 8712D	Foxboro Series 2800 Flowtubes
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 flowtube or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



Foxboro Flowtube to 8712D Transmitter

Connect coil drive and electrode cables as shown in Figure D-16.

Figure D-16. Generic Wiring Diagram for Foxboro Flowtubes and Rosemount 8712D

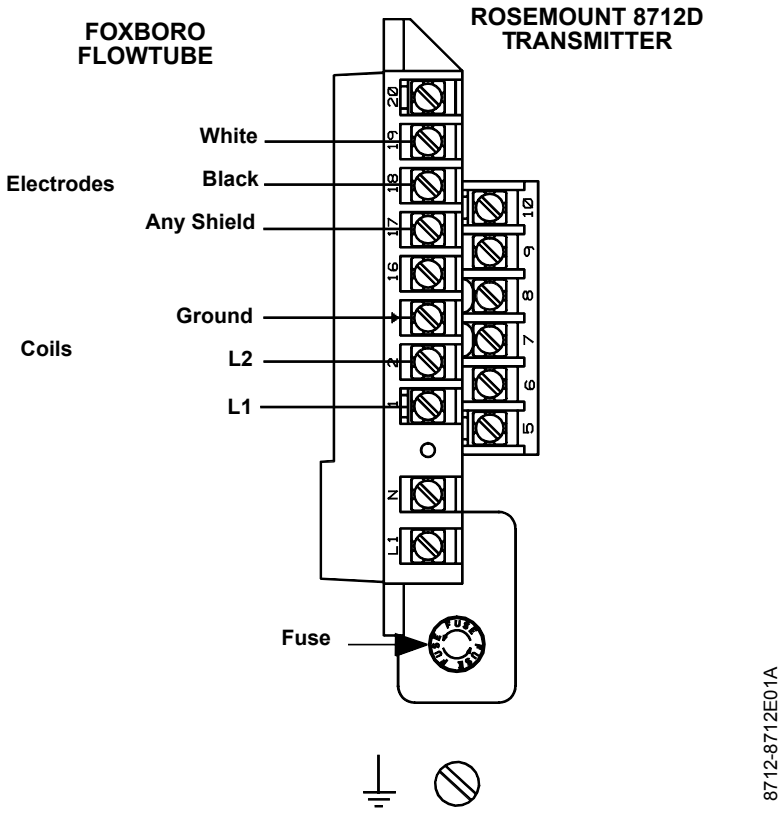
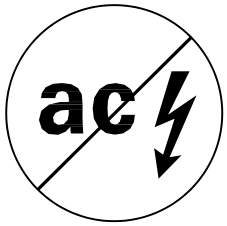


Table D-16. Foxboro Flowtube Wiring Connections

Rosemount 8712D	Foxboro Flowtubes
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 flowtube or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



KENT VERIFLUX VTC FLOWTUBE

Veriflux VTC Flowtube to 8712D Transmitter

Connect coil drive and electrode cables as shown in Figure D-17.

Figure D-17. Wiring Diagram for Kent Veriflux VTC Flowtube and Rosemount 8712D

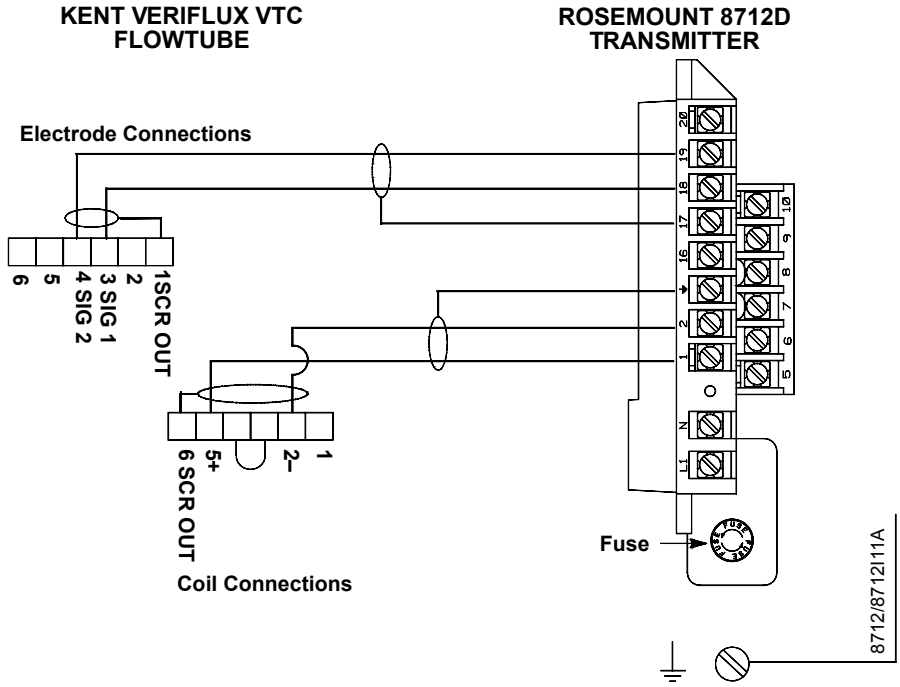
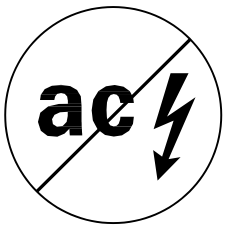


Table D-17. Kent Veriflux VTC Flowtube Wiring Connections

Rosemount 8712D	Kent Veriflux VTC Flowtubes
1	2
2	1
⏚	SCR OUT
17	SCR OUT
18	SIG1
19	SIG2

⚠CAUTION

This is a pulsed dc magnetic flowmeter. **Do not connect ac power to the flowtube or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



KENT FLOWTUBES

Kent Flowtube to Rosemount 8712D Transmitter

Connect coil drive and electrode cables as shown in Figure D-18.

Figure D-18. Generic Wiring Diagram for Kent Flowtubes and Rosemount 8712D

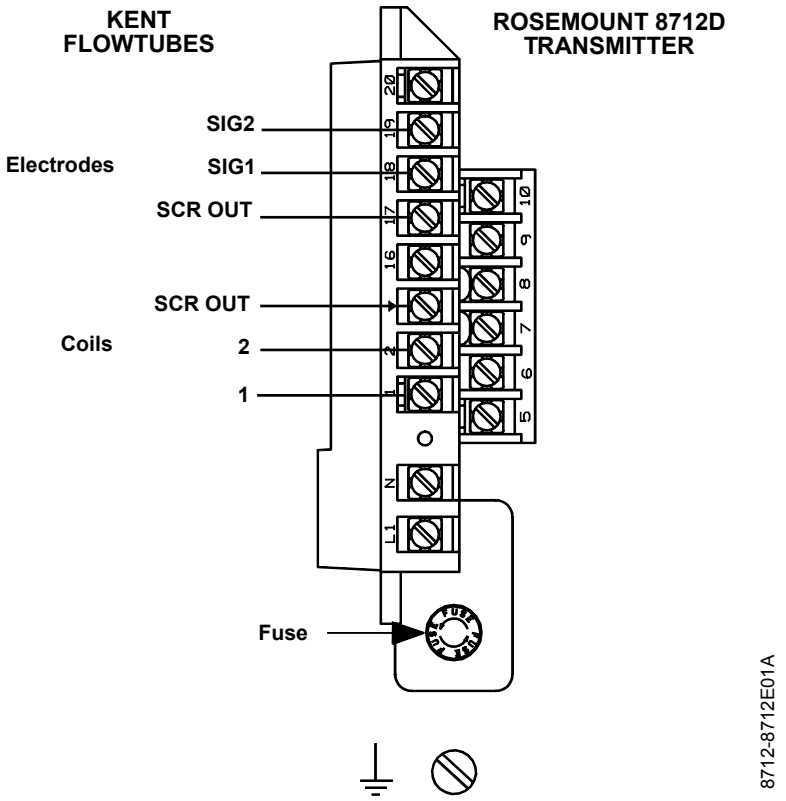


Table D-18. Kent Flowtube Wiring Connections

Rosemount 8712D	Kent Flowtubes
1	1
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 flowtube or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.

KROHNE FLOWTUBES

Connect coil drive and electrode cables as shown in Figure D-19.

Krohne Flowtube to Rosemount 8712D Transmitter

Figure D-19. Generic Wiring Diagram for Krohne Flowtubes and Rosemount 8712D

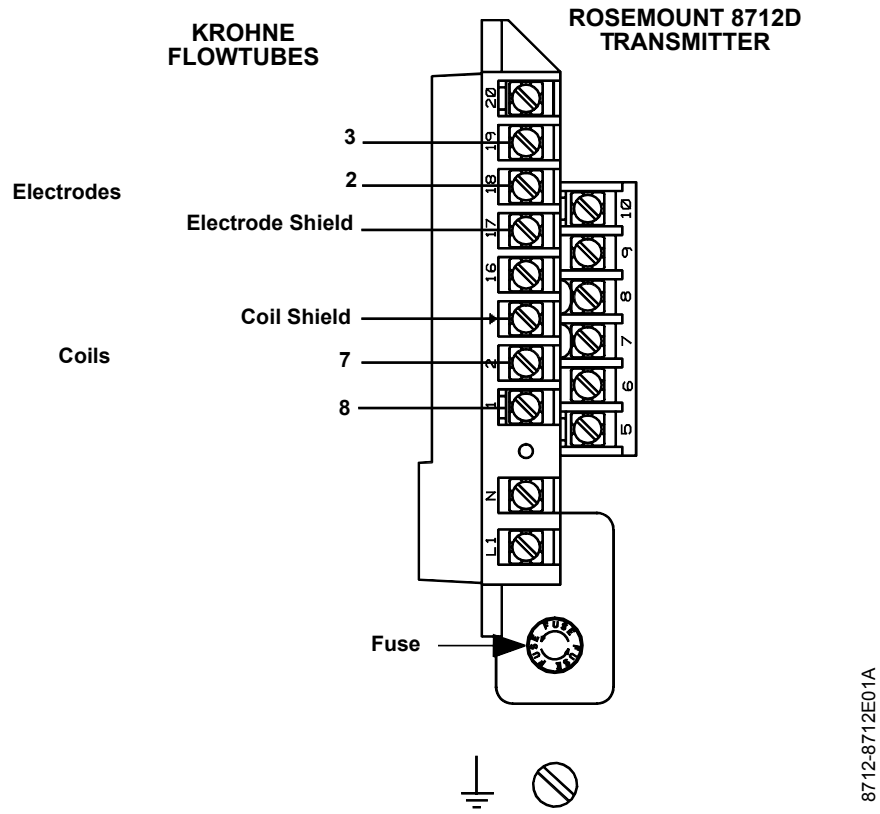
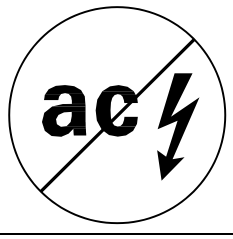


Table D-19. Krohne Flowtube Wiring Connections

Rosemount 8712D	Krohne Flowtubes
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 flowtube or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



TAYLOR FLOWTUBES

Series 1100 Flowtube to Rosemount 8712D Transmitter

Connect coil drive and electrode cables as shown in Figure D-20.

Figure D-20. Wiring Diagram for Taylor Series 1100 Flowtubes and Rosemount 8712D

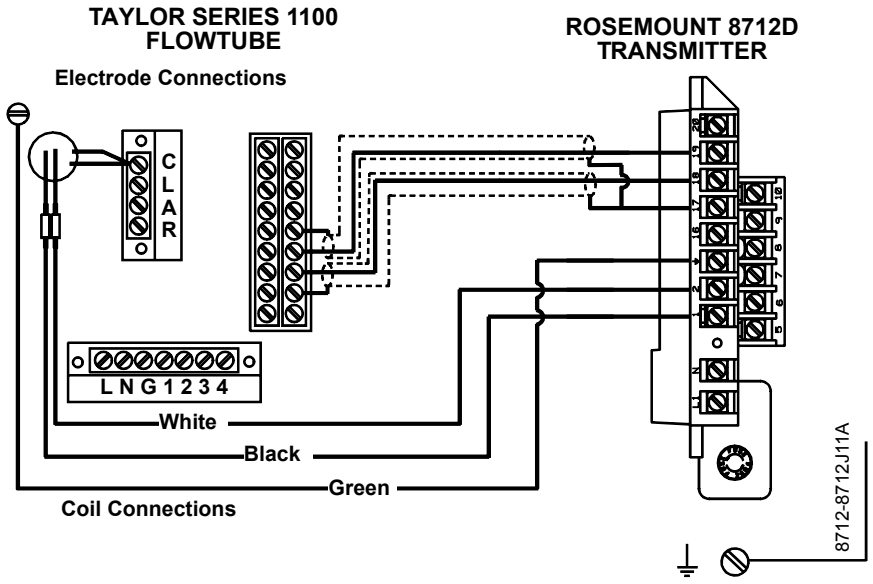
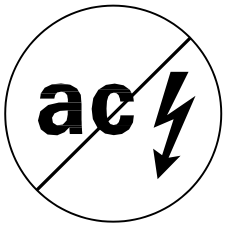


Table D-20. Taylor Series 1100 Flowtube Wiring Connections

Rosemount 8712D	Taylor Series 1100 Flowtubes
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 flowtube or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



Taylor Flowtube to Rosemount 8712D Transmitter

Connect coil drive and electrode cables as shown in Figure D-21.

Figure D-21. Generic Wiring Diagram for Taylor Flowtubes and Rosemount 8712D

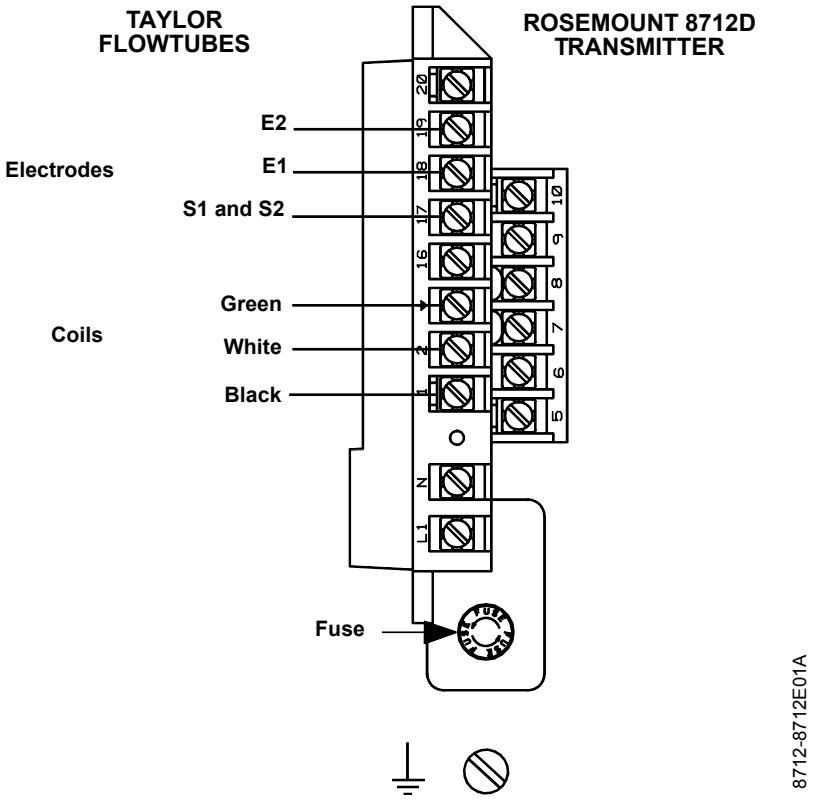
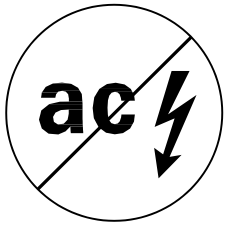


Table D-21. Taylor Flowtube Wiring Connections

Rosemount 8712D	Taylor Flowtubes
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 flowtube or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



YAMATAKE HONEYWELL FLOWTUBES

Yamatake Honeywell Flowtube to Rosemount 8712D Transmitter

Connect coil drive and electrode cables as shown in Figure D-22.

Figure D-22. Generic Wiring Diagram for Yamatake Honeywell Flowtubes and Rosemount 8712D

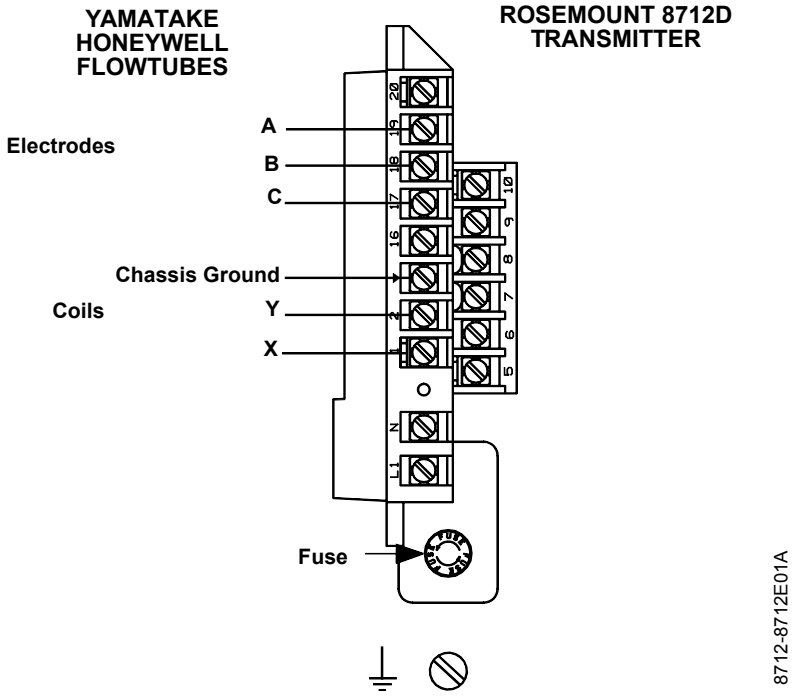
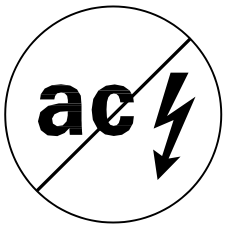


Table D-22. Yamatake Honeywell Flowtube Wiring Connections

Rosemount 8712D	Yamatake Honeywell Flowtubes
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 flowtube or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



YOKOGAWA FLOWTUBES

Yokogawa Flowtube to Rosemount 8712D Transmitter

Connect coil drive and electrode cables as shown in Figure D-23.

Figure D-23. Generic Wiring Diagram for Yokogawa Flowtubes and Rosemount 8712D

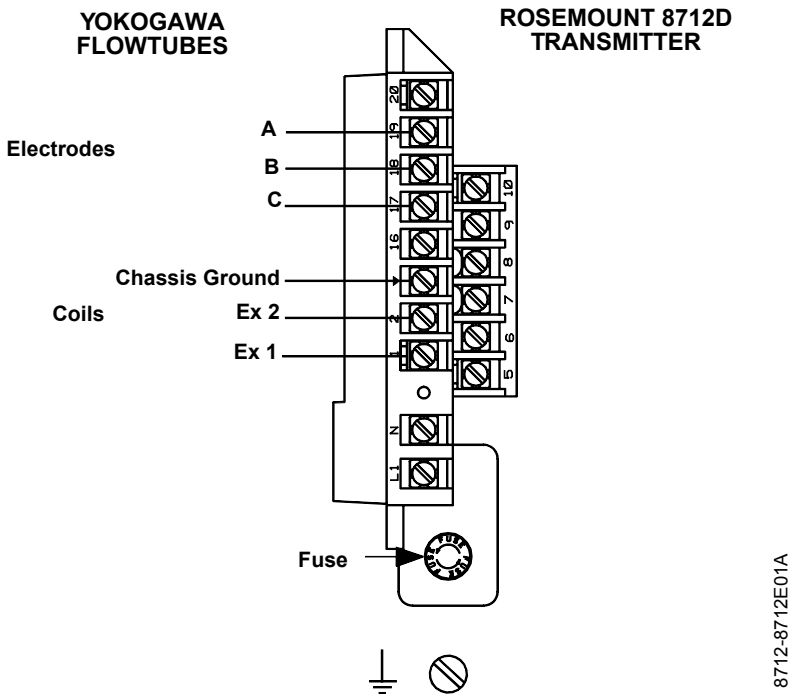
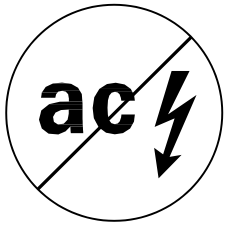


Table D-23. Yokogawa Flowtube Wiring Connections

Rosemount 8712D	Yokogawa Flowtubes
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 flowtube or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



GENERIC MANUFACTURER FLOWTUBES

Generic Manufacturer Flowtube to Rosemount 8712D Transmitter

Identify the Terminals

First check the flowtube 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.

Identify a chassis ground

1. Touch one probe of an ohmmeter to the flowtube chassis.
2. Touch the other probe to the each flowtube terminal and the record the results for each terminal.

The chassis ground will have a resistance value of one ohm or less.

Wiring Connections

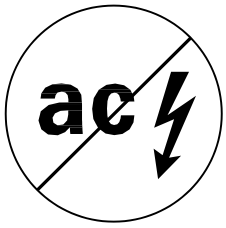
Connect the electrode terminals to Rosemount 8712D terminals 18 and 19. The electrode shield should be connected to terminal 17.

Connect the coil terminals to Rosemount 8712D terminals 1, 2, and ⏚.

If the Rosemount 8712D Transmitter indicates a reverse flow condition, switch the coil wires connected to terminals 1 and 2.

⚠CAUTION

This is a pulsed dc magnetic flowmeter. **Do not connect ac power to the flowtube or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



Index

Rosemount 8712D

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