00809-0100-4729
English
Rev. CA

Model 8712C/U/H Magnetic Flowmeter Transmitters

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PlantWeb

Product Manual

Model 8712C/U/H Magnetic Flowmeter Transmitters

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 a.m. to 7:00 p.m. CST)*

North American Response Center:
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⚠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.

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Section 1 Introduction

MANUAL SCOPE

The Series 8700 Magnetic Flowmeter System combines a Rosemount magnetic flowmeter flowtube and Rosemount magnetic flowmeter transmitter. This manual covers the Model 8712C/U/H Magnetic Flowmeter Transmitter. For specific magnetic flowtube information, refer to the Series 8700 Magnetic Flowmeter Flowtubes manual (document number 00809-0100-4727).

⚠WARNING

Attempting to install and operate the Model 8705, Model 8707 High-Signal, or Model 8711 Magnetic Flowmeter Flowtubes with the Model 8712, Model 8732, or Model 8742 Magnetic Flowmeter Transmitter without reviewing the instructions contained in this manual could result in personal injury or equipment damage.

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- scope of the manual
- brief system and operation description

Section 2: Installation

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- generic wiring diagram

SYSTEM DESCRIPTION

A Rosemount Series 8700 Magnetic Flowmeter System measures volumetric flow rate by detecting the velocity of a conductive liquid that passes through a magnetic field. The system consists of two major assemblies: the Model 8705, the Model 8707 High-Signal, or Model 8711 Magnetic Flowmeter Flowtube combined with a magnetic flowmeter transmitter.

The flowtube is installed in-line with process piping, either vertically or horizontally. Coils located on opposite sides of the flowtube create the necessary magnetic field. A conductive liquid moving through the magnetic field generates a voltage that is detected by two electrodes.

The transmitter drives the coils to generate the magnetic field and electronically conditions the voltage detected by the electrodes. The transmitter than produces analog and frequency output signals proportional to the liquid velocity.

Section 2 Installation

INTRODUCTION

This section covers the installation procedures for the Model 8712C/U/H Magnetic Flowmeter Transmitter. See the flowtube manual (document number 00809-0100-4727) for specific flowtube installation procedures.

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. Failure to follow safe installation guidelines or performing any servicing other than that contained in this manual may result in death or serious injury. Do not perform any servicing other than that contained in the operating instructions, unless qualified.

⚠WARNING

Explosions can cause death or serious injury. Verify that the operating environment of the flowtube and transmitter is consistent with the appropriate FM or CSA approval.

Do not connect a Model 8712C/U/H to a non-Rosemount flowtube that is located in an explosive atmosphere.

Failure to comply could result in an electrical spark or an explosion.

TRANSMITTER SYMBOLS

 Caution symbol — check product documentation for details

 Protective conductor (grounding) terminal

PRE-INSTALLATION

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

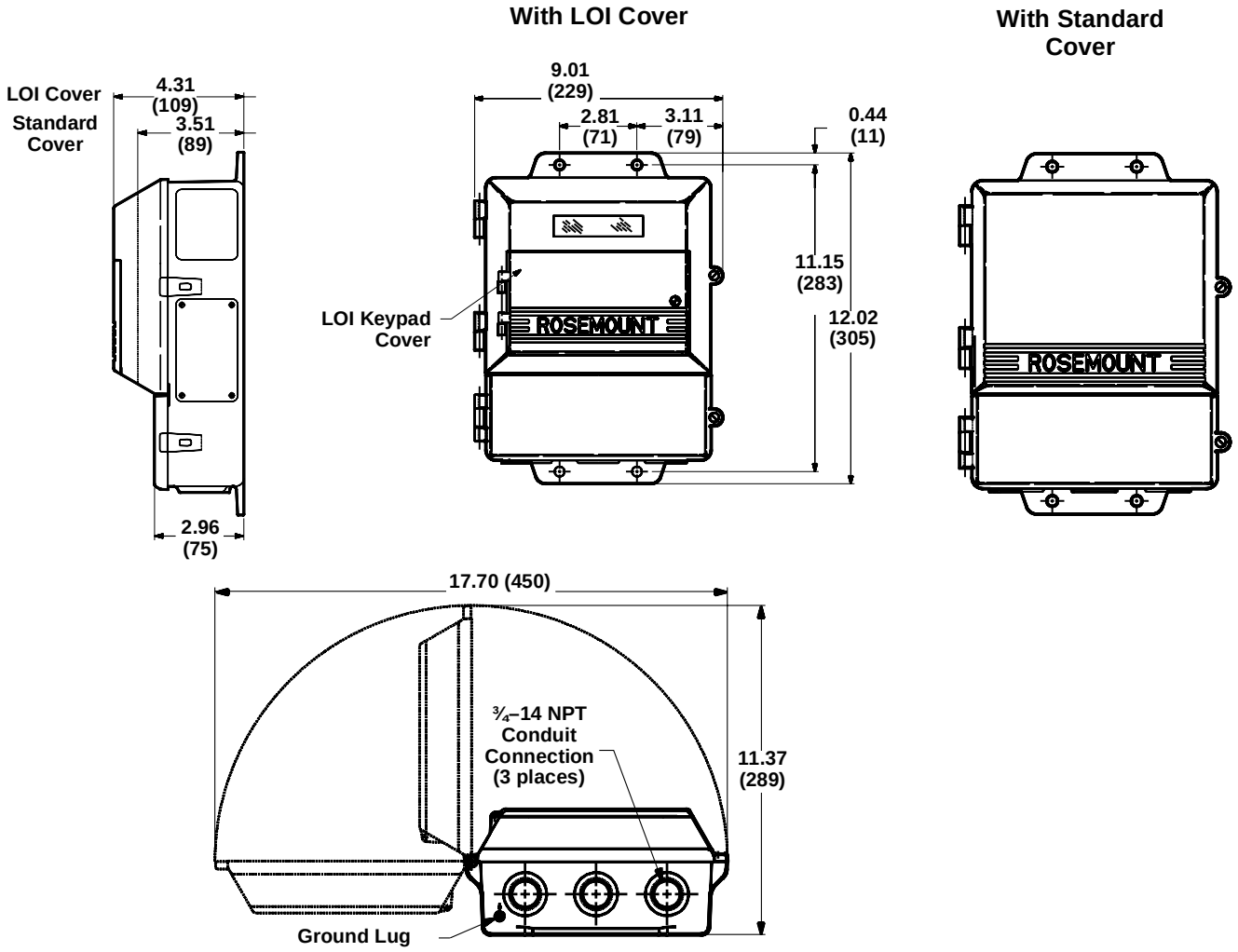
- Identify the options and configurations that apply to your application
- Set the hardware switches if necessary
- Consider mechanical, electrical, and environmental requirements

Mechanical Considerations

The mounting site for the Model 8712C/U/H 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 an upright position.

If the Model 8712C/U/H is mounted separately from the flowtube, it is not subject to limitations that might apply to the flowtube. For considerations regarding the installation of the flowtube, please refer to the flowtube manual (document number 00809-0100-4727).

FIGURE 2-1. Model 8712C/U/H Dimensional Drawing



NOTE
Dimensions are in inches (millimeters).

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Environmental Considerations

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

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

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

Both remotely and integrally mounted Model 8712C/U/H transmitters require external power and there must be access to a suitable power source. See **Transmitter Input Power** on page 2-7.

INSTALLATION PROCEDURES

Model 8712C/U/H installation includes both detailed mechanical and electrical installation procedures. Before undertaking the installation instructions outlined below, review the application and related considerations and requirements. When you understand the system requirements, proceed with installation.

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. Mounting hardware is included with remote-mounted transmitters.

Pipe Mounting

To mount the transmitter on a pipe:

1. Attach the mounting plate to the pipe using the mounting hardware.
2. Attach the Model 8712C/U/H to the mounting plate using the mounting screws.

Surface Mounting

To surface mount the transmitter:

1. Attach the Model 8712C/U/H to the mounting location using the mounting screws.

Identify Options and Configurations

The standard application of the Model 8712C/U/H 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)
- Ultrasonic Control
- 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 Jumpers/Switches

The Model 8712C/U/H electronics board is equipped with three user-selectable hardware switches (see Figure 2-2). These switches set the Failure Alarm Mode, Internal/External Analog Power, and Transmitter Security.

Hardware Switch	Standard Configuration (as shipped from factory)
Failure Alarm Mode:	*HIGH*
Internal/External Analog Power:	*INTERNAL*
Transmitter Security:	*OFF*

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

The external power option is required for multidrop communications applications. A 10–30 V dc external supply is required and the jumper must be reset. For further information on 4–20 mA external power, see **Connect 4–20 mA Loop External Power Source** on page 2-10.

Transmitter Security

There is a jumper on the Model 8712C/U/H that allows the user to lock out any configuration changes attempted on the transmitter. No changes to the configuration are allowed when the jumper is in the *ON* position. The flow rate indication and totalizer functions remain active at all times.

With the jumper 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.

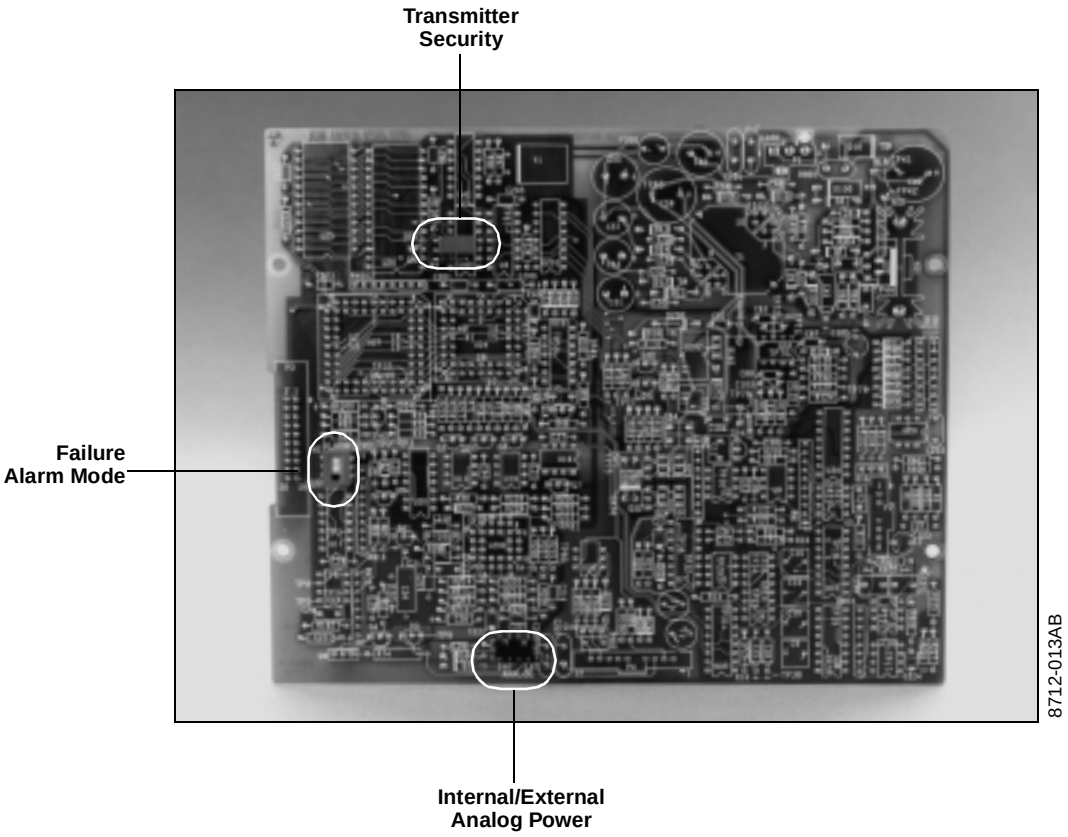
Changing Hardware Switch Settings

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 outlined below:

NOTE
The hardware switches are located on the solder 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 or jumper (see Figure 2-2).
4. **Switches:** Change the setting of the desired switches with a small screwdriver.
   Jumpers: Pull the jumper off of its current setting and connect to the desired setting.
5. Close the housing door and tighten the housing door screw.

FIGURE 2-2. Model 8712C/U/H Electronics Board and Hardware Switches/Jumpers



Electrical Considerations

Before making any electrical connections to the Model 8712C/U/H, consider the following standards and be sure to have the proper power supply, conduit, and other accessories.

Conduit Connections

Both the flowtube and transmitter junction boxes have ports for ¾–inch NPT conduit connections. If some of these ports are not being used, conduit seals will need to be installed. In some cases, conduits may also require drainage if there is a possibility of moisture build-up in the line.

A dedicated conduit line is required for the coil drive and electrode cables that connect the flowtube to the transmitter (see Figure 2-4 on page 2-7). Separate conduits are not necessary for the two cables, but a dedicated conduit line between each transmitter and flowtube is required. Instructions for installation of the conduit begin on page 2-6.

Conduit Installation

If ¾-inch NPT conduit is not installed between the flowtube and transmitter, install the conduit.

NOTE
A dedicated conduit line is required between each transmitter and flowtube. See page 2-7 for further information on conduit layout and design.

1. Install the conduit for operating options used in your application.
2. Connect the ¾-inch NPT conduit to the transmitter and to the flowtube in accordance with local or plant electrical codes.
3. Seal unused ports to prevent moisture or other contamination from entering the junction box.

NOTE
Do not overtighten metal plugs used to seal wiring compartment ports; overtightening can damage the housing.

Conduit Cables

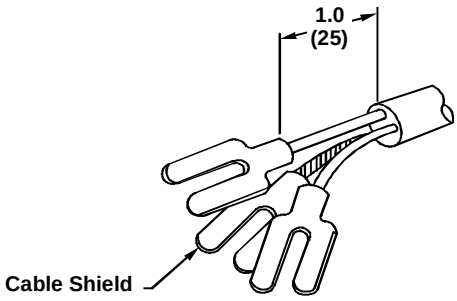
Run the appropriate size cable through the conduit connections in your magnetic flowmeter system.

1. Run the power cable from the power source to the transmitter.
2. Run the coil drive and electrode cables between the flowmeter and transmitter.
3. Run any additional cables required for your application and the applicable options.

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.

NOTE
Excessive lead length can cause unwanted transmitter noise.

FIGURE 2-3. Cable Preparation



NOTE
Dimensions are in inches (millimeters).

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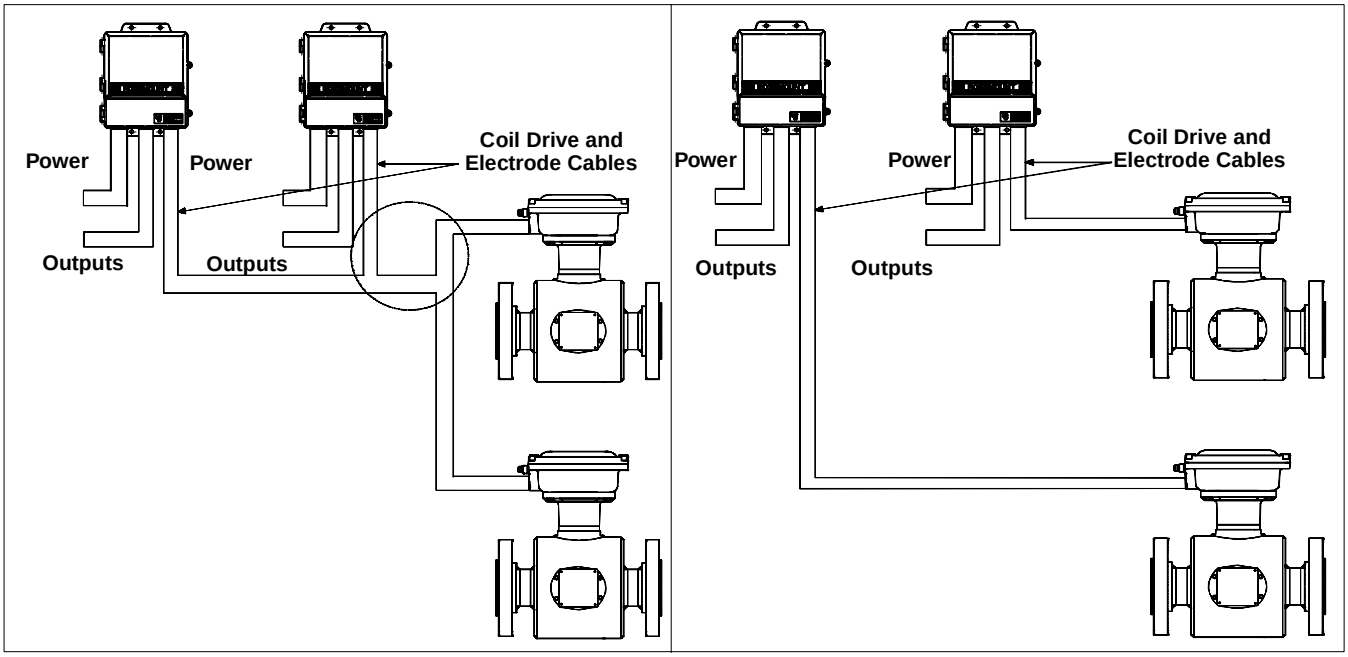
FIGURE 2-4. Conduit Preparation



Incorrect **Correct**

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Conduit Cables

Cables to be used in the conduit for coil drive and electrode connections must meet the standards shown in Table 2-1.

TABLE 2-1. Recommended Cable Specifications

Description	Rosemount Part Number
Signal Cable (20 AWG) Belden 8762, Alpha 2411 equivalent	08712-0061-0001
Coll Drive Cable (14 AWG) Belden 8720, Alpha 2442 equivalent	08712-0060-0001
Combination Signal and Coil Drive Cable (18 AWG)(1) Belden 9368 equivalent	08712-0750-0001

(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 100 ft (30 m).

Transmitter Input Power

The Model 8712C/U/H transmitter is designed to be powered by 10–30 V dc, 115 V ac, or 230 V ac. The seventh and eighth digits in the transmitter model number designates the appropriate power supply requirement.

Supply Wire Temperature Rating

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

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 115 V ac or 230 V ac Power Supply

Wire the transmitter according to local electrical requirements for 115 V ac or 230 V ac. In addition, follow the supply wire and disconnect requirements below:

Requirements for 10–30 V dc Power Supply

Units powered with 10–30 V dc may draw up to 2 amps of current. As a result, the input power wire must meet certain gauge requirements. Table 2-2 and Table 2-3 show the maximum wire length for corresponding supply voltages, wire gauges, and wire type.

Figure 2-5 shows the surge current for each corresponding supply voltage. For combinations not shown, you can calculate the maximum distance given the surge current, the voltage of the source, and the minimum start-up voltage of the transmitter, 10 V dc, using the following equation:

$$\text{MaximumResistance} = \frac{\text{SupplyVoltage} - 10\text{Vdc}}{\text{SurgeCurrent}}$$

Use Table 2-2 and Table 2-3 to determine the maximum wire length allowable for your power supply and maximum resistance.

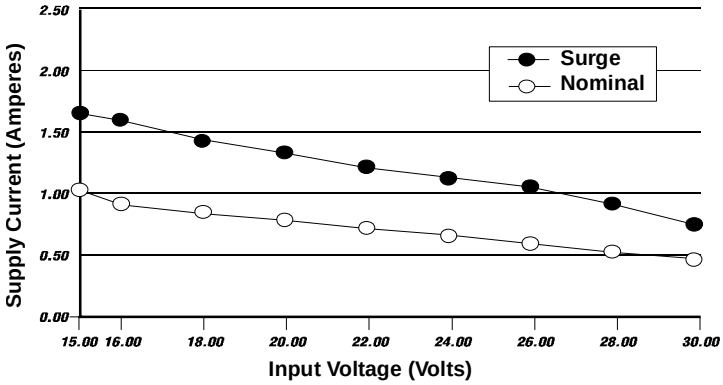
TABLE 2-2. Length of Annealed Copper (Cu) Wires

Types of Power Supply Wires		Maximum Length of the Wire for Each Corresponding Power Supply Source			
Wire Gauge	Annealed Cu milliohms/ft (milliohms/m)	30 V Supply ft (m)	24 V Supply ft (m)	20 V Supply ft (m)	14 V Supply ft (m)
20	10.15 (33.29)	1,230 (375)	625 (191)	365 (111)	115 (35)
18	6.385 (20.94)	1,955 (596)	990 (302)	585 (178)	185 (56)
16	4.016 (13.17)	3,110 (948)	1,580 (482)	930 (283)	295 (90)
14	2.525 (8.28)	4,950 (1,509)	2,515 (767)	1,485 (453)	475 (145)
12	1.588 (5.21)	7,870 (2,399)	3,995 (1,218)	2,360 (719)	755 (230)
10	0.999 (3.28)	12,510 (3,813)	6,355 (1,937)	3,750 (1,143)	1,200 (366)

TABLE 2-3. 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	Hand-drawn Cu milliohms/ft (milliohms/m)	30 V Supply ft (m)	24 V Supply ft (m)	20 V Supply ft (m)	14 V Supply ft (m)
18	6.640 (21.78)	1,880 (573)	955 (291)	565 (172)	180 (55)
16	4.176 (13.70)	2,990 (911)	1,520 (463)	895 (273)	285 (87)
14	2.626 (8.61)	4,760 (1,451)	2,415 (736)	1,425 (434)	455 (139)
12	1.652 (5.42)	7,565 (2,306)	3,840 (1,170)	2,270 (692)	725 (221)
10	1.039 (3.41)	12,030 (3,667)	6,110 (1862)	3,605 (1,099)	1,155 (352)

FIGURE 2-5. Supply Current versus Input Voltage



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OPTIONS, CONSIDERATIONS, AND PROCEDURES

If your application of the Model 8712C/U/H 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 Model 8712C/U/H.

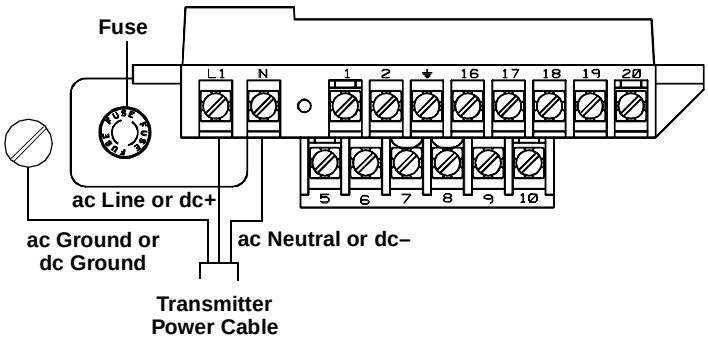
Connect Transmitter Power

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

1. Ensure that the power source and connecting cable meet the requirements outlined in **Transmitter Input Power** 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 follows:

- Connect ac Neutral/dc- to terminal N.
- Connect ac Line/dc+ to terminal L1.
- Connect ac Ground/dc Ground to the ground screw.

FIGURE 2-6. Transmitter Power Connections



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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 jumper is in the *internal* position. The user-selectable power supply jumper 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 HART Communicator or control system will be used, it must be connected across a minimum of 250 ohms resistance in the loop.

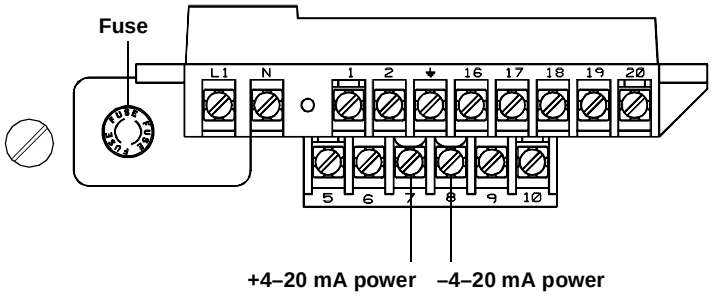
External

HART multidrop installations require a 10–30 V dc external analog power source (see **Multidrop Communications** on page 4-18). If a HART 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 2-5.
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.

FIGURE 2-7. 4–20 mA Loop Power Connections



Connect Pulse Output Power Source

The pulse output function provides an optically isolated switch-closure frequency output 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: 0.5 to 100 m/sec (adjustable)

MaximumPower: 5.75 watts

Switch Closure: transistor, open collector, PNP

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 above.
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 2-8 and Figure 2-9.

FIGURE 2-8. Electromechanical Totalizer/Counter

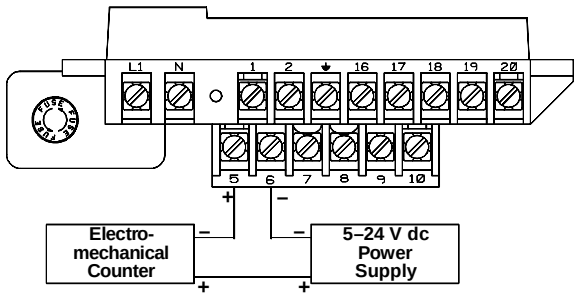
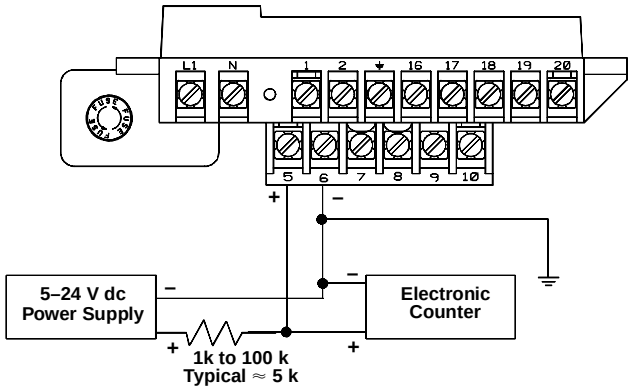


FIGURE 2-9. Electronic Totalizer/Counter without Integral Power Supply



Connect Auxiliary Output Control

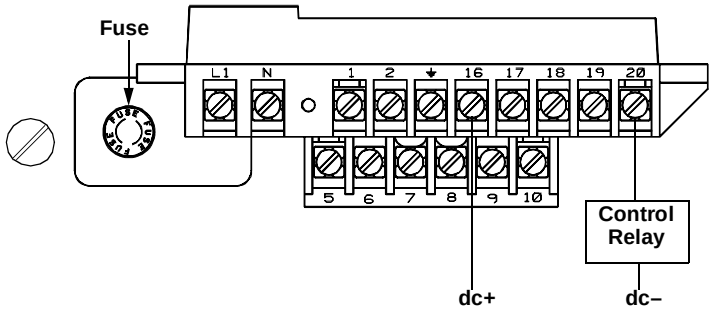
The auxiliary output control function allows you to externally signal a zero flow or reverse flow condition. The following requirements apply:

Supply Voltage:	5 to 24 V dc
Maximum Power:	5.75 watts
Switch Closure:	transistor, open collector, PNP

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 following steps:

1. Ensure that the power source and connecting cable meet the requirements outlined above.
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.

FIGURE 2-10. Auxiliary Output Control Power Connections



Connect Positive Zero Return (PZR) Power Source

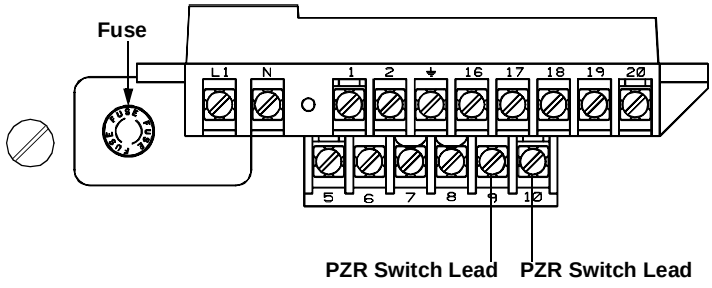
The PZR function allows the transmitter output to be forced to a zero flow rate signal. While in this state, the transmitter will not react to input changes. A zero flow rate signal appears until the PZR signal is removed.

PZR is activated by an isolated external switch closure connecting transmitter terminals 9 and 10.

To connect the PZR, complete the following steps.

1. Run the switch cable to the transmitter.
2. Connect switch leads to Terminal 9 and 10.

FIGURE 2-11. Positive Zero Return Connections



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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 Rosemount flowtube, refer to the appropriate wiring diagram in Appendix B. The calibration procedure listed below is not required for use with Rosemount flowtubes.

Flowtubes of Other Manufacturers

Before connecting another manufacturer's flowtube to the Model 8712U 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.
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:
   - Check the coils for shorts or open circuits.
   - Check the flowtube liner for wear or damage.
   - Check the electrodes for shorts, leaks, or damage.
8. Determine the coil resistance value of the flowtube. Record this value for the Universal Auto Trim function.
9. Connect the flowtube to the transmitter in accordance with reference wiring diagrams. See **Appendix B Wiring Diagrams** for specific drawings.

⚠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.	

10. Connect and verify all connections between the flowtube and the transmitter, then apply power to the transmitter.
11. Perform the Universal Auto Trim function as explained on page 4-5.

See **Safety Messages** on page 2-1 for complete warning information.

APPLYING POWER

All magnetic flowmeter system connections must be completed before power is applied to the system. Check the flowmeter connections between flowmeter and flowtube to be sure they are correct. Check the connections between the power supply and the system to be sure they are correct. Apply power to the transmitter.

SOFTWARE INSTALLATION

Once the magnetic flowmeter system is installed and communication is established, the transmitter should be configured for basic functions to complete the installation. You may perform these functions with the LOI (**Section 3 Local Operator Interface**) or HART Communicator (**Appendix A HART Communicator**). Specific instructions regarding these functions are provided in **Section 4 Device Software Functions**.

Basic software values must be set to complete installation:

- tube calibration number
- tube size
- units
- analog output range
- in-process calibration (Model 8712U and other manufacturers' flowtubes only)

If your application of the magnetic flowmeter system involves more advanced functions such as multidrop or pulse output, additional configuration steps may be required to enable full functionality. See **Section 4 Device Software Functions**.

Installation Check and Guide

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

Before You Begin

Be sure that power to your system is off before beginning these checks.

Transmitter

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

Flowtube

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. Rosemount Inc. 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 have their own cables.
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 microhms per centimeter minimum.
2. The process fluid must be free of air and gasses.
3. The flowtube should be full of process fluid.

Flowtube Resistance

1. Check the following loops with power off and wires disconnected. Record the readings in the open position of the table.

Loop Terminals	Reading	Parameters
1 to 2		This coil check should read between 2 and 18 Ω.
GND to 1		This coil to ground check should be open on highest range.
1 to 18		This coil to electrode check should be open on highest range.
1 to 19		This coil to electrode check should be open on highest range.

2. Check with the flowtube filled with a process fluid. Use the initial reading because the value will increase with time.

Loop Terminals	Reading	Parameters
17 to 18		This shield to electrode reading should be 100 kΩ or greater.
17 to 19		This shield to electrode reading should be 100 kΩ or greater.

If performing these checks and making any necessary adjustments to your system does not solve the problem, or for specific instructions on making these adjustments, see Table 5-1 on page 5-2 and Table 5-2 on page 5-3 or contact your Rosemount service representative.

Section 3

Local Operator Interface

LOCAL OPERATOR INTERFACE

The optional Local Operator Interface (LOI) provides an operator communications center for the Model 8712C/U/H. 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.

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.

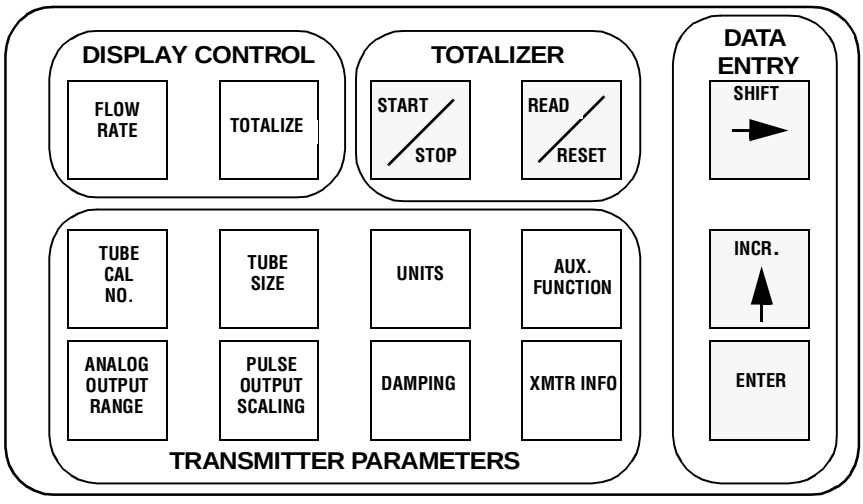
Data Entry Keys

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 Model 8712C/U/H through the **AUX. FUNCTION** key.

FIGURE 3-1. Local Operator Interface Keypad



Data Entry

The LOI keypad does not have numerical keys. Numerical data are 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, dash,** and **blank**. 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 in 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 tube size and the maximum flow rate.

TABLE 3-1. 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
Totalizer Keys	**Function Performed**
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 (0.15- through 60-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** — 6 or 30 Hz **Flow rate Display** — Flow–% Span, Flow–Totalize, %Span–Totalize **Totalizer Display** — Forward–Reverse or Net–Gross **Signal Processing** — On/Off **Special Units** — Input Base Unit-Conversion-Time Base **Aux. Output Control** — Reverse Flow/Zero Flow **Universal Auto Trim** — In-process Flowtube Calibration **Coil Current (Model 8712U only)** — 75, 125, 500 mA **Transmitter Gain (Model 8712U only)** — A, B, or C **Flowtube Gain (Model 8712U only)** — 50 to 199.99 Percent **Low Flow Cutoff** — 0.04 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 30 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

DIAGNOSTIC MESSAGES

The following error messages may appear on the LOI screen. To correct the problem, complete the steps indicated. If the problem persists, contact your sales or service representative. A letter "R" representing reverse flow and a letter "T" representing totalizer will flash on the LOI when activated.

TABLE 3-2. LOI Error Messages

Symptom	Potential Cause	Corrective Action
"Empty Pipe" displayed	Empty pipe	None – message will clear when pipe is full
	Wiring error	Check that wiring matches appropriate wiring diagrams – see **Appendix B**
	Electrode failure	Perform flowtube tests C and D on page 5-6
	Conductivity less than 5 microhms per cm	Increase conductivity to ≥ 5 microhms per cm
	Damaged or shorted transmitter to flowtube cables	Replace transmitter to flowtube cables
Coil Drive Open Circuit Displayed	Improper wiring	Check coil drive wiring and flowtube coils Perform flowtube test A–Flowtube Coil (see page 5-6)
	Other manufacturer's flowtube	Change coil current to 75 mA
	Electronics failure	Replace Model 8712C/U/H electronics
	Verify the transmitter is *not* a Model 8712H	Replace Model 8712H with Model 8712C/U/H
Flowtube will not Autozero ("Autozero Failure" can be cleared by cycling power)	Flow is not set to zero	Force flow to zero, re-perform autozero
	Unshielded cable in use	Change wire to shielded cable
	Moisture problems	See moisture problems in "Accuracy Section"
LOI is blank	Model 8712C/U/H is ranged improperly 4 mA point = 20 mA point	Correct ranging with HART Communicator – see **URV (Upper Range Value)** on page 4-6 and **LRV (Lower Range Value)** on page 4-7
	Blown fuse	Check fuse and replace with an appropriately rated fuse, if necessary
	LOI failure	Replace LOI
	Electronics failure	Replace electronics – see **Replacing the Electronics Module** on page 5-7
LOI is blinking, scrolling, or displaying scrambled letters	Unit experienced large transient	Recycle power – if problem persists replace electronics
LOI does not respond to key press	LOI failure	Replace LOI – use the HART Communicator in the interim
	Electronics failure	Replace the electronics – see **Replacing the Electronics Module** on page 5-7
"Auto-trim Failure" displayed (Transmitter power must be cycled to clear error message)	No flow in pipe while performing universal auto trim	Establish a known flow in tube, and perform universal auto-trim calibration – see **Universal Auto Trim (Model 8712U Only)** on page 4-5
	Wiring error or floating electrode shield	Check that wiring matches appropriate wiring diagrams – see **Appendix B**
	Flow rate is changing in pipe while performing universal auto trim routine	Establish a constant flow in tube, and perform universal auto-trim calibration – see **Universal Auto Trim (Model 8712U Only)** on page 4-5
	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 – see **Universal Auto Trim (Model 8712U Only)** on page 4-5
	Incorrect flowtube calibration number entered into transmitter for universal auto trim routine	Replace flowtube calibration number with 1000005010000001 – see **Calibration Number** on page 4-8
	Wrong tube size selected	Correct tube size setting – see **Line Size** on page 4-7
	Flowtube failure	Perform flowtube tests C and D on page 5-6

Section 4

Device Software Functions

INTRODUCTION

The Model 8712C/U/H features a full range of software functions for configuration of output from the transmitter. Software functions are accessed through the LOI (see **Section 3 Local Operator Interface**), a HART Communicator (see **Appendix A HART Communicator**), or a control system. Configuration variables may be changed at any time and specific instructions are provided through on-screen instructions.

SAFETY MESSAGES

Be sure to observe the following warnings and cautions before carrying out any software functions or changing configuration parameters.

⚠WARNING

Explosions can cause death or serious injury.

Before connecting the HART Communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or nonincendive field wiring practices.

Do not make connections to the HART Communicator serial port or NiCad recharger jack in an explosive atmosphere.

⚠CAUTION

Attempting an electronics trim without a Model 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 Model 8712C/U/H to clear the message. If the trim was completed or no error message appears, correction requires a Model 8714B or Model 8714C.

PROCESS VARIABLES

HART 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 range provides a gauge as to where the current flow of the meter is within the configured range of the flowmeter. For example, the range may be defined as 0 gal/min to 20 gal/min. If the current 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 milliammeter. If it does not match, a 4–20 mA trim is required. See page 4-3

Totalizer – 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 meter if your meter includes the pulse output option. This digital value is always available, even without the pulse output option.

DIAGNOSTICS AND SERVICE

Analog Output Test

HART Fast Keys	1, 1, 3
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

HART 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

HART 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 are driven to full-scale – 20 mA and 1,000 Hz. The test requires about ten seconds to complete.

D/A Trim and (4–20 mA Output Trim)

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

For maximum accuracy, the analog output should be calibrated and, if necessary, trimmed for your system loop. The *output trim* procedure alters the conversion of the digital signal into an analog 4–20 mA output.

Use the following steps to complete the Output Trim function.

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

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

Scaled D/A Trim

HART 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

HART 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 Model 8712C/U/H is no longer accurate. A Rosemount Model 8714 Calibration Standard is required to complete an electronics trim. Attempting an electronics trim without a Model 8714 may result in an inaccurate transmitter or an error message. Electronics trim must be performed only with the coil drive mode set to 6 Hz and with a nominal flowtube calibration number stored in the memory.

NOTE
Attempting an electronics trim without a Model 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 Model 8712C/U/H to clear the message. If the trim was completed or no error message appears, correction requires a Model 8714B or Model 8714C.

To simulate a nominal flowtube with the Model 8714, you must change the following four parameters in the Model 8712C/U/H:

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 Model 8714 flowtube simulator.
3. Power up the transmitter with the Model 8714 connected and read the flow rate. The electronics need about a 30-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 HART Communicator. The electronics trim takes about six minutes to complete. No transmitter adjustments are required.

Auto Zero Trim

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

The *auto zero trim* function initializes the transmitter for use with the 30 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 30 Hz.

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

Universal Auto Trim (Model 8712U Only)

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

The *universal auto trim* function enables the Model 8712U to calibrate flowtubes that were not calibrated at the Rosemount factory. (This function is not available for the Model 8712C/H.) 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. If the flowtube coil resistance is unknown, perform steps a-c to determine the resistance. Otherwise, skip to step 2.
   a. Disconnect the flowtube from the transmitter.
   b. Determine the resistance of the coil windings.
   c. Reconnect the flowtube wiring.
2. 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.

3. Complete the universal auto trim function.

When the routine is completed, the flowtube is ready for use.

BASIC SETUP

Tag

HART 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

HART 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 4-11).

The maximum flow rate information is not updated as the available units appear, but only after the data are 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 Model 8712C/U/H totalizes and provides a pulse output in gallons.

URV (Upper Range Value)

HART Fast Keys	1, 3, 3
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 any 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 –30 ft/s to +30 ft/s, as long as it is at least 1 ft/s from the lower range value (4 mA point). (See page 4-7.) The URV can also be set to a value less than the lower range value, which would cause the transmitter analog output to operate in reverse, with the electrical current increasing for lower (or more negative) flow rates.

LRV (Lower Range Value)

HART Fast Keys	1, 3, 4
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 –30 ft/s to 30 ft/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.

Line Size

HART 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 HART 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, 1, 1.5, 2, 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. The MAX FLOW value is identified as URV on the HART Communicator and most control systems.

Calibration Number

HART 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 number provides detailed calibration information to the Model 8712C/U/H. The calibration number is also printed inside the flowtube terminal block. To function properly within accuracy specifications, the number displayed on the transmitter must match the calibration number 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 Model 8712C. If the number reflects calibration to a Model 8712, 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 (Model 8712U Only)** on page 4-5

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

HART Fast Keys	1, 3, 7
LOI Key	Damping

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.

DETAILED SETUP

Pulse Output Scaling

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

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 1000 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 1000 Hz.

When selecting pulse output scaling, remember that the maximum pulse rate is 1000 Hz. With the 110 percent overrange capability, the absolute limit is 1100 Hz. For example, if you want the Model 8712C/U/H to pulse every time 0.01 gallons pass through the flowtube, and the flow rate is 1000 gal/min, you will exceed the 1000 Hz full-scale limit:

$$\frac{1000 \text{ gal/min}}{60 \text{ sec/min} \times 0.01 \text{ gal/pulse}} = 1666.65 \text{ Hz}$$

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.

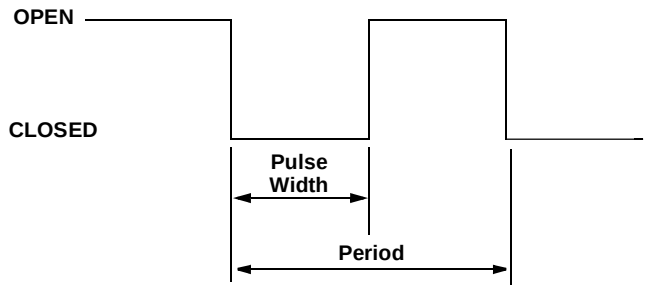
NOTE
For totalizing on the LOI, seven digits are available.

Pulse Width

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

The width, or duration, of the *pulse width* can be adjusted to match the requirements of different counters or controllers (see Figure 4-1).

FIGURE 4-1. Pulse Output



Example

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

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

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

Example

The maximum flow rate is 1,000 gpm. Set the pulse output scaling such that the transmitter outputs 1000 Hz at 1,000 gpm.

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

$$= \frac{1{,}000\ \text{gpm}}{(60\ \text{s/min})(1000\ \text{Hz})}$$

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

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

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.

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

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

$$= 5.833 \text{ Hz}$$

Example

The upper range value (20 mA) 3000 gpm. To obtain the highest resolution of the pulse output, 1000 Hz is scaled to the full scale analog reading.

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

$$= \frac{\text{3000 gpm}}{(\text{60 s/min})(\text{1000Hz})}$$

$$= 0.05 \text{ gal/pulse}$$

$$1 \text{ Pulse} = 0.05 \text{ gallon}$$

Special Units

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

The Model 8712C/U/H provides a selection of standard units configurations that meet the needs of most applications (see **Flow Rate Units** on page 4-6). If your application has special needs and the standard configurations do not apply, the Model 8712C/U/H 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

HART 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

HART 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

HART 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

HART 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

HART 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 HART Communicator and Model 8712C/U/H 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

HART 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 Enable

Reverse flow enable 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. This also enables the totalizer to count in the reverse direction.

Zero Flow

Zero flow activates the switch closure whenever the flow rate drops below the low flow cutoff or there is a reverse flow condition.

Totalizer

HART Fast Keys	1, 1, 4
LOI Key	Totalizer

Totalizer tallies the total amount of liquid or gas 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

HART 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 liquid or gas that has passed through the flowmeter since the totalizer was last reset

Start Totalizer

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

Start totalizer starts the totalizer counting from its current value.

Stop Totalizer

HART 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

HART Fast Keys	1, 1, 4, 6
LOI Key	Totalizer

Reset totalizer stops the totalizer and returns the totalizer value to zero.

NOTE
The totalizer value is saved in the EEPROM memory of the electronics every three minutes if the temperature is less than 131 °F (55 °C) or every six minutes if the temperature is greater than 131 °F (55 °C). Should power to the transmitter be interrupted, the totalizer value will start at the last saved value when power is re-applied.

Low Flow Cutoff

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

Low flow cutoff allows you to specify the flow rate, between 0.04 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

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

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

6 Hz

The standard coil pulse mode is 6 Hz, which is sufficient for nearly all applications.

30 Hz

If the process fluid causes a noisy or unstable output, increase the coil pulse mode to 30 Hz. If the 30 Hz mode is selected, perform the auto zero function as described on page 4-5.

Control Status

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

The operating mode allows the user to choose the mode of operation based on output stability.

Normal Mode

The normal mode uses 6 Hz coil drive mode and does not use the signal processing. Normal mode is usually sufficient and should be used whenever possible.

Filter Mode

The filter mode should be used only when the signal is noisy and gives an unstable output. Filter mode automatically uses 30 Hz coil drive mode and activates signal processing at the factory set default values.

When using filter mode, perform an auto zero, described on page 4-5 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 6 Hz will automatically change the operating mode from filter mode to normal mode.

Signal Processing Control

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

On/Off

When *ON* is selected, the Model 8712C/U/H 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 12 samples per second regardless of the selected coil drive mode. The three parameters that make up signal processing (number of samples, maximum percent limit, and time limit) are described below.

Number of Samples

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

0 to 125 Samples

The *number of samples* function sets the number of previous inputs used to calculate the average value. Because the output stage of the Model 8712C/U/H circuit is updated twelve times each second, regardless of 6 or 30 Hz coil drive mode, the factory preset value of 90 samples equates to 7.5 seconds.

For example, if you select a sample number of 120, the response time of the system will be 10 seconds (120 samples / 12 samples per second). A suggested nominal number of 90 samples is a good starting point for most applicable process fluids.

Maximum Percent Limit

HART 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

HART 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 120, 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 Model 8712C/U/H 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 Model 8712C/U/H includes a capability that enables you to review the configuration variable settings.

Review

HART 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 Model 8712U transmitter.

Coil Current (Model 8712U Only)

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

Based on the flowtube resistance and inductance, the *coil current* is automatically set when a universal auto trim is performed.

Transmitter Gain (Model 8712U Only)

HART Fast Keys	1, 4, 1, 8
LOI Key	Aux. Function

The *transmitter gain* settings A, B, and C correspond to 100 percent, 50 percent, and 25 percent of the flow input signal respectively. A coarse transmitter output adjustment, the transmitter gain is self-calculated by the Model 8712U during the universal auto trim procedure.

Flowtube Gain (Model 8712U Only)

HART Fast Keys	1, 4, 1, 9
LOI Key	Aux. Function

The *flowtube gain* setting represents a fine adjustment for setting the output of the Model 8712U Transmitter. As a percentage of flow, the flowtube gain is self-calculated by the Model 8712U during the universal auto trim routine.

Message

HART 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

HART 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

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

Flowtube 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.

Flowtube Serial Number

HART 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.

Liner Material

HART 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

HART 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 in the hardware.

Electrode Types

- Standard
- Ultrasonic
- Std & Ground
- Bullet
- Other

Electrode Material

HART 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 in the hardware.

Electrode Materials

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

MULTIDROP COMMUNICATIONS

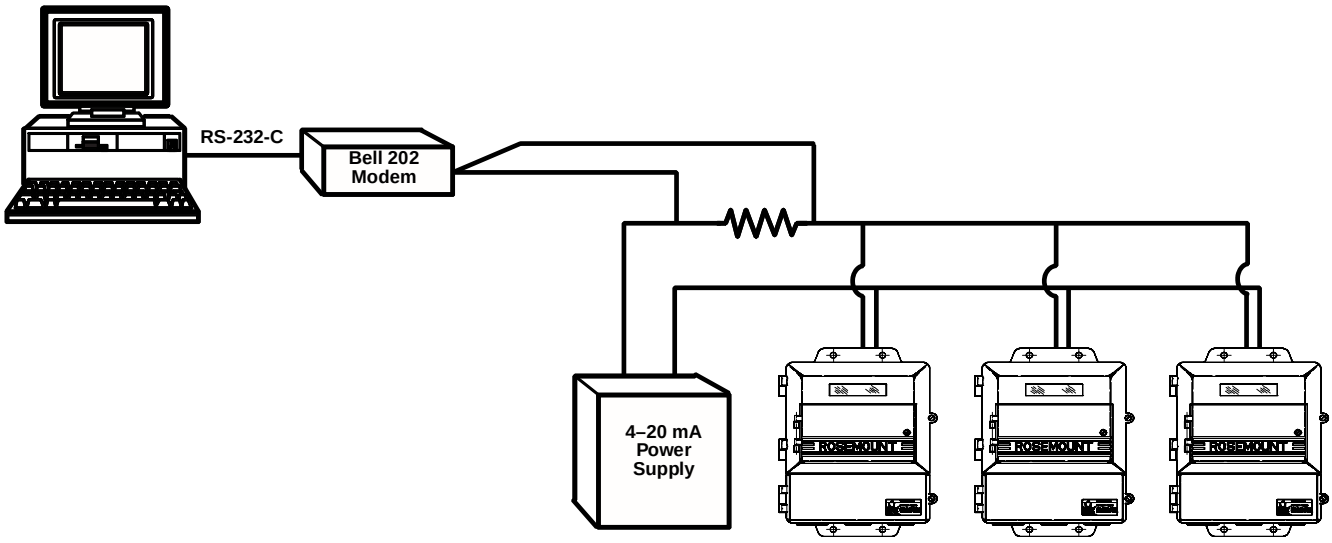
Multidrop configuration refers to the connection of several transmitters to a single communications transmission line. Communication between the HART Communicator and the transmitters takes place digitally with the analog output of the transmitters deactivated. Using the HART communications protocol, 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 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 4-2 shows a typical multidrop network. This figure is not an installation diagram. Contact Rosemount product support with specific requirements for multidrop applications.

The HART Communicator can test, configure, and format a Model 8712C/U/H multidrop installation the same way as it can a Model 8712C/U/H in a standard point-to-point installation.

FIGURE 4-2. Typical Multidrop Network



Model 8712C/U/H Magnetic Flowmeter Transmitters

Section 5

Troubleshooting

SAFETY MESSAGES

Instructions and procedures in this section may require special precautions to ensure the safety of the personnel performing the operations. 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. Performing any servicing other than that contained in this manual may result in death or serious injury. Do not perform any servicing other than that contained in the operating instructions, unless qualified.

⚠WARNING

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.

TROUBLESHOOTING GUIDELINES

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.

If there are problems with a new magmeter installation, see **Installation Check and Guide** on page 2-16 for a quick guide to solve the most common installation problems.

If an existing system is experiencing problems, use the following procedures or call your service representative.

1. Consider symptoms for basic troubleshooting in Table 5-1 on page 5-2.
2. Consider symptoms for advanced troubleshooting in Table 5-2 on page 5-3.
3. Run the software tests, page 5-5.
4. Perform the flowtube tests to see if flowtube must be removed from the process line.
5. Process-generated noise can create unwanted signal instability. Consult **Process Noise** on page 5-7.
6. Verify the wire shielding between flowtube and transmitter.
7. If the problem persists, contact your sales or service representative.

BASIC TRANSMITTER TROUBLESHOOTING

TABLE 5-1. Basic Troubleshooting–Model 8712C/U/H

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	Replace the electronics boards – see **Replacing the Electronics Module** on page 5-7
	Bad transformer	Replace transformer
	Analog output improperly configured	Check the analog power jumper – see **Hardware Jumpers/Switches** on page 2-4 for proper settings
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 A and B on Table 5-3 on page 5-6
	Empty pipe	Fill pipe
	Electronics failure	Replace the electronics boards – see **Replacing the Electronics Module** on page 5-7
Output at 21.6 mA	Transmitter not ranged properly	Reset the transmitter range values – see **Analog Output Zero(LRV)** and **URV (Upper Range Value)** on page 4-6; Check tube size setting in transmitter and make sure it matches your actual tube size – see **Line Size** on page 4-7.
Output at alarm level	Electronics failure	Cycle power by removing and installing the power fuse. If alarm is still present, replace the electronics boards. See **Replacing the Electronics Module** on page 5-7.
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	Open PZR switch 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
	Pulse width too wide	Reset pulse width – see **Pulse Width** on page 4-10
	Pulse width too narrow	Reset pulse width – see **Pulse Width** on page 4-10
	Electronics failure	Replace the electronics boards – see **Replacing the Electronics Module** on page 5-7.
Communication problems with the HART Communicator	4–20 mA output configuration	Check analog power jumper (internal/external). The HART 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 HART Communicator	Replace the batteries in the HART Communicator – see the communicator manual for instructions.
	Old revision of software in the HART Communicator	Consult your local sales office about updating to the latest revision of software.
Error Messages on LOI or HART Communicator	Many possible causes depending upon the message	See the Error Messages Table for the LOI or HART Communicator

ADVANCED TRANSMITTER TROUBLESHOOTING

TABLE 5-2. Advanced Troubleshooting–Model 8712C/U/H

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 – see **Review** on page 4-15 Check these other transmitter settings: • Flowtube calibration number • Units • Line size Perform a loop test to check the integrity if the circuit – see **Analog Output Test** on page 5-5
	Electrode Coating	Use replaceable electrodes in Model 8705; 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 on Table 5-3 on page 5-6.
	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 6 Hz to 30 Hz	Perform the auto zero function – see **Auto Zero Trim** on page 4-5
	Flowtube failure–Shorted electrode	Perform the flowtube Tests C and D on Table 5-3 on page 5-6.
	Flowtube failure–Shorted or open coil	Perform the flowtube Tests A and B on Table 5-3 on page 5-6.
	Transmitter failure	Replace the electronics boards – see **Replacing the Electronics Module** on page 5-7
Noisy Process	Chemical additives upstream of magnetic flowmeter	Complete the Noisy Process Basic procedure (page 5-7). 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 (page 5-7); Consult factory
	Electrode coating	Use replaceable electrodes in Model 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 2-7

Advanced Troubleshooting continued on next page

TABLE 5-2. Advanced Troubleshooting–Model 8712C/U/H

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 2-7 • Route cable line away from other equipment powered by 60 Hz
	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 Sticky valve (look for periodic oscillation of meter output)	Check control loop tuning Correct valve sticking
	Flowtube failure	Perform the flowtube Tests A, B, C, and D on Table 5-3 on page 5-6.
	Analog output loop problem	Check that the 4 to 20 mA loop matches the digital value. Perform analog output test.

SOFTWARE TESTING

Analog Output Test

HART Fast Keys	1, 4, 4, 3
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 quit after five minutes if the transmitter is not manual returned to normal operation.

Pulse Output Test

HART Fast Keys	1, 4, 3, 3, 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 quit after five minutes if the transmitter is not manually returned to normal operation.

Transmitter Test

HART Fast Keys	1, 2, 1, 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 are driven to full-scale, 20 mA and 1,000 Hz. The test requires about ten seconds to complete.

FLOWTUBE TROUBLESHOOTING

The Model 8712C/U/H, Model 8732C, or Model 8742C Magnetic Flowmeter Transmitters perform self diagnostics on the entire magnetic flowmeter system: the transmitter, the flowtube, and the interconnecting wiring. While most of the diagnostics are related to the transmitter microprocessor, some tests diagnose specific flowtube problems.

If a problem with the flowtube is identified, the following chart (Table 5-3 on page 5-6) can assist in troubleshooting the flowtube.

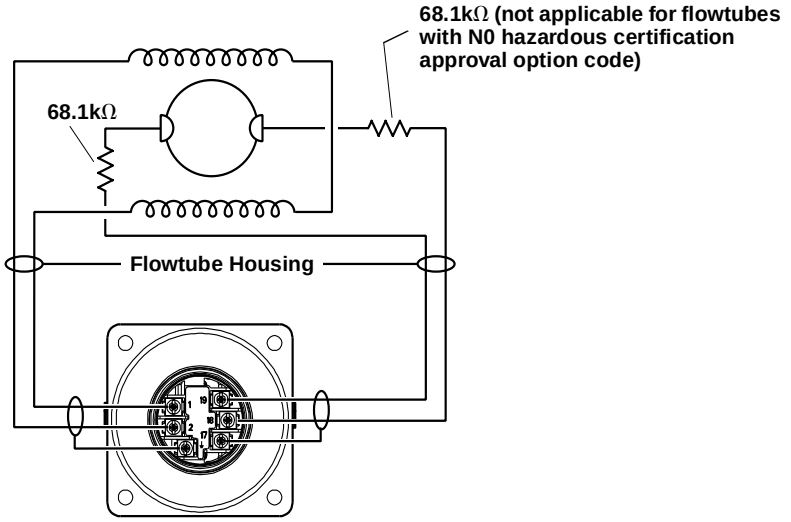
NOTE
Before performing any of the flowtube tests, cut off power and disconnect all connections inside the flowtube junction box.

Take all readings from inside the junction box with a multimeter. Readings taken at the transmitter terminals may provide incorrect or inconclusive information and should be avoided. A flowtube circuit diagram is provided in Figure 5-1 on page 5-7.

TABLE 5-3. Flowtube Troubleshooting

Step 1	Step 2	Step 3
Test A–Flowtube Coil		
Disconnect power from the transmitter by removing the fuse. Disconnect wires 1 and 2 from the transmitter.	Measure the resistance across wires 1 and 2 going to the flowtube, using the lowest ohms scale. The reading should be between 2 and 18 Ω.	A reading outside this range indicates that the coils or cables may be open or shorted.
Test B– Coil Shield to Coil		
Disconnect power from the transmitter by removing the fuse. Disconnect wires 1, 2, and ground from the transmitter.	Measure the resistance from the coil shield (ground) to wires 1 and 2 using the highest scale. Both readings should be overrange.	Any reading on the scale indicates that the coils are shorted to the housing.
Test C– Electrode Shield to Electrode (See Note Below)		
Disconnect power from the transmitter by removing the fuse. Disconnect wires 17, 18, and 19 from the transmitter. Test with process in the flowtube (either flow or no flow).	Measure the resistance from wire 17 to 18 and 17 to 19. This reading will change as you hold the leads on the wires, so use the initial reading. These readings should both be between 1 kΩ and 3 MΩ and close to each other.	A reading near 68kΩ or 0Ω indicates a possible shorted electrode. A stable reading indicates a shorted electrode. A high reading indicates a possible coated electrode, non-conductive process, or electrode not in contact with process.
Test D– Positive to Negative Electrode (See Note Below)		
Disconnect power from the transmitter by removing the fuse. Disconnect wires 18, and 19 from the transmitter. Test with process in the flowtube (either flow or no flow).	Measure the resistance between wires 18 and 19. This reading should be in the range between 100 kΩ and 2MΩ.	An overrange reading indicates a coated electrode, non-conductive process, or electrode not in contact with the process.

FIGURE 5-1.
Flowtube Circuit Diagram



Process Noise

In some circumstances, process conditions such as slurries or fluids with high solid contents can cause the meter output to be unstable. The basic procedure for addressing a noisy process situation is outlined below. Complete them in order. When the output attains the desired stability, no further steps are required.

Noisy Conditions Basic Procedure

1. Change coil drive to 30 Hz and perform the Auto Zero function (see page 4-5) on the transmitter.
2. Increase the analog damping to 5 seconds.
3. Activate digital signal processing.
4. Consult Rosemount Sales Representative about using a High-Signal Magnetic Flowmeter System.

REPLACEMENT PROCEDURES

This section includes instructions for replacing the electronics board. If the electronics board in the transmitter ever fails, modular construction makes it easy to remove and replace.

Replacing the Electronics Module

Removing the Electronics

Removal of the electronics board consists of loosening several screws and disconnecting several connectors. Refer to Figure 5-2 and Figure 5-3 for location of these screws and connectors.

1. Remove power from the transmitter by removing fuse or by another technique.
2. Loosen and remove the four captive screws on the sides of the board as shown in Figure 5-2.
3. Pull the board out of the housing about two inches to access the connectors on the component side of the circuit board.
4. Disconnect the cables at the Power Connector and both Terminal Block Connectors. See Figure 5-2 for the exact locations.

5. Disconnect the cable at the LOI Connector as shown in Figure 5-2.

The power supply transformer may be left in the unit unless it is suspected to be faulty.

FIGURE 5-2. Model 8712C/U Captive Screws and Connectors

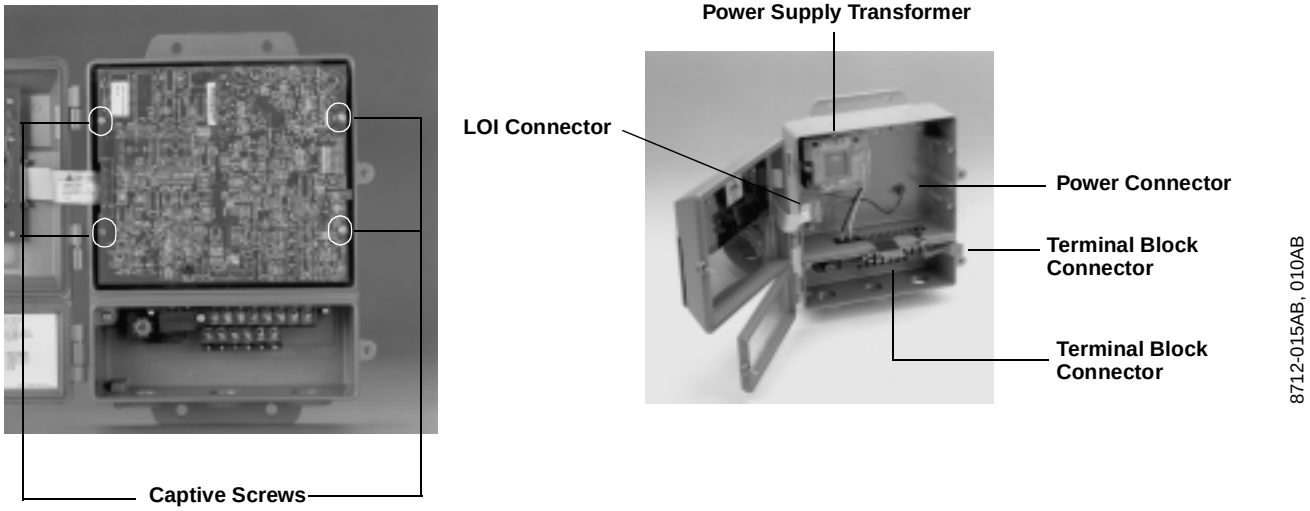
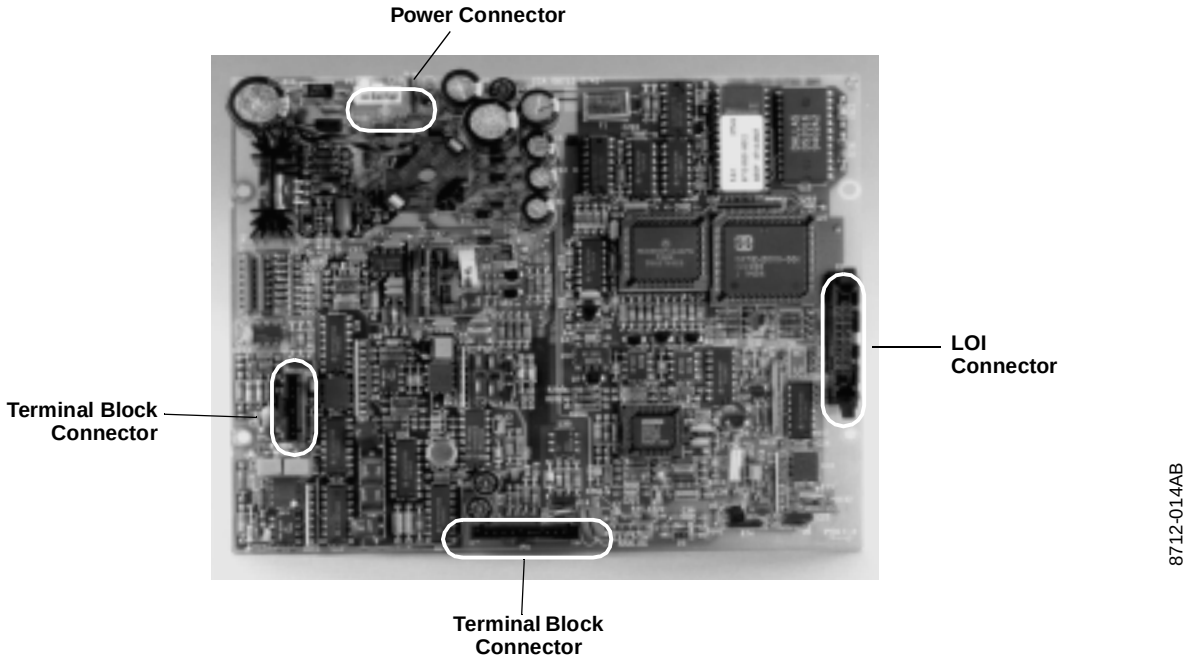


FIGURE 5-3. Model 8712C/U Electronics Board Connection Ports



Installing the Electronics

1. Make sure that the large power supply transformer in the upper left hand corner is present. Transmitters operating by dc power do not have a transformer.
2. Holding the board component side down, connect the Power Connector and the Terminal Block Connectors.
3. Connect the LOI Connector.
4. Place the board in the housing, aligning the holes with the four standoffs. Insert and tighten the captive screws.
5. Make sure that the fuse is sized properly with the power supply transformer.

Input Power	Fuse Size
10–30 V dc 115 V ac 230 V ac	3 A 1 A ½ A

6. Restore power to the unit and reconfigure the electronics.

NOTE
Transformers are replaced with a wiring assembly for dc powered units (10-30 V dc).

Replacing the LOI Electronics

Remove the LOI Electronics Assembly

Tools for this installation

- One large Phillips head screwdriver
- One small Phillips head screwdriver
- One small flat head screwdriver

Complete the following steps to remove the LOI electronics assembly.

1. Disconnect power from the transmitter.
2. Loosen the housing cover screw and open the housing door.
3. Loosen the electronics board mounting screws and remove the board.
4. Unsnap the LOI connector and disconnect it from the LOI electronics.
5. Unsnap the LOI keypad connector and disconnect it from the LOI electronics.

Install the LOI Electronics Assembly

Complete the following steps to install a new LOI electronics assembly.

1. Disconnect power from the transmitter.
2. Connect the LOI keypad connector to the LOI electronics assembly and snap it into place.
3. Connect the LOI connector to the LOI electronics and snap it into place.
4. Position the LOI electronics assembly so that the LOI display is shown clearly through the LOI window in the housing cover.
5. Tighten the six LOI holding screws until they are snug.
6. Close the transmitter housing cover and tighten the cover screw.

RETURN OF MATERIALS

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

The North American Response Center (1-800-654-7768) will assist you with any needed information or materials and is available for users within the United States and Canada, 24 hours a day.

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 the product was last exposed to. Mishandling products exposed to a hazardous substance may result in death or serious injury. A copy of the Material Safety Data Sheet may be required, depending on the nature of the hazardous substance as defined by OSHA.

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

 See **Safety Messages** on page 5-1 for complete warning information.

Section 6

Specifications

SPECIFICATIONS

Functional Specifications

Flowtube Compatibility

Model 8712C is compatible with all Rosemount flowtubes – Model 8705, Model 8707, and Model 8711. The Model 8712U is also compatible with AC and DC powered flowtubes of other manufacturers. The Model 8712H is only compatible with Model 8707 high-signal flowtube.

Flowtube Coil Resistance

Model 8712C: 25 Ω maximum

Model 8712U: 350 Ω maximum

Model 8712H: 10 Ω maximum

Flow Rate Range

Capable of processing signals from fluids that are traveling between 0.04 and 30 ft/s (0.01 to 10 m/s) for both forward and reverse flow in all flowtube sizes; full scale continuously adjustable between –30 and 30 ft/s (–10 to 10 m/s)

Conductivity Limits

Process liquid must have a conductivity of 5 microsiemens/cm (5 micromhos/cm) or greater for Model 8712C/U; process liquid must have a conductivity of 50 microsiemens/cm (50 micromhos/cm) for the Model 8712H (excludes the effect of interconnecting cable length in remote mount transmitter installations)

Power Supply

Model 8712C/U: 115 or 230 V ac ±10%, 50–60 Hz or 10–30 V dc

Model 8712H: 115 V ac ±10%, 50–60 Hz

Installation Coordination

Installation (overvoltage) Category II

Power Consumption

Model 8712C/U: 20 watts maximum

Model 8712H: 300 watts maximum

Ambient Temperature Limits

Operating

Model 8712C/U: –20 to 140 °F (–29 to 60 °C) with local operator interface

–30 to 150 °F (–34 to 66 °C) without local operator interface

Model 8712H: –20 to 130 °F (–29 to 54 °C) with or without local operator interface

Storage

–22 to 176 °F (–30 to 80 °C)

Humidity Limits

0–100% RH at 120 °F (49 °C), decreases linearly to 10% RH at 130 °F (54 °C)

Enclosure Ratings

NEMA 4X, CSA Enclosure Type 4X

Output Signals

Analog Output Adjustment

4–20 mA, jumper-selectable as internally or externally powered 5 to 24 V dc; 0 to 1000 Ω load

Engineering units – lower and upper range values are user-selectable

Output automatically scaled to provide 4 mA at lower range value and 20 mA at upper range value; full scale continuously adjustable between -30 and 30 ft/s (-10 to 10 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; 250 Ω required for HART communications

Scalable Frequency Adjustment

0-1000 Hz, externally powered at 5 to 24 V dc, translator switch closure up to 5.75 w; pulse value can be set to equal desired volume in selected engineering units; pulse width adjustable from 0.5 to 100 m/s.

Local operator interface automatically calculates and displays maximum allowable output frequency.

Auxiliary Output Function

Externally powered at 5 to 24 V dc, transistor switch closure up to 3 W to indicate either:

Reverse Flow: Activates switch closure output when reverse flow is detected; reverse flow rate is displayed

Zero Flow: Activates switch closure output when flow goes to 0 ft/s

Positive Zero Return

Forces outputs of the transmitter to the zero flow rate signal level; activated by applying a contact closure

Software Lockout

Security lockout jumper on the electronics board can be set to deactivate all LOI and HART-based communicator functions to protect configuration variables from unwanted or accidental change

Output Testing

Analog Output Test

Transmitter may be commanded to supply a specified current between 3.75 and 23.25 mA

Pulse Output Test

Transmitter may be commanded to supply a specified frequency between 1 and 1000 Hz

Turn-on Time

30 minutes to rated accuracy from power up,
5 seconds from power interruption

Start-up Time

0.2 seconds from zero flow

Low Flow Cutoff

Adjustable between 0.04 and 1 ft/s (0.01 and 0.3 m/s); below selected value, output is driven to the zero flow rate signal level

Overrange Capability

Signal output will remain linear until 110% of upper range value or 33 ft/s; signal output will remain constant above these values; out of range message displayed on LOI and the HART Communicator

Damping

Adjustable between 0.2 and 256 seconds

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.

Model 8712U 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 the known flow rate.

Hazardous Locations Certifications

N0 Factory Mutual (FM) Approval Non-incendive, non-flammable fluid service for Class I, Division 2 Groups A, B, C, and D; Dust-ignition proof for Class II/III, Division 1 Groups E, F, and G hazardous locations. T5 temperature level
AND
Canadian Standards Association (CSA) Approval Suitable for use in Class I, Division 2 Groups A, B, C, and D; Dust-ignition proof for Class II/III, Division 1, Groups E, F, and G hazardous locations

N5 Factory Mutual (FM) Approval Non-incendive, flammable fluid service for Class I, Division 2 Groups A, B, C, and D; Dust-ignition proof for Class II/III, Division 1 Groups E, F, and G hazardous locations. T5 temperature level

CE CE Marking

Performance Specifications

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

Accuracy

Model 8712C/U with Model 8705 Flowtube

System accuracy is ±0.5% of rate from 1 to 30 ft/s (0.3 to 10 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 0.01% of span

Model 8712H with Model 8707 Flowtube

System accuracy is ±0.5% of rate from 3 to 30 ft/s (1 to 10 m/s); between 0.04 and 3.0 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 0.1% of span

Model 8712C/U with Model 8711 Flowtube

System accuracy is ±0.5% of rate from 3 to 30 ft/s (1 to 10 m/s); below 3 ft/s (1 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 0.1% of span

Model 8712U 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 0.05% of span.

There is no accuracy specification for other manufacturers' flowtubes calibrated in the process line.

Vibration Effect

±0.1% of span per SAMA PMC 31.1, Level 2

Repeatability

±0.1% of reading

Response Time

0.2 seconds maximum response to step change in input

Stability

±0.1% of rate over six months

Ambient Temperature Effect

±1% per 100 °F (37.8 °C)

RFI Effect

Class 1, A, B, C: ±0.5% of span at 3 V/m per SAMA PMC 33.1, wires and conduit

Supply Voltage Effect

Transmitter meets supply voltage effect requirements of SAMA PMC 31.1, Section 5.10.1 through 5.10.5; transmitter withstands surges in supply voltage as specified in IEEE 472, 1974

Physical Specifications

Materials of Construction

Housing

Low-copper aluminum, NEMA 4X and IEC 529 IP65

Pollution Degree 2

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; integrally mounted transmitters are factory-wired to the flowtube

Cable Requirements for Remote-Mount Transmitters

Transmitter Input Power

Description	P/N
Signal Cable (20 AWG) Belden 8762, Alpha 2411 equivalent	08712-0061-0001
Coil Drive Cable (14 AWG) Belden 8720, Alpha 2442 equivalent	08712-0060-0001
Combination Signal and Coil Drive Cable (18 AWG)(1) Belden 9368 equivalent	08712-0750-0001

(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 100 ft (30 m).

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. When ordering the combination cable, the lengths specified must be from 5 to 500 feet (1.5 to 150 meters).

Cable longer than 100 feet (30 meters) is not recommended for high-signal systems.

Line Power Fuses

115 V ac systems

1 amp, Quick-acting Bussman AGCI or equivalent

5 amp, Quick-acting Bussman AGCI or equivalent (Model 8712H only)

230 V ac systems

0.5 amp, Quick-acting Bussman AGCI or equivalent

10–30 V dc systems

3 amp, Quick-acting Bussman AGCI or equivalent

Transmitter Dimensions and Weight

Transmitter: approximately 9 lb (4 kg);

Add 1 lb (0.5 kg) for local operator interface – see Figure 15.

ORDERING INFORMATION

NC = No Charge
NA = Not Applicable

		Availability		
Model	**Product Description**	**C**	**U**	**H**
8712C	Magnetic Flowmeter Transmitter	•	NA	NA
8712U	Universal Magnetic Flowmeter Transmitter	NA	•	NA
8712H	High-Signal Magnetic Flowmeter Transmitter (For use with Model 8707 High-Signal Flowtube only.)	NA	NA	•
Code	**Transmitter Style**	**C**	**U**	**H**
R	Remote (2-inch pipe or surface mounting)	•	•	•
T	Integral (mounted to flowtube)	•	•	•
Code	**Power Supply Voltage**	**C**	**U**	**H**
03	10–30 V dc	•	•	NA
12	115 V ac, 50–60 Hz	•	•	•
24	230 V ac, 50–60 Hz	•	•	NA
Code	**Hazardous Location Certifications**	**C**	**U**	**H**
N0	Factory Mutual (FM) Class I, Division 2 Approval for nonflammable fluids; Canadian Standards Association (CSA) Class I, Division 2 Approval	•	•	•
N5	Factory Mutual (FM) Class I, Division 2 Approval for flammable fluids	•	•	•
CE	CE Marking	•	•	NA
Code	**Options**	**C**	**U**	**H**
B6	Stainless Steel 4-bolt Kit for 2-inch Pipe Mount	•	•	•
C1	Custom Configuration (Completed CDS 00806-0100-4668 required with order)	•	•	•
C4	Analog output levels compliant with NAMUR recommendations NE43, 18-January-1994(1) and high alarm level	•	•	•
CN	Analog output levels compliant with NAMUR recommendations NE43, 18-January-1994(1) and low alarm level	•	•	•
D1	High Accuracy Calibration [0.25% of rate from 3 to 30 ft/s (0.9 to 10 m/s)] matched flowtube and transmitter system(2)	•	NA	NA
M4	Local Operator Interface (LOI)	•	•	•
T1	Battery-backed Totalizer	•	•	NA
Typical Model Number: 8712C R 12 N 0 M 4				

(1) NAUMUR-compliant operation; alarm latch operations are pre-set at the factory and can not be changed to standard operation in the field.
(2) Option Code must be ordered for both flowtube and transmitter.

SPARE PARTS

FIGURE 6-1. Model 8712C/U Exploded View Drawing (refer to Table ?-??)

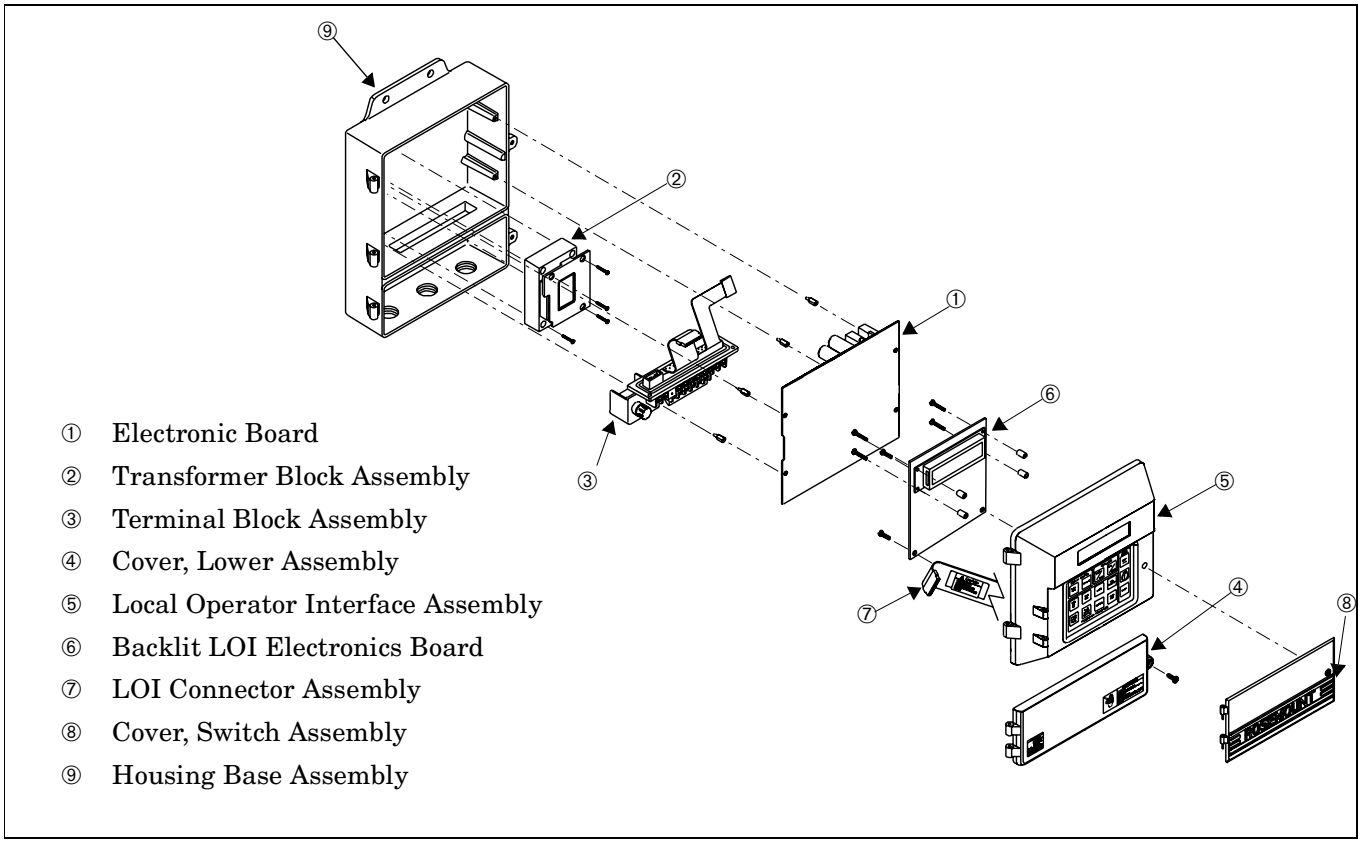


TABLE 6-1. Model 8712C/U Spare Parts (refer to Figure ?-??)

Contact factory for Model 8712H spare parts.

Drawing Reference	Part Description	Part Number
①	Electronics Kits (115 V ac) with battery-backed Totalizer and Transformer Electronics Kits (230 V ac) with battery-backed Totalizer and Transformer Electronics Kits (10-30 V dc) with battery-backed Totalizer and Wiring Harness Electronics Kit with battery-backed Totalizer (Replaces 08712-0507-0031)	08712-0533-0032 08712-0533-0034 08712-0533-0036 08712-0507-0032
②	Transformer Block Assembly Kit 115 V ac (includes block, mounting hardware, wiring diagram, and fuse) Transformer Block Assembly 230 V ac (includes block, mounting hardware, wiring diagram, and fuse) Wiring Harness Assembly Kit 10 to 30 V dc (includes harness, mounting hardware, wiring diagram, and fuse)	 08712-0513-0002 08712-0516-0002 08712-0529-0002
③	Terminal Block Assembly	08712-0044-0002
④	Lower Compartment Cover	08712-0063-0010
⑤	Complete LOI Assembly (Includes Backlit Display Kit, LOI Connector, and Cover)	08712-0015-0002
⑥	Backlit Display Electronics Kit with LOI Connector Assembly	08712-0096-0001

Spare Parts continued on next page

Contact factory for Model 8712H spare parts.

Drawing Reference	Part Description	Part Number
⑦	LOI Connector Assembly	08712-0016-0004
⑧	Switch Assembly Cover	08712-0017-0001
⑨	Housing Base Assembly with Terminal Block Assembly	08712-0053-0001
–	Upper Assembly Cover without LOI	08712-0058-0001
	Transmitter and Flowtube Accessories	
–	U-bolt for 2-inch Pipe Mount Kit (includes 1 each)	C098300002
–	Multi-Point Reference Calibration Standard (for use with Model 8712C, Model 8712U, or Model 8732C Transmitters)	8714DQ4
–	Flowtrol Totalizer (Kessler-Ellis)	08712-0400-0002
–	Spare Model 8714D Cable (for Model 8712C or 8712U transmitters)	08714-0205-0001
–	SST U-bolt for 2-inch Pipe Mount Kit	C09830006

STANDARD CONFIGURATION

Engineering Units:	ft/sec
4 mA (1 V dc):	0
20 mA (5 V dc):	30
Tube Size:	3-inch
Flowtube Calibration Number:	1000005010000000.

CUSTOM CONFIGURATION (OPTION CODE C1)

If Option Code C1 is ordered, Configuration Data Sheet (CDS) 00806-0100-4668 must be submitted at the time of order.

Appendix A HART Communicator

INTRODUCTION

Included in this appendix

- Menu tree structure
- Fast key sequence features
- Description of the HART Communicator keypad
- Connections and hardware
- Basic features
- Functions of menus
- Diagnostic messages

NOTE
This appendix provides a brief summary of the HART Communicator and is not meant to replace the HART Communicator manual. Please refer to the HART Communicator manual for detailed instructions on the use, features, and full capabilities of the HART Communicator.

SAFETY MESSAGES

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

⚠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 HART 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 A-1. HART Communicator Menu Tree for Model 8712C/U/H

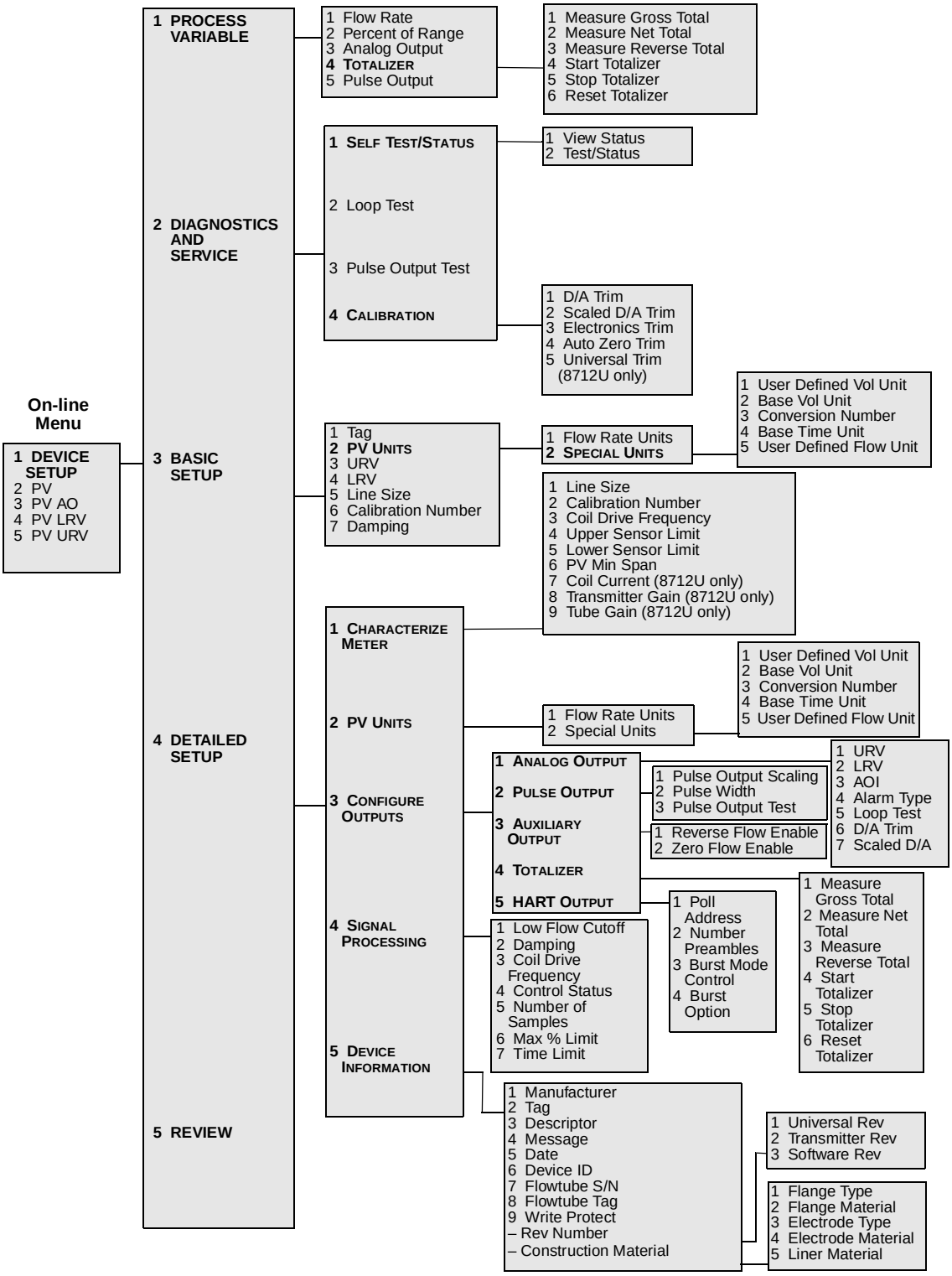


TABLE A-1. HART Fast Key Sequences

Function	HART Fast Key
Analog Output	1, 1, 3
Auto Zero Trim	1, 2, 4, 4
Auxiliary Output	1, 4, 3, 3
Base Time Unit	1, 3, 2, 2, 4
Base Vol Unit	1, 3, 2, 2, 2
Basic Setup	1, 3
Burst Mode Control	1, 4, 3, 5, 3
Burst Option	1, 4, 3, 5, 4
Calibration	1, 2, 4
Calibration Number	1, 3, 6
Coil Current (8712U Only)	1, 4, 1, 7
Coil Drive Frequency	1, 4, 1, 3
Configure Outputs	1, 4, 3
Construction Material	1, 4, 5, –
Control Status	1, 4, 4, 4
Conversion Number	1, 3, 2, 2, 3
D/A Trim	1, 2, 4, 1
Damping	1, 3, 7
Date	1, 4, 5, 5
Descriptor	1, 4, 5, 3
Detailed Setup	1, 4
Device ID	1, 4, 5, 6
Device Information	1, 4, 5
Device Setup	1
Diagnostics and Service	1, 2
Electronics Trim	1, 2, 4, 3
Flow Rate	1, 1, 1
Flow Rate Units	1, 3, 2, 1
Flowtube S/N	1, 4, 5, 7
Flowtube Tag	1, 4, 5, 8
Gross Total	1, 1, 4, 1
HART Output	1, 4, 3, 5
Line Size	1, 3, 5
Loop Test	1, 2, 2
Low Flow Cutoff	1, 4, 4, 1
LRV (Lower Range Value)	1, 3, 4
LSL (Lower Sensor Limit)	1, 4, 1, 5
Manufacturer	1, 4, 5, 1
Max % Limit	1, 4, 4, 6
Message	1, 4, 5, 4
Net Total	1, 1, 1, 2
Number of Samples	1, 4, 4, 5

Function	HART Fast Key
Number Preambles	1, 4, 3, 5, 2
Percent of Range	1, 1, 2
Poll Address	1, 4, 3, 5, 1
Process Variables	1, 1
Pulse Output	1, 1, 5
Pulse Output Scaling	1, 4, 3, 2, 1
Pulse Output Test	1, 2, 3
Pulse Width	1, 4, 3, 2, 2
PV	2
PV AO	3
PV LRV	4
PV Min Span	1, 4, 1, 6
PV URV	5
PV Units	1, 3, 2
Reset Totalizer	1, 1, 4, 6
Reverse Flow Enable	1, 4, 3, 3, 1
Reverse Total	1, 1, 4, 3
Review	1, 5
Rev Number	1, 4, 5 –
Scaled D/A Trim	1, 2, 4, 2
Self Test	1, 2, 1, 2
Self Test/Status	1, 2, 1
Signal Processing	1, 4, 4
Special Units	1, 3, 2, 2
Start Totalizer	1, 1, 4, 4
Stop Totalizer	1, 1, 4, 5
Tag	1, 3, 1
Time Limit	1, 4, 4, 7
Totalizer	1, 1, 4
Transmitter Gain (8712U Only)	1, 4, 1, 8
Tube Gain (8712U Only)	1, 4, 1, 9
Universal Trim (8712U Only)	1, 2, 4, 5
URV (Upper Range Value)	1, 3, 3
User Defined Flow Unit	1, 3, 2, 2, 5
User Defined Vol Unit	1, 3, 2, 2, 1
USL (Upper Sensor Limit)	1, 4, 1, 4
View Status	1, 2, 1, 1
Write Protect	1, 4, 5, 9
Zero Flow Enable	1, 4, 3, 3, 2

CONNECTIONS AND HARDWARE

⚠ The HART 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 HART Communicator should be connected in parallel with the transmitter. Use the loop connection ports on the rear panel of the HART Communicator (see Figure A-2). The connections are non-polarized.

FIGURE A-2. Rear Connection Panel with Optional NiCad Recharger Jack

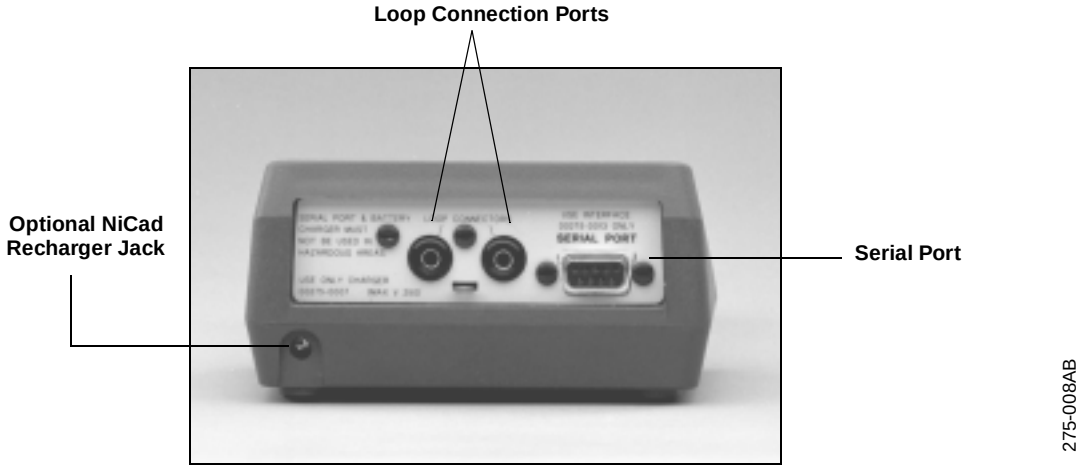
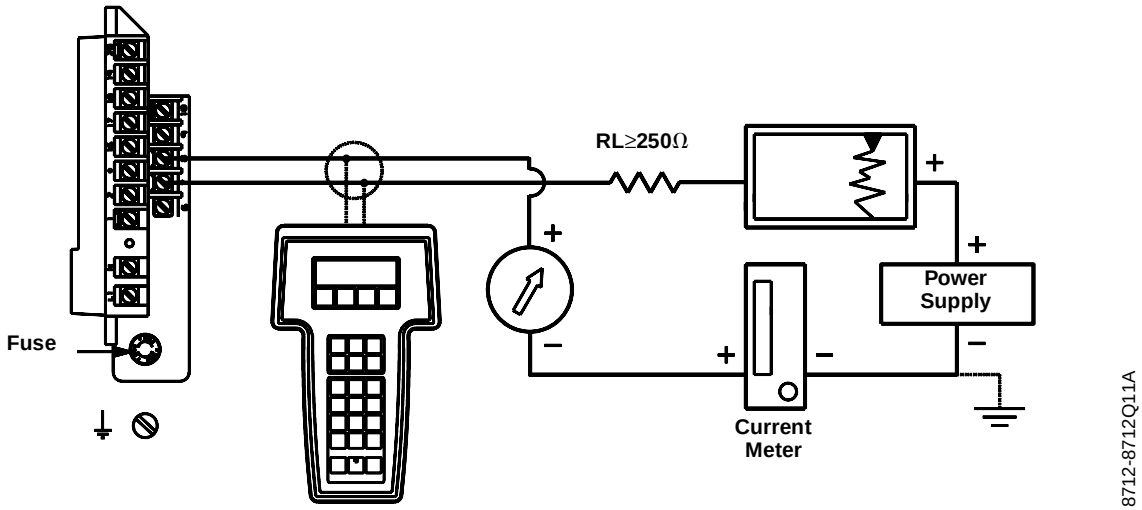


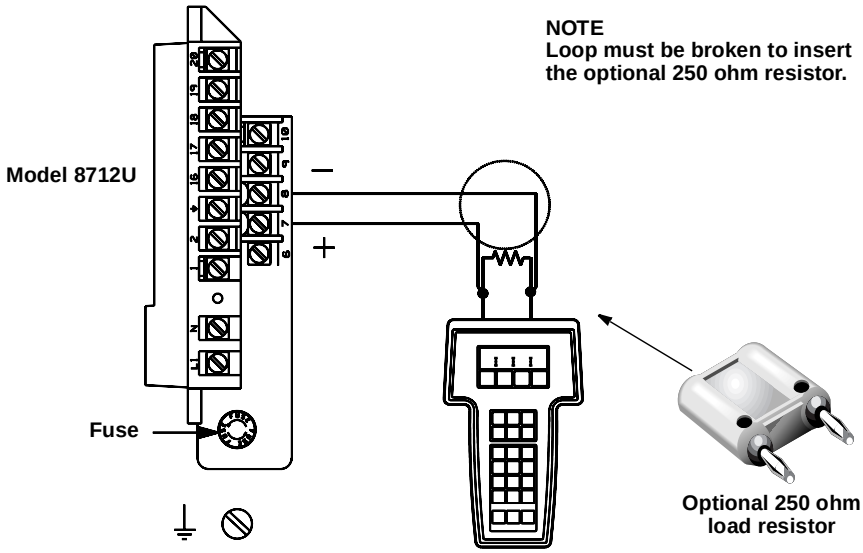
FIGURE A-3. Connecting the HART Communicator to a Transmitter Loop



NOTE
The HART Communicator needs a minimum of 250 ohms resistance in the loop to function properly. The HART Communicator does not measure loop current directly.

⚠ See **Safety Messages** on page A-1 for complete warning information.

FIGURE A-4. Connecting the HART Communicator with the Optional Load Resistor

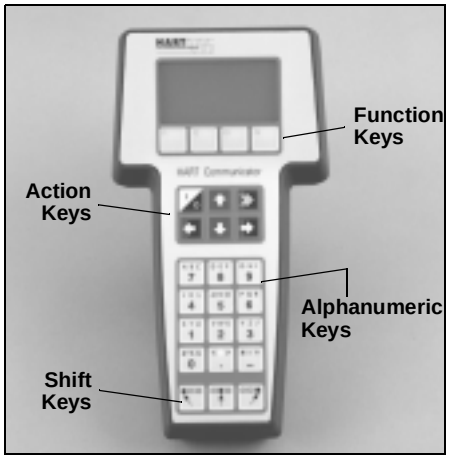


8712-8712Q11B, 0275B01A

BASIC FEATURES

The basic features of the HART Communicator include Action Keys, Function Keys, and Alphanumeric and Shift Keys.

FIGURE A-5. The HART Communicator



275-011AB

Action Keys

The Action Keys

As shown in Figure A-5, 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 HART 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. Press OK."

If a HART-compatible device is found, the communicator displays the Online Menu with device ID and tag.

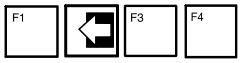
Directional Keys

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 HART Communicator on and displays the Hot Key Menu. See Customizing the Hot Key Menu in the HART 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 HART 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 A-6. HART Communicator Alphanumeric and Shift Keys

275-0383A

Data Entry

Some menus require data entry. Use the Alphanumeric and Shift keys to enter all alphanumeric information into the HART 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 A-7). Do not press these keys simultaneously, but one after the other.

FIGURE A-7. Data Entry Key Sequence

HART Fast Key Feature

The HART 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 HART 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.

HART Fast Key Example

The HART 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 HART Fast Key sequence is 1,4,5,5.

HART 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 HART Fast Keys will not function properly.

Use Table A-1, an alphabetical listing of every on-line function, to find the corresponding HART Fast Keys. These codes are applicable only to the transmitter and the HART Communicator.

MENUS AND FUNCTIONS

The HART 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

When the HART Communicator is turned on, one of two menus will appear. If the HART Communicator is connected to an operating loop, the communicator will find the device and display the Online Menu (see below). If it is not connected to a loop, the communicator will indicate that no device was found. When you press OK (F4), it will display the 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 HART Communicator (Memory) to the transmitter (Device) or vice versa. Transfer is used to move off-line data from the HART 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 HART 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 pressure output of current-to-pressure transmitters.
- *Utility*–The Utility option provides access to the contrast control for the HART Communicator LCD screen and to the autopoll setting used in multidrop applications.

Once selecting a Main Menu option, the HART Communicator provides the information you need to complete the operation. If further details are required, consult the HART Communicator manual.

Online Menu

The Online Menu can be selected from the Main Menu as outlined above, or it may appear automatically if the HART 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) when it is activated 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 HART 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 A-2. 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.

Diagnostic Messages continued on next page

TABLE A-2. 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 hockey 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.

Appendix B Wiring Diagrams

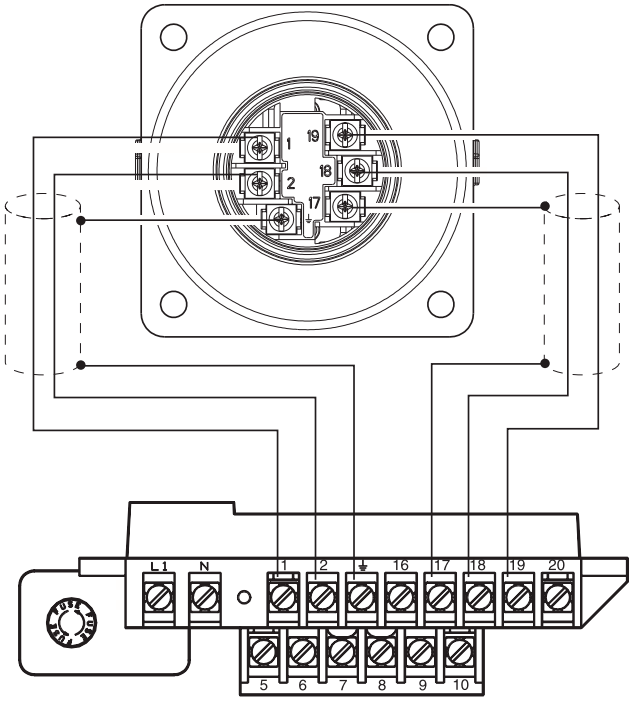
The wiring diagrams in this section illustrate the proper connections between the Model 8712C/U/H and most flowtubes currently on the market. Specific diagrams are included for most models, and where information for a particular model of a manufacturer is not available, a generic drawing pertaining to that manufacturers' flowtubes is provided. If the manufacturer for your flowtube is not included, see the drawing for generic connections.

ROSEMOUNT FLOWTUBES

Model 8705/8707/8711 Flowtubes to Model 8712C/U Transmitter

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

FIGURE B-1. Wiring Diagram to Model 8712C/U/H Transmitter



8712-04A

TABLE B-1. Rosemount Model 8705/8707/8711 Flowtube Wiring Connections

Rosemount Model 8712C/U/H Transmitters	Rosemount Model 8705/8707/8711 Flowtubes
1	1
2	2
⏚	⏚
17	17
18	18
19	19

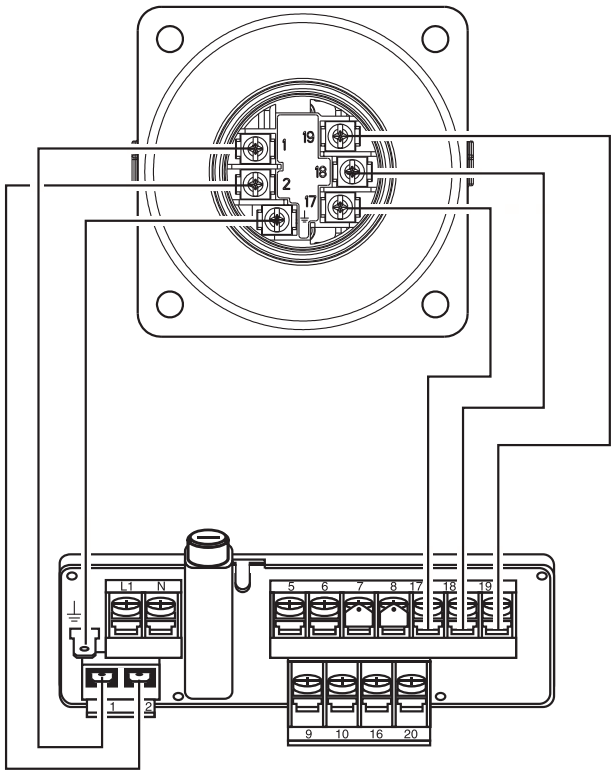
⚠CAUTION

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.

Model 8707 High-Signal Flowtube to Model 8712H High-Signal Transmitter

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

FIGURE B-2.
Wiring Diagram to Model 8712H High-Signal Transmitter



8712-03A

TABLE B-2. Rosemount Model 8707 Flowtube Wiring Connections

Rosemount Model 8712H Transmitters	Rosemount Model 8707 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.

Model 8701 Flowtube to Model 8712U Transmitter

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

FIGURE B-3. Wiring Diagram for Rosemount Model 8701 Flowtube and Rosemount Model 8712U Transmitter

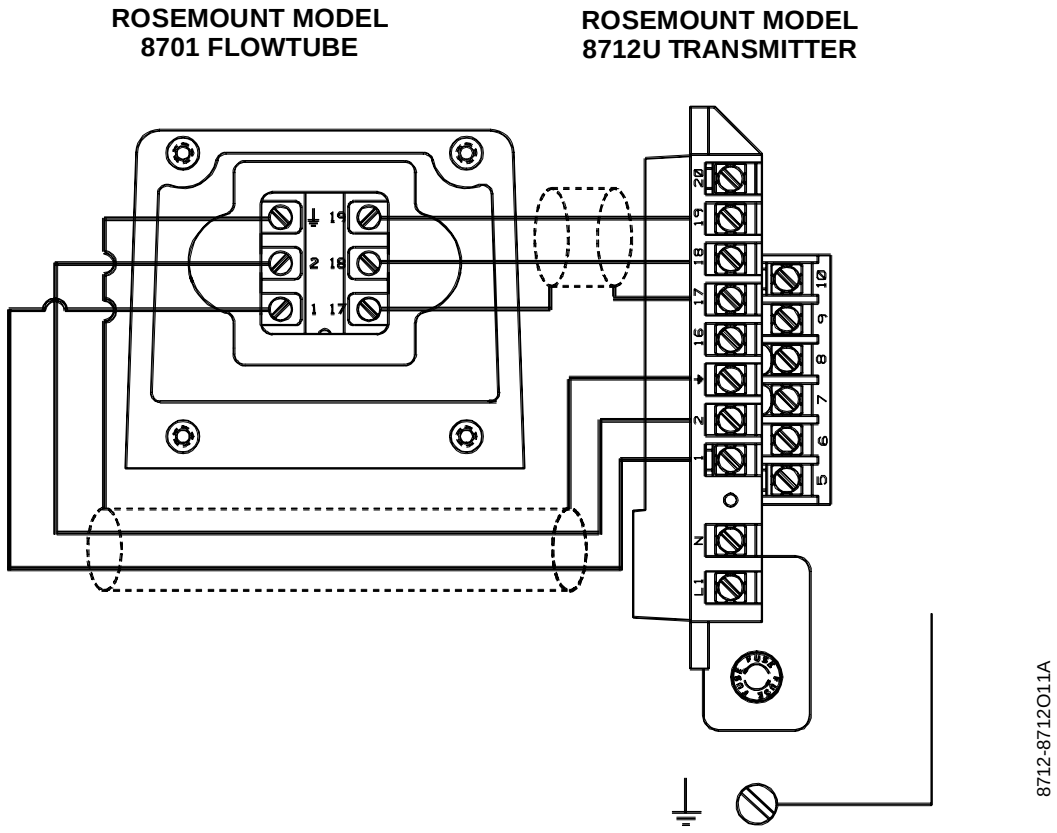
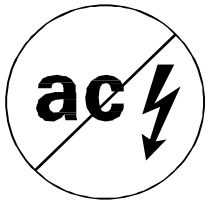


TABLE B-3. Rosemount Model 8701 Flowtube Wiring Connections

Rosemount Model 8712U	Rosemount Model 8701 Flowtubes
1	1
2	2
⏚	Ground
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 8705 Flowtube to Model 8712U Transmitter

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

FIGURE B-4. Wiring Diagram for Rosemount 8705 Flowtube and Rosemount Model 8712U Transmitter

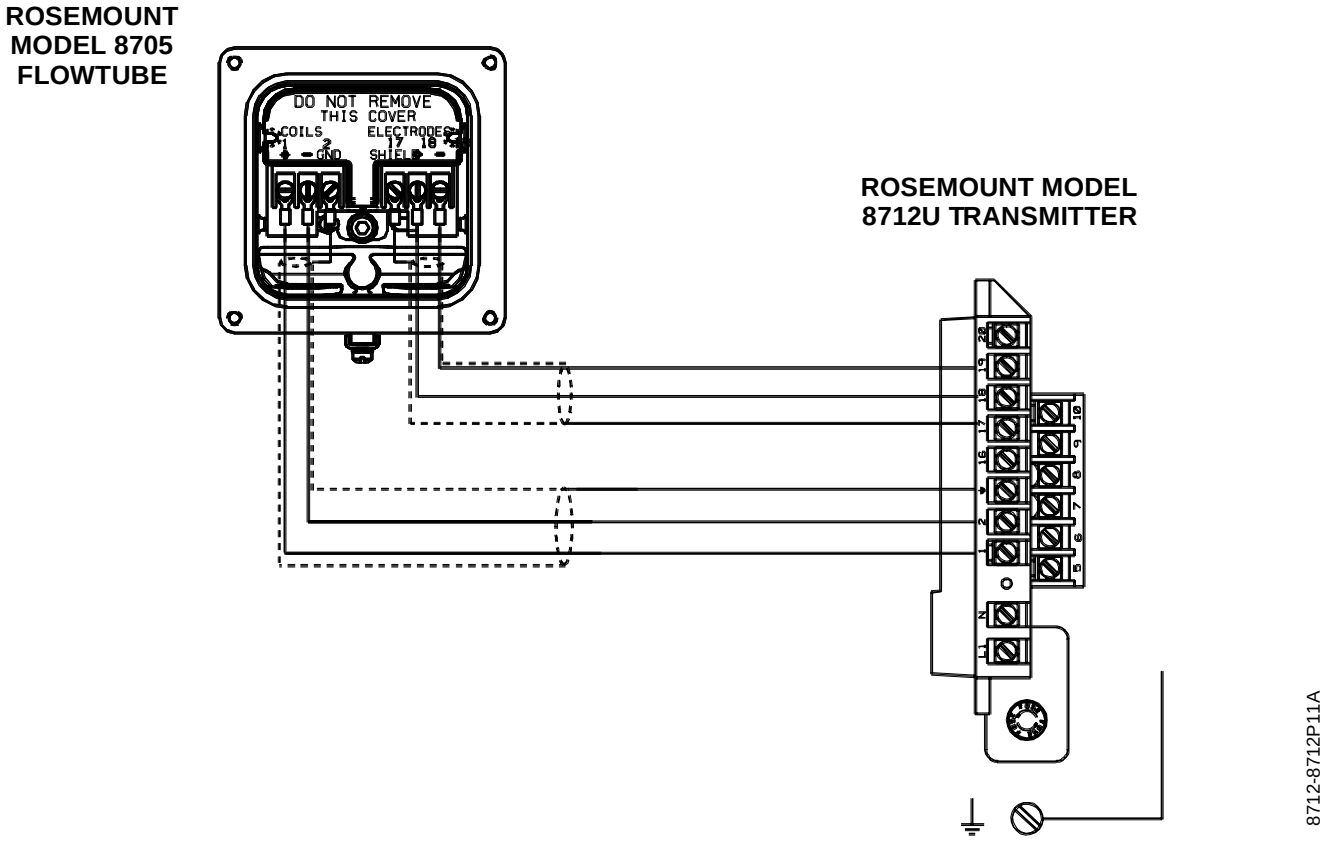
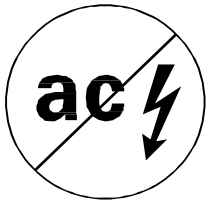


TABLE B-4. Rosemount Model 8705 Flowtube Wiring Connections

Rosemount Model 8712U	Rosemount Model 8705 Flowtubes
1	1
2	2
⏚	Ground
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 8711 Flowtube to Model 8712U Transmitter

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

FIGURE B-5. Wiring Diagram for Rosemount Model 8711 Flowtube and Rosemount Model 8712U Transmitter

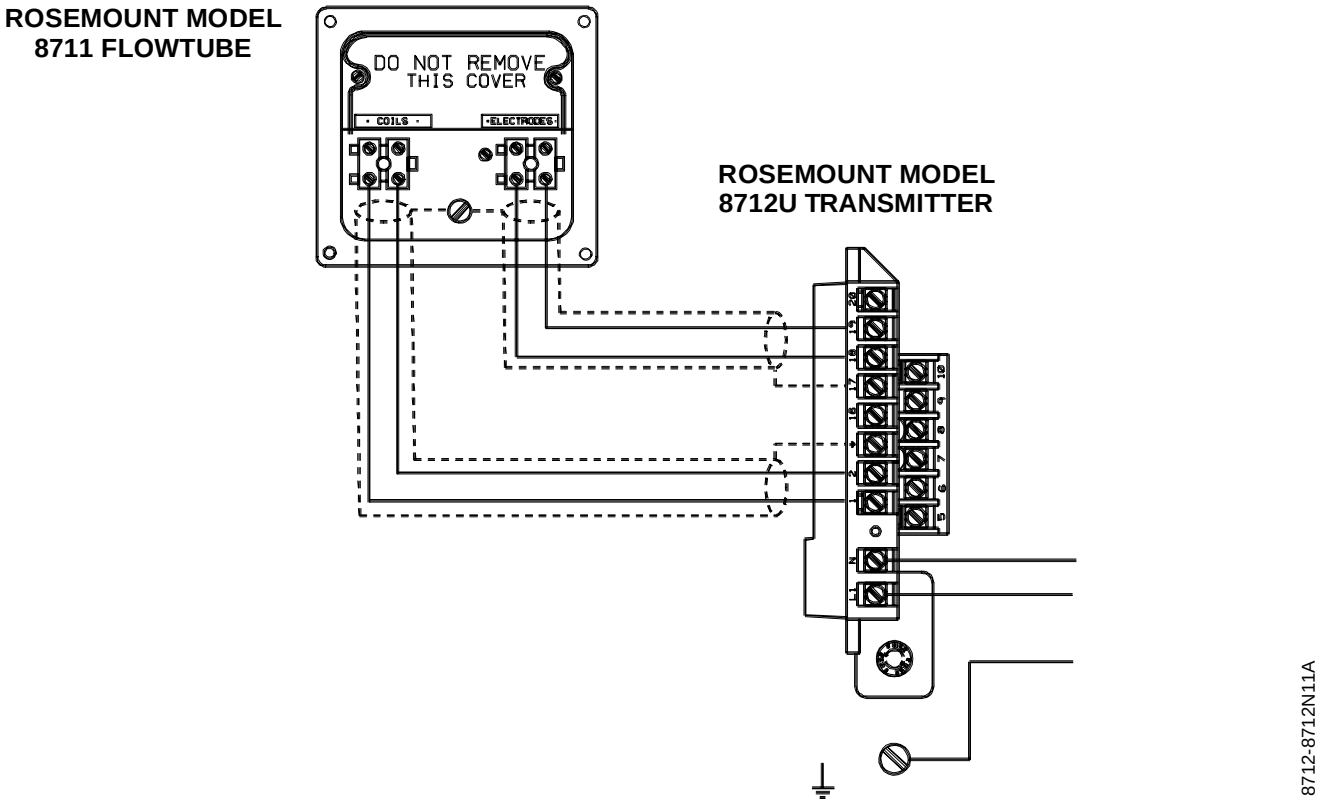
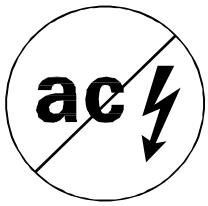


TABLE B-5. Rosemount Model 8711 Flowtube Wiring Connections

Rosemount Model 8712U	Rosemount Model 8711 Flowtubes
1	Coils +
2	Coils –
⏚	Ground
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.



BROOKS FLOWTUBES

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

Model 5000 Flowtube to Model 8712U Transmitter

FIGURE B-6. Wiring Diagram for Brooks Flowtube Model 5000 and Rosemount Model 8712U

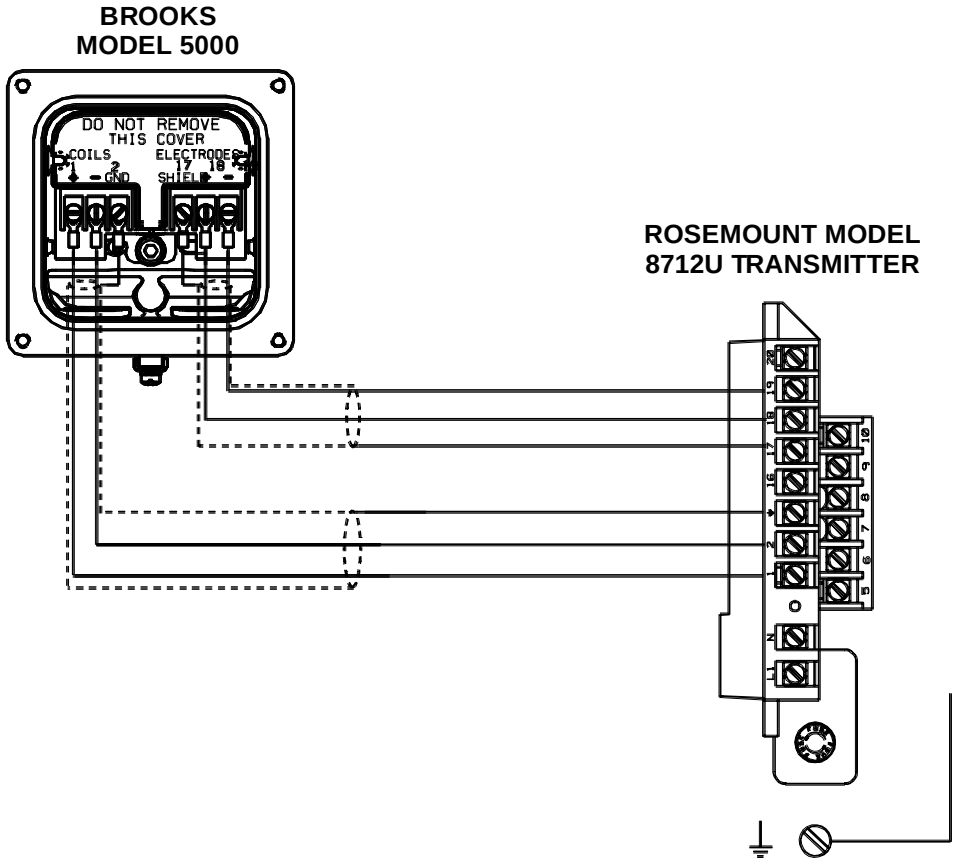
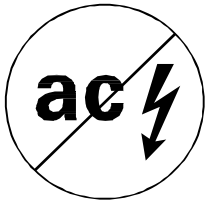


TABLE B-6. Brooks Model 5000 Flowtube Wiring Connections

Rosemount Model 8712U	Brooks Flowtubes Model 5000
1	1
2	2
⏚	Ground
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 Model 8712U Transmitter

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

FIGURE B-7. Wiring Diagram for Brooks Flowtube Model 7400 and Rosemount Model 8712U

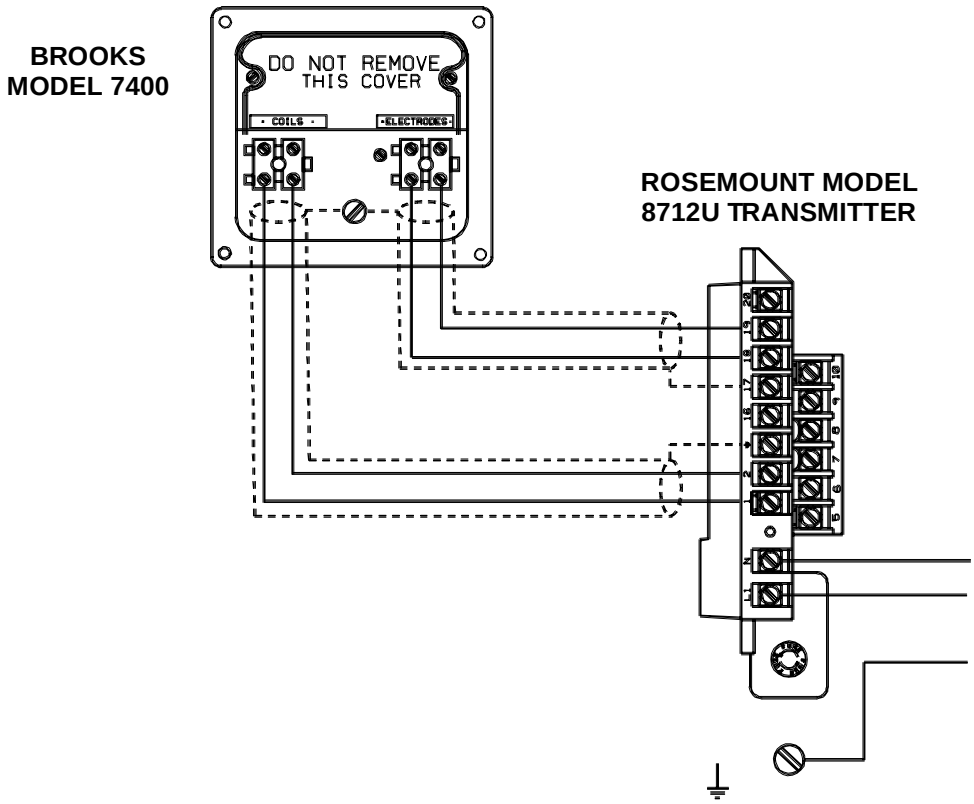
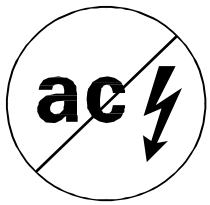


TABLE B-7. Brooks Model 7400 Flowtube Wiring Connections

Rosemount Model 8712U	Brooks Flowtubes Model 7400
1	Coils +
2	Coils –
⏚	Ground
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

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

Endress and Hauser Flowtube to Model 8712U Transmitter

FIGURE B-8. Wiring Diagram for Endress and Hauser Flowtubes

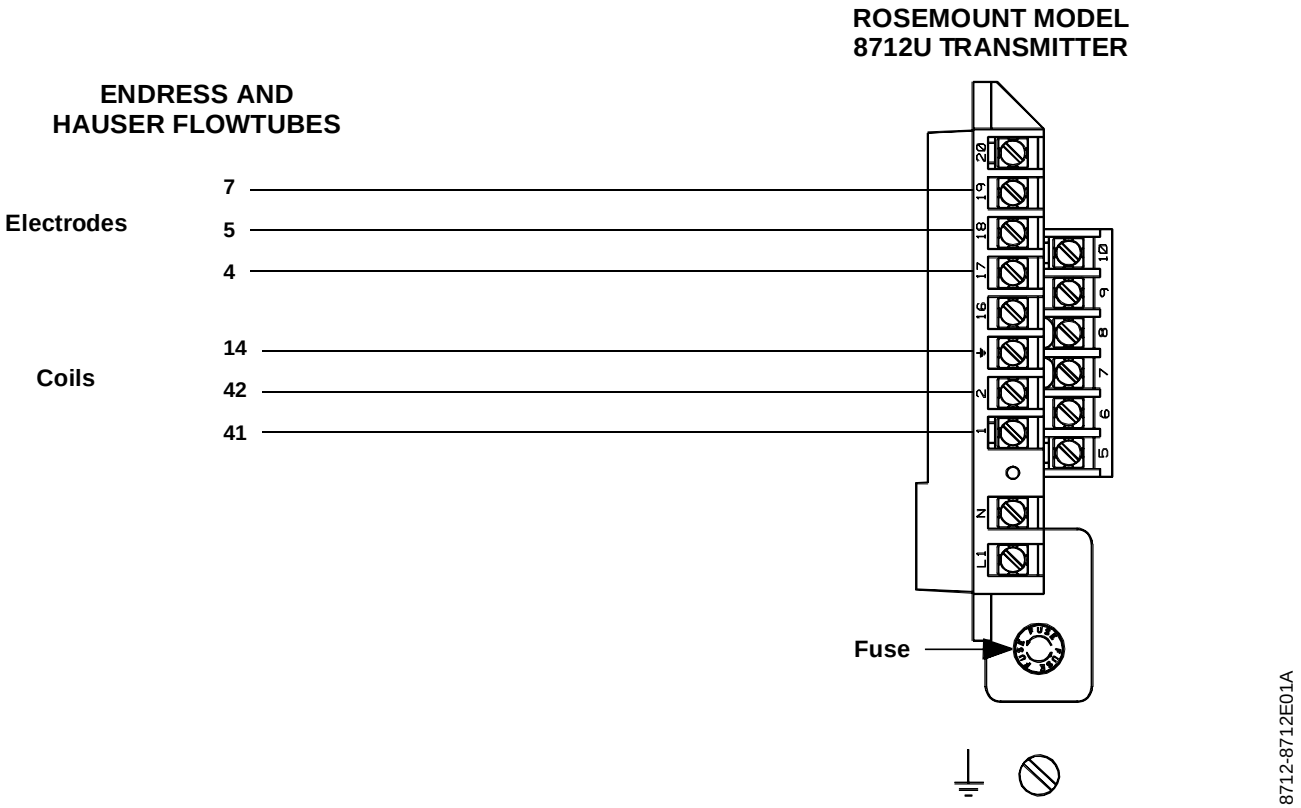


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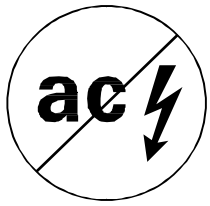
TABLE B-8. Endress and Hauser Flowtube Wiring Connections

Rosemount Model 8712U	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

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

Model 10D1418 Flowtube to Model 8712U Transmitter

FIGURE B-9. Wiring Diagram for Fischer and Porter Flowtube Model 10D1418 and Rosemount Model 8712U

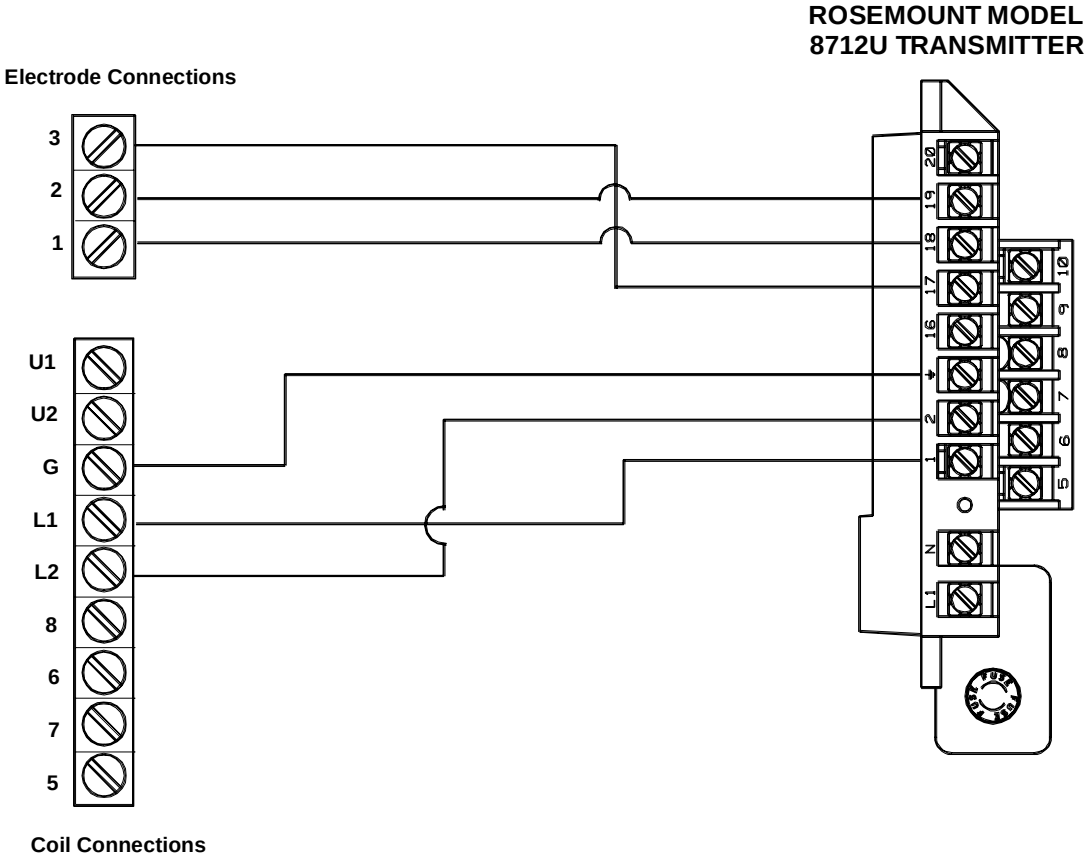


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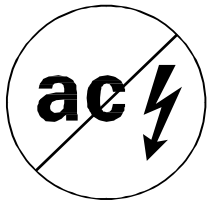
TABLE B-9. Fischer and Porter Model 10D1418 Flowtube Wiring Connections

Rosemount Model 8712U	Fischer and Porter Model 10D1418 Flowtubes
1	L1
2	L2
⏚	Chassis Ground
17	3
18	1
19	2

⚠CAUTION

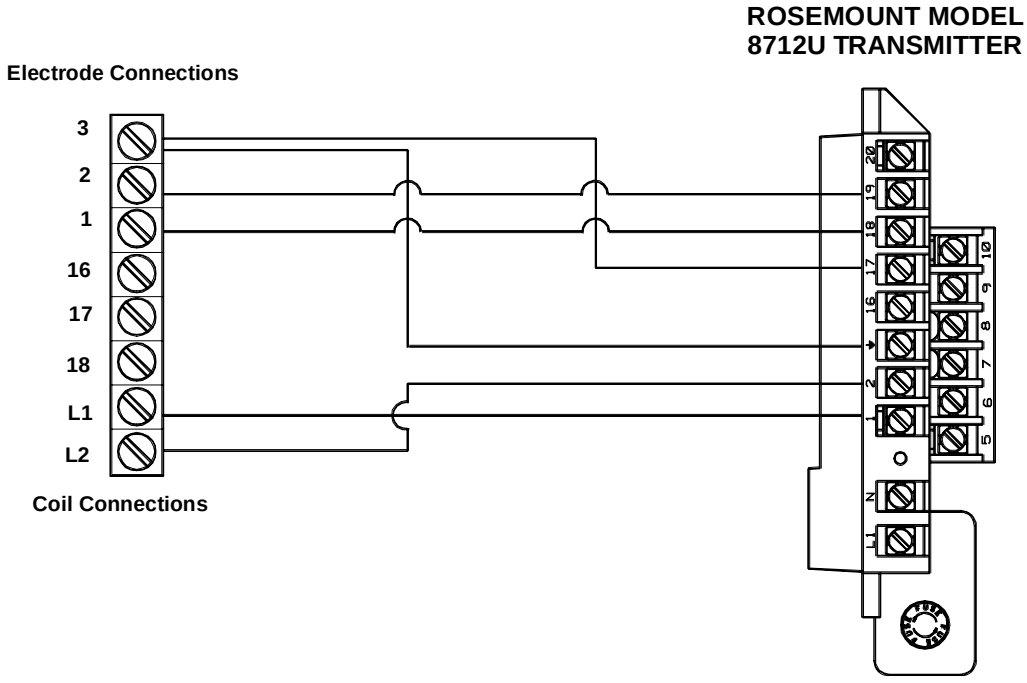
This is a pulsed dc magnetic flowmeter. **Do not connect ac power to the flowtube or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



Model 10D1419 Flowtube to Model 8712U Transmitter

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

FIGURE B-10. Wiring Diagram for Fischer and Porter Flowtube Model 10D1419 and Rosemount Model 8712U



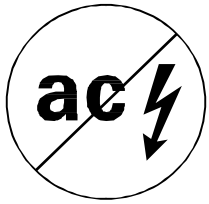
8712-1001A

TABLE B-10. Fischer and Porter Model 10D1419 Flowtube Wiring Connections

Rosemount Model 8712U	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 Model 8712U Transmitter

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

FIGURE B-11. Wiring Diagram for Fischer and Porter Flowtube Model 10D1430 (Remote) and Rosemount Model 8712U

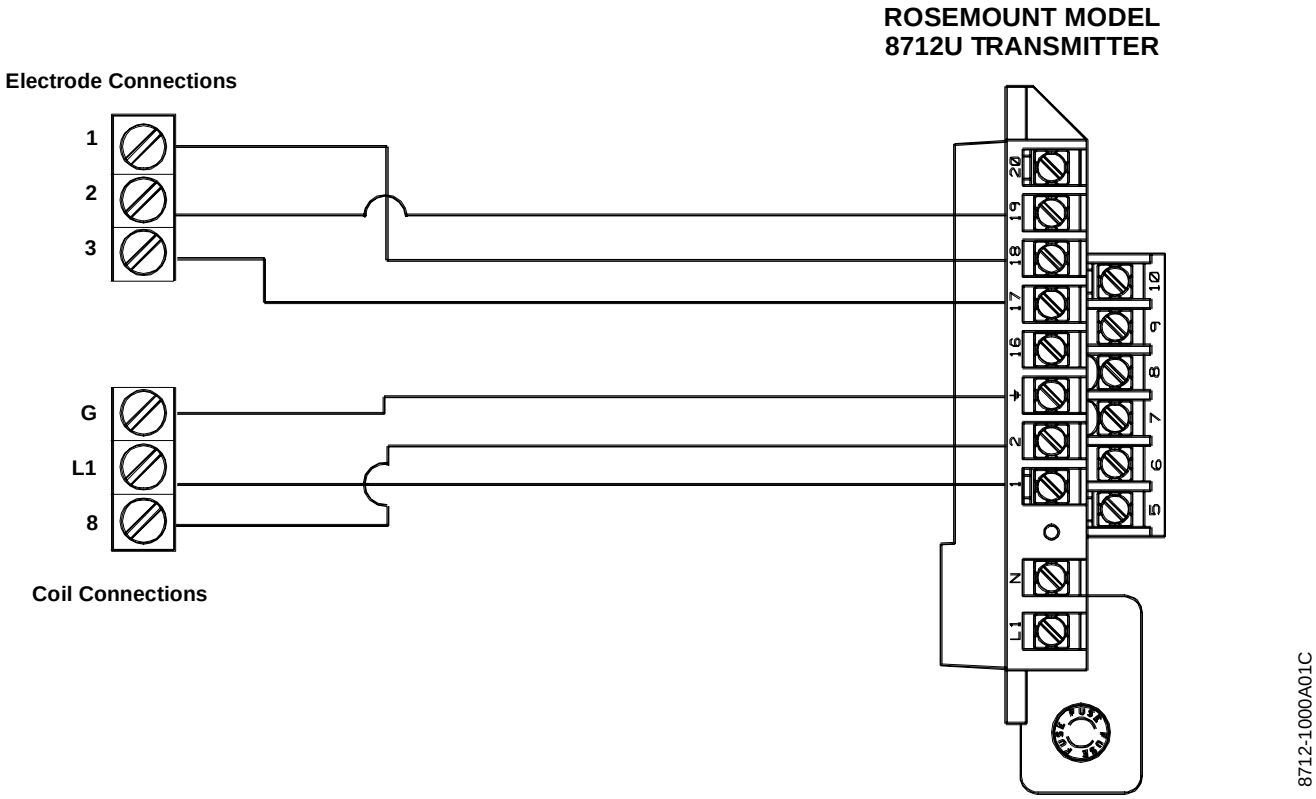
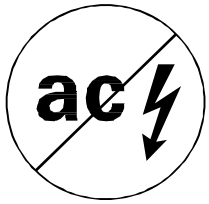


TABLE B-11. Fischer and Porter Model 10D1430 (Remote) Flowtube Wiring Connections

Rosemount Model 8712U	Fischer and Porter Model 10D1430 (Remote) Flowtubes
1	L1
2	8
⏚	G
19	3
18	1
17	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 Model 8712U Transmitter

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

FIGURE B-12. Wiring Diagram for Fischer and Porter Flowtube Model 10D1430 (Integral) and Rosemount Model 8712U

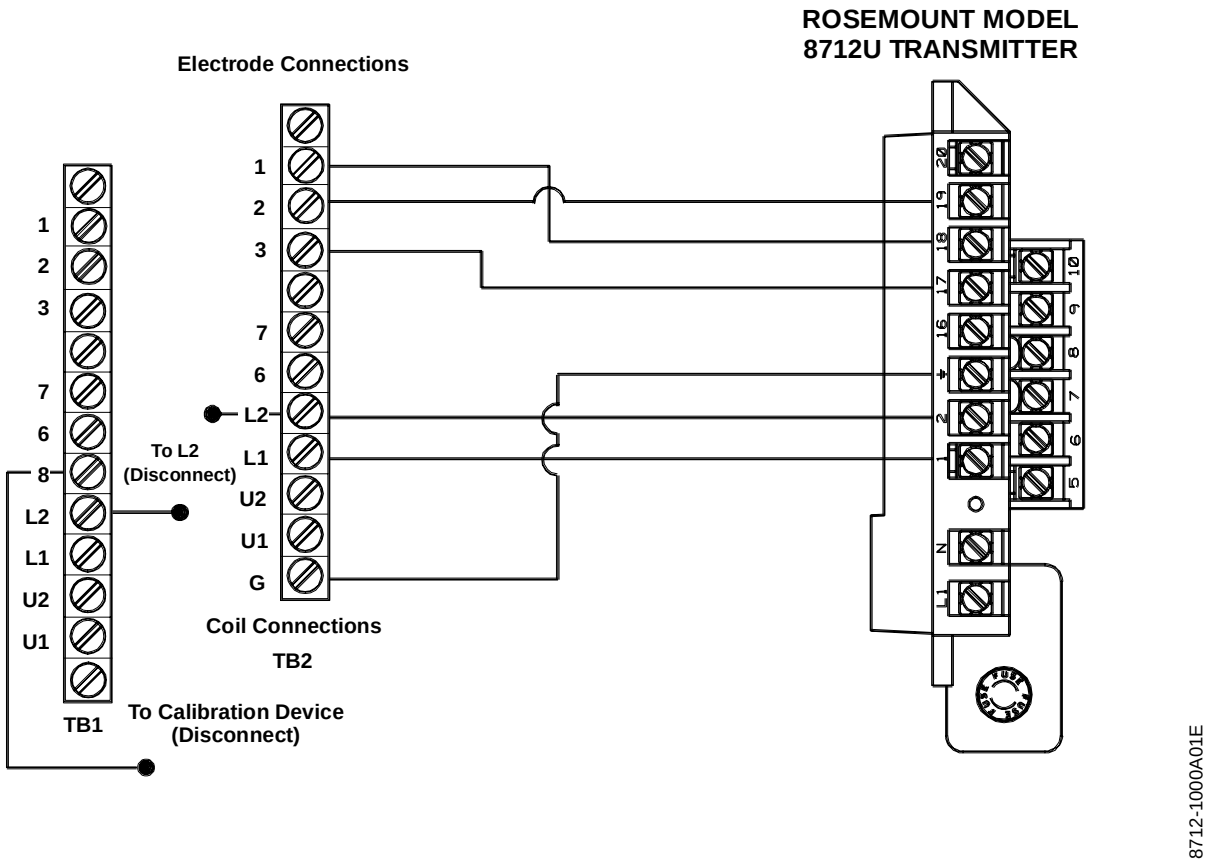
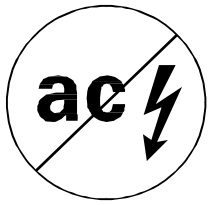


TABLE B-12. Fischer and Porter Model 10D1430 (Integral) Flowtube Wiring Connections

Rosemount Model 8712U	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 Model 8712U Transmitter

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

FIGURE B-13. Wiring Diagram for Fischer and Porter Flowtube Model 10D1465 and Model 10D1475 (Integral) and Rosemount Model 8712U

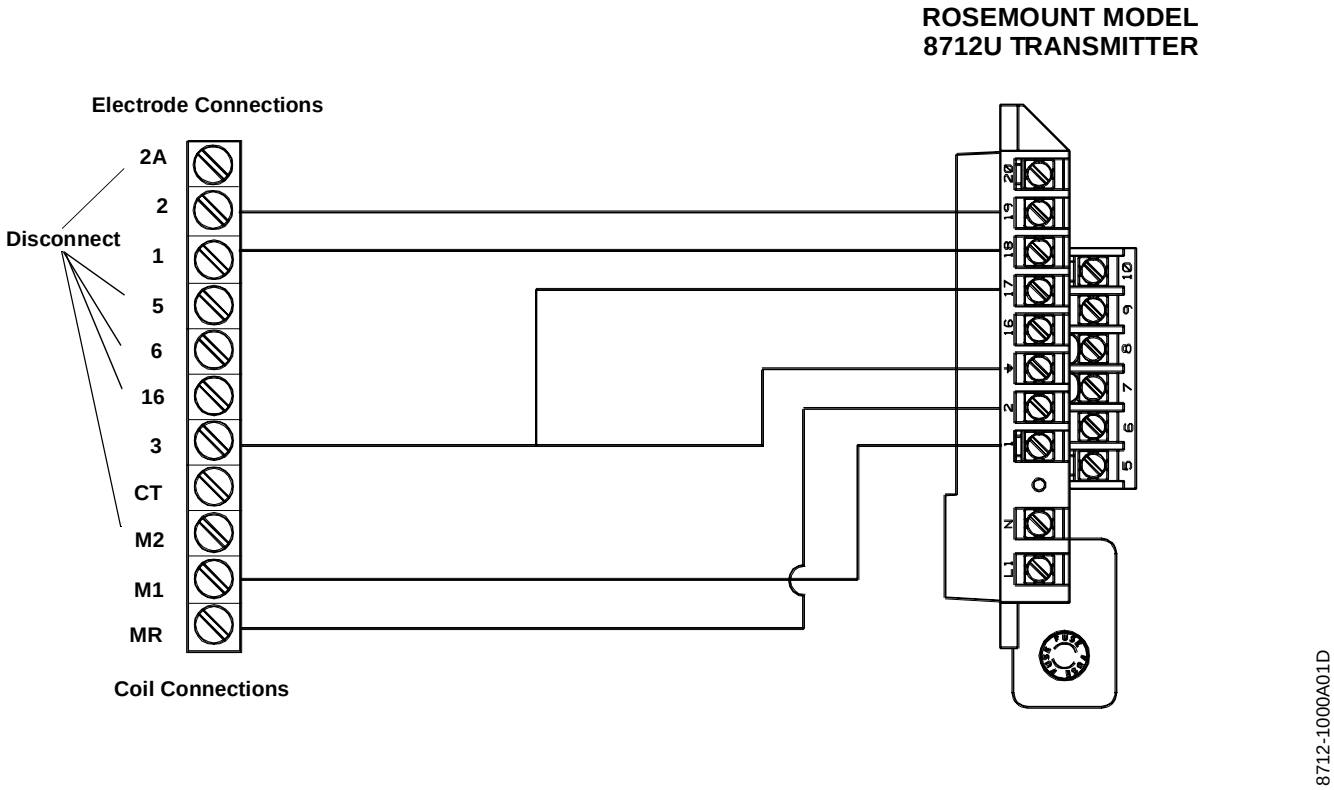
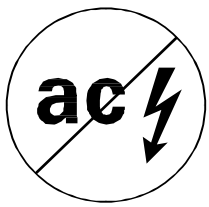


TABLE B-13. Fischer and Porter Model 10D1465 and 10D1475 Flowtube Wiring Connections

Rosemount Model 8712U	Fischer and Porter Model 10D1465 and 10D1475 Flowtubes
1	M1
2	MR
⏚	3
19	3
18	1
17	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 Model 8712U Transmitter

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

FIGURE B-14. Generic Wiring Diagram for Fischer and Porter Flowtubes

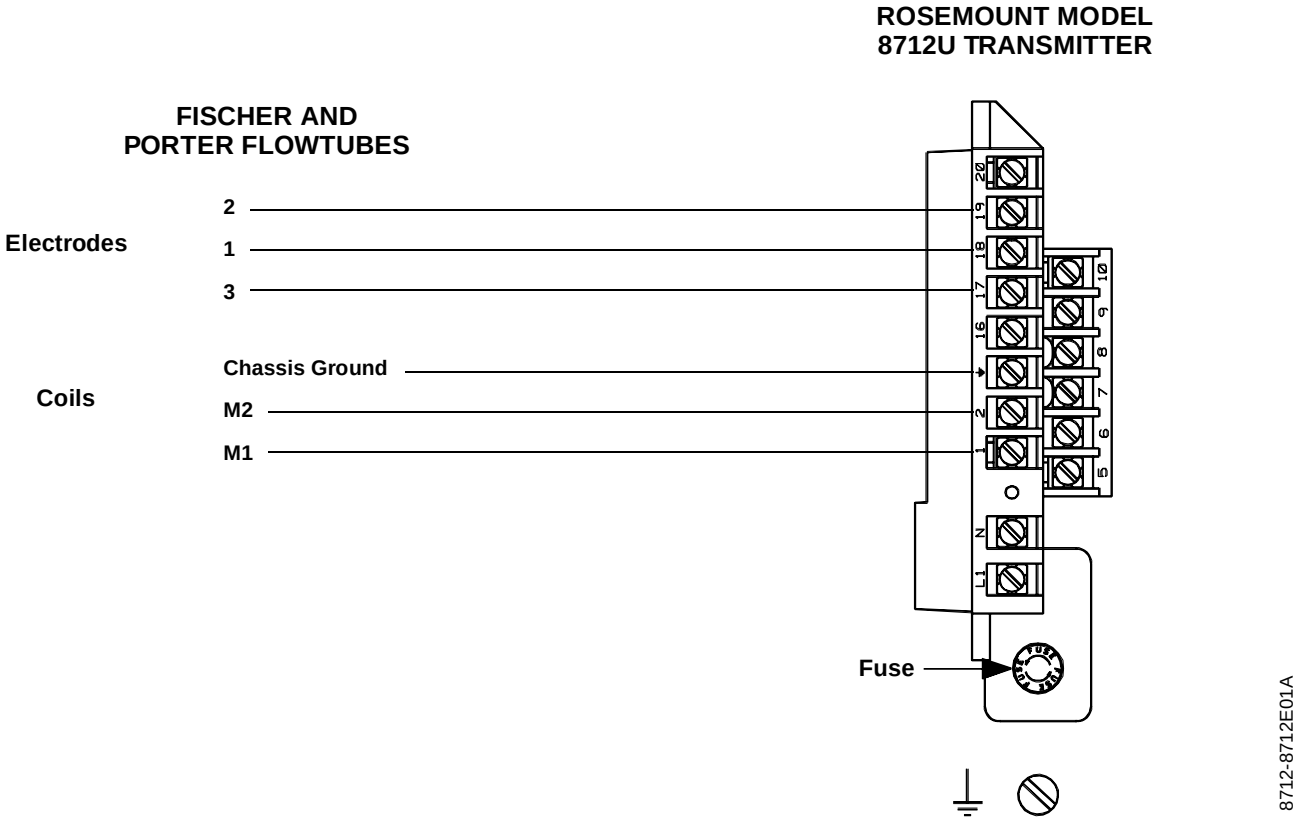


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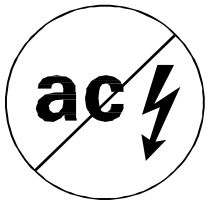
TABLE B-14. Fischer and Porter Generic Flowtube Wiring Connections

Rosemount Model 8712U	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

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

Series 1800 Flowtube to Model 8712U Transmitter

FIGURE B-15. Wiring Diagram for Foxboro Series 1800 and Rosemount Model 8712U

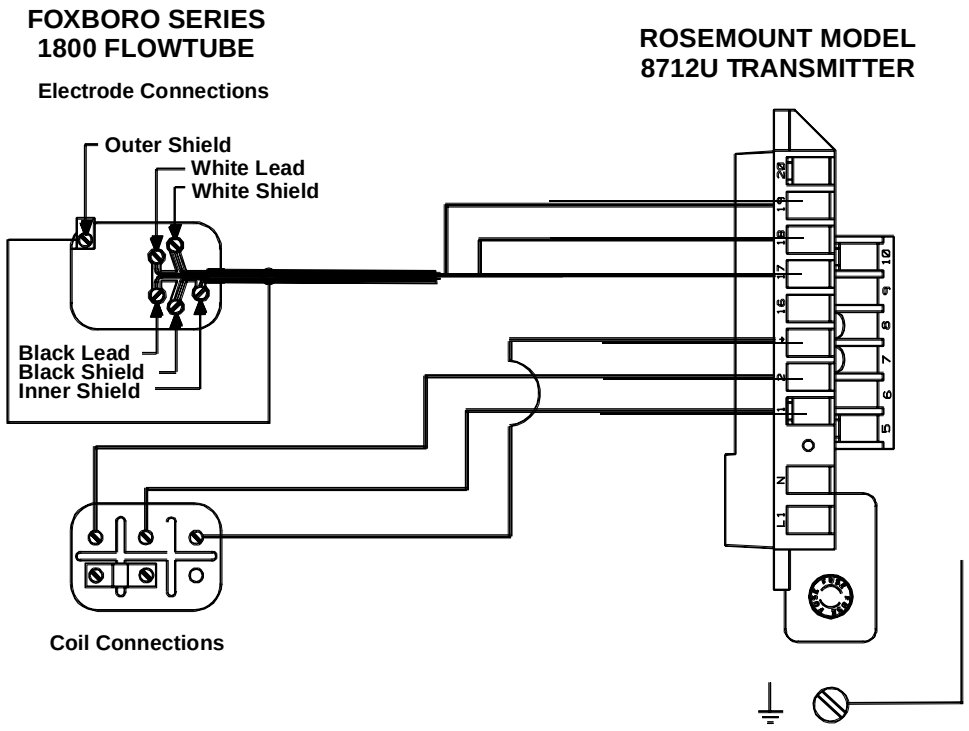
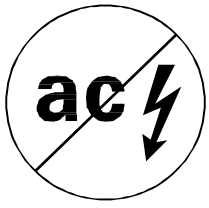


TABLE B-15. Foxboro Series 1800 Flowtube Wiring Connections

Rosemount Model 8712U	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 Model 8712U Transmitter

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

FIGURE B-16. Wiring Diagram for Foxboro Series 1800 (Version 2) and Rosemount Model 8712U

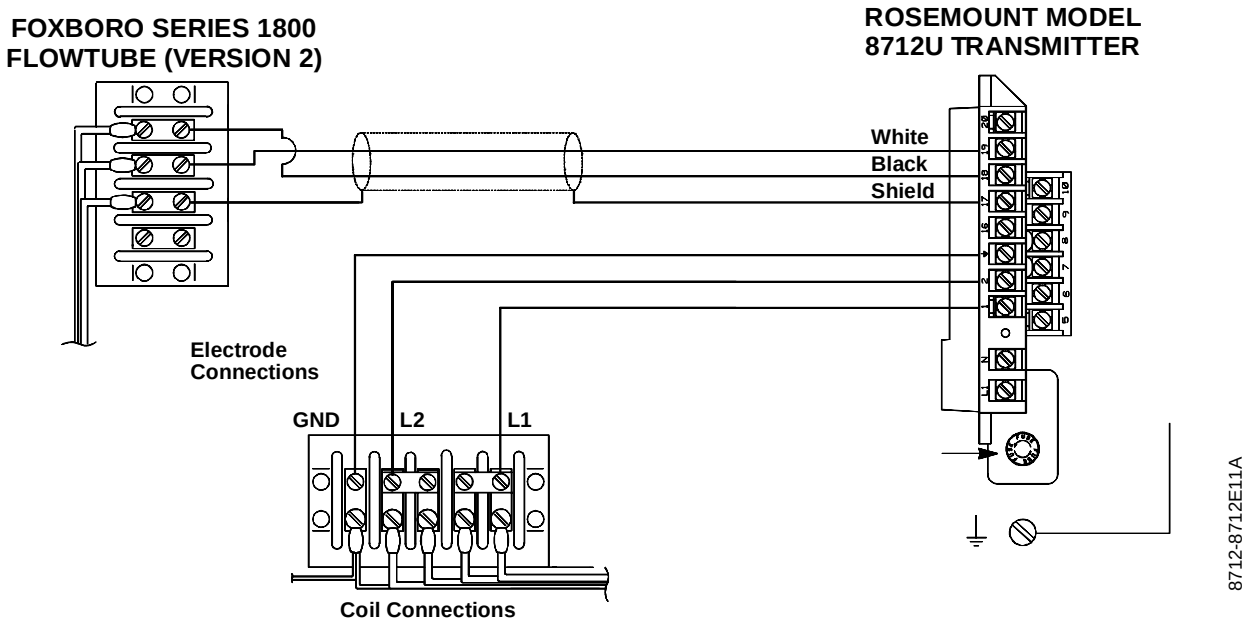
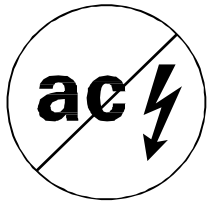


TABLE B-16. Foxboro Series 1800 (Version 2) Flowtube Wiring Connections

Rosemount Model 8712U	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 Model 8712U Transmitter

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

FIGURE B-17. Wiring Diagram for Foxboro Series 2800 and Rosemount Model 8712U

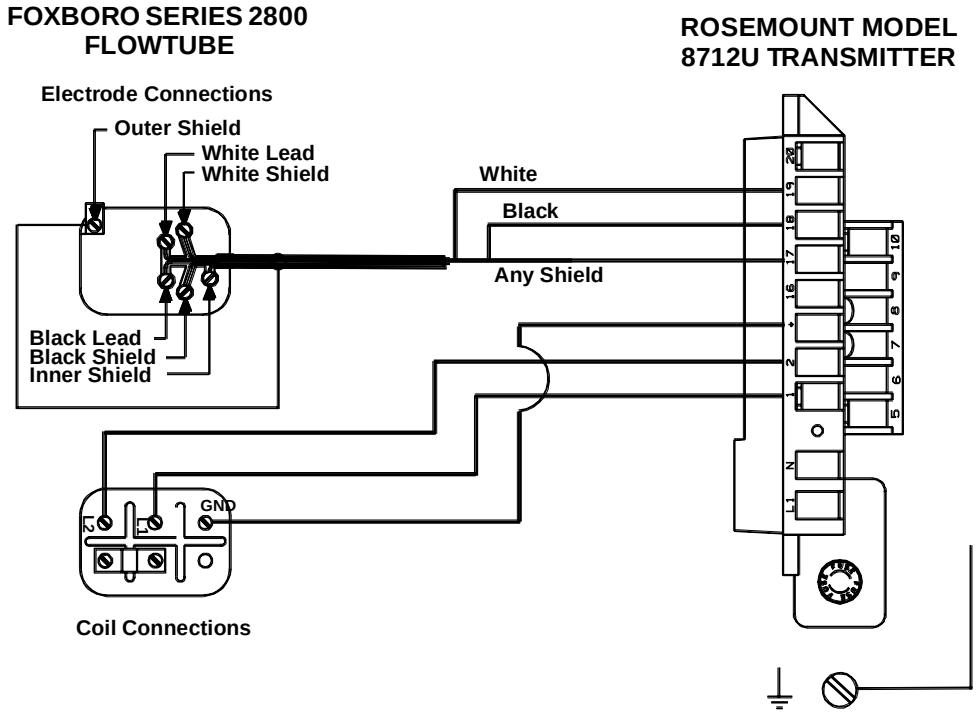
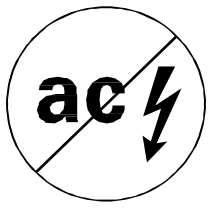


TABLE B-17. Foxboro Series 2800 Flowtube Wiring Connections

Rosemount Model 8712U	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 Model 8712U Transmitter

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

FIGURE B-18. Generic Wiring Diagram for Foxboro Flowtubes

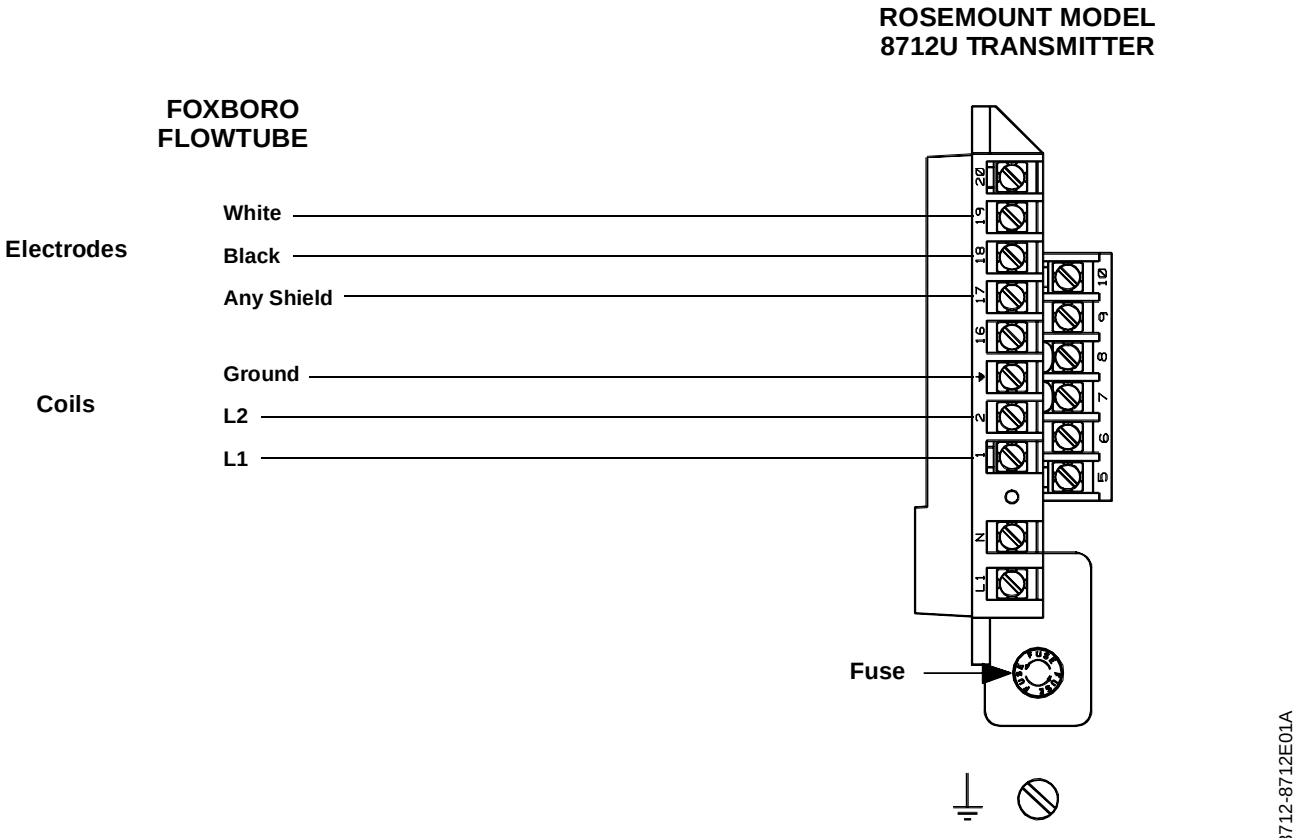


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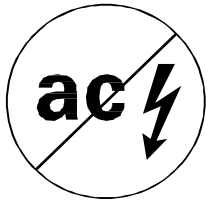
TABLE B-18. Foxboro Flowtube Wiring Connections

Rosemount Model 8712U	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

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

Veriflux VTC Flowtube to Model 8712U Transmitter

FIGURE B-19. Wiring Diagram for Kent Veriflux VTC Flowtube and Rosemount Model 8712U

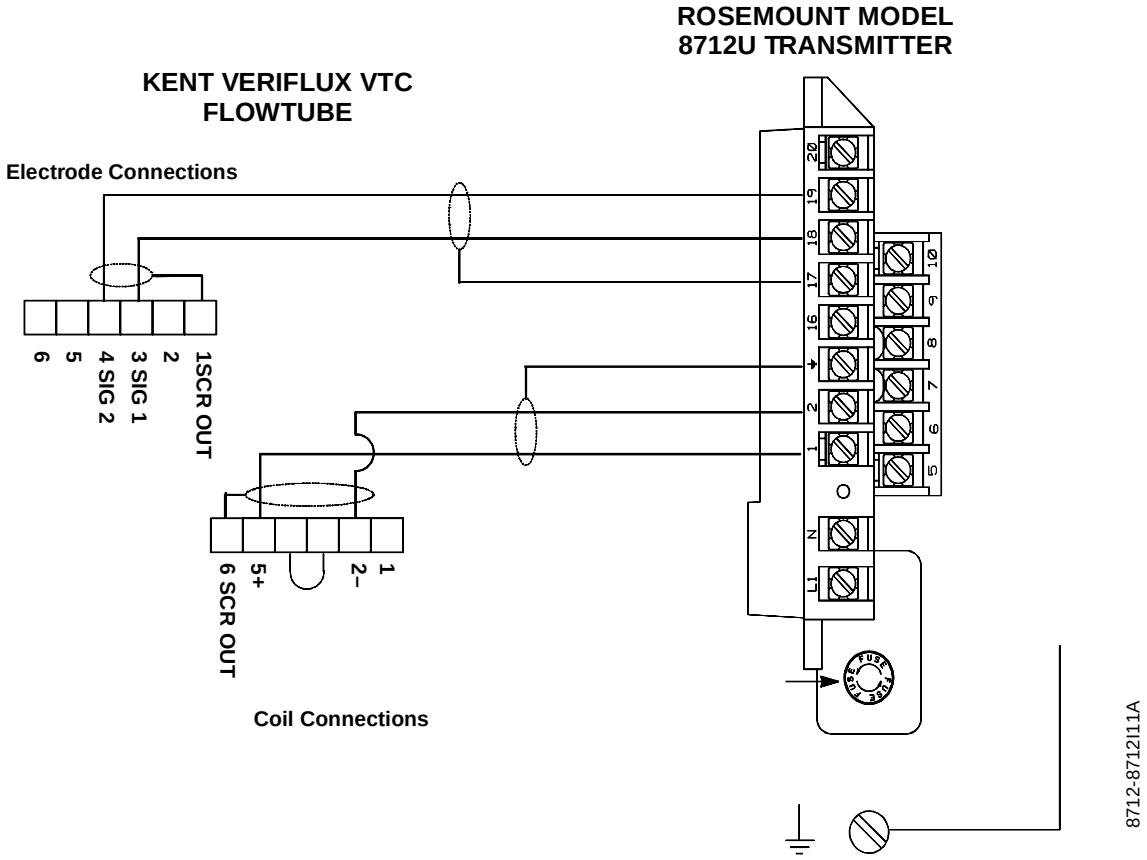
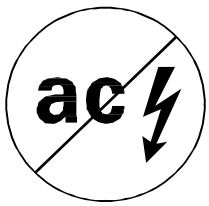


TABLE B-19. Kent Veriflux VTC Flowtube Wiring Connections

Rosemount Model 8712U	Kent Veriflux VTC Flowtubes
1	2
2	1
⏚	SCR OUT
17	SCR OUT
20	SIG2
19	SIG1

⚠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

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

Kent Flowtube to Model 8712U Transmitter

FIGURE B-20. Generic Wiring Diagram for Kent Flowtubes

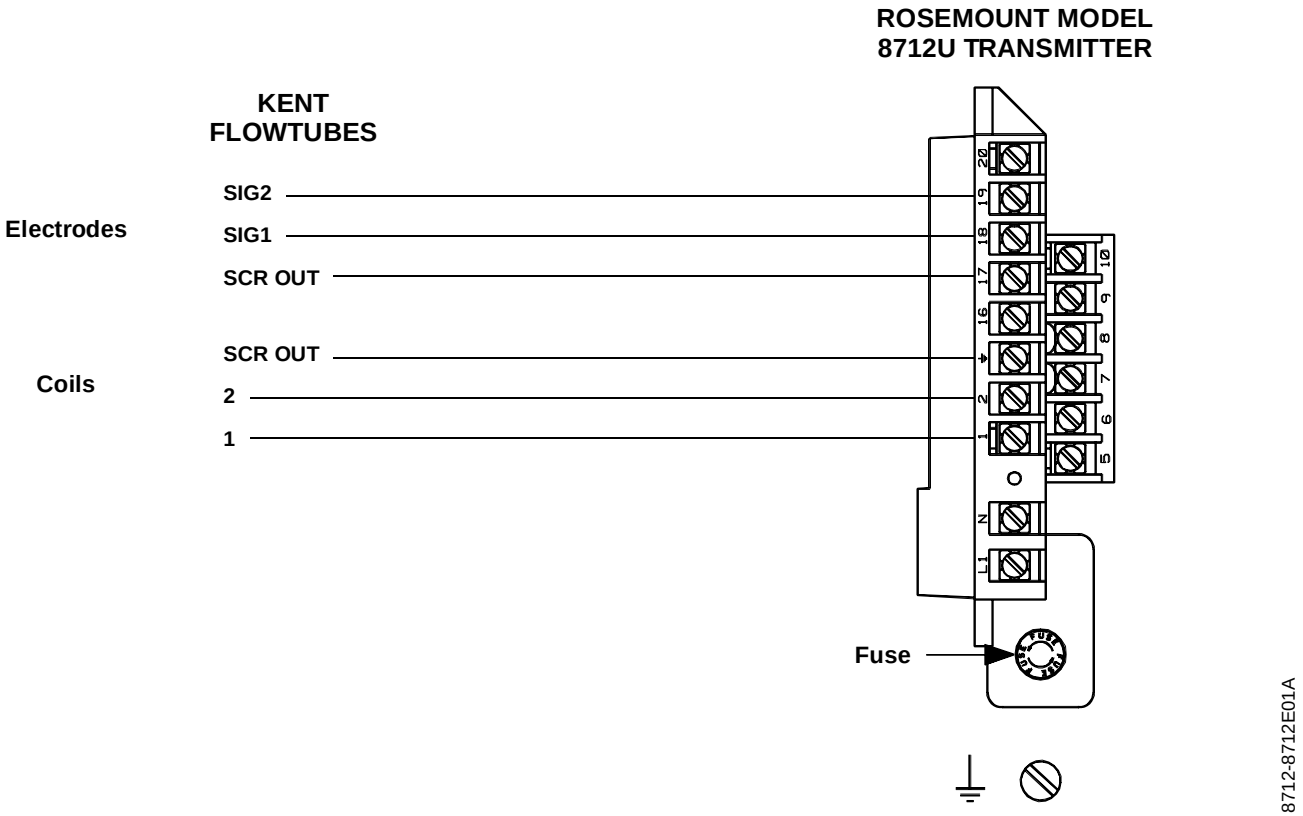
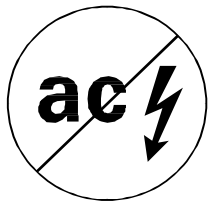


TABLE B-20. Kent Flowtube Wiring Connections

Rosemount Model 8712U	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 B-21.

Krohne Flowtube to Model 8712U Transmitter

FIGURE B-21. Generic Wiring Diagram for Krohne Flowtubes

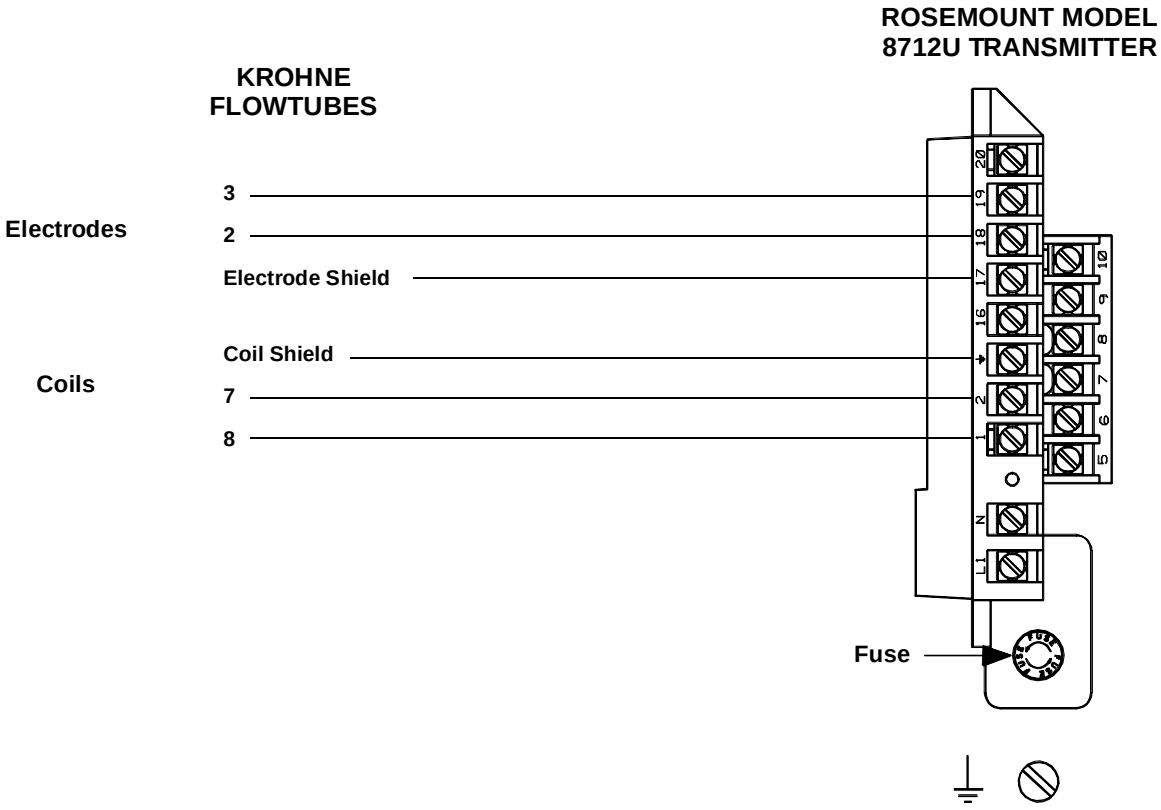


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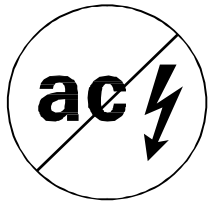
TABLE B-21. Krohne Flowtube Wiring Connections

Rosemount Model 8712U	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

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

Series 1100 Flowtube to Model 8712U Transmitter

FIGURE B-22. Wiring Diagram for Taylor Series 1100 Flowtubes and Rosemount Model 8712U

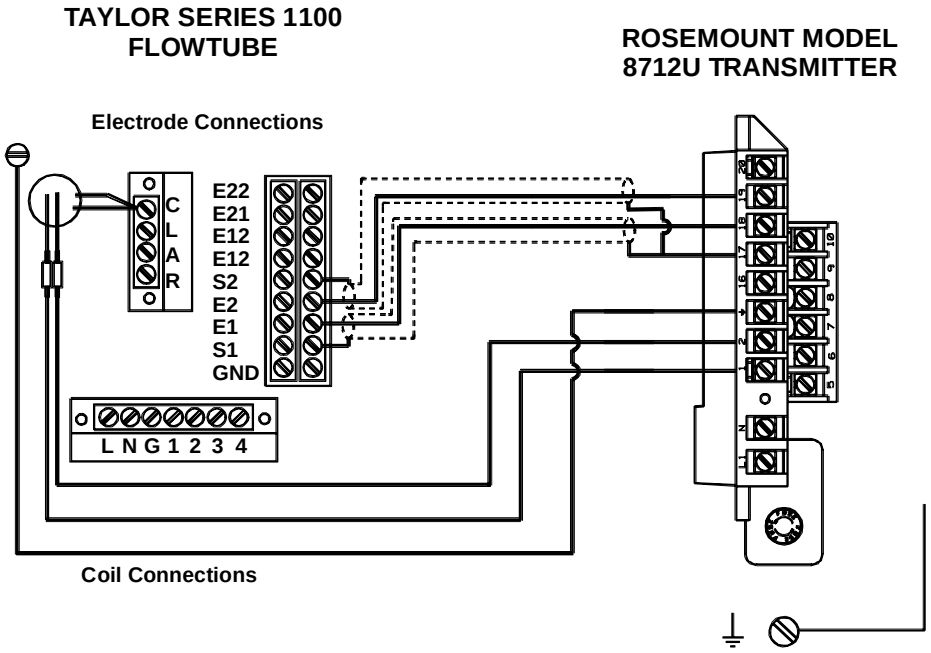
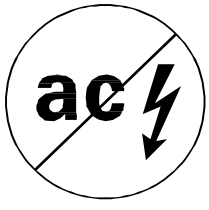


TABLE B-22. Taylor Series 1100 Flowtube Wiring Connections

Rosemount Model 8712U	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 Model 8712U Transmitter

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

FIGURE B-23. Generic Wiring Diagram for Taylor Flowtubes

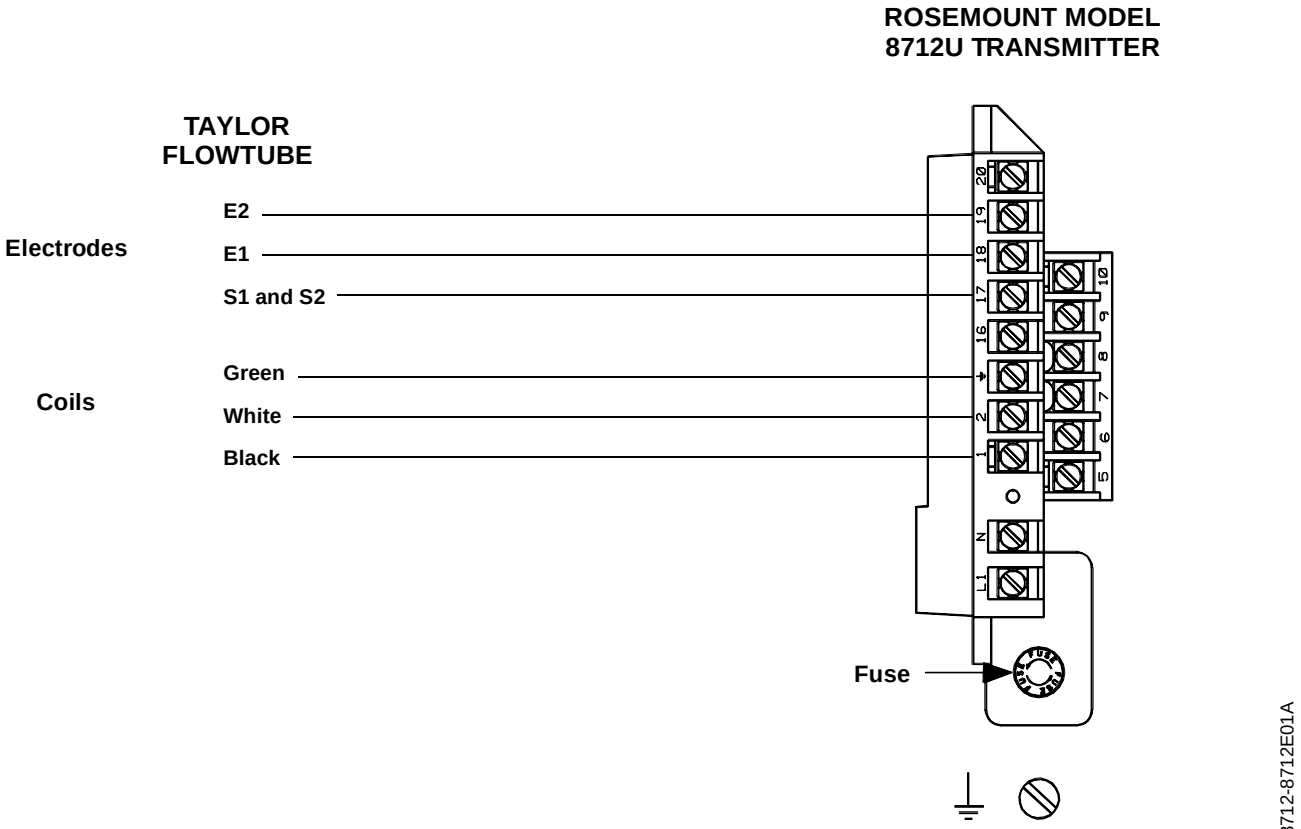
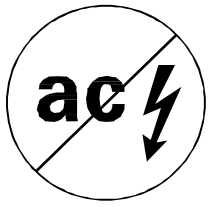


TABLE B-23. Taylor Flowtube Wiring Connections

Rosemount Model 8712U	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

Connect coil drive and electrode cables as shown in Figure B-24.

Yamatake Honeywell Flowtube to Model 8712U Transmitter

FIGURE B-24. Generic Wiring Diagram for Yamatake Honeywell Flowtubes

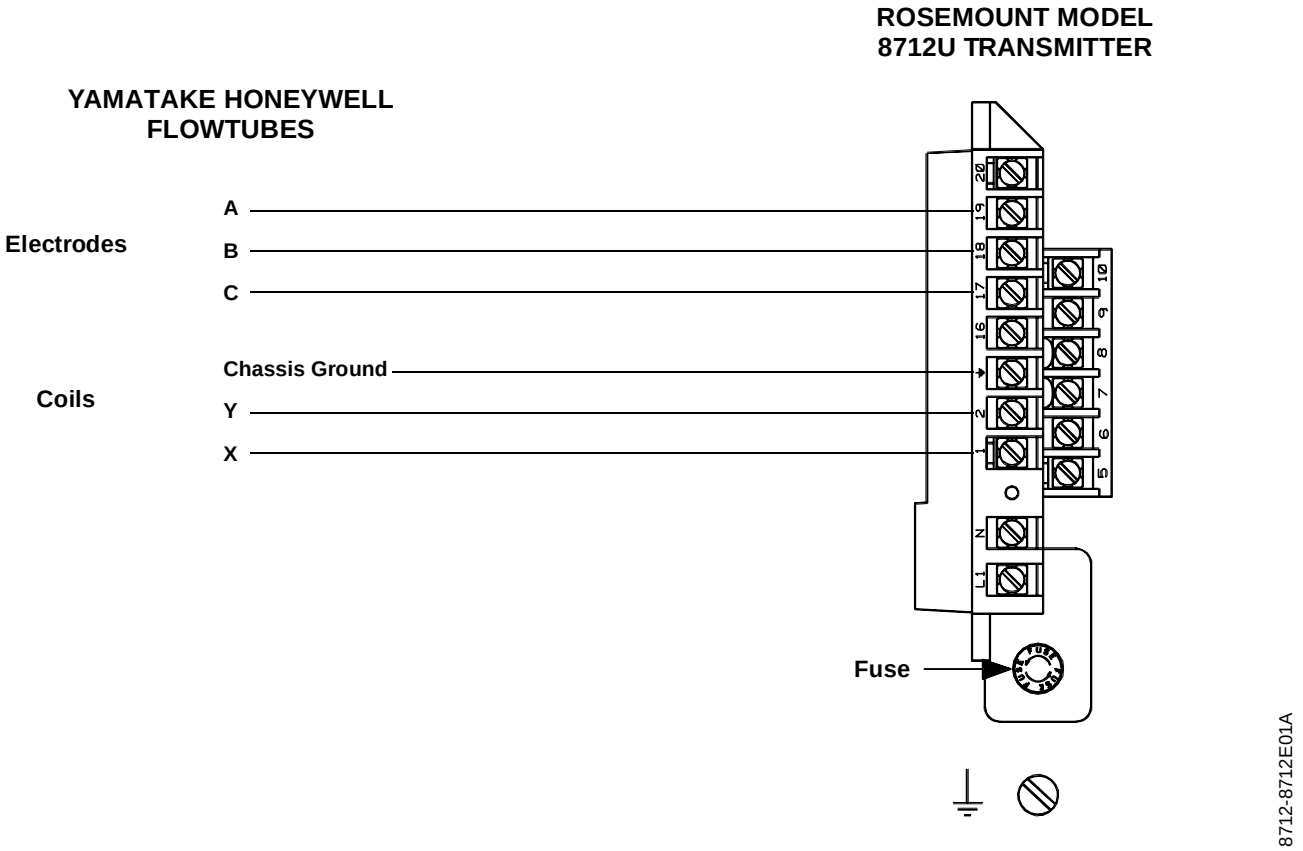
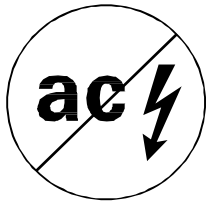


TABLE B-24. Yamatake Honeywell Flowtube Wiring Connections

Rosemount Model 8712U	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

Connect coil drive and electrode cables as shown in Figure B-25.

Yokogawa Flowtube to Model 8712U Transmitter

FIGURE B-25. Generic Wiring Diagram for Yokogawa Flowtubes

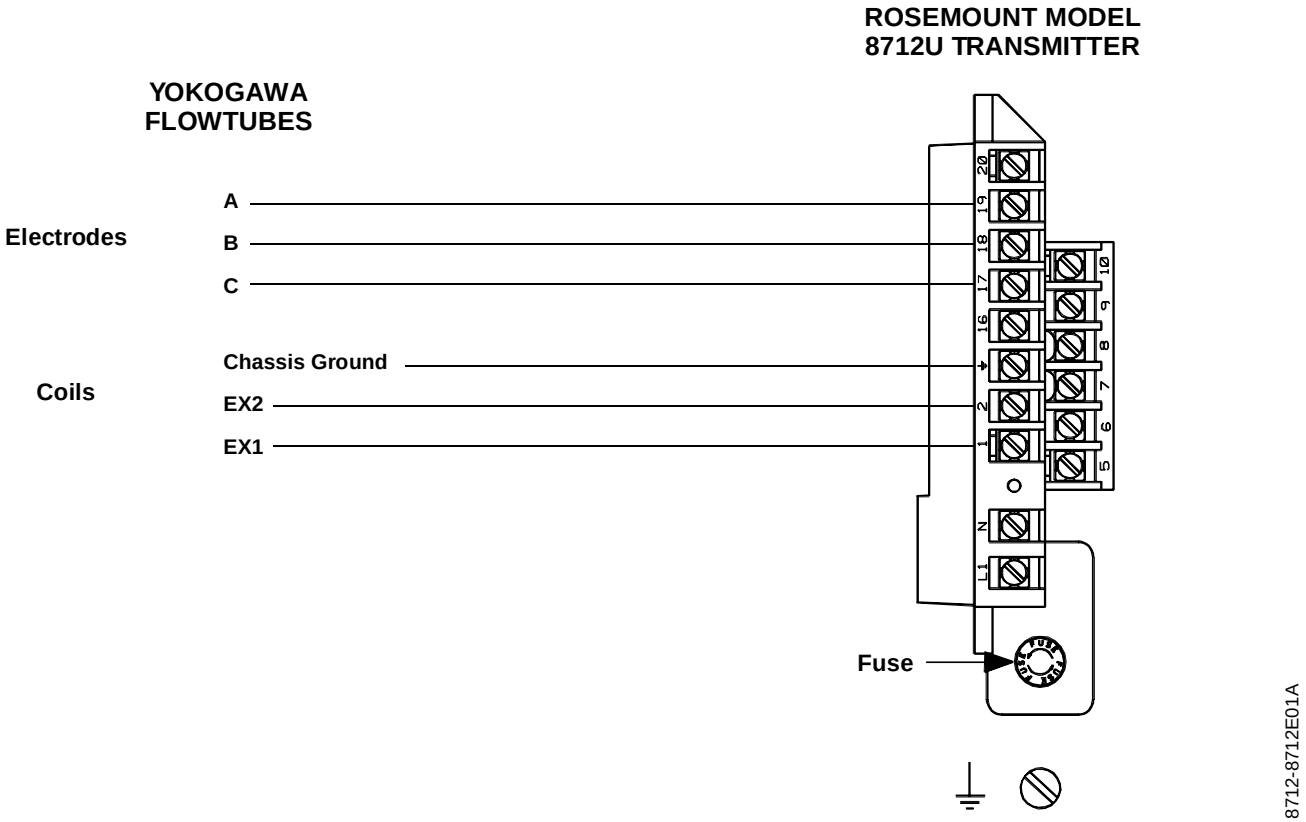


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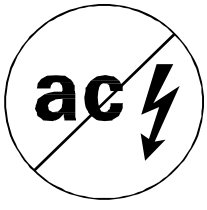
TABLE B-25. Yokogawa Flowtube Wiring Connections

Rosemount Model 8712U	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 Model 8712U 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

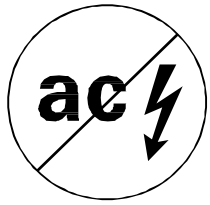
Connect the electrode terminals to Model 8712U terminals 18 and 19. The electrode shield should be connected to terminal 17.

Connect the coil terminals to Model 8712U terminals 1, 2, and ⏚.

If the Model 8712U Transmitter indicates a reverse flow condition, switch the coil wires connected to terminals 18 and 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.



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