MagneW 3000 *PLUS* Electromagnetic Flowmeter User's Manual

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About This Publication

This manual provides the user with technical and operational information for the MagneW 3000 ***PLUS*** Magnetic Flowmeter. Use this manual to assist you in installing, operating, maintaining, and troubleshooting the MagneW 3000 product.

Warning / Caution / Attention

Hazardous situations or faulty operations may occur if the flowmeter is not used correctly. The following explains the meaning of the information flagged by the labels shown below.

WARNING	A warning indicates a potentially hazardous situation which, if not avoided, could result in death or serious personal injury.
CAUTION	A caution indicates actions or procedures which, if not performed correctly, may lead to incorrect operation or physical damage to the unit.
ATTENTION	An attention indicates actions or procedures which, if not performed correctly, may indirectly affect operations or lead to an unexpected instrument response.

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Acronyms

ANSI .... American National Standard Institute
APM .... Advanced Process Manager
APMM .... Advanced Process Manager Module
DE mode .... Digital Enhanced Communications Mode
DOP .... Digital Operator Panel
EMI .... Electromagnetic Interference
FTA .... Field Termination Assembly
HPM .... High-Performance Process Manager
IDF .... International Dairy Federation
I/O .... Inputs/Outputs
LCN .... Local Control Network
mA dc .... Milliamperes Direct Current
N•M .... Newton-Meters
NPT .... National Pipe Thread
NVM .... Non-Volatile Memory
PM .... Process Manager
PMM .... Process Manager Module
RFI .... Radio Frequency Interference
SFC .... Smart Field Communicator
STDC .... Smart Transmitter Digital Communications
STI IOP .... Smart Transmitter Interface Input/Output Processor
STIM .... Smart Transmitter Interface Module
TAC .... Technical Assistance Center
UCN .... Universal Control Network
US .... Universal Station
Vac .... Volts Alternating Current
Vdc .... Volts Direct Current

Parameters

DAMPING .... Damping Time Constant for Transmitter
DECONF .... DE Configuration Mode
LRL .... Lower Range Limit
LRV .... Lower Range Value
PTEXECST .... Point Execution State
PV .... Process Variable
PVCALC .... PV Calculation Value
PVEUHI .... PV High Range in Engineering Units
PVEULO .... PV Low Range in Engineering Units
PVRAW .... Raw PV Value
SECVAR .... Secondary Variable
SENSRTYP .... Transmitter Type
SERIALNO .... Transmitter PROM identification
STI_EU .... Engineering Units for Range Values
STISWVER .... Transmitter Software Version
STITAG .... Transmitter Tag Name
URL .... Upper Range Limit
URV .... Upper Range Value

References

Publication Title	Publication Number
MagneW 3000 ***PLUS*** *Smart Electromagnetic Flowmeter Specification and Application Guide*	36-KI-29-02
MagneW 3000 Magnetic Flowmeter Implementation and Service Manual	AV-305
MagneW 3000 Calibrator Calibration Manual	36-KI-26-01
SFC Smart Field Communicator Model STS103 Operating Guide	34-ST-11-14
PM/APM Smartline Transmitter Integration Manual	PM 12-410

Section 1 – Introduction

1.1 Overview

Section contents

This section contains the following topics:

Description

The MagneW 3000 ***PLUS*** Magnetic Flowmeter consists of a detector/converter combination which operates on the principles of Faraday's law.

The MagneW 3000 ***PLUS*** flowmeter is available in two configurations: integral and remote.

- *Integral:* The converter is mounted directly on the detector and they are installed as an integrated unit on a pipe.
- *Remote:* The detector and converter are installed separately and are connected together by cables.

Figures 1-1 illustrates the available MagneW 3000 ***PLUS*** detector/converter configurations.

CE Conformity (Europe)

The MagneW 3000 ***PLUS*** meets the following CE Mark standards:

- emission limits for EN 50081-1-1993
- immunity standards for EN 50082-2-1995.

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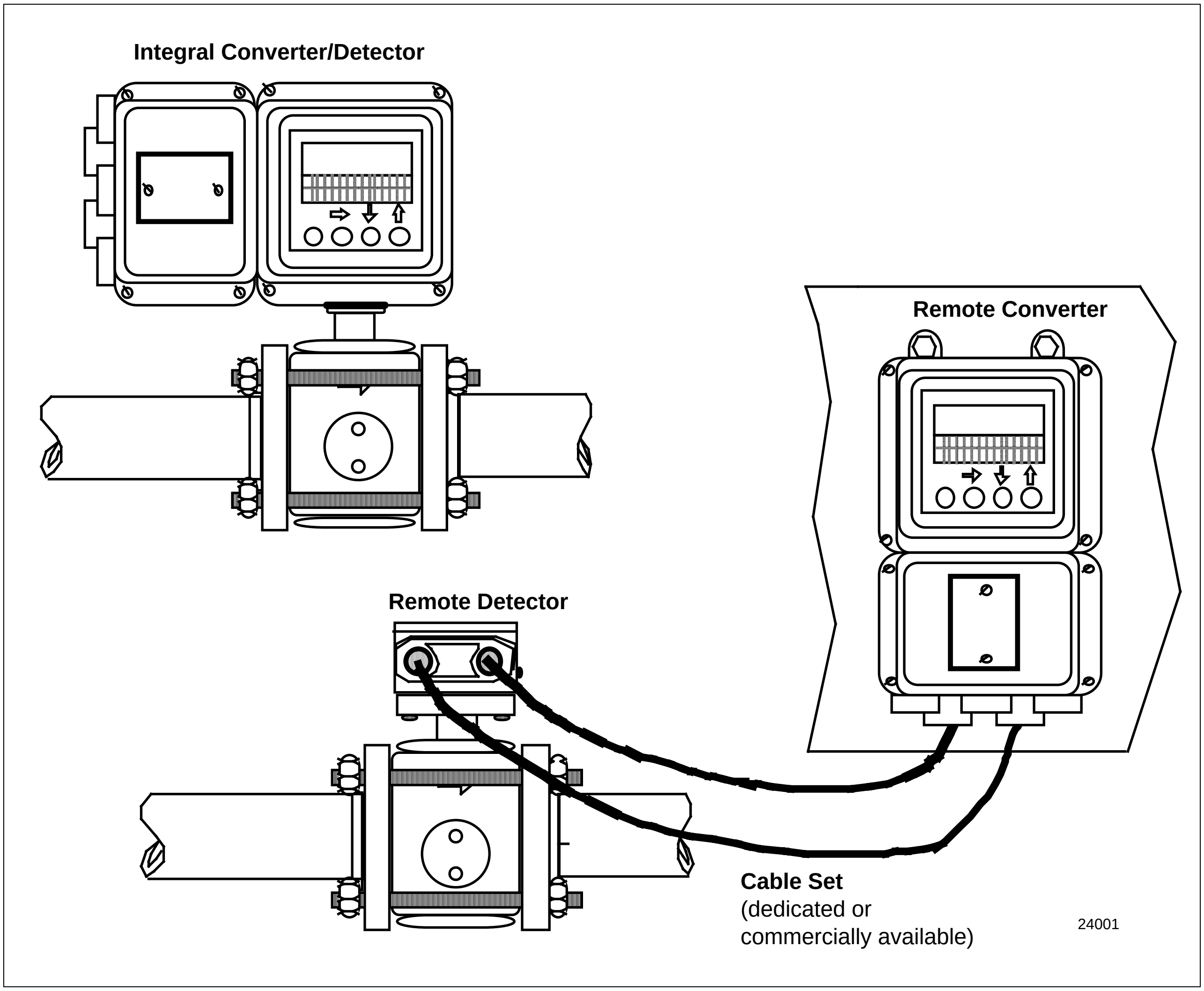
Integral and remote configuration diagram

Figure 1-1 Typical Integral and Remote MagneW 3000 Configuration Models



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Detector summary

Because the detector does the actual measuring of the flow rate, it serves as the primary element for MagneW 3000 ***PLUS***.

The detector measures the conductive fluid as it moves through a magnetic field and sends this signal to the converter.

Converter summary

The converter is responsible for powering the coils of the detector and converting the signals sent by the detector into linear 4-20 mA outputs for determining fluid flow rate.

Converters also provide optional pulse outputs to drive counters and totalizers.

Available models

Table 1-1 outlines the detector and converter models available.

Table 1-1 MagneW 3000 ***PLUS*** Detector and Converter Model Types

Model	Lining	Pipe Connection	Diameter—mm (in.)
DETECTORS			
General/watertight	PFA	Union/hose/clamp	2.5 to 15 (0.1 to 0.6)
General/watertight	PFA Polyurethane rubber	Wafer	2.5 to 200 (0.1 to 7.9) 25 to 200 (1 to 7.9)
General/watertight	PFA Polyurethane rubber Chloroprene rubber	Flange	25 to 600 (1 to 23.6) 25 to 200 (1 to 7.9) 250 to 600 (10 to 23.6)
General/submersible	PFA	Union/hose/clamp	15 (0.6)
General/submersible	PFA Polyurethane rubber	Wafer	15 to 200 (0.6 to 7.9) 25 to 200 (1 to 7.9)
General/submersible	PFA Polyurethane rubber Chloroprene rubber	Flange	250 to 600 (10 to 23.6) 25 to 200 (1 to 7.9) 250 to 600 (10 to 23.6)
CONVERTERS			
General	Integral or remote type		

Operator interface

Because the MagneW 3000 ***PLUS*** is a current output based device, it can be operated and configured using the SFC Smart Field Communicator. The flowmeter can also be operated and configured locally using the optional Digital Operator Panel (DOP) or remotely from the control room at the Universal Station or Global User Station (GUS) as part of Honeywell's **TotalPlant** Solution (TPS) system. (TPS is the evolution of TDC 3000^{X}.)

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Analog or digital system configuration

The choice of either an analog output or digital output system configuration depends on whether or not you want to use the digitally enhanced (DE) communication mode.

In analog mode, the flowmeter sends the instantaneous flow rate as a proportional 4 to 20 milliampere output signal to a controller or a recorder in the control system.

A flowmeter in the DE mode can communicate in a direct digital fashion with a Universal Station in Honeywell's TPS system. The digital signal can include flow rate, flowmeter database, and self-diagnostics.

Analog mode

In the analog mode, the flowmeter can be configured with or without SFC communications (Figure 1-2).

The DC power supply that transmits the analog output, when the flowmeter is used without SFC communication, is built into the product. The analog output signal is transmitted directly to the host control system.

- *Analog output range:* 0.8 to 22.4 mA (–20 to +115%)
- *Resistive load:* 0 to 600 ohms.

When the flowmeter is used in the analog mode with SFC communications, an external power supply (DC power) and external resistive load (minimum 250 ohms) is required.

- *Analog output range:* 3.2 to 22.4 mA (–5 to +115%)
- *DC power:* 16 to 45 Vdc
- *Maximum value of external resistive load is calculated:*

Maximum resistive load (ohms) =

$$\frac{\text{External power supply for communication} - 8.5\text{V}}{0.025}$$

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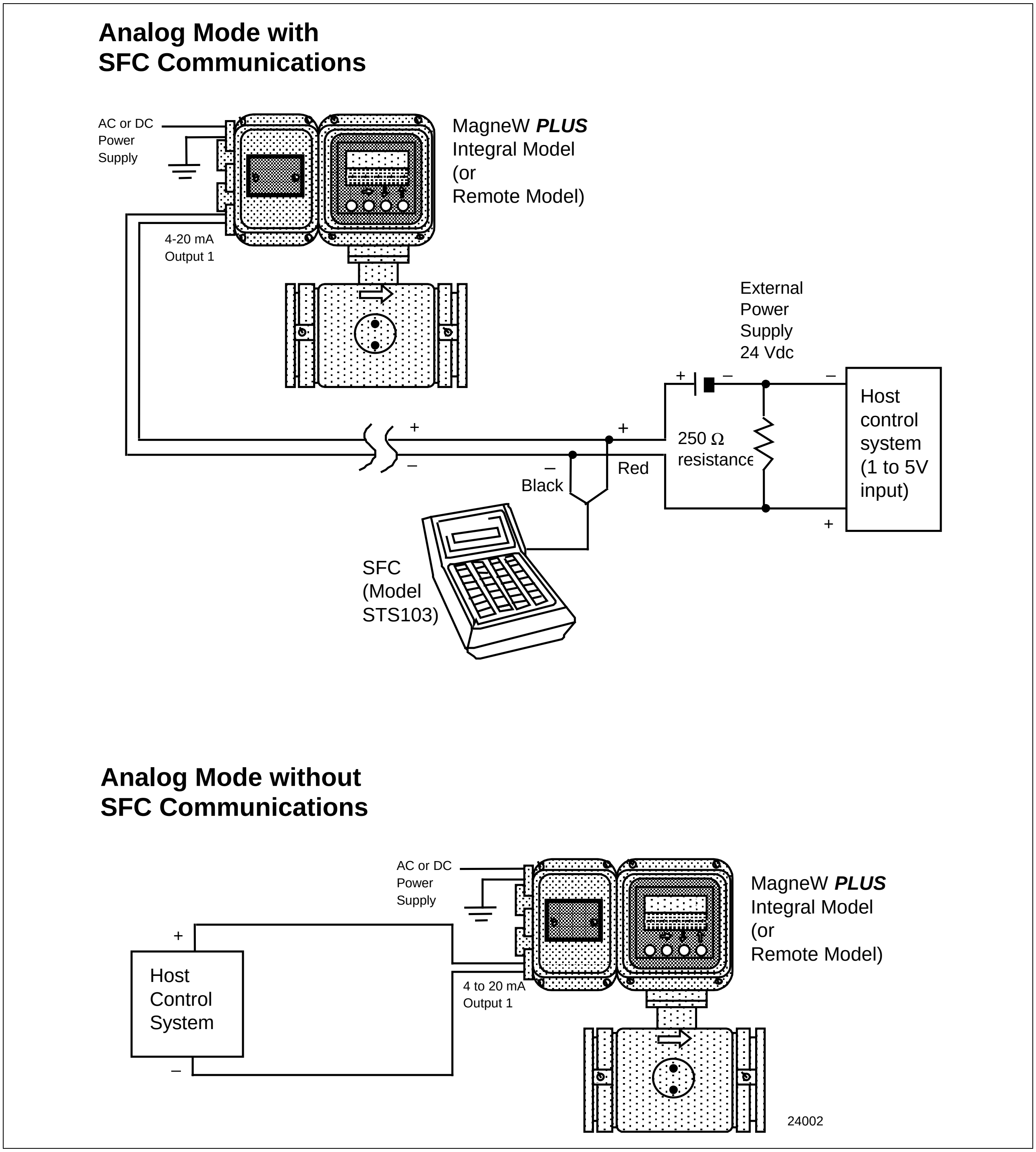
Analog mode, continued

Figure 1-2 illustrates a sample analog system configuration with SFC or without SFC communications.

Figure 1-2 Analog System Configuration—With or Without SFC Communications



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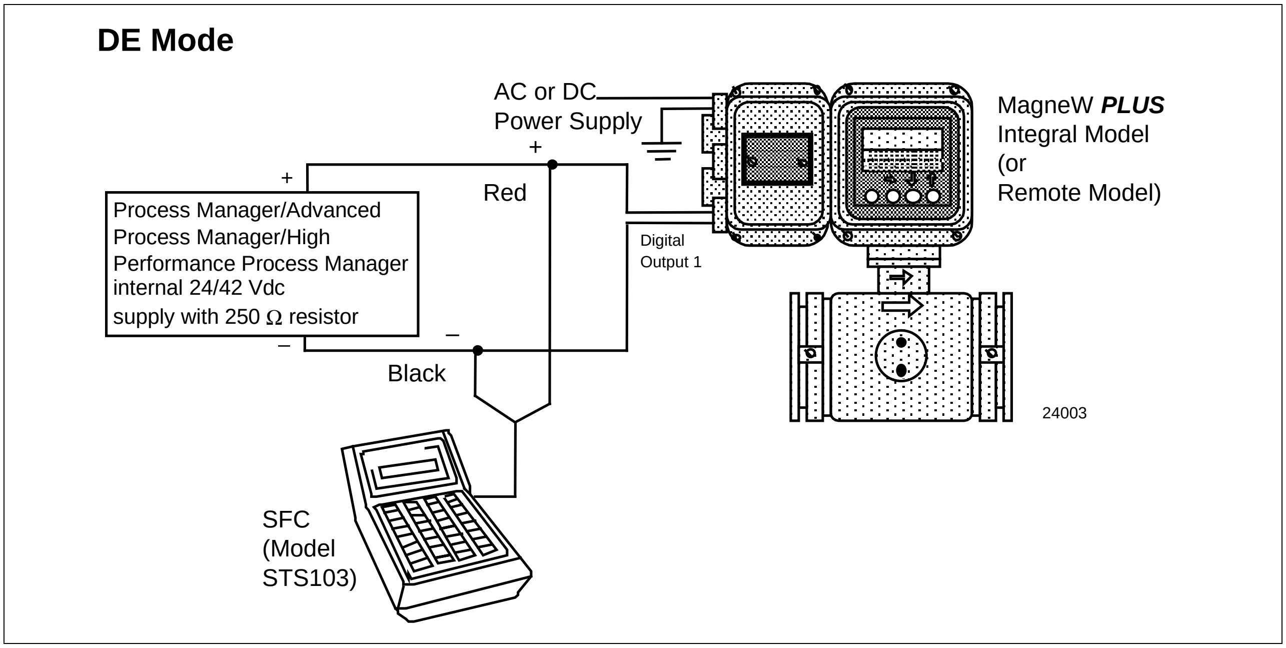
DE mode

In the DE mode, the flowmeter outputs the digital signal directly to Honeywell's TPS system. The digital signal includes the flow rate, self-diagnostics, and can be configured to include or not include the flowmeter's database. The Process Manager (PM), Advanced Process Manager (APM), or High-Performance Process Manager (HPM) includes an internal 24/42 Vdc power supply with 250 ohm resistor to enable SFC communication.

Figure 1-3 illustrates a sample digital system configuration with SFC.

Figure 1-3 Digital System Configuration with SFC Communications



1.2 Operating Principle

Summary

The MagneW 3000 ***PLUS*** detector fits on the pipe and measures the flow. The detector receives its power from the converter in the form of dc square waves to the detector's excitation coils. These coils create a magnetic field at a right angle with respect to flow direction.

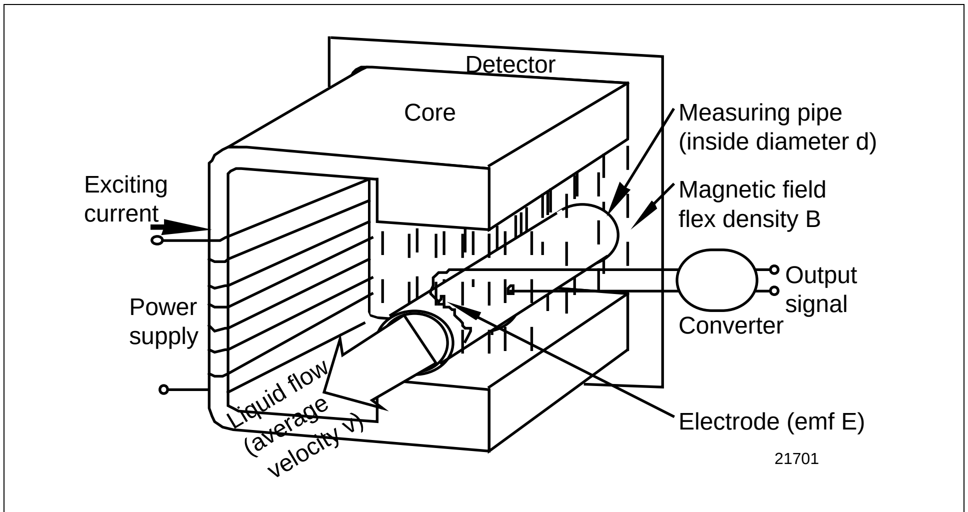
As the conductive liquid flows through this magnetic field, a voltage is produced across the electrodes which is proportional to liquid flow velocity. The detector sends these voltage signals to the converter.

The converter, which holds the circuitry that calculates and displays the flow data, converts the detector signals into standard 4-20 mA outputs for recording and control instrumentation.

Operational diagram

Figure 1-4 shows the principle of operation for the MagneW 3000 ***PLUS*** Magnetic Flowmeter. By detecting the induced voltage with a pair of electrodes installed in the pipe, volumetric measurement of liquid flow (conductor) can be made.

Figure 1-4 Principle of Operation



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1.2 Operating Principle, Continued

Faraday's Law

The measuring principles of the electromagnetic flowmeter are explained by Faraday's Law which states that the voltage induced across any conductor, as it moves at right angles through a magnetic field, is proportional to that conductor's velocity.

As applied to the design of the magnetic flowmeter, Faraday's Law means that the voltage (E) depends on the average flow velocity (V), the magnetic flux density (B), and the inside diameter of the pipe (D).

Faraday's Law diagram

The relationship between the liquid flow velocity and the voltage as expressed in the Faraday formula is explained in Figure 1-5.

Figure 1-5 Faraday's Law Formula

Faraday's Formula:

$$\boxed{E \propto V \times B \times D}$$

where:

E = Induced Electromagnetic Voltage (V)
The voltage generated by the flow of the conductive liquid through the magnetic field of the flowmeter.

V = Average Flow Velocity (m/s)
The average velocity of the liquid through the cross section of the flowmeter.

B = Magnetic Flux Density (t)
The strength of the magnetic field generated by the field coils.

D = Inside Diameter of the pipe (m)
The distance between the electrodes which detect the signal voltage (E) that is generated.

1.3 Construction of the Measuring System

Introduction

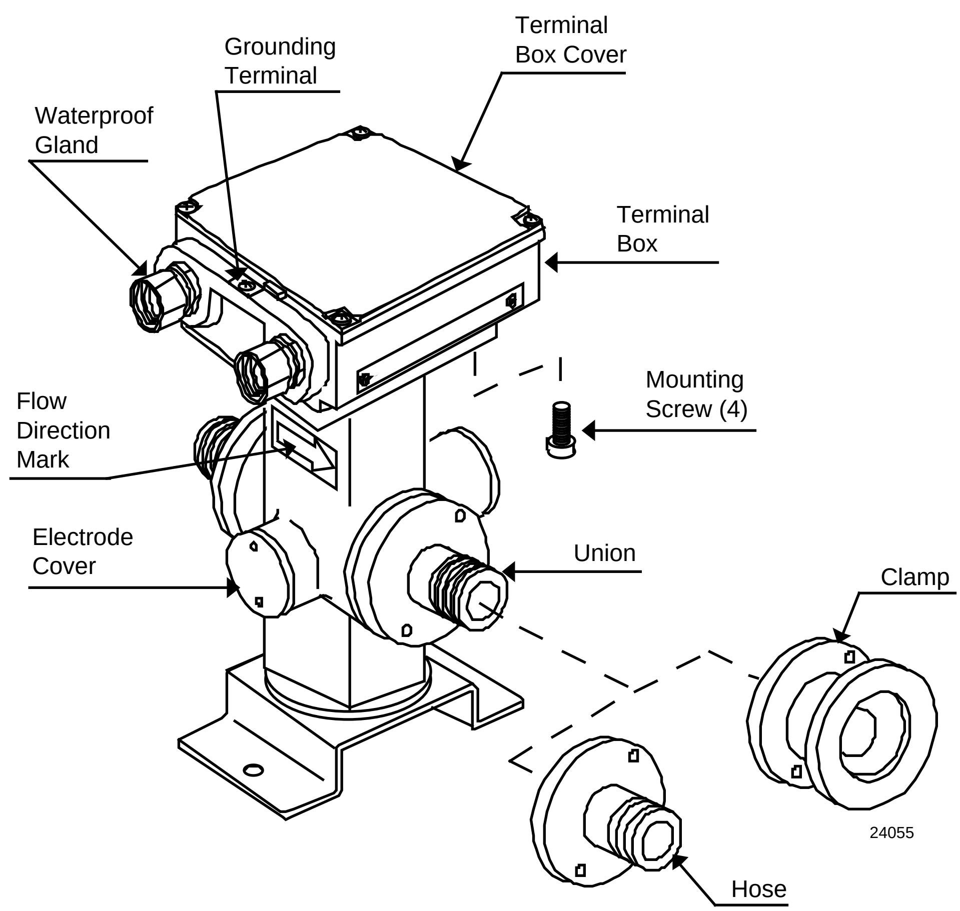
This section provides details on the parts and their functions for

- the detector,
- the detector terminal box, and
- the converter.

Main components of the detector

Figure 1-6 shows the structure of the detector and the names of its major parts.

Figure 1-6 Details of the Detector



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Main components of the detector, continued

Table 1-2 explains the major parts of the detector.

Table 1-2 Detector Parts

Part	Description
Flow direction mark	Indicates the direction of fluid flow. The detector should be mounted so that the measured fluid flows in the direction indicated by this mark.
Electrodes	Generate an electromotive force signal proportional to the flow rate of the fluid passing through the detector. The electrode material varies depending on the corrosion characteristics of the fluid to be measured.
Electrode cover	Houses the electrodes. Do not remove the cover with the detector installed on a pipe.
Terminal box (remote model only)	• Houses the connection terminals used to apply a standard voltage. • Houses excitation and signal terminals.
Terminal box cover (remote model only)	Protects the contents of the terminal box. Must be kept on during operation.
Union (connected by screws) **Hose** **Clamp**	• The connection uses a union, hose, and clamp. The material is SUS316. • Applicable for detector bore diameters of 2.5 to 15 mm (0.1 to 0.6 in.)
NOT SHOWN	
Grounding ring	Used with wafer and flange connections. The material varies according to the corrosive characteristics of the fluid to be measured. Also, the structure varies with the material.
Flanges	Allows easy centering of the detector. Flange structure varies according to the flanges of the pipes to which the detector is to be fitted.

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Main components of the detector terminal box

Figure 1-7 shows the structure of the detector terminal box and the names of its major parts.

Figure 1-7 Details of the Detector Terminal Box

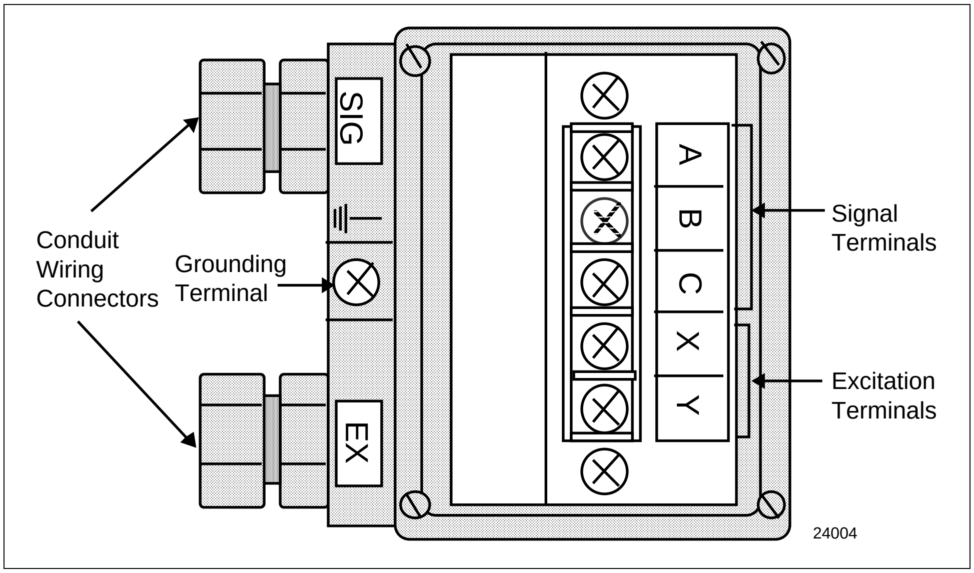

Table 1-3 explains the major parts of the detector terminal box.

Table 1-3 Detector Terminal Box Parts

Part	Description
Signal terminals	These terminals are marked A, B, and C.
Excitation terminals	These terminals are marked X and Y.
Conduit wiring connectors	The excitation cable and the signal cable are wired through these connectors.
Grounding terminal	This terminal is used to ground the detector (Class 3 grounding).

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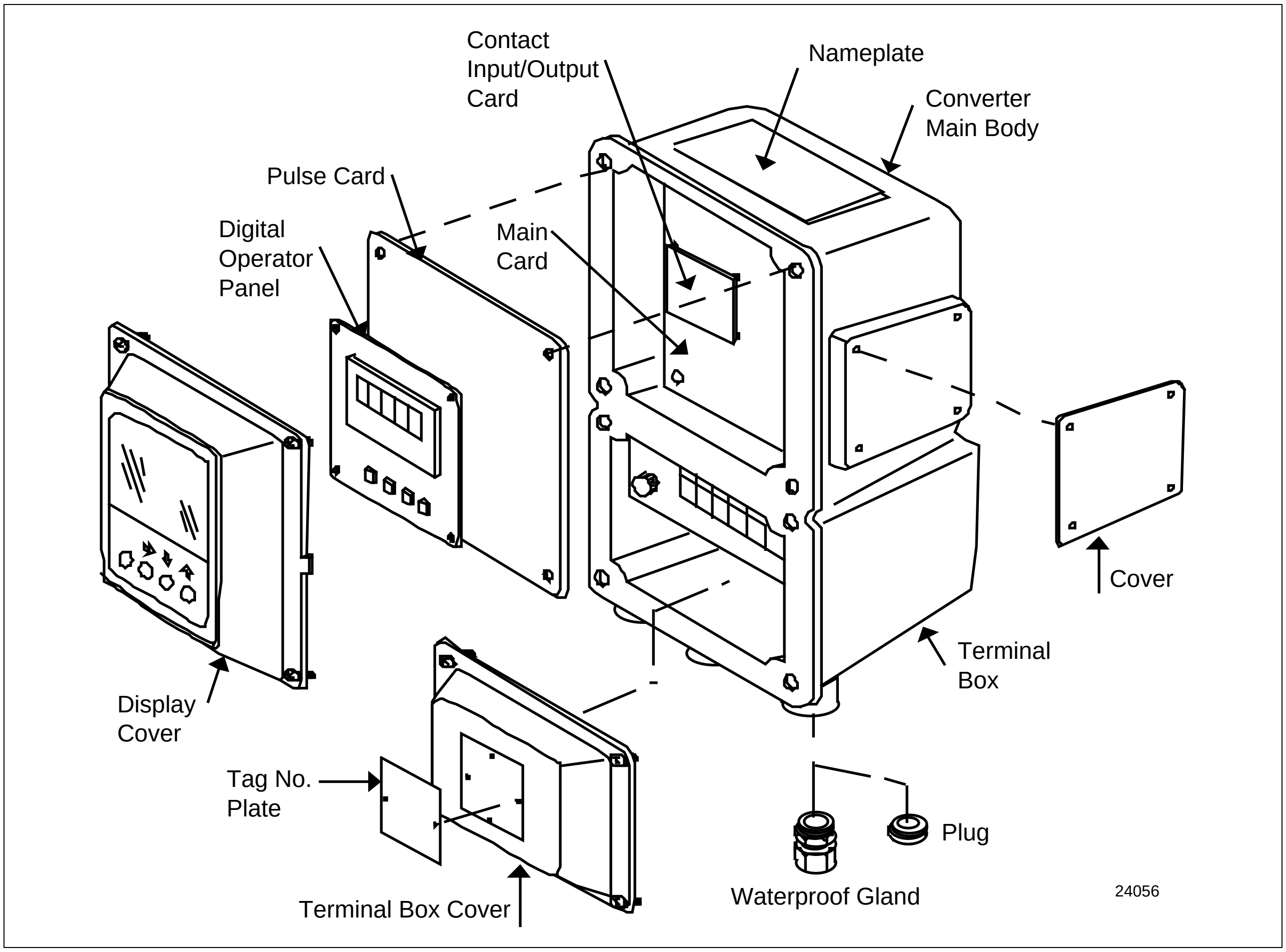
Main components of the converter

Figure 1-8 shows the structure of the converter and the names of its major parts.

Figure 1-8 Details of the Converter



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Main components of the converter, continued

Table 1-4 explains the major parts of the converter.

Table 1-4 Converter Parts

Part	Description
Main card	• Converts signal from the detector into instantaneous flow rate. • Outputs flow rate to the control equipment as an analog or digital signal.
Digital operator panel	• Indicates the instantaneous flow rate or the integrated flow rate. • The flowmeter functions can be changed using the four keys on the panel.
Terminal box	• Encloses the input/output terminals. • Contains an integrated 12 kV, 100A isolator.
Nameplate	Indicates the model number and the product number.
Tag number plate	Indicates tag number as specified in the product order.
Contact input/output card	Electronics are fitted with optional I/O board. This model can be configured for • two contact inputs, • two contact outputs, or • one contact input and one contact output
Pulse card	Indicates this is an optional pulse output model with a built-in counter. Depending on pulse configuration, the flow rate per pulse in the forward and/or reverse direction, or the difference between them, can be counted.

Section 2 – Installation

2.1 Overview

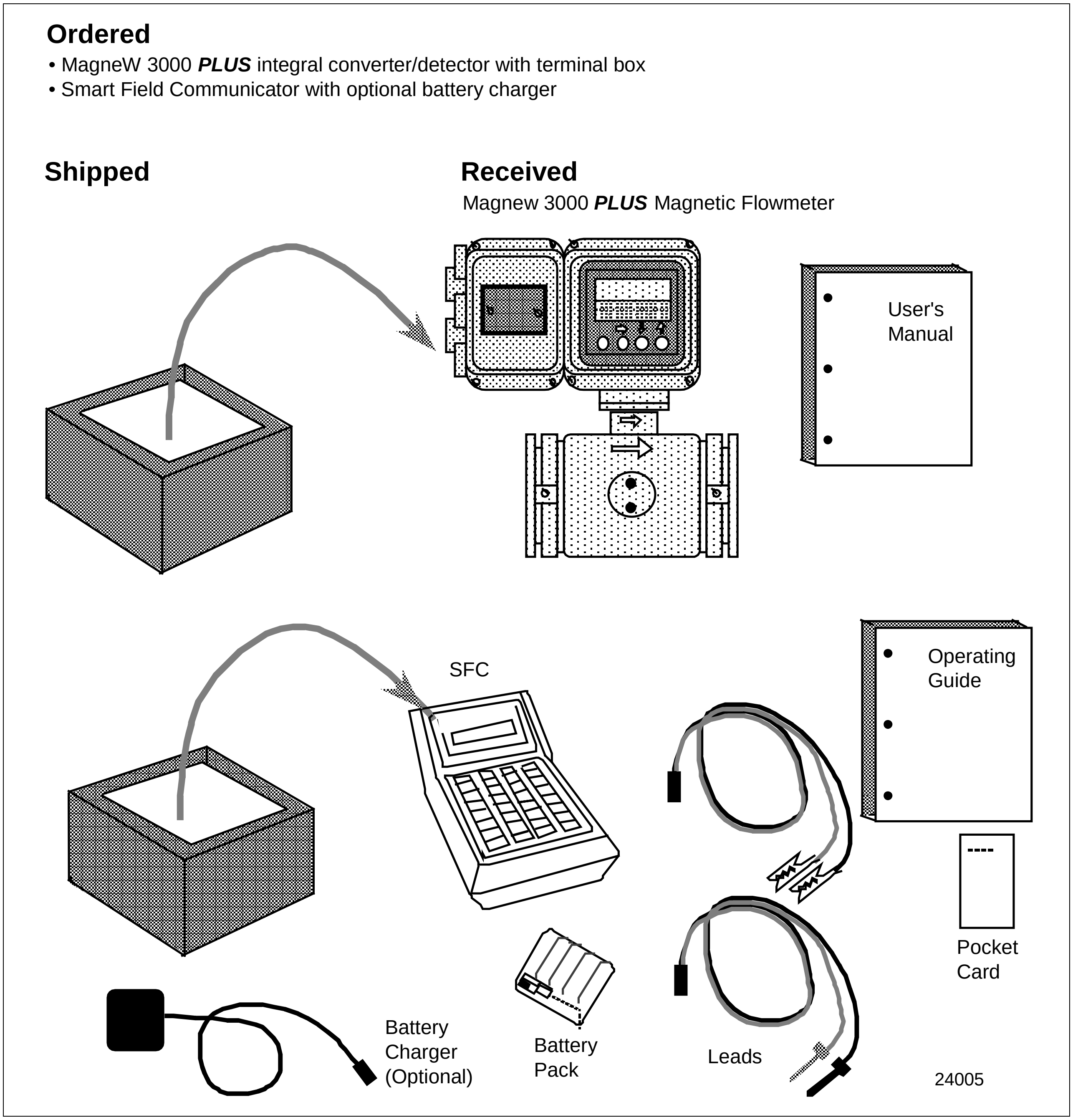
Section contents

This section contains the following topics:

2.2 Bench Check

Unpack the MagneW 3000 ***PLUS*** Magnetic Flowmeter and Smart Field Communicator (SFC), and verify that the components ordered were received. It is a good idea to inspect the components for visible signs of shipping damage so any claims can be filed immediately with the carrier. Figure 2-1 shows the components that would be shipped and received for a typical MagneW 3000 ***PLUS*** and SFC order.

Figure 2-1 Typical MagneW 3000 ***PLUS*** and SFC Order



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Storage precautions

When storing the flowmeter before use, the following precautions should be observed:

- Store indoors at room temperature and humidity, and in a place safe from vibration or shock.
- Store in the same condition as it was shipped.

When storing this device after use, the following precautions should be observed:

- Attach the display cover, the terminal box cover, and the water-proof gland to keep out moisture.
- Store the product in its original packaging.
- Store indoors at normal temperature and humidity and in a place safe from vibration or shock.

You should make the following checks listed in Table 2-1 before installing the MagneW 3000 ***PLUS***.

Table 2-1 Pre-installation Checks

Check ...	For...
Unit nameplate and flanges	Correct pressure rating for your system
Relative humidity	5 to 100%
Ambient temperature	**Integral Converter/Detector:** –25 to +60°C (–13 to +140°F) **Remote Converter:** –25 to +60°C (–13 to +140°F) **Remote Detector with Liner:** *Teflon PFA:* –30 to +80°C (–22 to +176°F) *Polyurethane Rubber/Chloroprene Rubber:* –30 to +60°C (–22 to +140°F)

ATTENTION Be sure to check that you are meeting converter/detector model type and corresponding liquid temperature/liquid pressure specifications. Refer to Table 5 in *36-KI-29-02, MagneW 3000* ***PLUS*** *Specification and Application Data.*

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English and metric tools normally found in a shop tool box will be required to install the MagneW 3000 ***PLUS*** detector/converter. This includes metric Allen wrenches (hex wrenches), and metric open-end and/or box-end wrenches.

The excitation and signal cables are available as a set from Honeywell (Model Number KIW-XXX-XXX). Users must supply cables for wiring the power and other I/O signals to the converter. Belden number 9250 and Alpha 9816 cables are recommended.

2.3 Installation Considerations

Introduction

To make full use of the MagneW 3000 ***PLUS*** functions, observe the following criteria to select the best installation site. Failure to meet these criteria could result in output errors.

- Install the flowmeter in a location with an ambient temperature of –25 to +60°C (–13 to +140°F) and a relative humidity of 5 to 100%.
- Install the flowmeter away from high-current power lines, motors, and transformers to prevent damage from electromagnetic induction.
- Do not install the flowmeter in a location subject to severe vibration or a highly corrosive atmosphere. Failure to meet this requirement could cause equipment damage.
- If possible, install the flowmeter out of direct sunlight, wind, and rain.

- Choose a location where the conductance of the fluid to be measured matches the stated specification and is fairly constant.
- Choose a location where the fluid to be measured can be regarded as electrochemically uniform. That is, if two fluids are mixed at an upstream point, the two fluids should be uniformly mixed by the time they reach the measurement point.
- Choose a location where the suspended solids of a measured liquid, if any, are uniformly distributed.
- The fluids listed below could cause measurement trouble. Therefore, do not use this device to measure them, even if their conductance, temperature, and pressure fall within the its specifications.
  - Fluids that have sufficient conductance at high temperatures but do not satisfy the conductance requirements at room temperature—about 20°C (68°F).
    EXAMPLES: fatty acids and soap
  - Certain fluids that contain surfactants
    EXAMPLES: rinses, shampoos, and CWM
  - Conductive adherents
    EXAMPLE: deposition of rosin plus conductive material
  - Insulating adherents
    EXAMPLES: oil, kaolinite, kaolin, and calcium stearate

2.4 Detector Mounting Summary

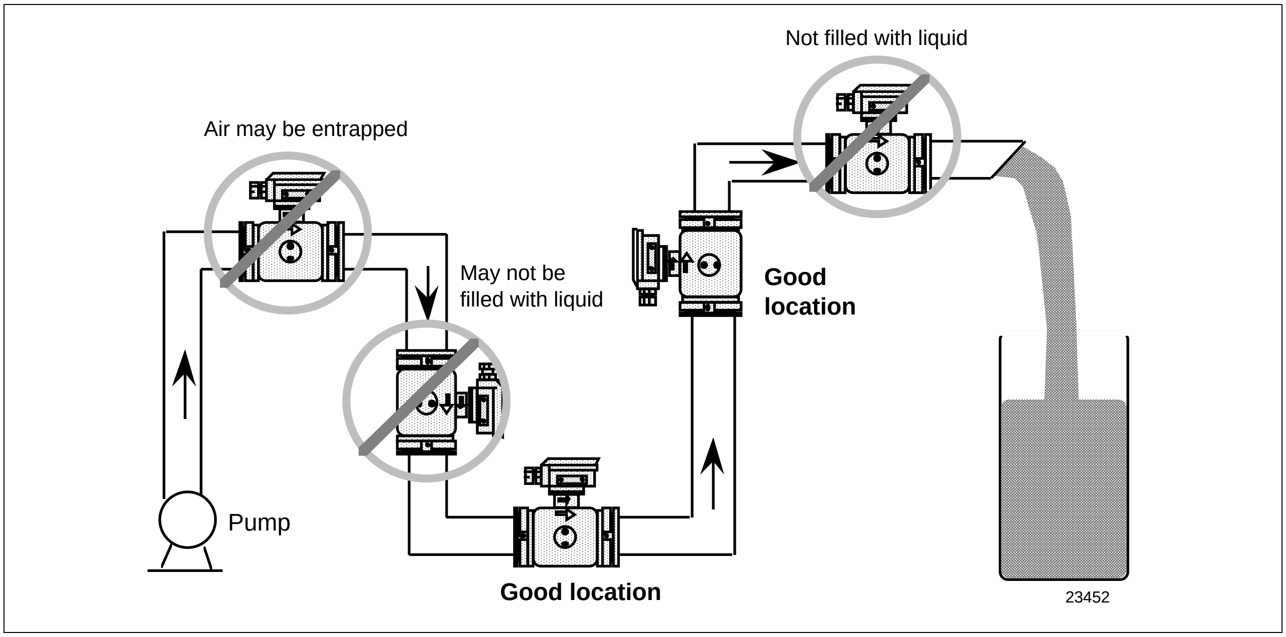
Detector mounting guidelines

The following mounting guidelines should be observed to assure optimum performance. While these guidelines will be useful for installation purposes, it is *critical* that your site selection is evaluated carefully prior to actual flowmeter purchase.

- Locate the detector at a point in the pipeline where it will always be filled with the measured liquid. Be sure the measured liquid at this point has a minimum electrical conductivity of three micromhos per centimeter. Figure 2-2 illustrates possible detector mounting locations in a typical piping run.

  CAUTION The pipe should be filled with liquid and the detector installed at a site that satisfies the “good” locations in Figure 2-2. If the pipe is not filled it can cause an output error.

Figure 2-2 Possible Detector Mounting Locations in a Typical Piping Run



- Be sure that the face-to-face space between the flanges is sufficient for the given detector size. Do not force the detector to fit into an insufficient face-to-face space.
- Be sure to flush the inside of the piping to eliminate any foreign matter before installing the detector.

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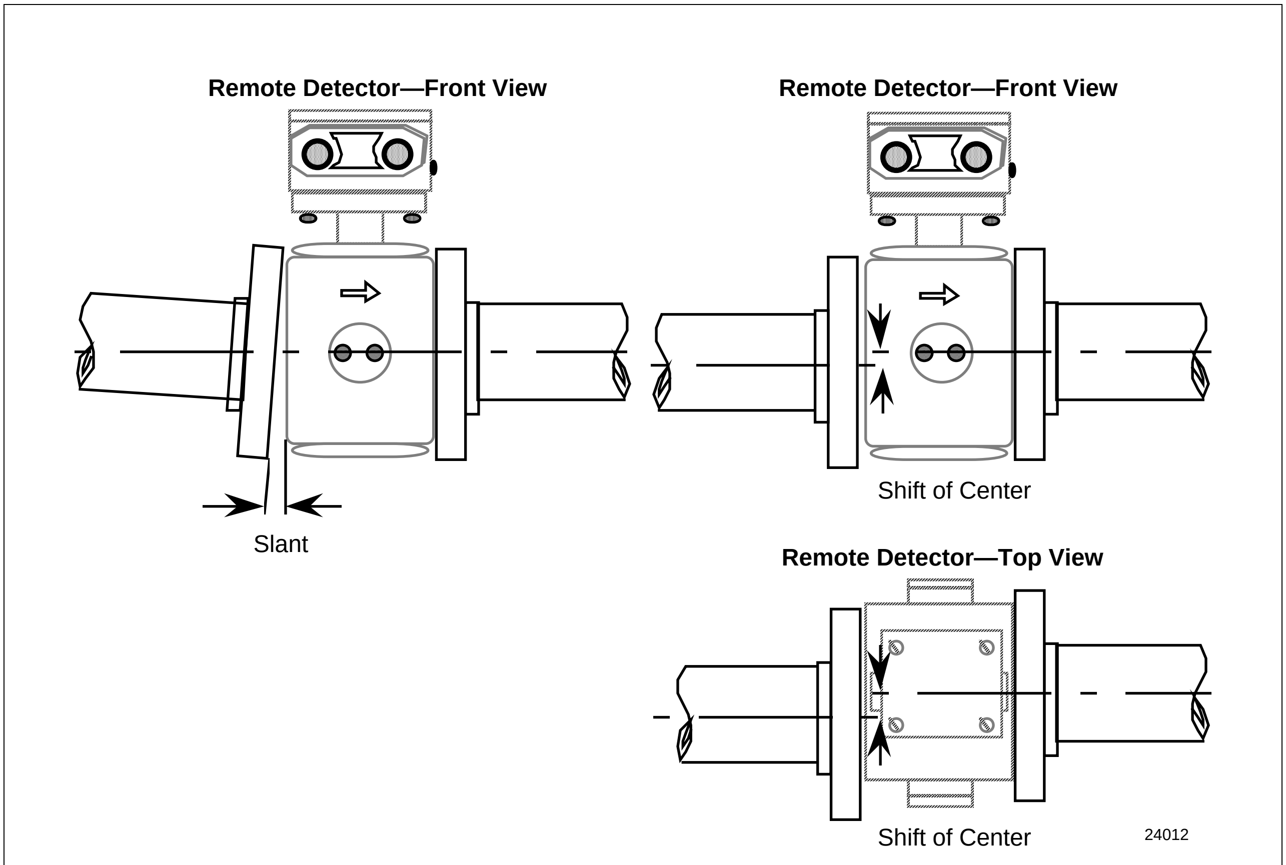
Detector mounting guidelines, continued

- Be sure at least 400 mm (16 inches) and 500 mm (20 inches) of clearance are available for maintenance of electrodes and inspection of terminals, respectively.
- Locate the detector as far as practical from any pump in the line so that the flow does not pulsate.
- Be sure that the centers of the connecting pipes are in alignment both horizontally and vertically, and each pipe flange is square—no slant or shift from center. Figure 2-3 illustrates checks for alignment of centers and square flanges.

Figure 2-3 Checks for Alignment of Centers and Square Flanges



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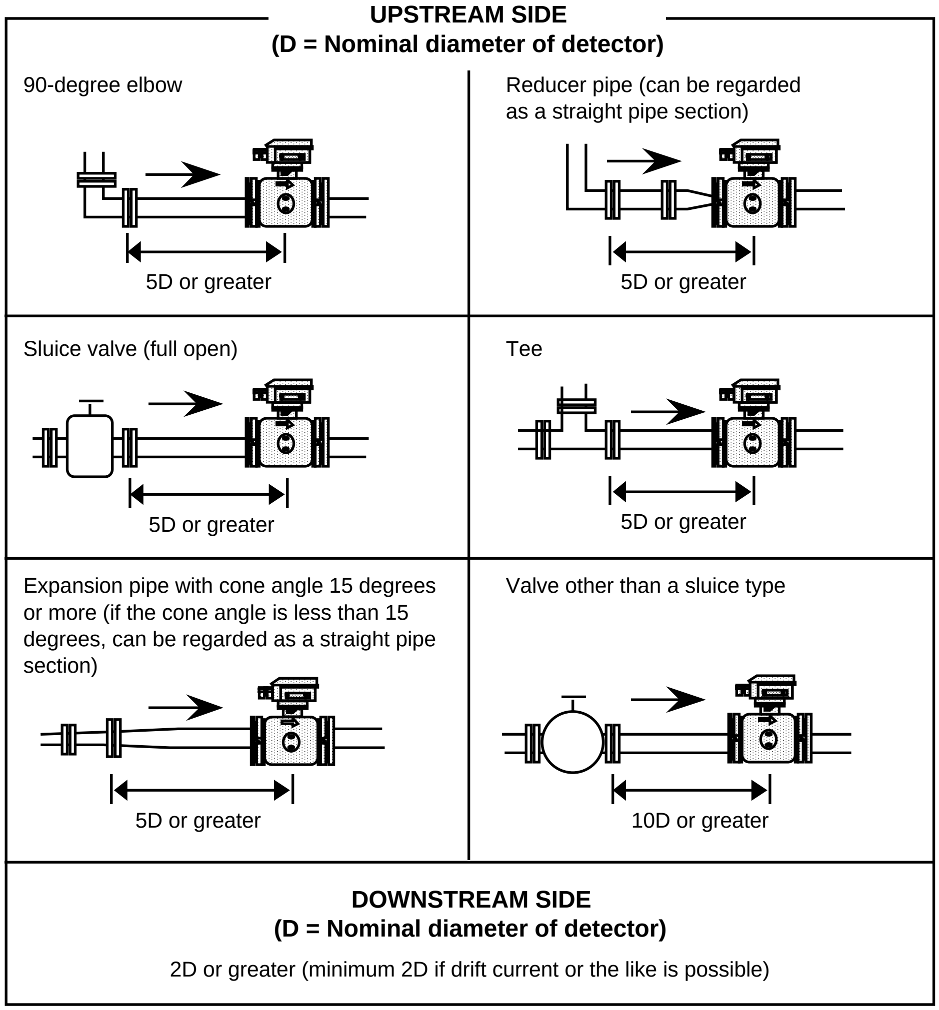
2.4 Detector Mounting Summary, Continued

Detector mounting guidelines, continued

Always install a straight pipe section in the upstream and downstream sides of the detector. Although a pipe section is not necessary on the downstream side, secure a section of at least 2D if drift current or similar is likely.

See Figure 2-4 for recommended lengths of straight pipe in upstream and downstream sections in a given piping configuration.

Figure 2-4 Recommended Upstream and Downstream Straight Pipe Lengths



2.5 Repositioning the Terminal Box and the Converter

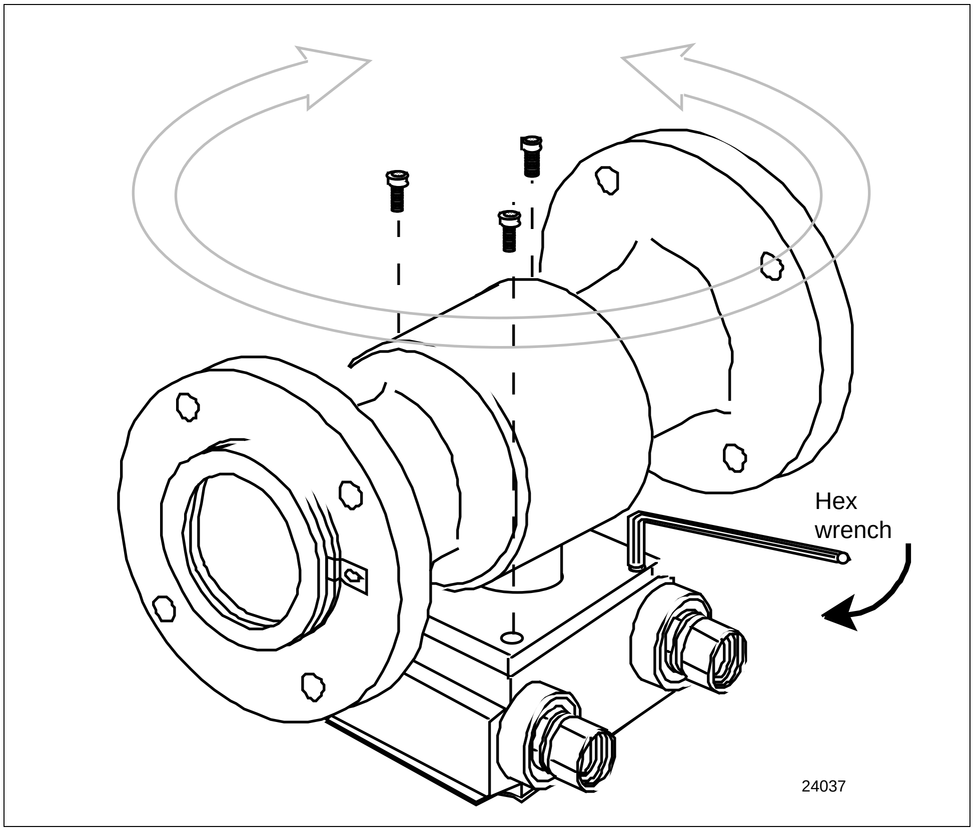
Introduction

In some locations, the direction of the terminal box (remote model) or the converter (integral model) may be unsuitable if the detector is installed as shipped. In such cases, you can reposition the terminal box or the converter. This should be done prior to installing the detector in the pipeline.

Procedure

Referring to Figure 2-5 for location of screws, follow the procedure in Table 2-2 for repositioning the terminal box or the converter.

Figure 2-5 Repositioning Terminal Box or Converter



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2.5 Repositioning the Terminal Box and the Converter, Continued

Procedure, continued

Table 2-2 Procedure for Repositioning Terminal Box or Converter

Step	Action
1	Using an M5 hex wrench, remove the four screws securing the terminal box or converter. **CAUTION** After removing the screws, do not pull hard on the terminal box or converter, as this can break the lead wire inside.
2	Holding the detector, rotate the terminal box or converter horizontally to the desired position. **CAUTION** • Do not rotate the unit more than 180° (one half rotation). Any greater rotation can break wiring parts. • If the terminal box or converter is removed, make sure that the O-ring, which provides an air-tight seal, is still fitted into the O-ring grooves.
3	Using a hex wrench, retighten the four screws to secure the terminal box or converter.

2.6 Methods of Installation

Summary

The MagneW 3000 ***PLUS*** can be installed as a wafer, flange, union, hose, or clamp unit. Refer to the appropriate type to install your flowmeter properly.

Installation notes

CAUTION

- Before installing the detector be sure to flush out any foreign matter that may be present in the interior passage of the detector. Residual foreign matter could cause output errors.
- Do not stain the electrodes with your fingerprints or other greasy substance.
- Align the flow direction mark on the detector with the direction of the liquid flow. Improper alignment could result in a negative output.

2.7 Installing Wafer Type Flowmeters

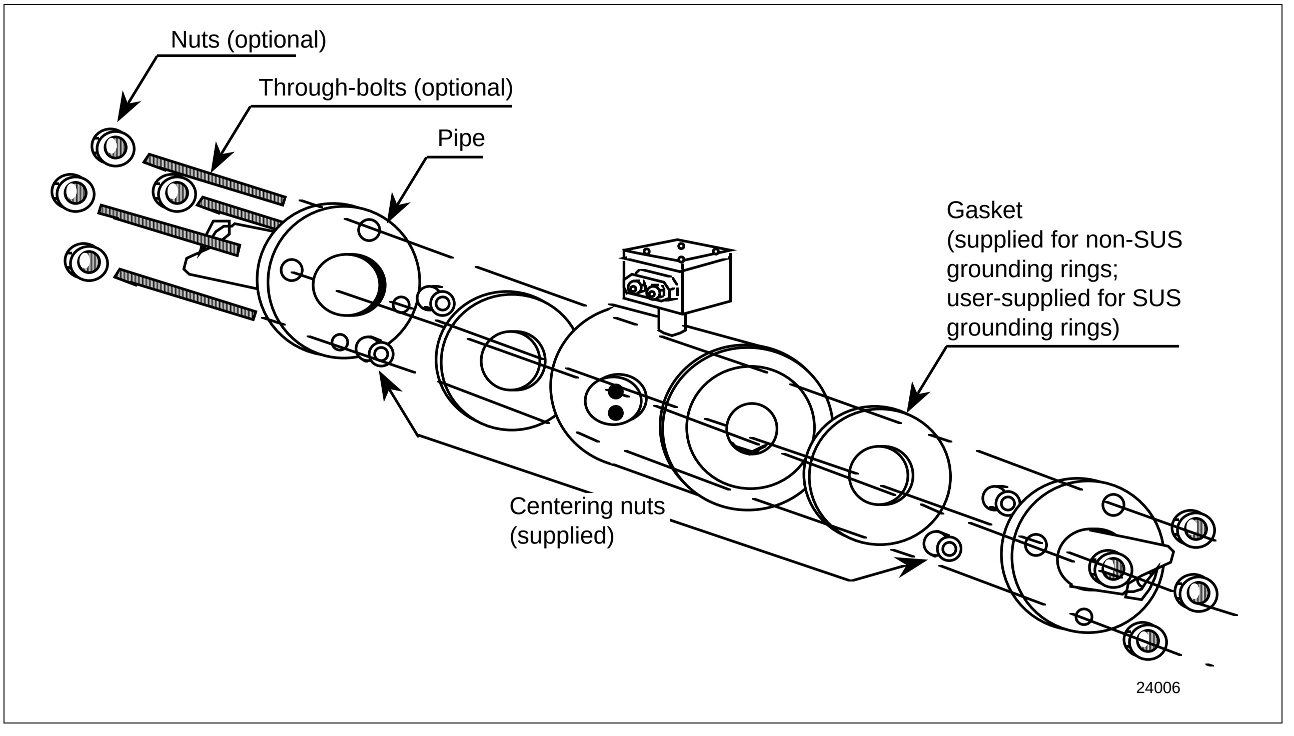
2.7.1 Basic Installation Method

Installation example

Figure 2-6 shows the basic method for installing a wafer type flowmeter.

CAUTION Be careful when handling this unit. Dropping it could cause injury.

Figure 2-6 Wafer Type Installation Assembly Example



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Fastening torque

Table 2-3 gives the fastening torque for each pipe bore. Using centering hardware, apply the prescribed fastening torque to prevent any liquid leak from the pipe.

Table 2-3 Torque Ratings for Wafer Type Detectors

Detector Size		Fastening Torque	
millimeters	**inches**	**N•m**	**ft-lb**
2.5 to 15	0.1 to 0.6	13 to 18	9.6 to 13.2
25	1	20 to 30`	14.7 to 22.2
40, 50, 65, 80	1.6, 2, 2.6, 3.1	30 to 50	22.2 to 36.9
100	3.9	50 to 70	36.9 to 51.5
125, 150	5, 5.9	80 to 100	59 to 73.7
200	7.9	90 to 100	66.4 to 73.3

CAUTION Tighten each bolt a little at a time and apply uniform pressure to all the bolts while fastening them. If leakage does not stop on completion of fastening, make sure that the pipe is not off center, then tighten the bolts little by little. Install the detector carefully so that the fastening torque does not exceed the prescribed limit; otherwise, the unit could be damaged.

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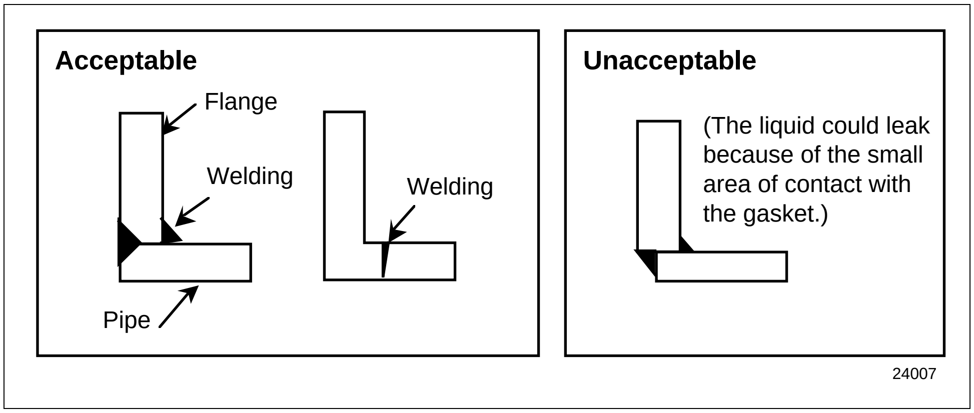
2.7.1 Basic Installation Method, Continued

Flange shape

The flanges used should be such that the area of contact with the gasket is maximized, as shown in Figure 2-7.

Figure 2-7 Flange Shape



WARNING Before installing the detector, make sure that the pipe is exactly straight and centered. Any irregularity in these respects could cause leakage or other hazards.

CAUTION Never force the device between two flanges when the space is too narrow. This can damage the unit.

Parts needed

The following parts are necessary for the installation of the detector.

- Centering nuts (four supplied)
- Connecting bolts and nuts (available separately)
- Gaskets—
  User-supplied when using grounding rings made of SUS material. We recommend gasket material such as joint sheet or PTFE.
  When using grounding rings made of hastelloy, titanium, tantalum, or platinum, gaskets are supplied with flowmeter. For the bore diameters of the gaskets, refer to Table 2-4.
- Protective plate—Required when connecting the detector to polyvinyl chloride (PVC) piping.

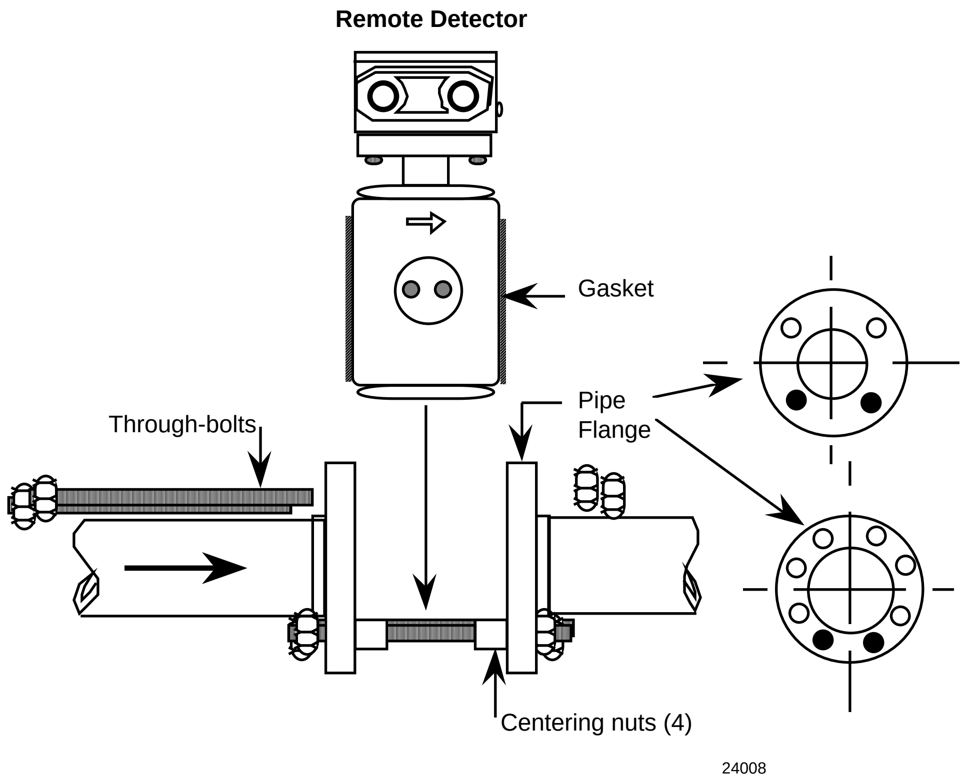
2.7.2 Installation on a Horizontal Pipe

Installation procedure

Follow the procedure in Table 2-4 for mounting a wafer type flowmeter on a horizontal pipe.

CAUTION Improper installation may result in leakage or damaged to the pipe flanges.

Table 2-4 Horizontal Installation of a Wafer Type Flowmeter Procedure

Step	Action
1	Place two centering nuts each onto two through-bolts then insert the through-bolts in the flange holes indicated by the black dots. 
2	Orient detector so its flow direction arrow points in same directions as fluid flows.

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Installation procedure, continued

Table 2-4 Horizontal Installation of a Wafer Type Flowmeter Procedure, Continued

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>3</td><td>Carefully insert detector and gaskets between the pipe flanges.

The proper use and assembly of gaskets, and the possible use of a protective plate, are dependent upon the grounding ring material and pipe material being used. From the following information, determine the combination of pipe and grounding ring materials and the installation method that apply.

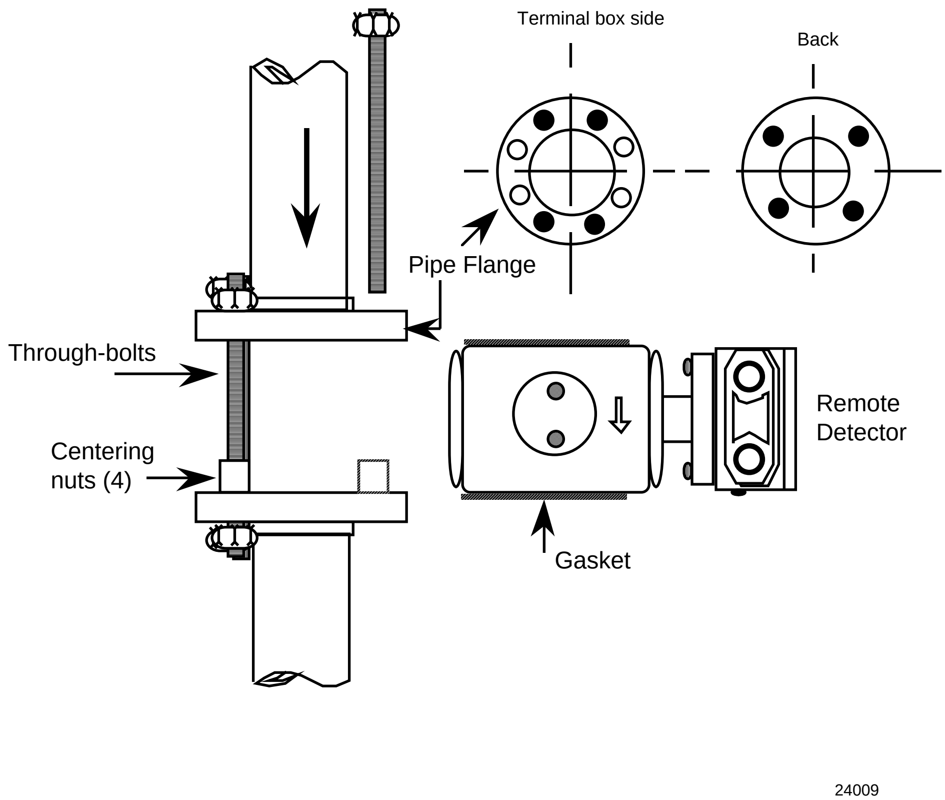
<table>
<tr><th>Pipe Material</th><th>Grounding Ring Material</th><th>PTFE Gaskets Supplied?</th><th>Installation Assembly refer to ...</th><th>Gasket Diameters refer to ...</th></tr>
<tr><td>Metal</td><td>SUS</td><td>No (joint sheet or PTFE recommended)</td><td>Figure 2-8</td><td>Table 2-6</td></tr>
<tr><td>Metal</td><td>Other than SUS</td><td>Yes</td><td>Figure 2-9</td><td>——</td></tr>
<tr><td>PVC</td><td>SUS</td><td>No (joint sheet or PTFE recommended)</td><td>Figure 2-10
Figure 2-11 (with protective plate)
Figure 2-12 (rubber gaskets—not recommended)</td><td>Table 2-6
Table 2-6
Tables 2-7 and 2-8</td></tr>
<tr><td>PVC</td><td>Other than SUS</td><td>Yes</td><td>Figure 2-13
Figure 2-14 (with protective plate)
Figure 2-15 (rubber gaskets—not recommended)</td><td>——
——
Tables 2-7 and 2-8</td></tr>
</table>
</td></tr>
<tr><td>4</td><td>Make sure no gaskets protrude into the piping and that the detector is properly centered.</td></tr>
<tr><td>5</td><td>Insert the remaining through-bolts into the flange holes and tighten the bolts evenly using the appropriate fastening torques given in Table 2-3.</td></tr>
</table>

2.7.3 Installation on a Vertical Pipe

Installation procedure Follow the procedure in Table 2-5 for mounting a wafer type flowmeter on a vertical pipe.

CAUTION Improper installation may result in leakage or damaged to the pipe flanges.

Table 2-5 Vertical Installation of a Wafer Type Flowmeter Procedure

Step	Action
1	Insert two through-bolts, each with one centering nut, into two of the four flange holes at the back (indicated by black dots). 
2	Orient detector so its flow direction arrow points in same direction as the fluid flows.

Continued on next page

2.7.3 Installation on a Vertical Pipe, Continued

Installation procedure, continued

Table 2-5 Vertical Installation of a Wafer Type Flowmeter Procedure, Continued

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>3</td><td>Carefully insert detector and gaskets between the pipe flanges.

The proper use and assembly of gaskets, and the possible use of a protective plate, are dependent upon the grounding ring material and pipe material being used. From the following information, determine the combination of pipe and grounding ring materials and the installation method that apply.

<table>
<tr><th>Pipe Material</th><th>Grounding Ring Material</th><th>PTFE Gaskets Supplied?</th><th>Installation Assembly refer to ...</th><th>Gasket Diameters refer to ...</th></tr>
<tr><td>Metal</td><td>SUS</td><td>No (joint sheet or PTFE recommended)</td><td>Figure 2-8</td><td>Table 2-6</td></tr>
<tr><td>Metal</td><td>Other than SUS</td><td>Yes</td><td>Figure 2-9</td><td>——</td></tr>
<tr><td>PVC</td><td>SUS</td><td>No (joint sheet or PTFE recommended)</td><td>Figure 2-10
Figure 2-11 (with protective plate)
Figure 2-12 (rubber gaskets—not recommended)</td><td>Table 2-6
Table 2-6
Tables 2-7 and 2-8</td></tr>
<tr><td>PVC</td><td>Other than SUS</td><td>Yes</td><td>Figure 2-13
Figure 2-14 (with protective plate)
Figure 2-15 (rubber gaskets—not recommended)</td><td>——
——
Tables 2-7 and 2-8</td></tr>
</table></td></tr>
<tr><td>4</td><td>Insert through-bolts fitted with one centering nut each into the remaining two flange holes shown by black dots in Step 1.</td></tr>
<tr><td>5</td><td>Make sure no gaskets protrude into the piping and that the detector is properly centered.</td></tr>
<tr><td>6</td><td>Insert the remaining through-bolts into the flange holes and tighten the bolts evenly using the appropriate fastening torque given in Table 2-3.</td></tr>
</table>

2.7.4 Gaskets and Protective Plate for Wafer Type Flowmeters

Gaskets

Table 2-6 gives the bore diameters for gaskets.

WARNING Make sure the bore diameters of the pipe and the detector are exactly the same. Install the detector so that the gasket does not protrude into the inner bore of the pipe, as this could result in leakage or other hazards.

CAUTION

- Too small a gasket diameter can affect the flow velocity distribution resulting in inaccurate measurements.
- Too large a gasket diameter can cause leakage. Also, any solid substance in the fluid to be measured could accumulate between the gasket and the flange, resulting in inaccurate measurements.

Table 2-6 Recommended Inner Diameters of Gaskets

Bore Diameter	Inner Diameter	
millimeters (inches)	millimeters	inches
2.5 (0.1)	6 ±1	0.24 ±0.04
5 (0.2)	6 ±1	0.24 ±0.04
10	11 ±1	0.43 ±0.04
15 (0.6)	16 ±1	0.63 ±0.04
25 (1)	25 ±1	1 ±0.04
40 (1.6)	40 ±1	1.6 ±0.04
50 (2)	51 ±1	2 ±0.04
65 (2.5)	64 ±1	2.5 ±0.04
80 (3.1)	76 ±1	2.9 ±0.04
100 (3.9)	101 ±1	3.9 ±0.04
125 (5)	124 ±1	4.8 ±0.04
150 (5.9)	148 ±1	5.8 ±0.04
200 (7.9)	196 ±1	7.7 ±0.04

Continued on next page

2.7.4 Gaskets and Protective Plate for Wafer Type Flowmeters, Continued

Gaskets, continued

Honeywell does not recommend the use of rubber gaskets. However, if you decide to install the detector at a lower torque level using rubber gaskets, you must use gaskets with the bore and outside diameters shown in Table 2-7 and Table 2-8. Depending on the grounding ring material, two gaskets of different thicknesses may be required (Figures 2-12 and 2-15).

Table 2-7 Inner and Outside Diameters of Rubber Gaskets—0.5 to 1 mm (0.02 and 0.04 in) thick

Bore Diameter	Inner Diameter		Outside Diameter	
millimeters (inches)	millimeters	inches	millimeters	inches
2.5 (0.1)	6 ±1	0.24 ±0.04	34 ±1	1.33 ±0.04
5 (0.2)	6 ±1	0.24 ±0.04	34 ±1	1.33 ±0.04
10	11 ±1	0.43 ±0.04	34 ±1	1.33 ±0.04
15 (0.6)	16 ±1	0.63 ±0.04	34 ±1	1.33 ±0.04
25 (1)	25 ±1	1 ±0.04	50 ±1	2 ±0.04
40 (1.6)	40 ±1	1.6 ±0.04	75 ±1	3 ±0.04
50 (2)	51 ±1	2 ±0.04	91 ±1	3.5 ±0.04
65 (2.5)	64 ±1	2.5 ±0.04	111 ±1	4.4 ±0.04
80 (3.1)	76 ±1	2.9 ±0.04	121 ±1	4.8 ±0.04
100 (3.9)	101 ±1	3.9 ±0.04	146 ±1	5.7 ±0.04
125 (5)	124 ±1	4.8 ±0.04	177 ±1	6.9 ±0.04
150 (5.9)	148 ±1	5.8 ±0.04	207 ±1	8.1 ±0.04
200 (7.9)	196 ±1	7.7 ±0.04	257 ±1	10.1 ±0.04

Continued on next page

2.7.4 Gaskets and Protective Plate for Wafer Type Flowmeters, Continued

Gaskets, continued

Table 2-8 Inner and Outside Diameters of Rubber Gaskets—3 to 4 mm (0.12 and 0.16 in) thick

Bore Diameter	Inner Diameter		Outside Diameter	
millimeters (inches)	**millimeters**	**inches**	**millimeters**	**inches**
2.5 (0.1)	6 ±1	0.24 ±0.04	34	1.33
5 (0.2)	6 ±1	0.24 ±0.04	34	1.33
10	11 ±1	0.43 ±0.04	34	1.33
15 (0.6)	16 ±1	0.63 ±0.04	34	1.33
25 (1)	25 ±1	1 ±0.04	50	2
40 (1.6)	40 ±1	1.6 ±0.04	68	2.67
50 (2)	51 ±1	2 ±0.04	84	3.3
65 (2.5)	64 ±1	2.5 ±0.04	104	4.09
80 (3.1)	76 ±1	2.9 ±0.04	114	4.48
100 (3.9)	101 ±1	3.9 ±0.04	139	5.47
125 (5)	124 ±1	4.8 ±0.04	166	6.53
150 (5.9)	148 ±1	5.8 ±0.04	190	7.48
200 (7.9)	196 ±1	7.7 ±0.04	240	9.44

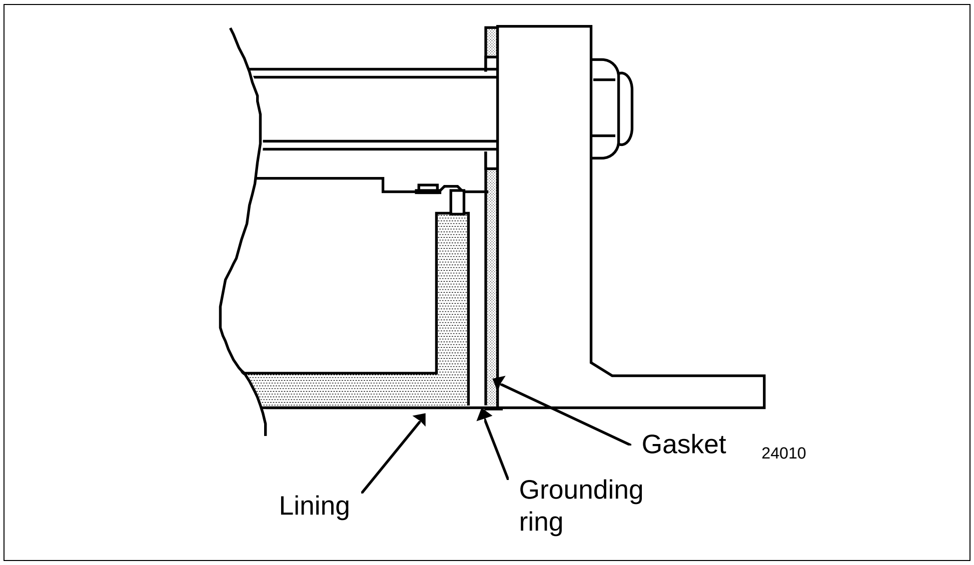
Continued on next page

2.7.4 Gaskets and Protective Plate for Wafer Type Flowmeters, Continued

Metal pipe, SUS ring

Figure 2-8 shows the proper installation when the wafer type flowmeter has a grounding ring made of SUS material and is being mounted on a metal pipe.

Figure 2-8 Installation Using SUS Grounding Ring and Metal Pipe

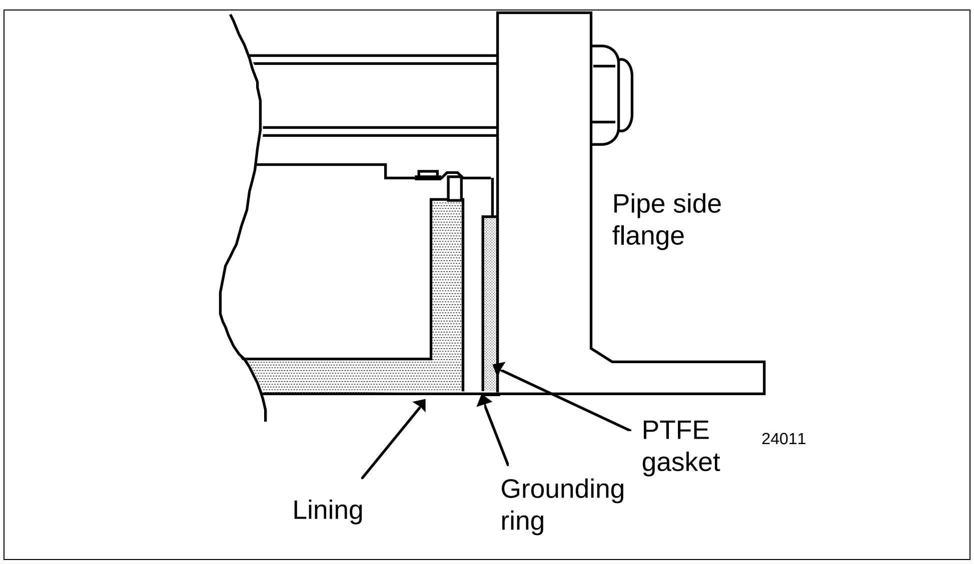


Metal pipe, non-SUS ring

Figure 2-9 shows the proper installation when the wafer type flowmeter has a grounding ring made of material other than SUS and is being mounted on a metal pipe.

CAUTION The use of an additional gasket besides the supplied PTFE gasket may result in leakage.

Figure 2-9 Installation Using Non-SUS Grounding Ring and Metal Pipe



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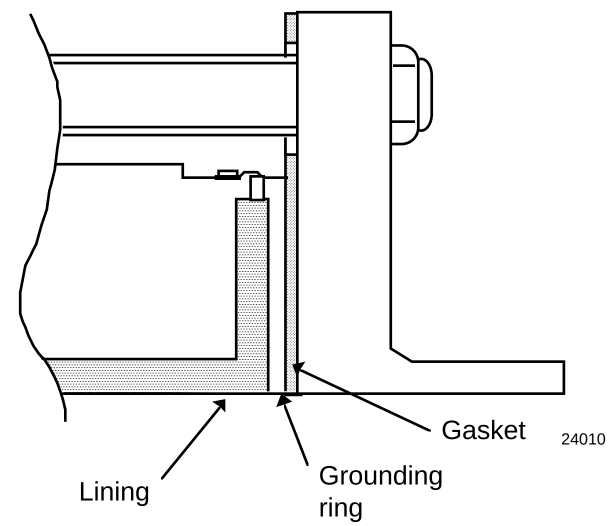
2.7.4 Gaskets and Protective Plate for Wafer Type Flowmeters, Continued

PVC pipe, SUS ring

Figure 2-10 shows the proper installation when the wafer type flowmeter has a grounding ring made of SUS material and is being mounted on a PVC pipe.

Figure 2-10 Installation Using SUS Grounding Ring and PVC Pipe



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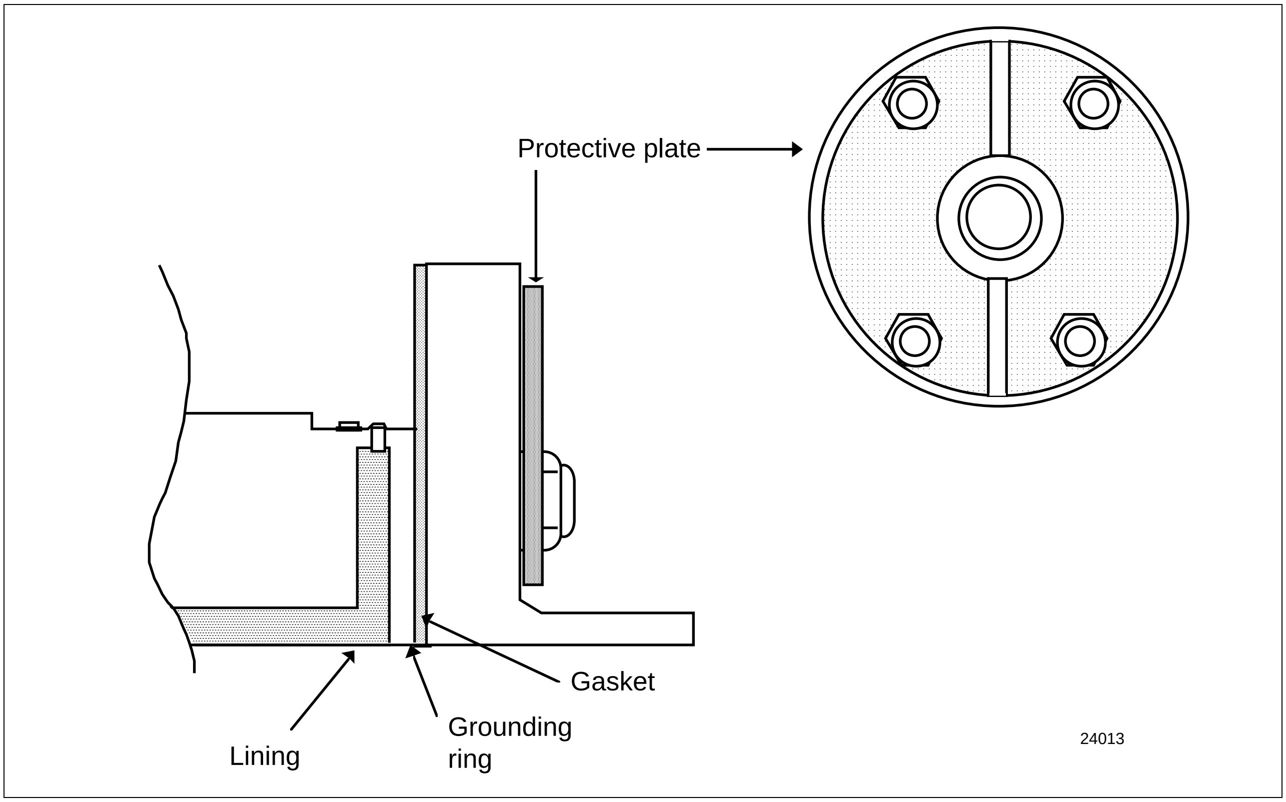
2.7.4 Gaskets and Protective Plate for Wafer Type Flowmeters, Continued

PVC pipe, SUS ring, continued

Figure 2-11 shows the proper installation when the wafer type flowmeter has a grounding ring made of SUS material and is being mounted on a PVC pipe with a protective plate. The protective plate should be installed between the outer side of the PVC flange and the detector. A protective plate is used to prevent damage or deformation of the PVC pipe.

Figure 2-11 Installation Using SUS Material Grounding Ring and PVC Pipe with a Protective Plate



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PVC pipe, SUS ring, continued

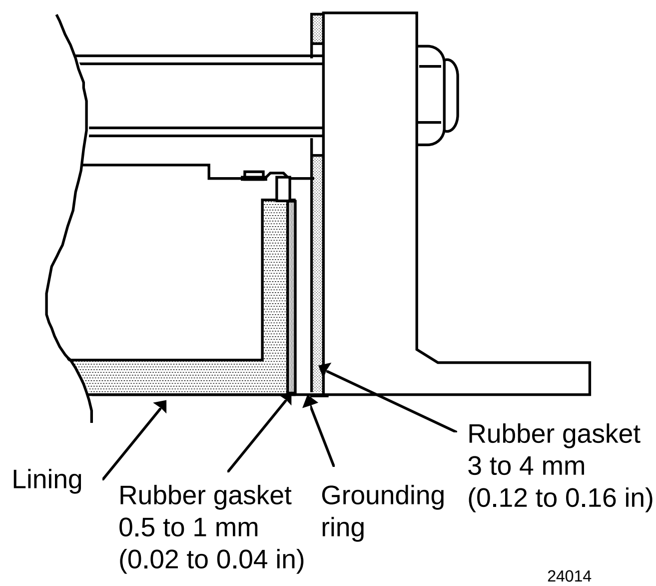
When using rubber gaskets is unavoidable, use the installation method, shown in Figure 2-12, for a wafer type flowmeter being mounted on a PVC pipe.

Prepare two rubber gaskets of different thicknesses: one within 0.5 to 1 mm (0.02 to 0.04 in), the other within 3 to 4 mm (0.12 and 0.16 in). Remove the grounding ring from the detector, then reinsert it sandwiched between the two rubber gaskets. The thinner rubber gasket should be between the Teflon line and the ground ring.

When using rubber gaskets, you must use a low fastening torque, but one that provides a leak-proof joint.

CAUTION The use of rubber gaskets and a lower fastening torque may result in insufficient surface pressure between the lining and the grounding ring, result in leakage. *Honeywell does not recommend using rubber gaskets.*

Figure 2-12 Installation Using SUS Material Grounding Ring with Rubber Gaskets and a PVC Pipe



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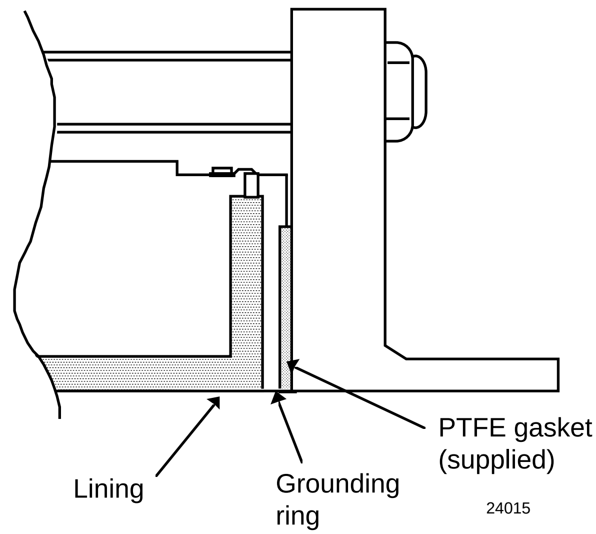
2.7.4 Gaskets and Protective Plate for Wafer Type Flowmeters, Continued

PVC pipe, non-SUS ring

Figure 2-13 shows the proper installation when the wafer type flowmeter has a grounding ring made of non-SUS material and is being mounted on a PVC pipe.

Figure 2-13 Installation Using Non-SUS Material Grounding Ring and PVC Pipe



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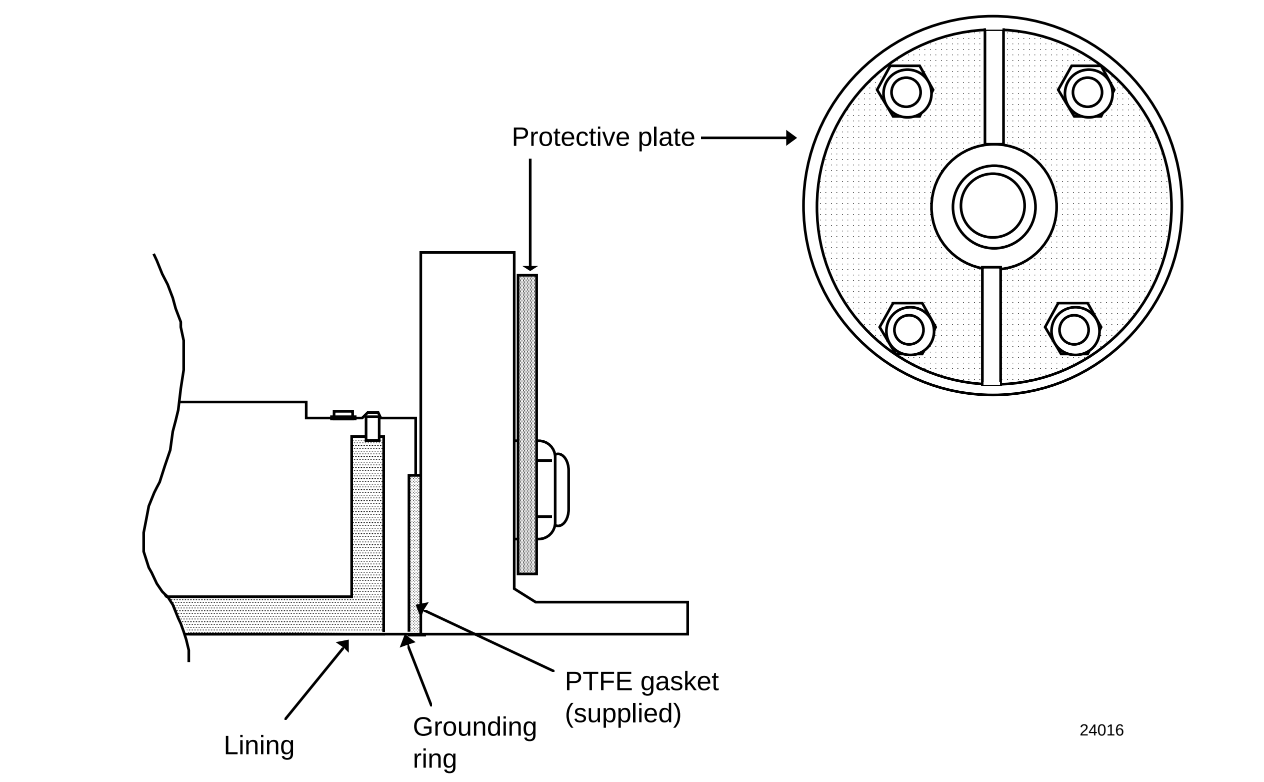
2.7.4 Gaskets and Protective Plate for Wafer Type Flowmeters, Continued

PVC pipe, non-SUS ring, continued

Figure 2-14 shows the proper installation when the wafer type flowmeter has a grounding ring made of non-SUS material and is being mounted on a PVC pipe with a protective plate. The protective plate should be installed between the outer side of the PVC flange and the detector. A protective plate is used to prevent damage or deformation of the PVC pipe.

Figure 2-14 Installation Using Non-SUS Material Grounding Ring and PVC Pipe with a Protective Plate



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2.7.4 Gaskets and Protective Plate for Wafer Type Flowmeters, Continued

PVC pipe, non-SUS ring, continued

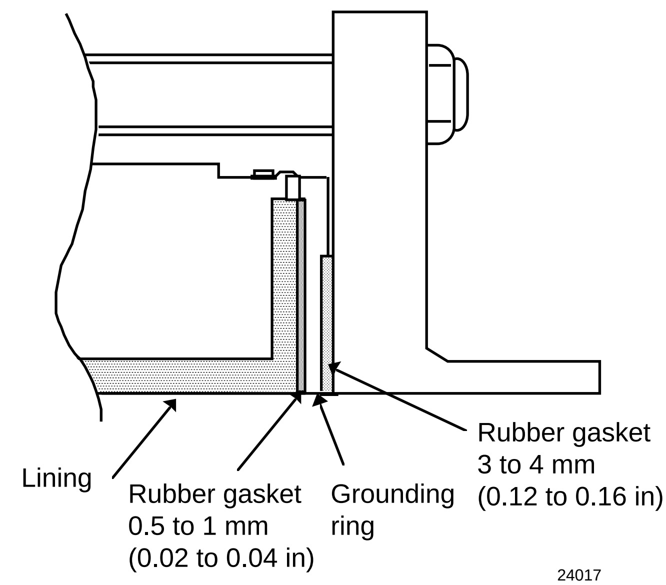
When using rubber gaskets is unavoidable, use the installation method, shown in Figure 2-15, for a wafer type flowmeter being mounted on a PVC pipe.

Prepare two rubber gaskets of different thicknesses: one within 0.5 to 1 mm (0.02 to 0.04 in), the other within 3 to 4 mm (0.12 and 0.16 in). Remove the grounding ring from the detector, then insert the thinner rubber gasket. Reinsert the grounding ring on top of the rubber gasket. Then remove the PTFE gasket and insert the thicker rubber gasket to replace it.

When using rubber gaskets, you must use a low fastening torque, but one that provides a leak-proof joint.

CAUTION The use of rubber gaskets and a lower fastening torque may result in insufficient surface pressure between the lining and the grounding ring, result in leakage. *Honeywell does not recommend using rubber gaskets.*

Figure 2-15 Installation Using Non-SUS Material Grounding Ring with Rubber Gaskets and a PVC Pipe



2.8 Installing Flange Type Flowmeters

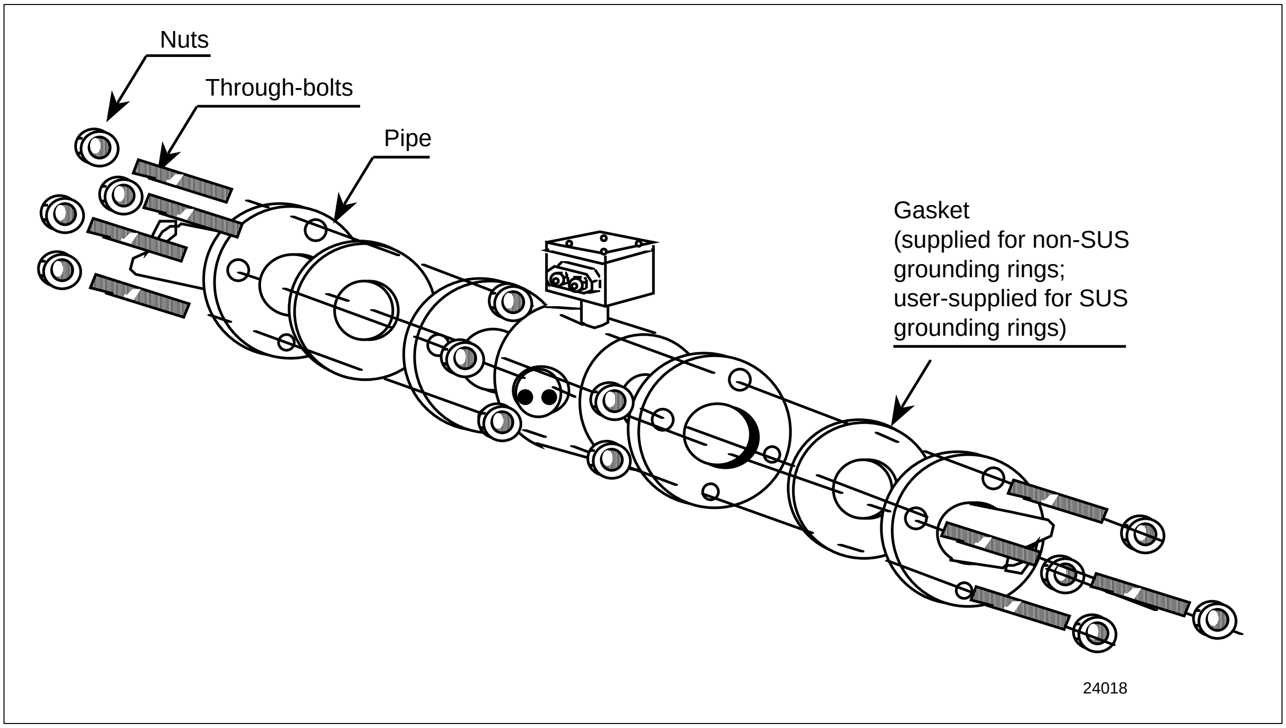
2.8.1 Basic Installation Method

Installation example

Figure 2-16 shows the basic method for installing a flange type flowmeter.

CAUTION Be careful when handling this unit. Dropping it could cause injury.

Figure 2-16 Flange Type Installation Assembly Example



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2.8.1 Basic Installation Method, Continued

Fastening torque

Table 2-9 gives the fastening torque for each pipe bore. Using centering hardware, apply the prescribed fastening torque to prevent any liquid leak from the pipe.

WARNING Table 2-9 shows the fastening torque for each pipe bore. Apply the prescribed fastening torque to prevent leakage.

Table 2-9 Torque Ratings for Flange Type Detectors

Detector Size millimeters (inches)	Flange Ratings	Fastening Torque	
		N•m	ft-lb
25 (1)	JIS 10K JIS 20K JIS 30K ANSI 150 ANSI 300 DIN 10/16 DIN 25/40	21 to 31 21 to 32 23 to 36 11 to 17 22 to 34 10 to 14 12 to 18	15 to 23 15 to 24 17 to 27 8 to 13 16 to 25 7 to 10 9 to 13
40 (1.6)	JIS 10K JIS 20K JIS 30K ANSI 150 ANSI 300 DIN 10/16 DIN 25/40	22 to 32 22 to 34 41 to 65 13 to 18 36 to 57 22 to 32 25 to 38	16 to 24 16 to 25 30 to 48 10 to 13 27 to 42 16 to 24 18 to 28
50, 65 (2, 2.6)	JIS 10K JIS 20K JIS 30K ANSI 150 ANSI 300 DIN 10/16 DIN 25/40	24 to 34 19 to 31 22 to 34 23 to 32 20 to 32 24 to 34 28 to 42	17 to 25 14 to 23 16 to 25 17 to 24 15 to 24 17 to 25 21 to 31
80 (3.1)	JIS 10K JIS 20K JIS 30K JIS G3451 F12 ANSI 150 ANSI 300 DIN 10/16 DIN 25/40	20 to 31 37 to 61 42 to 66 18 to 37 26 to 35 37 to 57 20 to 31 25 to 39	15 to 22 27 to 45 31 to 49 13 to 27 19 to 26 27 to 42 15 to 23 18 to 29

Continued on next page

Fastening torque, continued

Table 2-9 Torque Ratings for Flange Type Detectors, Continued

Detector Size millimeters (inches)	Flange Ratings	Fastening Torque N•m	Fastening Torque ft-lb
100 (3.9)	JIS 10K	22 to 33	16 to 24
	JIS 20K	41 to 66	30 to 49
	JIS 30K	61 to 95	45 to 70
	JIS G3451 F12	21 to 41	15 to 30
	ANSI 150	21 to 31	15 to 23
	ANSI 300	43 to 66	32 to 49
	DIN 10/16	22 to 33	16 to 24
	DIN 25/40	48 to 74	35 to 55
125, 150 (5, 5.9)	JIS 10K	47 to 67	35 to 49
	JIS 20K	58 to 91	43 to 67
	JIS 30K	80 to 123	59 to 91
	JIS G3451 F12	23 to 45	17 to 33
	ANSI 150	42 to 60	31 to 44
	ANSI 300	50 to 74	37 to 55
	DIN 10/16	47 to 67	35 to 49
	DIN 25/40	97 to 145	72 to 107
200 (7.9)	JIS 10K	44 to 65	32 to 48
	JIS 20K	66 to 102	49 to 75
	JIS 30K	94 to 142	69 to 105
	JIS G3451 F12	24 to 44	18 to 32
	ANSI 150	42 to 59	31 to 44
	ANSI 300	81 to 120	60 to 89
	DIN 10/16	47 to 68	35 to 50
	DIN 25/40	123 to 189	91 to 139
250 (9.8)	JIS 10K	51 to 63	38 to 46
	JIS 20K	81 to 99	60 to 73
	JIS G3451 F12	73 to 89	54 to 66
	ANSI 150	69 to 85	51 to 63
	ANSI 300	82 to 97	60 to 72
	DIN 10/16	57 to 69	42 to 51
	DIN 25	108 to 127	80 to 94
300 (11.8)	JIS 10K	50 to 62	37 to 46
	JIS 20K	79 to 97	58 to 72
	JIS G3451 F12	49 to 59	36 to 44
	ANSI 150	56 to 68	41 to 50
	ANSI 300	116 to 136	86 to 100
	DIN 10/16	45 to 55	33 to 41
	DIN 25	105 to 122	77 to 90

Continued on next page

Fastening torque, continued

Table 2-9 Torque Ratings for Flange Type Detectors, Continued

Detector Size millimeters (inches)	Flange Ratings	Fastening Torque	
		N•m	ft-lb
350 (13.8)	JIS 10K JIS 20K JIS G3451 F12 ANSI 150 ANSI 300 DIN 10/16 DIN 25	54 to 66 143 to 167 66 to 80 80 to 98 116 to 136 42 to 52 160 to 189	40 to 49 105 to 123 49 to 59 59 to 72 86 to 100 31 to 38 118 to 139
400 (15.8)	JIS 10K JIS 20K JIS G3451 F12 ANSI 150 ANSI 300 DIN 10/16 DIN 25	72 to 88 160 to 189 69 to 85 80 to 98 166 to 195 72 to 88 199 to 234	53 to 65 118 to 139 51 to 43 59 to 72 122 to 144 53 to 65 147 to 173
450 (17.7)	JIS 10K JIS 20K JIS G3451 F12 ANSI 150	101 to 119 158 to 185 139 to 164 136 to 160	74 to 88 117 to 136 103 to 121 100 to 118
500 (19.7)	JIS 10K JIS 20K JIS G3451 F12 ANSI 150 DIN 10/16 DIN 25	114 to 133 173 to 204 133 to 161 155 to 189 106 to 129 214 to 251	83 to 98 128 to 150 98 to 119 114 to 139 78 to 95 158 to 185
600 (23.6)	JIS 10K JIS 20K JIS G3451 F12 ANSI 150 DIN 10/16 DIN 25	184 to 216 267 to 315 127 to 154 214 to 262 153 to 185 292 to 343	136 to 159 197 to 232 94 to 114 158 to 193 113 to 136 215 to 253

CAUTION Tighten each bolt a little at a time and apply uniform pressure to all the bolts while fastening them. If leakage does not stop on completion of fastening, make sure that the pipe is not off center, then tighten the bolts little by little. Install the detector carefully so that the fastening torque does not exceed the prescribed limit; otherwise, the unit could be damaged.

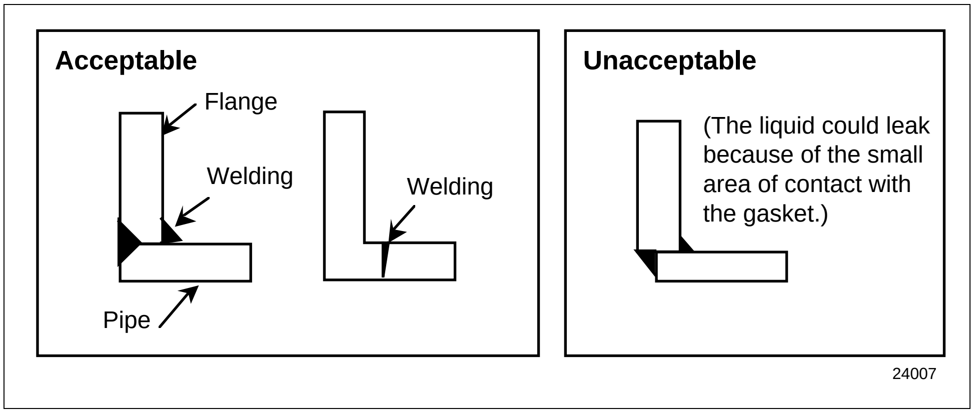
Continued on next page

2.8.1 Basic Installation Method, Continued

Flange shape

The flanges used should be such that the area of contact with the gasket is maximized, as shown in Figure 2-17.

Figure 2-17 Flange Shape



WARNING Before installing the detector, make sure that the pipe is exactly straight and centered. Any irregularity in these respects could cause leakage or other hazards.

CAUTION Never force the device between two flanges when the space is too narrow. This can damage the unit.

Parts needed

The following parts are necessary for the installation of the detector.

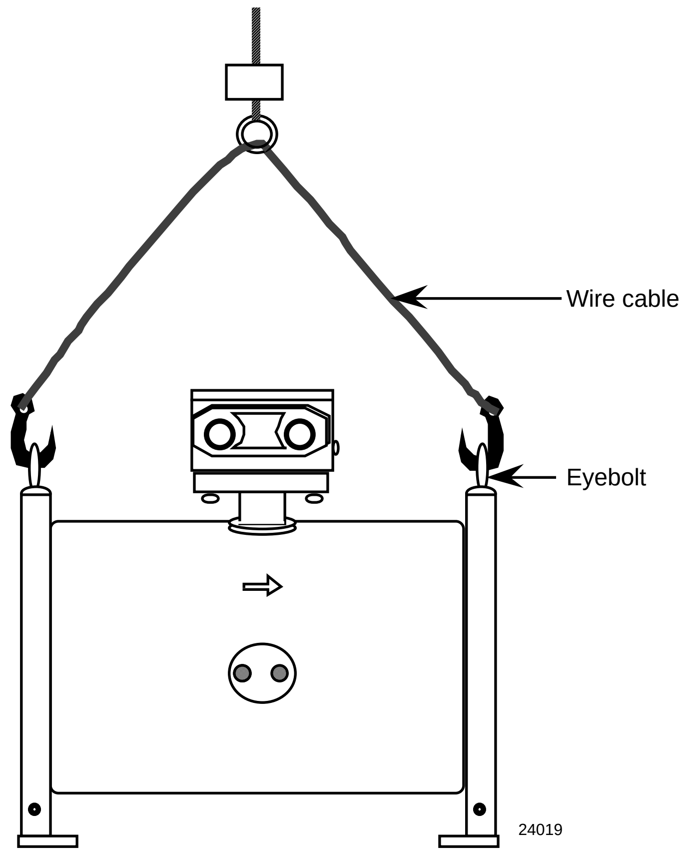
- Connecting bolts and nuts (available separately)
- Gaskets—
  User-supplied when using grounding rings made of SUS material. We recommend gasket material such as joint sheet or PTFE.
  When using grounding rings made of hastelloy, titanium, tantalum, or platinum, gaskets are supplied with flowmeter. For the bore diameters of the gaskets, refer to Table 2-11.

2.8.2 Installation Procedure

Installation procedure Follow the procedure in Table 2-10 for mounting a flange type flowmeter.

CAUTION Improper installation may result in leakage or damaged to the pipe flanges.

Table 2-10 Installation of a Flange Type Flowmeter Procedure

Step	Action
1	*For detector sizes larger than 200 mm (7.9 in),* connect wire cables to detector's two integral eyebolts to safely hoist the detector. 
2	Orient detector so its flow direction arrow points in same direction as the fluid flows.

Continued on next page

Installation procedure, continued

Table 2-10 Installation of a Flange Type Flowmeter Procedure, Continued

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>3</td><td>Carefully insert detector and gaskets between the pipe flanges.

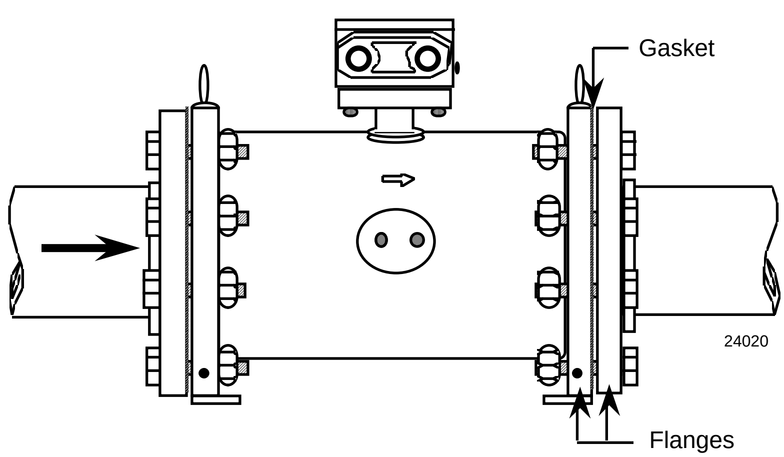
The proper use and assembly of gaskets, and the possible use of a protective plate, are dependent upon the grounding ring material and pipe material being used. From the following information, determine the combination of pipe and grounding ring materials and the installation method that apply.

<table>
<tr><th>Pipe Material</th><th>Grounding Ring Material</th><th>PTFE Gaskets Supplied?</th><th>Installation Assembly refer to ...</th><th>Gasket Diameters refer to ...</th></tr>
<tr><td>Metal</td><td>SUS</td><td>No (joint sheet or PTFE recommended)</td><td>Figure 2-8</td><td>Table 2-6</td></tr>
<tr><td>Metal</td><td>Other than SUS</td><td>Yes</td><td>Figure 2-9</td><td>——</td></tr>
<tr><td>PVC</td><td>SUS</td><td>No (joint sheet or PTFE recommended)</td><td>Figure 2-10
Figure 2-11 (with protective plate)
Figure 2-12 (rubber gaskets—not recommended)</td><td>Table 2-6
Table 2-6

Tables 2-7 and 2-8</td></tr>
<tr><td>PVC</td><td>Other than SUS</td><td>Yes</td><td>Figure 2-13
Figure 2-14 (with protective plate)
Figure 2-15 (rubber gaskets—not recommended)</td><td>——
——

Tables 2-7 and 2-8</td></tr>
</table>
</td></tr>
<tr><td>4</td><td>Make sure no gaskets protrude into the piping and that the detector is properly centered.</td></tr>
<tr><td>5</td><td>Bolt flanges together with standard flange bolts and nuts. Tighten bolts evenly to approximate torque listed in Table 2-9.

Remote Detector Bolted to Pipe Flanges

</td></tr>
</table>

2.8.3 Gaskets and Protective Plate for Flange Type Flowmeters

Gaskets

Table 2-11 gives the bore diameters for gaskets.

WARNING Make sure the bore diameters of the pipe and the detector are exactly the same. Install the detector so that the gasket does not protrude into the inner bore of the pipe, as this could result in leakage or other hazards.

CAUTION

- Too small a gasket diameter can affect the flow velocity distribution resulting in inaccurate measurements.
- Too large a gasket diameter can cause leakage. Also, any solid substance in the fluid to be measured could accumulate between the gasket and the flange, resulting in inaccurate measurements.

Table 2-11 Recommended Inner Diameters of Gaskets

Bore Diameter millimeters (inches)	Inner Diameter	
	millimeters	inches
25 (1)	25 ±1	1 ±0.04
40 (1.6)	40 ±1	1.6 ±0.04
50 (2)	51 ±1	2 ±0.04
65 (2.5)	64 ±1	2.5 ±0.04
80 (3.1)	76 ±1	2.9 ±0.04
100 (3.9)	101 ±1	3.9 ±0.04
125 (5)	124 ±1	4.8 ±0.04
150 (5.9)	148 ±1	5.8 ±0.04
200 (7.9)	196 ±1	7.7 ±0.04
250 (9.8)	246 ±1	9.8 ±0.04
300 (11.8)	296 ±1	11.7 ±0.04
350 (13.8)	346 ±1	13.6 ±0.04
400 (15.8)	396 ±1	15.6 ±0.04
450 (17.7)	446 ±1	17.6 ±0.04
500 (19.7)	496 ±1	19.5 ±0.04
600 (23.6)	596 ±1	23.5 ±0.04

Continued on next page

2.8.3 Gaskets and Protective Plate for Flange Type Flowmeters, Continued

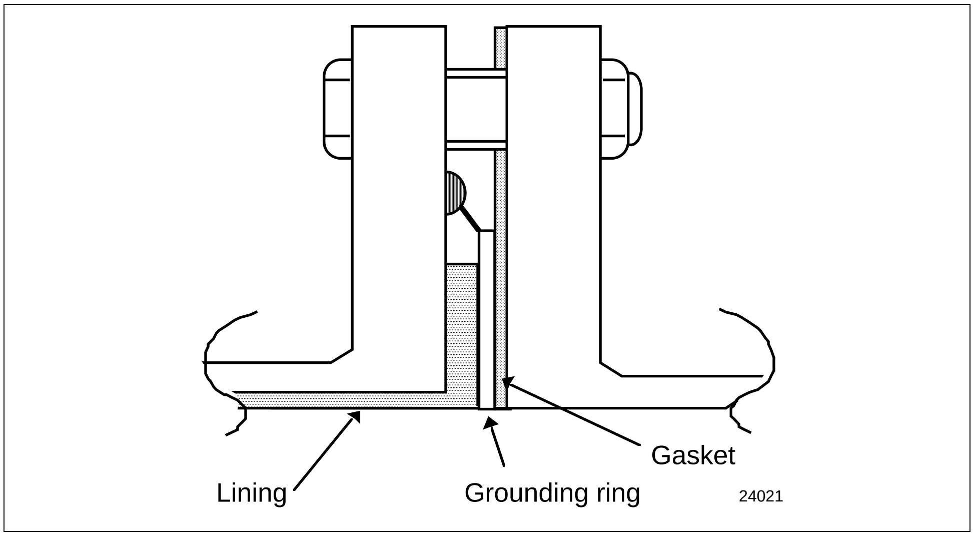
Gaskets, continued

Honeywell does not recommend the use of rubber gaskets. However, if you decide to install the detector at a lower torque level using rubber gaskets, you must use gaskets with the bore and outside diameters shown in Tables 2-7 and 2-8 on pages 34 and 35, respectively. Depending on the grounding ring material, two gaskets of different thicknesses may be required (Figures 2-12 and 2-15).

Metal pipe, SUS ring

Figure 2-18 shows the proper installation when the flange type flowmeter has a grounding ring made of SUS material and is being mounted on a metal pipe.

Figure 2-18 Installation Using SUS Grounding Ring and Metal Pipe



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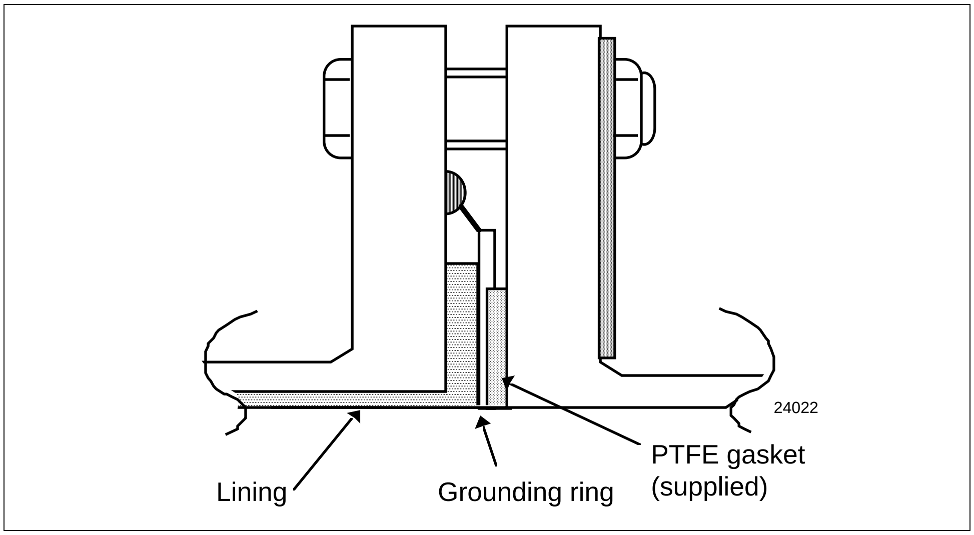
2.8.3 Gaskets and Protective Plate for Flange Type Flowmeters, Continued

Metal pipe, non-SUS ring

Figure 2-19 shows the proper installation when the flange type flowmeter has a grounding ring made of material other than SUS and is being mounted on a metal pipe.

CAUTION The use of an additional gasket besides the supplied PTFE gasket may result in leakage.

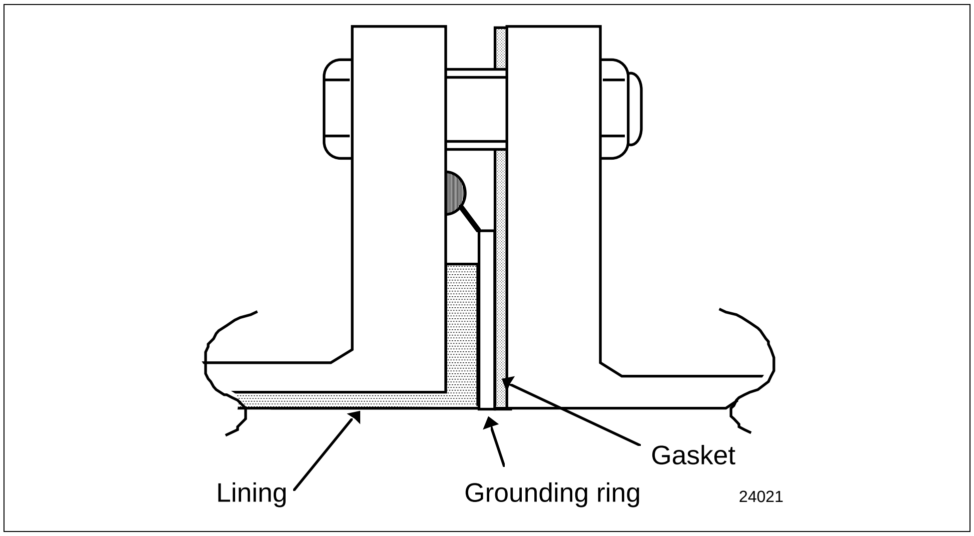
Figure 2-19 Installation Using Non-SUS Grounding Ring and Metal Pipe



PVC pipe, SUS ring

Figure 2-20 shows the proper installation when the flange type flowmeter has a grounding ring made of SUS material and is being mounted on a PVC pipe.

Figure 2-20 Installation Using SUS Grounding Ring and PVC Pipe



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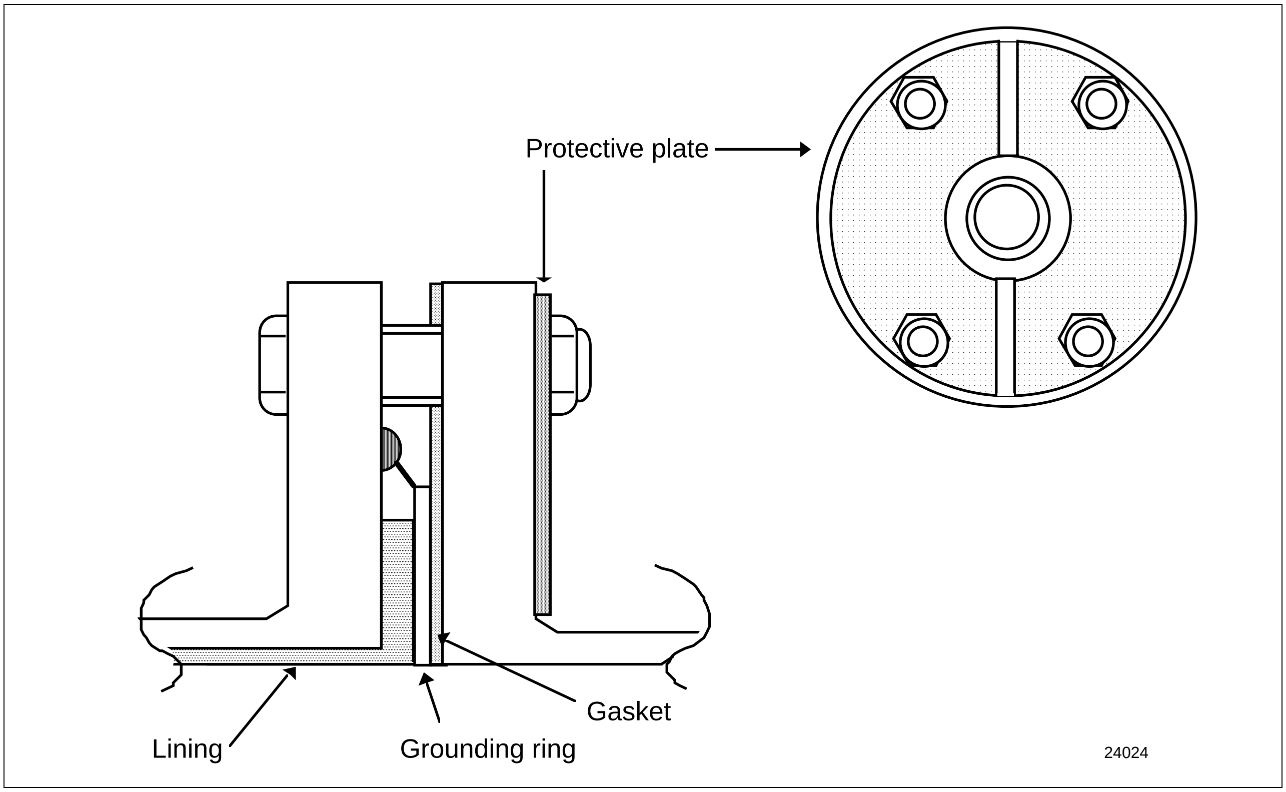
2.8.3 Gaskets and Protective Plate for Flange Type Flowmeters, Continued

PVC pipe, SUS ring, continued

Figure 2-21 shows the proper installation when the flange type flowmeter has a grounding ring made of SUS material and is being mounted on a PVC pipe with a protective plate. The protective plate should be installed between the outer side of the PVC flange and the detector. A protective plate is used to prevent damage or deformation of the PVC pipe.

Figure 2-21 Installation Using SUS Material Grounding Ring and PVC Pipe with a Protective Plate



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2.8.3 Gaskets and Protective Plate for Flange Type Flowmeters, Continued

PVC pipe, SUS ring, continued

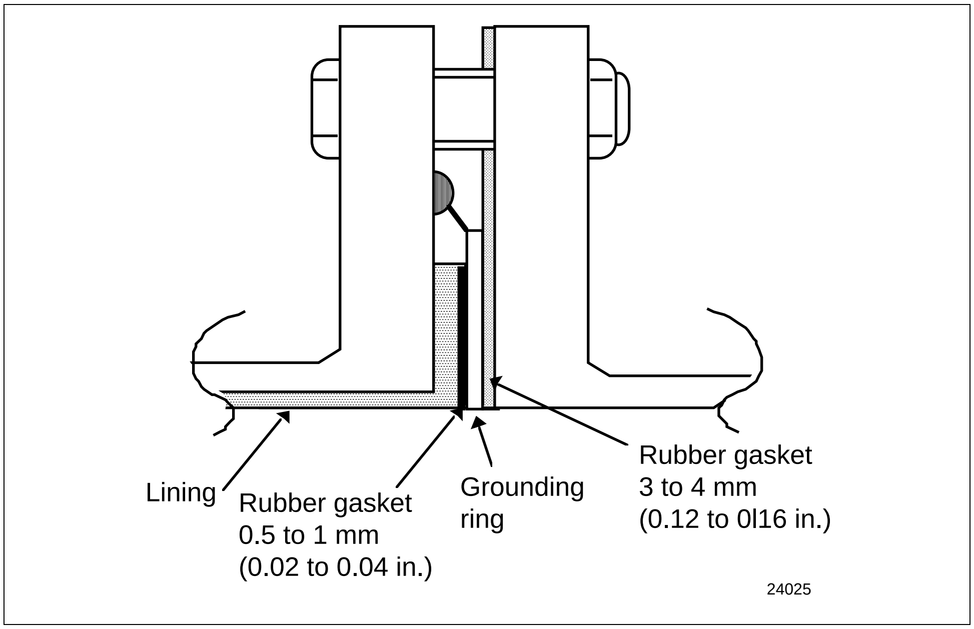
When using rubber gaskets is unavoidable, use the installation method, shown in Figure 2-22, for a flange type flowmeter being mounted on a PVC pipe.

Prepare two rubber gaskets of different thicknesses: one within 0.5 to 1 mm (0.02 to 0.04 in), the other within 3 to 4 mm (0.12 and 0.16 in). Remove the grounding ring from the detector, then reinsert it sandwiched between the two rubber gaskets. The thinner rubber gasket should be between the Teflon line and the ground ring.

When using rubber gaskets, you must use a low fastening torque, but one that provides a leak-proof joint.

CAUTION The use of rubber gaskets and a lower fastening torque may result in insufficient surface pressure between the lining and the grounding ring, result in leakage. *Honeywell does not recommend using rubber gaskets.*

Figure 2-22 Installation Using SUS Material Grounding Ring with Rubber Gaskets and a PVC Pipe



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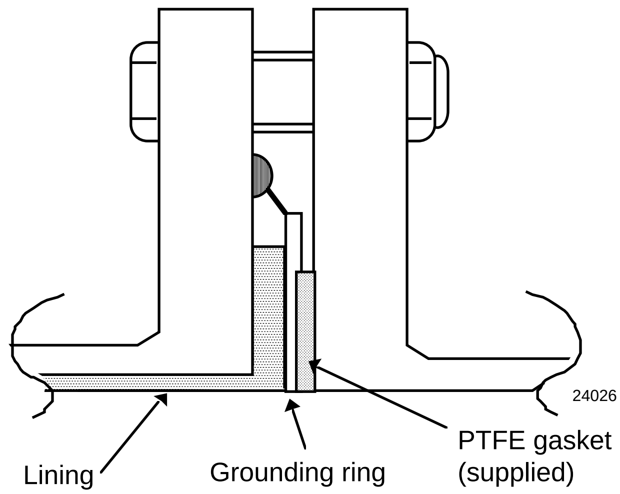
2.8.3 Gaskets and Protective Plate for Flange Type Flowmeters, Continued

PVC pipe, non-SUS ring

Figure 2-23 shows the proper installation when the flange type flowmeter has a grounding ring made of non-SUS material and is being mounted on a PVC pipe.

Figure 2-23 Installation Using Non-SUS Material Grounding Ring and PVC Pipe



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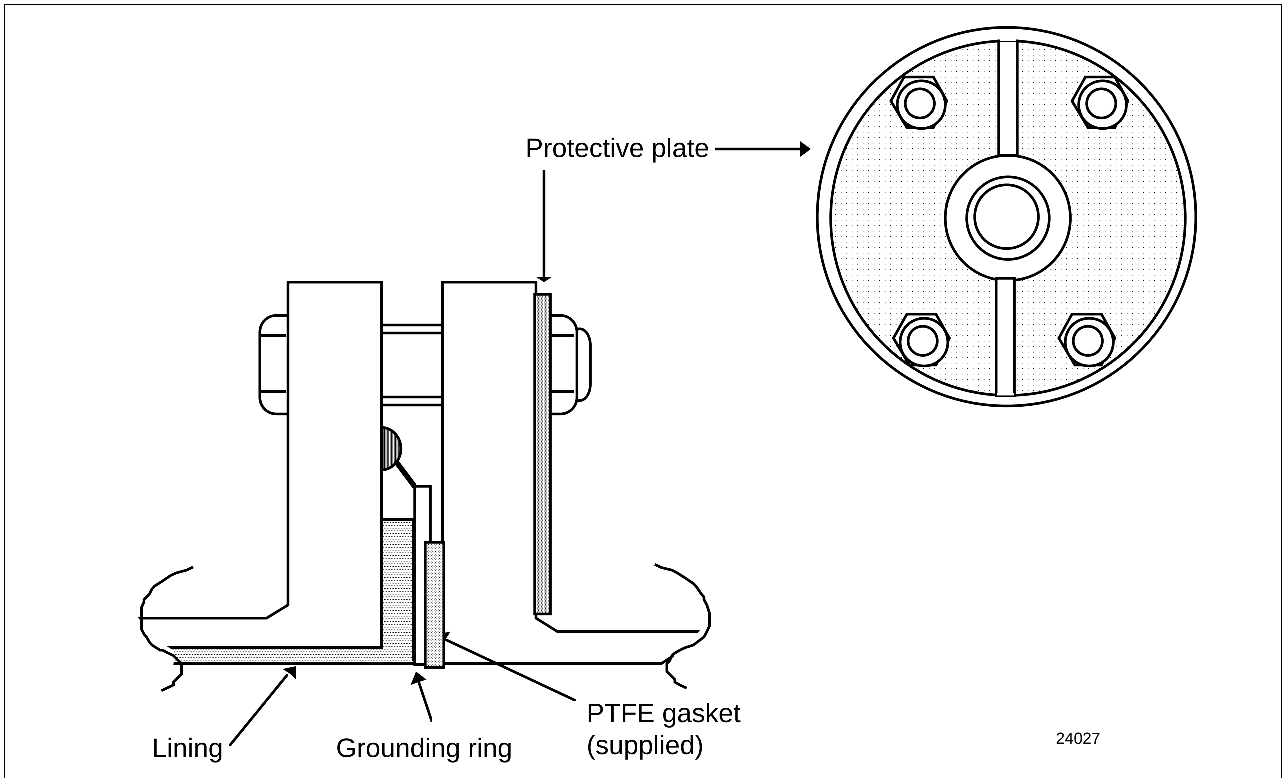
2.8.3 Gaskets and Protective Plate for Flange Type Flowmeters, Continued

PVC pipe, non-SUS ring, continued

Figure 2-24 shows the proper installation when the flange type flowmeter has a grounding ring made of non-SUS material and is being mounted on a PVC pipe with a protective plate. The protective plate should be installed between the outer side of the PVC flange and the detector. A protective plate is used to prevent damage or deformation of the PVC pipe.

Figure 2-24 Installation Using Non-SUS Material Grounding Ring and PVC Pipe with a Protective Plate



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2.8.3 Gaskets and Protective Plate for Flange Type Flowmeters, Continued

PVC pipe, non-SUS ring, continued

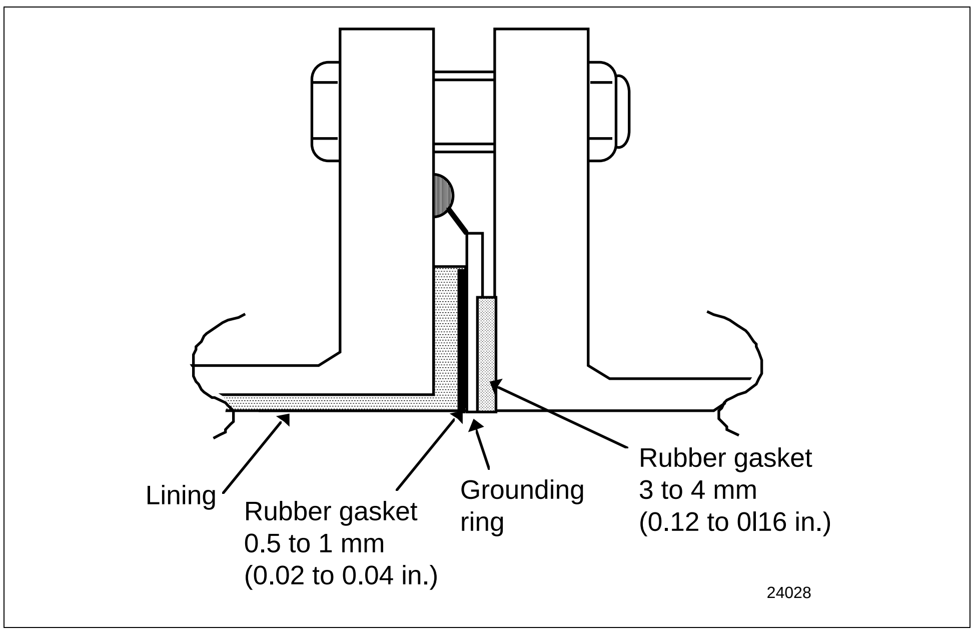
When using rubber gaskets is unavoidable, use the installation method, shown in Figure 2-25, for a flange type flowmeter being mounted on a PVC pipe.

Prepare two rubber gaskets of different thicknesses: one within 0.5 to 1 mm (0.02 to 0.04 in), the other with 3 to 4 mm (0.12 and 0.16 in). Remove the grounding ring from the detector, then insert the thinner rubber gasket. Reinsert the grounding ring on top of the rubber gasket. Then remove the PTFE gasket and insert the thicker rubber gasket to replace it.

When using rubber gaskets, you must use a low fastening torque, but one that provides a leak-proof joint.

CAUTION The use of rubber gaskets and a lower fastening torque may result in insufficient surface pressure between the lining and the grounding ring, result in leakage. *Honeywell does not recommend using rubber gaskets.*

Figure 2-25 Installation Using Non-SUS Material Grounding Ring with Rubber Gaskets and a PVC Pipe



2.9 Installing Union and Hose Type Flowmeters

Procedure

Table 2-12 summarizes typical steps for mounting a union or hose type flowmeter.

Table 2-12 Procedure for Mounting Union or Hose Type Flowmeters

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>Orient detector so its flow direction arrow points in same directions as fluid flows. The direction of the terminal box or the converter can be changed. Refer to Section 2.5 Repositioning the Terminal Box and the Converter.</td></tr>
<tr><td>2</td><td>Fasten the flowmeter to a stand, then position the detector so that the center of the pipe aligns with that of the measuring pipe.</td></tr>
<tr><td>3</td><td>For union assembly, mount the union joint nuts (user-supplied) on the process pipe. Using the union joint nuts, connect the pipe by screwing it into the connection hole of the flowmeter. Proceed to Step 4.

For hose assembly, screw in the hose, then fasten it with a fastening band (user-supplied), etc.</td></tr>
<tr><td>4</td><td>Use a torque wrench to tighten the union joint nuts. Alternately tighten the upstream and downstream joint nuts, little by little, over three or four turns.

CAUTION Fasten the detector using the specified fastening torque to prevent leakage.

<table>
<tr><th>Size
millimeters (inches)</th><th>Maximum Fastening Torque
N•m (lb-ft)</th></tr>
<tr><td>2.5 (0.1)</td><td>12 (9)</td></tr>
<tr><td>5 (0.2)</td><td>12 (9)</td></tr>
<tr><td>10 (0.4)</td><td>18 (13)</td></tr>
<tr><td>15 (0.6)</td><td>18 (13)</td></tr>
</table>
</td></tr>
</table>

2.10 Installing IDF Clamp/Tri Clamp Type Flowmeters

Procedure

Table 2-13 summarizes typical steps for mounting an IDF clamp or Tri clamp type flowmeter.

Table 2-13 Procedure for Mounting IDF or Tri Clamp Type Flowmeters

Step	Action
1	Weld the supplied ferrules to the process pipes. Thoroughly polish inside of welded pipe to make surfaces as smooth as possible.
2	Flush piping to remove any foreign matter from inside.
3	Orient detector so its flow direction arrow points in the same direction as fluid flows.
4	Carefully and precisely set supplied gaskets in grooves of detector's end connections. **WARNING** Mount it carefully into the groove so that there is no misalignment of the gasket, as this can cause leakage of other hazards.
5	Carefully insert the detector between pipe ferrules until detector end connections and ferrules are aligned.
6	Secure end connections and ferrules with provided clamps.

2.11 Mounting the Remote Converter

Summary

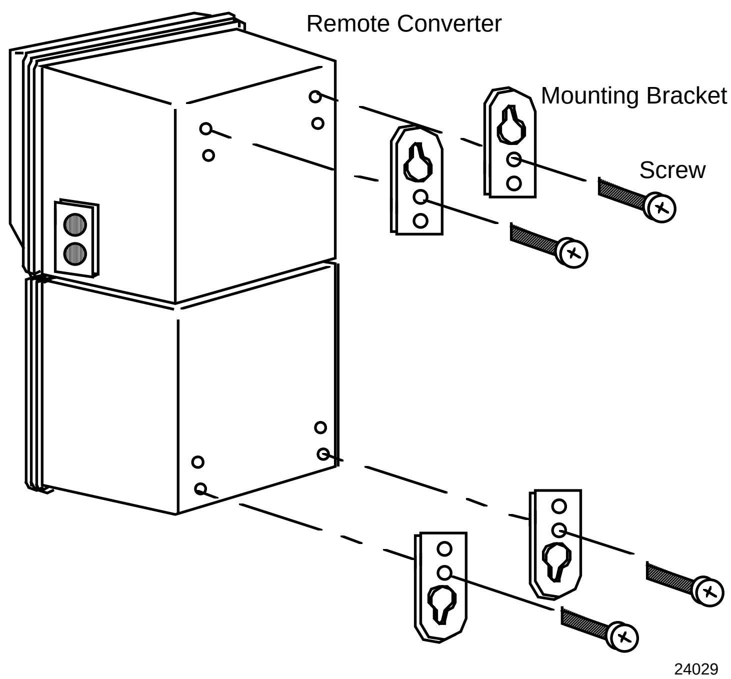
You can mount the remote converter to a

- surface of a wall when wall mounting brackets are ordered, or
- 2-inch (50 mm) vertical pipe when pipe mounting brackets are ordered.

Typical wall mounting procedure

Table 2-14 summarizes typical steps for mounting a remote converter on a wall.

Table 2-14 Mounting Remote Converter to a Wall

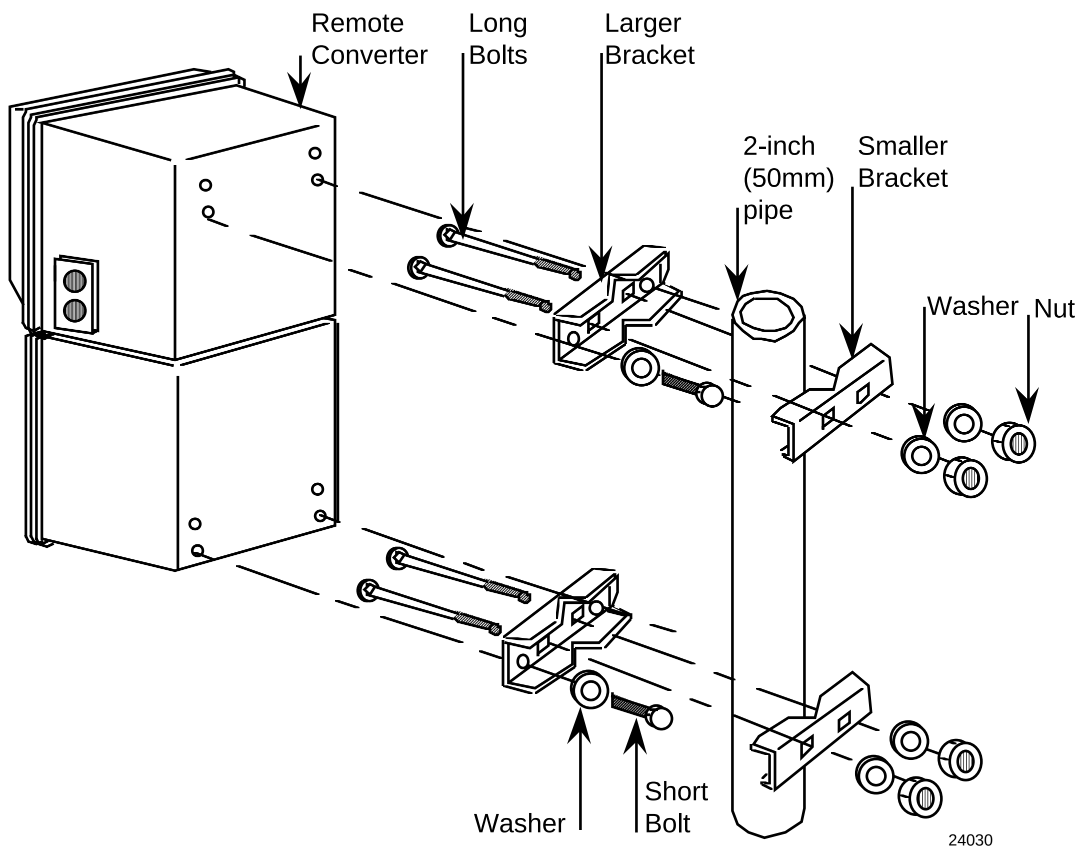
Step	Action
1	Install four mounting brackets at corners on back of converter with screws and washers provided. 
2	Position converter on wall and mark location of mounting holes in brackets for user supplied mounting hardware.
3	Prepare wall for mounting hardware and secure converter to wall with user supplied hardware.

Continued on next page

Typical pipe mounting procedure

Table 2-15 summarizes typical steps for mounting a remote converter on a 2-inch (50mm) pipe stand.

Table 2-15 Mounting Remote Converter to a Pipe

Step	Action
1	Hold large bracket with smooth side facing you and insert two long bolts into square holes in bracket. Position smooth side of large bracket and bolt heads against top back of converter case so mounting holes in bracket align with bolt holes in case. Secure bracket to converter with two short bolts and washers provided.
2	Repeat Step 1 for the other large bracket, but secure to bottom back of converter case.
3	Position converter on 2-inch (50mm) pipe stand so pipe fits in grooves of larger brackets. Slip smaller brackets, with grooves toward pipe, over long bolts and secure with nuts and washers. 

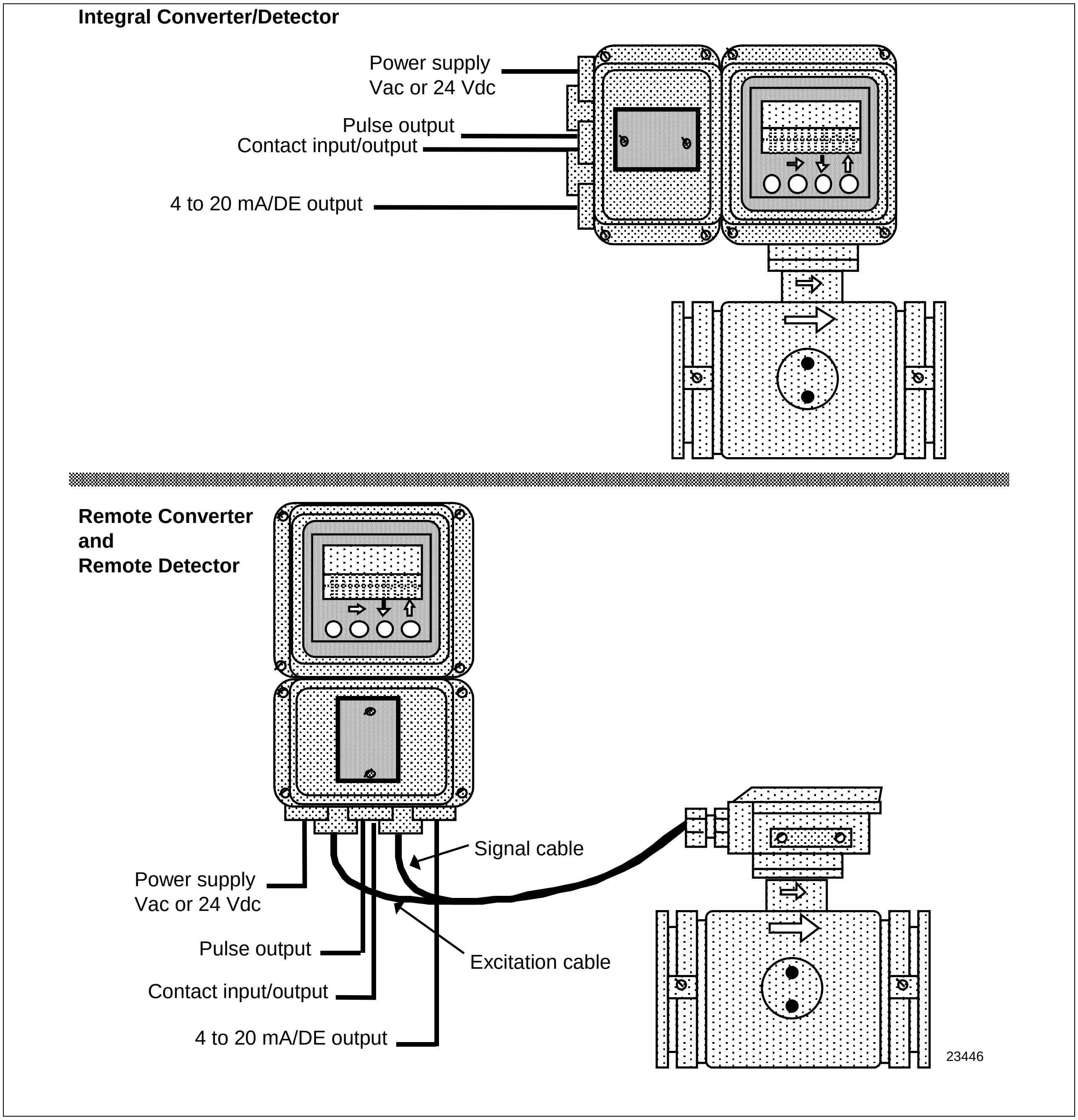
2.12 Wiring Summary

Wiring summary

The wiring requirements vary depending upon which MagneW 3000 ***PLUS*** flowmeter model you ordered. An integral converter/detector model does not require external cables for carrying the excitation current from the converter to the detector and the detector's output signal to the converter. These external excitation and signal cables are required to connect a remote detector to a remote converter.

Figure 2-26 provides an overview of the possible wiring requirements for MagneW 3000 ***PLUS*** flowmeters.

Figure 2-26 Overview of MagneW 3000 ***PLUS*** Wiring Requirements



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Honeywell offers the excitation and signal cables as a set under a separate model number. The cables are available with terminal lugs and the signal cable comes with or without a shield drive.

The signal cable is a 2-core individually double-shielded cable with a conductor section of 0.75 mm^2 (0.001 in^2) and an outer diameter of 11.4 mm (0.45 in).

The excitation current cable is a 2-core chloroprene cabtyre cable with a conductor section of 0.2 mm^2 (0.003 in^2) and an outer diameter of 10.5 mm (0.4 in).

Users must obtain commercially available cables for wiring the power and other I/O signals to the converter. The recommended wiring cable is a 600V vinyl sheath electrical wire with a conductor section of 2 mm^2 (0.003 in^2), or a twisted cable with an equivalent or higher capacity. Belden no. 9250 or Alpha no. 9816 are also recommended.

Shielded wiring is recommended for wiring at locations subject to electromagnetic noise interference. Select a sheath material suitable for the cable installation environment (consider ambient temperature, corrosive gas, corrosive fluid, etc.).

Cables are run to the terminal block through the conduit connection (G1/2 internal thread, CM20 external thread, Pg13.5, or 1/2 NPT internal thread). A cable outer diameter of 11 mm (0.43 in) is optimum). A crimp terminal (M4 screw) with an insulation sleeve is recommended for the terminal connections.

The maximum length of the wiring cable is 1500 m (4, 921 ft). The maximum length between the remote converter and detector is 300 m (984 ft).

2.13 Wiring Guidelines

General wiring guidelines

- Do not run the cables near a motor, a transformer, or a large current-carrying cable which may cause induction noise. Run the cables at least 1 meter (3.3 feet) away from heavy-duty power cables.
- Do not bundle the signal cable with excitation cable. Put the signal cable in a separate metallic conduit, flexible tube, or duct.
- Be sure any metallic conduit or flexible tube slants away from the integral converter/detector terminal box so any water condensation will drain away from the converter.
- Use a waterproof gland at the conduit connection.
- Do not splice the excitation or signal cable at a junction box between the remote detector and remote converter. If splicing the cable is unavoidable, use Honeywell's cable junction box part number 80720002-000 which has been designed specifically for this purpose.
- Do not short the converter's excitation current terminals X and Y.
- Restrict the length of the excitation and signal cables based on the electrical conductivity (µS/m) of the liquid to be measured. Refer to Figure 2-27.

  For example, if measuring potable water or sewage water with an electrical conductivity of 100,000 µS/m (1000 µΩ/cm), the cables could be up to 300 meters (984 feet) long for a detector with a diameter of 10 mm (0.4 in) or greater. If you need cables that are longer than 500 meters (1640 feet), be sure that the cross section of the cable is such that the voltage drop in the cable does not exceed 5 volts. Use this formula to calculate the excitation cable cross section area.

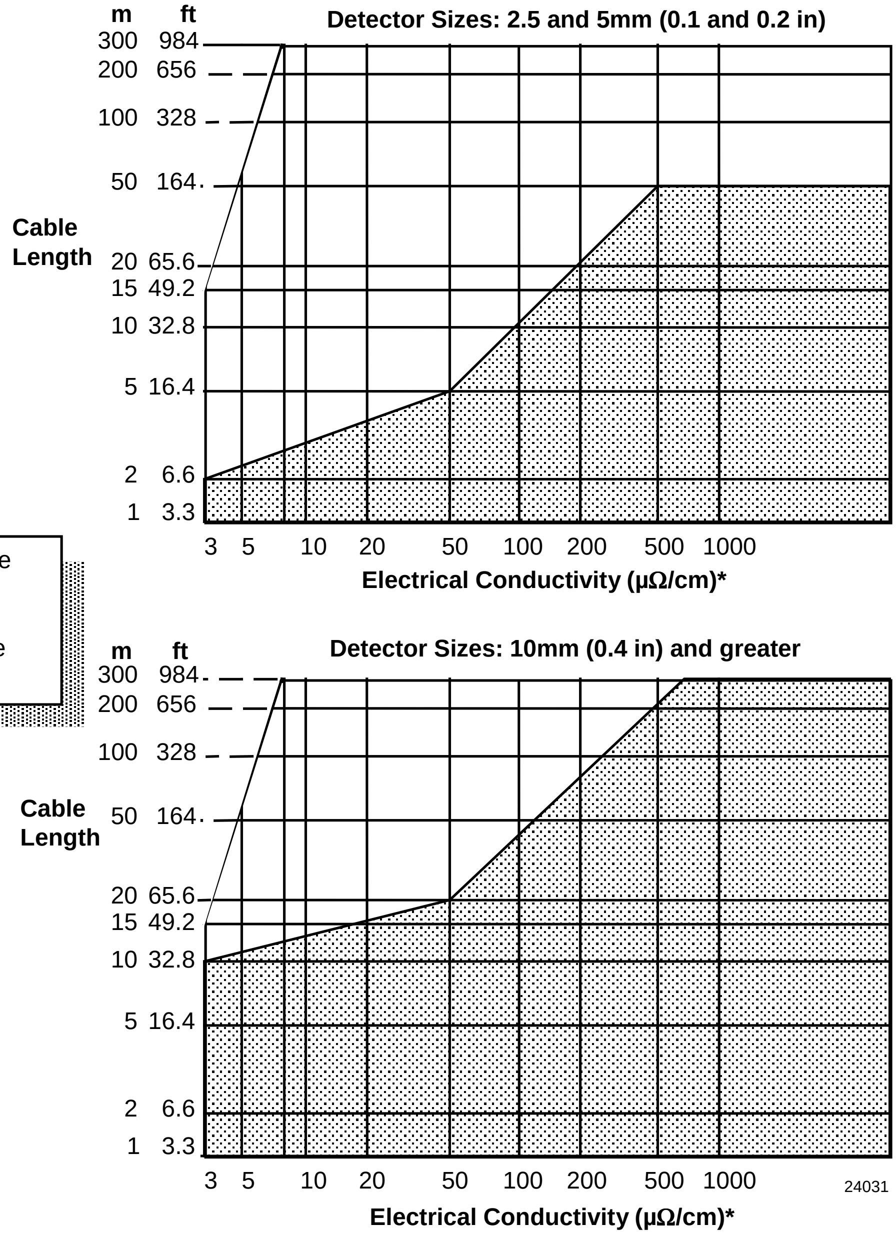
  $$\text{A (cross section area: mm}^2\text{)} = \frac{35.6 \text{ x L (cable distance:M) x } 0.4 \text{ (A)}}{1000 \text{ x } 5 \text{ (V)}}$$

Continued on next page

General wiring guidelines, continued

Figure 2-27 shows the relationship between cable length and liquid conductivity.

Figure 2-27 Cable Length Versus Liquid Conductivity



The shaded portions are the areas where commercially available cables or cables without shield drives can be used.

NOTE: Empty pipe detection alarm is available only when the electrical conductivity of the fluid is greater than 150 µS/cm.

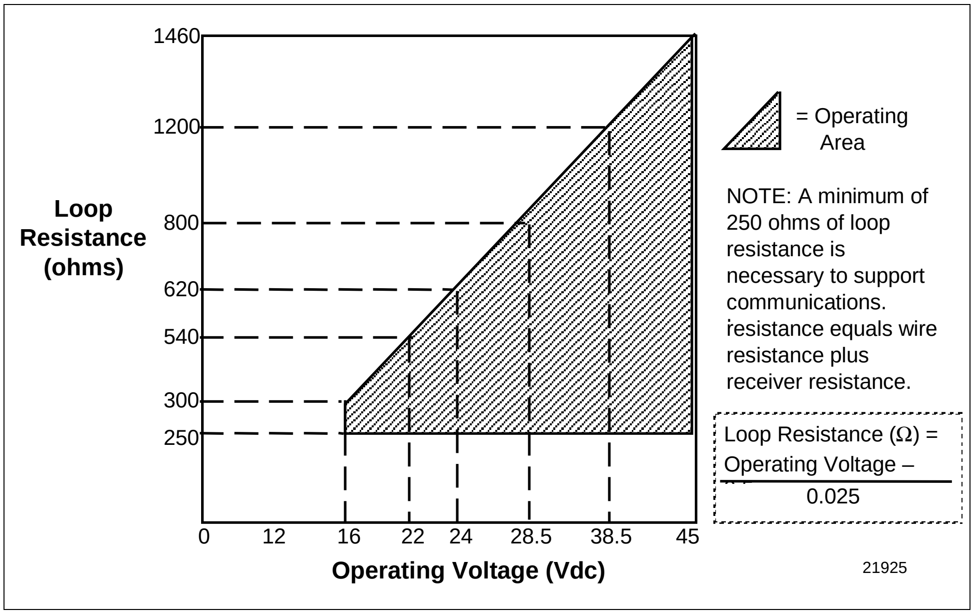
** All water-based liquids have high conductivity and do not require a shield drive. Some organic, petrochemical, and oil-based liquids have low conductivity and a shield drive should be considered.*

Continued on next page

General wiring guidelines, continued

•Be sure that the loop resistance which equals the wire resistance plus the receiver resistance is within 0 to 600 ohms for a converter with an internal 24 Vdc power supply and no SFC communications, or 250 to 1460 ohms for a converter to be used with an external 16 to 45 Vdc power supply and support SFC communications and/or digital integration with our TPS system. See Figure 2-28 for converter operating range when used with an external power supply. For a cable with a 2 mm^2 (0.003 in^2) cross section, the resistance is approximately 20 ohms for a cable run 1 km (3,281 ft) long. In this case, the output cable could be up to 10 km (6.2 miles) long for a converter with an internal 24 Vdc power supply and a receiver with a load of 400 ohms.

Figure 2-28 Converter Operating Range with External Power Supply



- Be sure the length of the pulse output cable does not exceed 1 km (3,281 ft).
- Be sure the resistance of the ground circuit is 1 ohm or less if the converter is equipped with the optional lightning arrester.
- Barriers can be installed per manufacturer's instructions for flowmeters to be used in intrinsically safe applications. The safety barriers go between the signal cable from the remote detector to the remote converter.

Continued on next page

Smart Transmitter Interface module

Flowmeters that are to be used with our TPS system will be connected to the Smart Transmitter Interface Module in the Process Manager (PM) or Advanced Process Manager (APM) through a Field Termination Assembly (FTA). The TPS system provides signal power supply. See *Appendix A* for further operating details using the TPS system·

The MagneW 3000 flowmeter can be used with one of these three optional output meters:

- Analog Meter
- DE Meter
- SM 3000 Smart Meter

They all provide a 0 to 100% indication of the flowmeter's output through traditional pointer and scale or 25-segment bargraph and digital readout. Meters are mounted remotely in a separate housing.

You connect the analog and DE meters across the current output terminals on the converter.

You will have to alter loop power connections to connect the three-wire SM 3000 meter in the loop wiring to the current output terminals on the converter.

ATTENTION The detail operation of the optional remote meters is beyond the scope of this manual and is not covered here.

2.14 Electrical Wiring

Introduction

A commercial power supply or 24 Vdc ±10% power supply is used.

WARNING Only the converter is designed for a 24 Vdc power supply. DO NOT wire power supply directly to the detector itself, as this can cause irreparable damage to the internal measuring circuits.

When installing the cable connecting the flowmeter to the control equipment, the following precautions must be observed.

- **CAUTION** Run the wiring away from equipment that may cause noise, such as high-capacity transformers, motors, or power supplies. DO NOT install the cable in the same tray or duct as other power cables. Output errors may result.
- Wiring with electrical tube and duct is recommended to keep out water and protect the wire from external damage.
- Use a waterproof gland at the conduit connection.

Terminal arrangement

Figure 2-29 shows the terminal blocks of the remote converter and the remote detector and Table 2-16 explains the terminal symbols.

WARNING

- During wiring, turn OFF the power supply before opening the cover in order to prevent the danger of electrical shock.
- DO NOT perform wiring work while the power is ON, as this may also result in electrical shock.

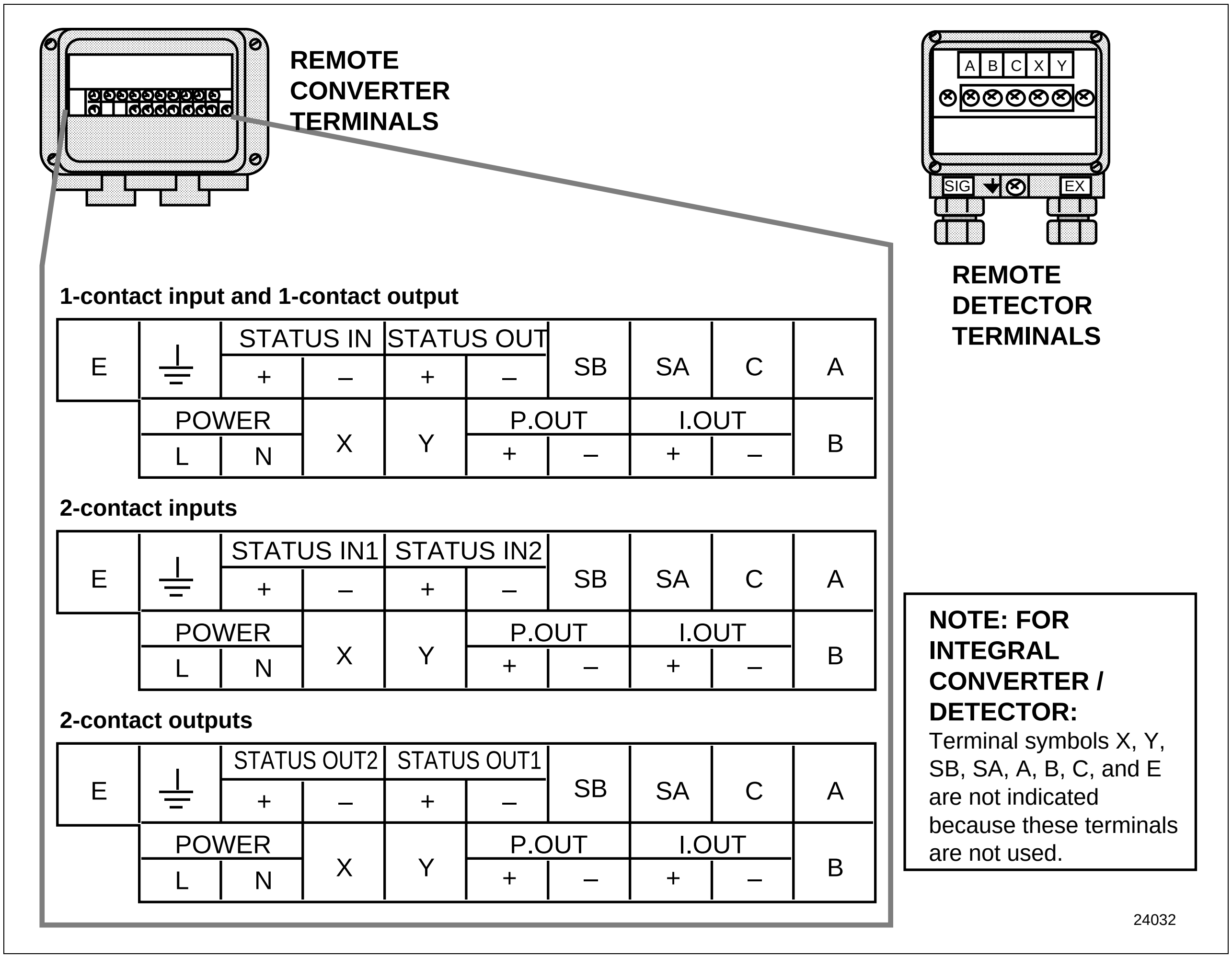
CAUTION

- Perform wiring as directed to prevent equipment damage.
- Be sure to check the power line wiring positions carefully, as a high-voltage power flow is used.

Continued on next page

Terminal arrangement, continued

Figure 2-29 Terminal Arrangement for Remote Converter/Detector



Terminal arrangement for integral converter

Terminals X, Y, SB, SA, A, B, C, and E are not indicated as these terminals are not used.

Terminal arrangement of a 24 Vdc converter

The 24 Vdc converter's power terminal is marked POWER DC 24V. Pay close attention to the positive and negative polarity.

Continued on next page

Terminal arrangement, continued

Table 2-16 Terminal Symbols

Type	Symbol		Meaning
REMOTE CONVERTERS			
1-contact input and 1-contact output	A		Flow rate signal input
	B		
	C		
	SA		
	SB		
	I.OUT	+	Current output
		–	
	P.OUT	+	Pulse output
		–	
	X		Excitation output
	Y		
	STATUS OUT	+	Contact output
		–	
	STATUS IN	+	Contact input
		–	
	POWER AC	L	Power supply
		N	
	E		Not used
	⏚		Class 3 grounding
2-contact inputs	A		Flow rate signal input
	B		
	C		
	SA		
	SB		
	I.OUT	+	Current output
		–	
	P.OUT	+	Pulse output
		–	
	X		Excitation output
	Y		
	STATUS IN1	+	Contact output
		–	
	STATUS IN2	+	Contact input
		–	
	POWER AC	L	Power supply
		N	
	E		Not used
	⏚		Class 3 grounding

Terminal arrangement, continued

Table 2-16 Terminal Symbols, Continued

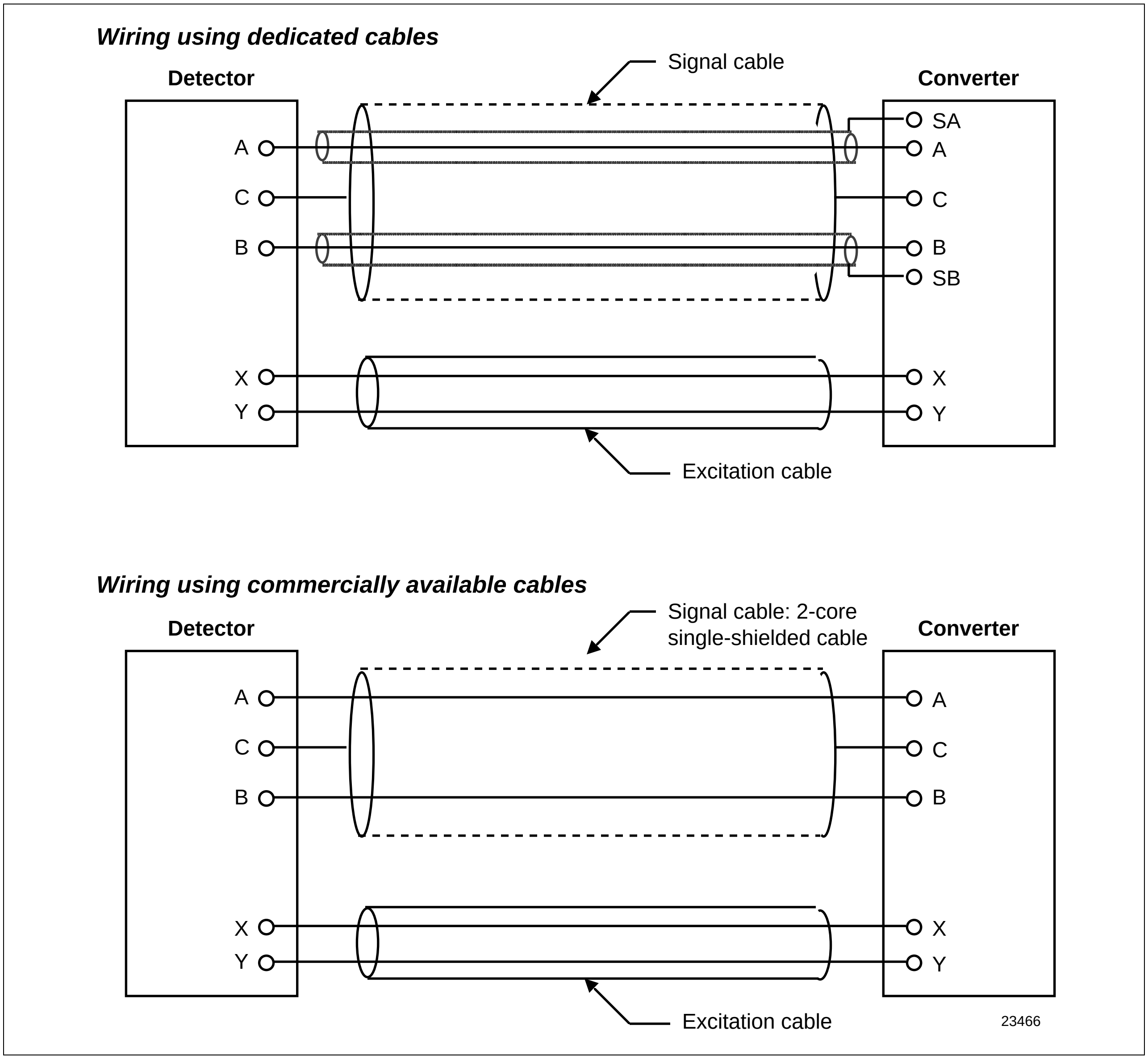
Type	Symbol		Meaning
REMOTE CONVERTERS			
2-contact outputs	A		Flow rate signal input
	B		
	C		
	SA		
	SB		
	I.OUT	+	Current output
		–	
	P.OUT	+	Pulse output
		–	
	X		Excitation output
	Y		
	STATUS OUT2	+	Contact output
		–	
	STATUS OUT1	+	Contact input
		–	
	POWER AC	L	Power supply
		N	
	E		Not used
	⏚		Class 3 grounding
24 VDC CONVERTER			
1-contact input and 1-contact output	A		Flow rate signal input
	B		
	C		
	SA		
	SB		
	I.OUT	+	Current output
		–	
	P.OUT	+	Pulse output
		–	
	X		Excitation output
	Y		
	STATUS OUT	+	Contact output
		–	
	STATUS IN	+	Contact input
		–	
	POWER DC 24V	**L+ ??**	Power supply
		L– ??	
	E		Not used
	⏚		Class 3 grounding

2.14.1 Wiring the Remote Detector and Converter

Summary

Figure 2-30 shows a wiring diagram for connecting the remote detector and remote converter. Two variations are shown: one using the optional dedicated cables (Model No. KIW-XXX-XXX), the other using commercially available cables.

Figure 2-30 Detector to Converter Wiring



2.14.2 Current Output Wiring

Summary

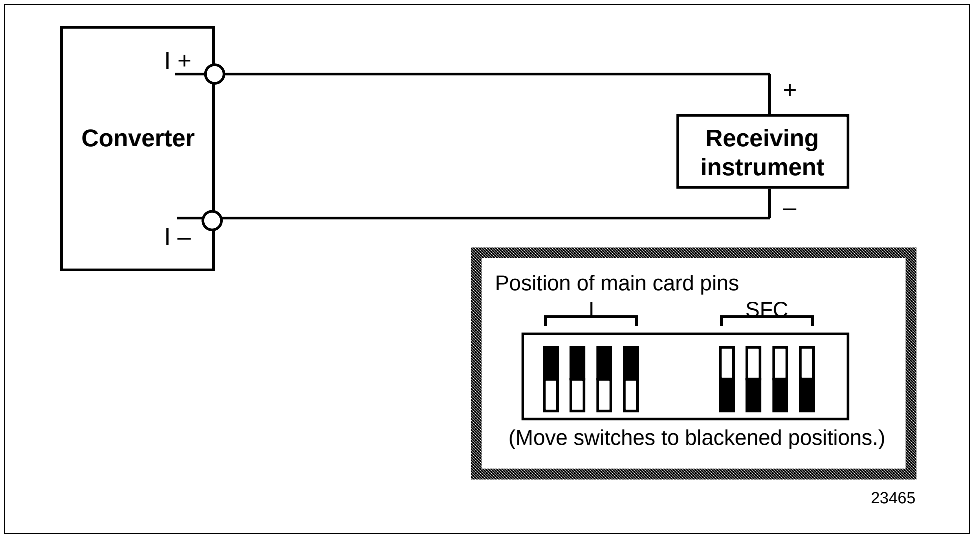
The current output wiring method depends on whether or not SFC/DE communication is used. An external power supply is required to communicate with the SFC and pins on the main board must be positioned properly.

Figures 2-31 and 2-32 show typical wiring examples plus the necessary position of the main card pins for SFC/DE communication.

ATTENTION Turn the power supply OFF before switching the main card pins.

CAUTION Improper wiring of polarity can cause damaged to the equipment. Be sure to check wiring carefully.

Figure 2-31 Current Output Wiring with No SFC Communications



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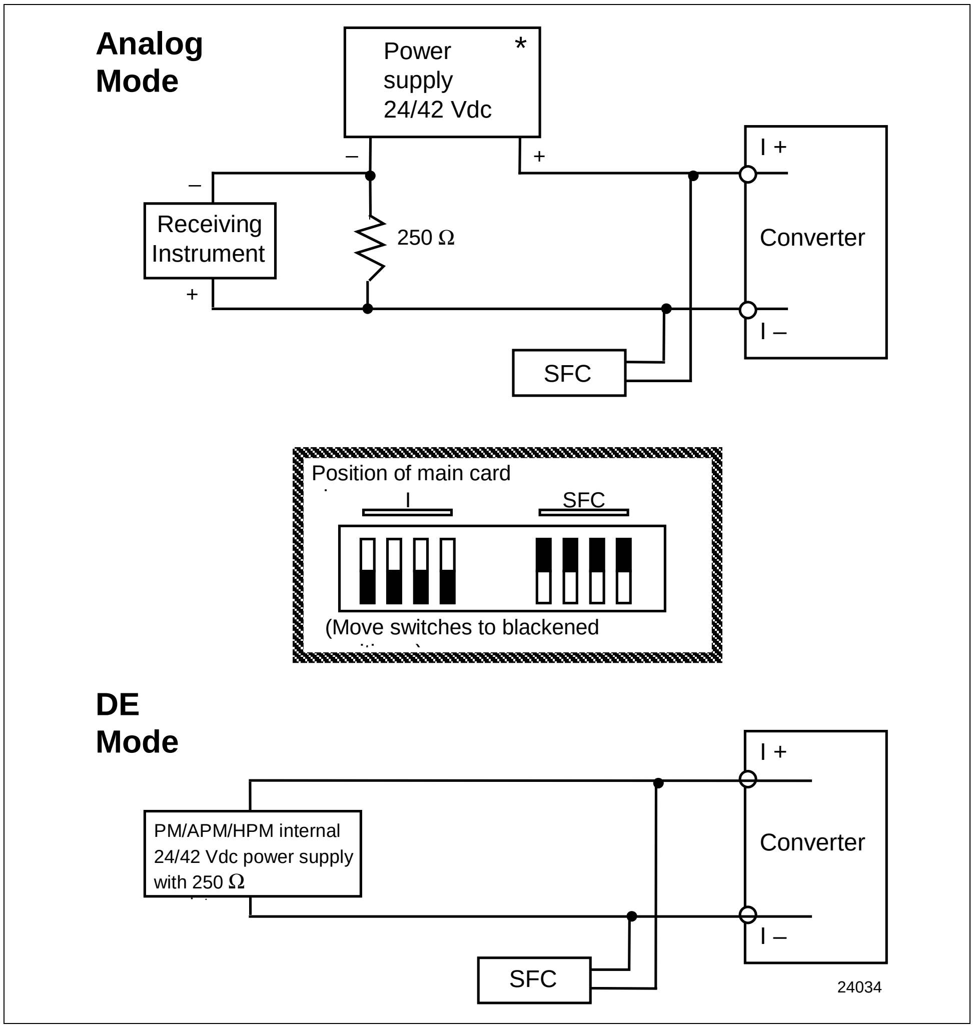
Summary, continued

Figure 2-32 Current Output Wiring with SFC Communications



2.14.3 Pulse Output Wiring

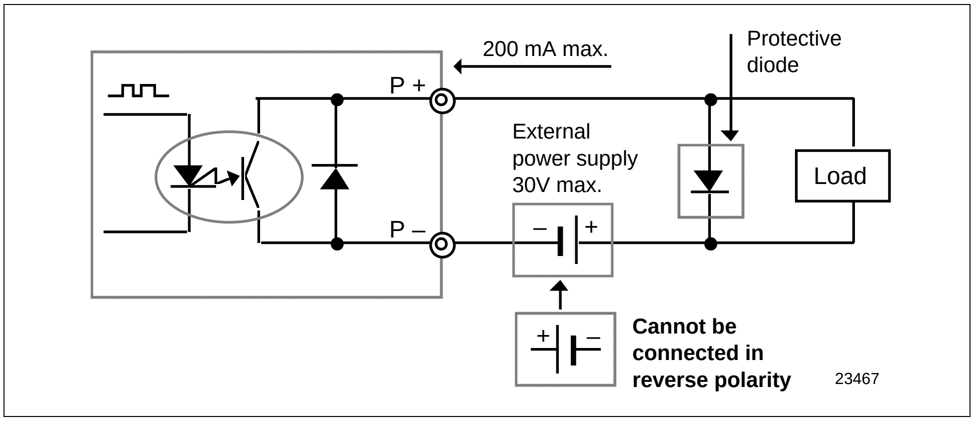
Summary

The pulse output is an open collector output. Pay close attention to voltage and polarity when wiring. Figure 2-33 shows the wiring for the optional pulse output.

CAUTION

- Improper wiring of polarity can cause damaged to the equipment. Be sure to check wiring carefully.
- Use an external power supply with voltage and capacity that satisfies the given specifications.

Figure 2-33 Pulse Output Wiring



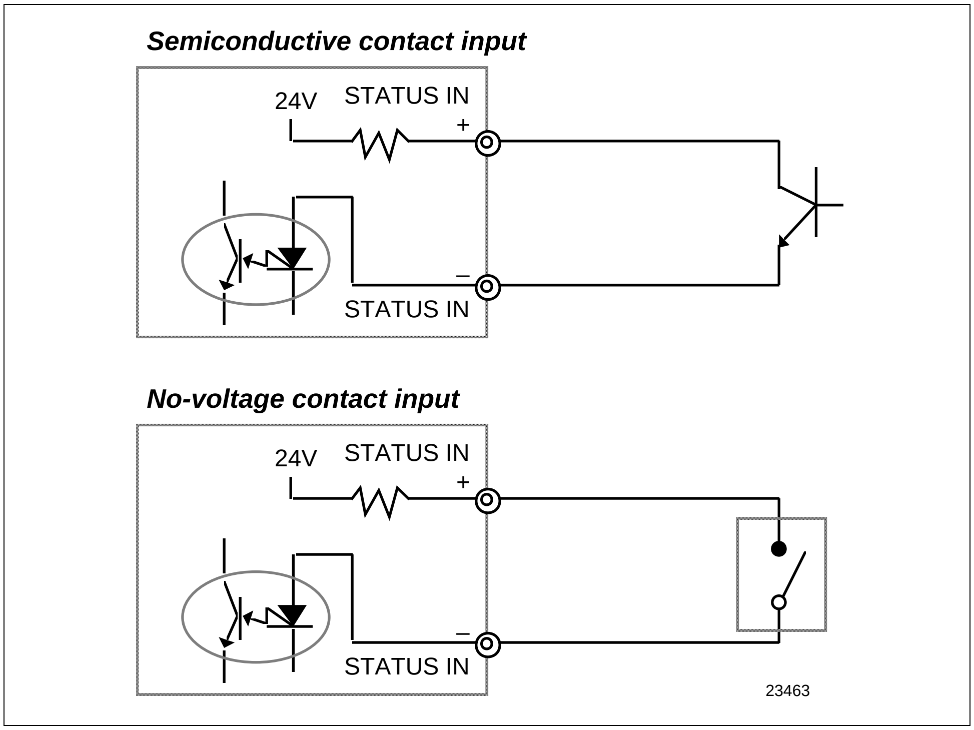
2.14.4 Input/Output Wiring

Contact input wiring

Either a semiconductive contact or a no-voltage contact can be used as the contact input. Figure 2-34 shows the wiring for both.

ATTENTION The contact input/output terminals are not available when a 2-contact output model has been selected.

Figure 2-34 Contact Input Wiring



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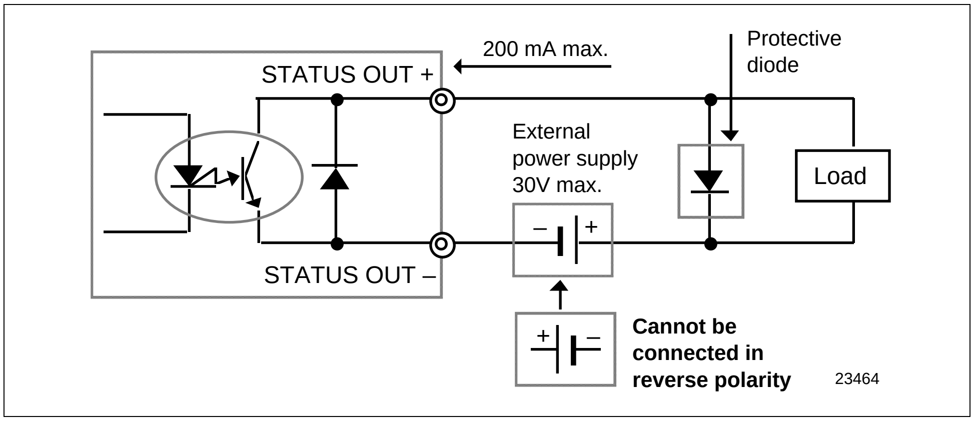
Contact output wiring

This is an open collector output. Pay close attention to voltage and polarity when wiring. Figure 2-35 shows the wiring for a contact output.

CAUTION

- Improper wiring of polarity can cause damage to the equipment. Be sure to check wiring carefully.
- Use an external power supply with voltage and capacity that satisfies the given specifications.

Figure 2-35 Contact Output Wiring



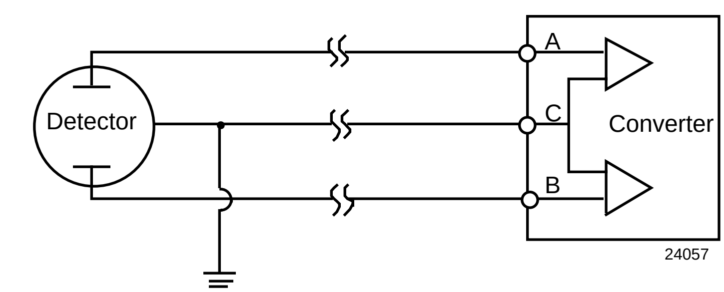
2.15 Grounding

Summary

•Connect signal to ground at the detector side and be sure to ground the converter case to the same point to avoid the possible noise effects of two-point grounding (Figure 2-36).

- Keep the ground wire as short as possible and avoid running the wire for long distances above ground. This will help to keep the ground wire from acting as an antenna that can pick up high frequency noise.
- Be sure ground connections are making good contact and that they are secure.
- For converters equipped with a lightning arrester, keep the resistance of the grounding circuit equal to 1 ohm or less.
- Be sure the flowmeter is grounded before putting it into operation.

Figure 2-36 Correct Grounding



Section 3 – Set-up

3.1 Overview

Section contents

This section contains the following topics:

Introduction

Before using the MagneW 3000 ***PLUS***, be sure to do the following.

- Set whether or not communications are used.
- Set the empty detection function.

3.2 Setting the Communications Function

Introduction

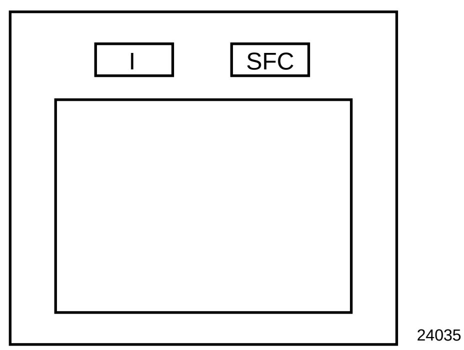
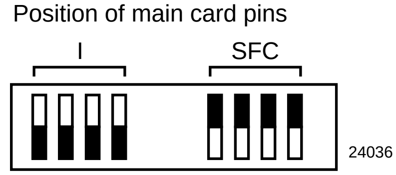
You can configure the MagneW 3000 ***PLUS*** for SFC/DE communications or not. Use the appropriate procedure:

- Procedure 1—with communications
- Procedure 2—no communications

Procedure 1

Table 3-1 gives the procedure for setting the switches to enable SFC/DE communications.

Table 3-1 Setting Switches for Communications Procedure

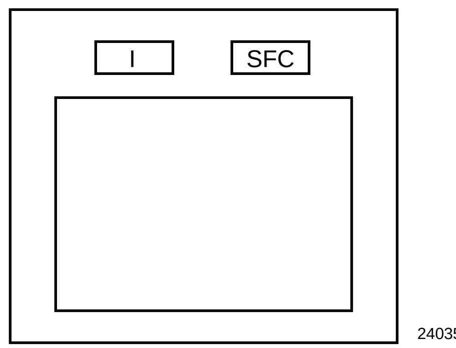
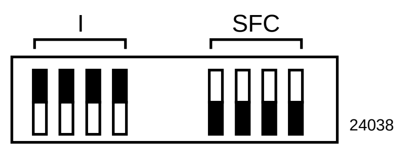
Step	Action
1	If applicable, remove the display by removing the four screws at the corners and pulling it straight out. **CAUTION** The display is connected via a connector and must be pulled straight out, otherwise the display could break.
2	With the main card visible, locate the SFC and I switches on the upper part of the card.  Main Card
3	Set the switches as shown below. (Move the switches to the blackened positions.) Position of main card pins  (Move switches to blackened positions.)
4	Replace the display if applicable.

Continued on next page

Procedure 2

Table 3-2 gives the procedure for setting the switches for no communications.

Table 3-2 Setting Switches for No Communications Procedure

Step	Action
1	If applicable, remove the display by removing the four screws at the corners and pulling it straight out. **CAUTION** The display is connected via a connector and must be pulled straight out, otherwise the display could break.
2	With the main card visible, locate the SFC and I switches on the upper part of the card.  Main Card
3	Set the switches as shown below. (Move the switches to the blackened positions.) Position of main card pins  (Move switches to blackened positions.)
4	Replace the display if applicable.

3.3 Setting the Empty Detection Function

Introduction

This functions fixes the output at 4 mA and latches the display to zero when the detector is empty.

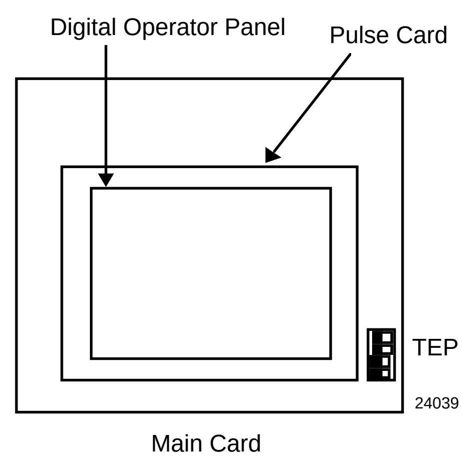
Procedure

To set the empty detection function, follow the procedure given in Table 3-3.

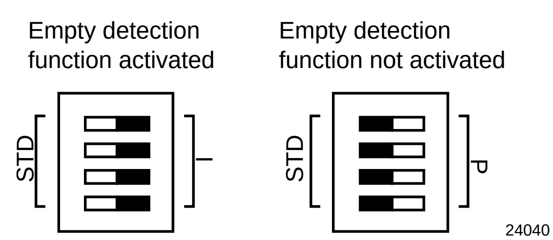
Table 3-3 Procedure for Setting the Empty Detection Function

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>If applicable, remove the display by removing the four screws at the corners and pulling it straight out.

CAUTION The display is connected via a connector and must be pulled straight out, otherwise the display could break.</td></tr>
<tr><td>2</td><td>With main card visible, locate the switches on the lower right of the card.



</td></tr>
<tr><td>3</td><td>Set STD switches for analog output and pulse output as shown below. (Move the switches to the blackened positions.)



(Move switches to blackened positions.)</td></tr>
<tr><td>4</td><td>Replace the display if applicable.</td></tr>
</table>

Section 4 – Configuration, Start-up, and Operation with DOP

4.1 Overview

Section contents

This section contains the following topics:

About this section

This section applies to the user of the optional integral Digital Operator Panel (DOP) as th MagneW 3000 ***PLUS*** interface. The section covers the components of the DOP, explains l operate the DOP itself, then explains how to configure, start and stop, and operate the Ma 3000 ***PLUS*** using the DOP only.

- *If you are using the SFC to configure and operate the flowmeter,* refer to Section 5.
- *If you are using the Universal Station to configure and operate the flowmeter,* refer to Appendix B.

4.2 Digital Operator Panel (DOP)

4.2.1 DOP Components

Summary

Figure 4-1 and Tables 4-1 and 4-2 identify the components that make up the DOP interface.

Figure 4-1 View of Digital Operator Panel (DOP)

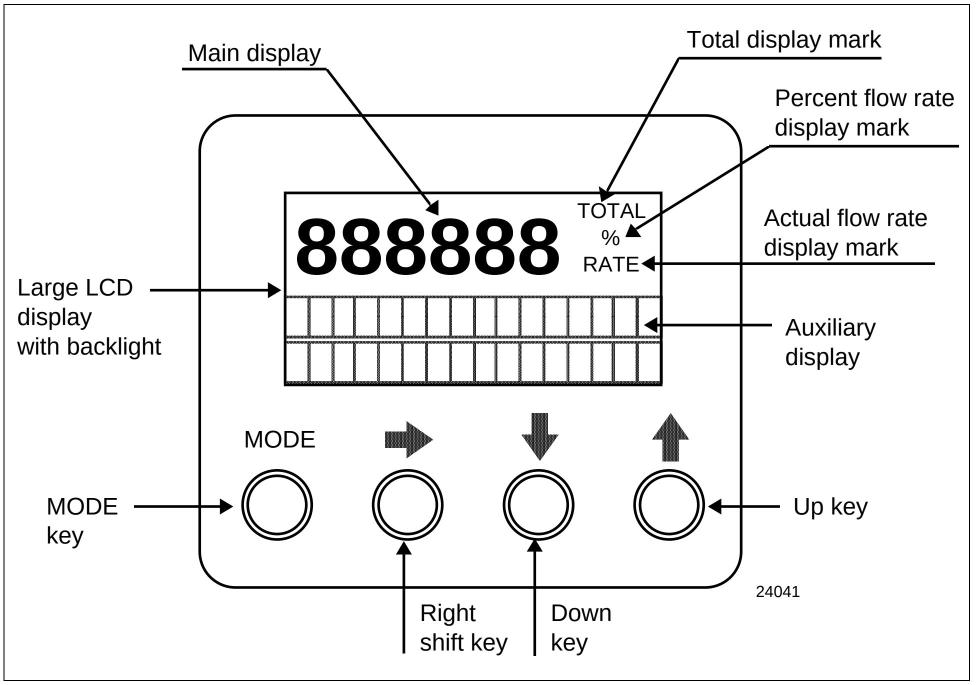


Table 4-1 Description of DOP Components

Component	Description
Main display	A 7-segment, 6-digit display that indicates the flow rate selected in the Operator's Mode.
% (percent flow rate display mark)	Indicates that percent flow rate is currently displayed.
RATE (actual flow rate display mark)	Indicates that actual flow rate is currently displayed.
TOTAL (total display mark)	Indicates that the totalized value is currently displayed.
Auxiliary display	16-digit, 2-line display that lets you monitor actions for entering/changing configuration, operation, and calibration data, as well as checking diagnostic functions. • During the Measuring Mode, indicates a flow rate to supplement the flow rate indication selected in the Operator's Mode. • Indicates the totalized flow value when pulse function is selected.

Continued on next page

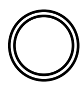
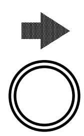
DOP keys

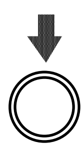
Table 4-2 explains the four keys on the DOP.

ATTENTION

- When using the keys, be sure to close the cover. Only touch the keys through the glass.
- When using the keys, touch the glass lightly, targeting the central part of each key.
- Hold down the [⇧] or [⇩] key to scroll characters, up to 40 times.

Table 4-2 Explanation of DOP Keys

Key	Explanation
MODE key MODE 	• Enter the Operator's Mode. • After changing the parameters or internal data in the Engineering Mode or Maintenance Mode, press this key to write the data into memory. • Touch this key for more than one second to complete the write.
Right shift key 	Shift the auxiliary display's cursor to the right.

Down key

	• Change the parameter at the cursor position.
	• Display the previous screen.
	When the cursor is located at the far left of the upper row (, #, >)*
	`* OPERATOR'S`
	`MODE`
	Cursor
	Changes the screen.
	When the cursor is located at a numerical figure
	`* DAMPING`
	`001.0 S`
	Cursor
	Decrements the numerical figure.
	When the cursor is located at the decimal point
	`* 1.000m/s`
	`SPAN 07.069 m3/h`
	Cursor
	Moves the decimal point to the right.

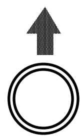
Continued on next page

4.2.1 DOP Components, Continued

DOP keys, continued

Table 4-2 Explanation of DOP Keys, Continued

Key	Explanation

Up key

	• Change the parameter at the cursor position.
	• Display the next screen.
	When the cursor is located at the far left of the upper row (, # >)*
	`* OPERATOR'S`
	`MODE`
	Cursor — Changes the screen.
	When the cursor is located at a numerical figure
	`* DAMPING`
	`001.0  S`
	Cursor — Increments the numerical figure.
	When the cursor is located at the decimal point
	`*      1.000m/s`
	`SPAN 07.069 m³/h`
	Cursor — Moves the decimal point to the left.
	When the cursor is located at READY
	`* AUTO ZERO`
	`READY`
	Cursor — Starts operation when touched.

About analog and DE modes

If your converter is using its internal power supply to drive the current output loop, it can only operate in the analog mode. If you are using an external power supply to drive the converter's current output loop, the loop is SFC and/or TPS-system compatible. This means that you can use the SFC to put the converter in an analog or digital enhanced (DE) transmission mode, or the TPS system will put the converter in DE mode for communications.

ATTENTION You ***cannot*** use the DOP to select or change the analog or DE mode configuration.

4.2.2 Operating the Display/DOP

DOP interface characteristics

Keep these basic interface characteristics in mind when you use the DOP to configure a transmitter.

- The DOP has these four selectable modes of operation.
  - Measuring Mode
  - Operator's Mode
  - Engineering Mode
  - Maintenance Mode

  A press of the [**MODE**] key calls up the Operating mode or returns you to the Measuring mode which is the default mode of operation. You can access the Engineering mode or Maintenance mode through the Operating mode.
- You can tell what mode you are in by the identifying symbol that appears as the first character in the top line of the DOP display. The identifying symbols are

  * for Operating mode,

  # for Engineering mode, and

  > for Maintenance mode.
- You must press the [**MODE**] key after any parameter entry or change to have data retained in non-volatile memory. If selected mode "times out" before [**MODE**] key is pressed, all parameter entries/changes are lost and return to previous settings/selections.
- The cursor (_) must be under the identifying symbol to use the [⇧] and [⇩] keys to call up other menu items as applicable. Otherwise, the [⇧] and [⇩] keys will change the selected digit or setting.
- The Operating, Engineering, and Maintenance modes will time out and automatically return to the Measuring mode if two minutes or more elapses between keystrokes.

Continued on next page

Selecting modes

CAUTION Opening the Engineering or Maintenance mode selection screen is dependen write-protect setting. Only the Engineering mode selection screen will be available if the wr protect switches on the main board are set to level 1, 2, or 3. If level 0 is selected, both the Engineering mode and the Maintenance mode will open.

Table 4-3 gives the procedure for selecting the Engineering Mode (for setting flowmeter parameters).

Table 4-3 Entering the Engineering Mode

Step	Procedure	Screen
1	Enter the Operator's mode by pressing the [**MODE**] key for more than one second. Press the [⇨] key to select YES, then press the [⇧] key to start the Operator's mode. About two seconds after that, the screen will indicate the damping time constant display.	0.0 % ENTER IN OP.MODE YES OR NO 0.0 % * DAMPING 003.0s
2	Scroll to the Engineering mode selection screen by pressing the [⇧] key as often as necessary.	0.0 % * MODE ENTER ENGINEERING
3	Touch the [⇨] key once.	0.0 % * MODE ENTER ENGINEERING
4	Touch the [⇧] key, and the display will change to the Engineering mode. After three seconds, you will see a display similar to the sample shown at right.	0.0 % # ENGINEERING MODE 0.0 % # ID SET XXXXXXXX

Continued on next page

4.2.2 Operating the Display/DOP, Continued

Selecting modes, continued

Table 4-4 gives the procedure for selecting the Maintenance Mode (for performing adjustments or inspection).

Table 4-4 Entering the Maintenance Mode

Step	Procedure	Screen
1	Enter the Operator's mode by pressing the [**MODE**] key for more than one second. Press the [⇨] key to select YES, then press the [⇧] key to start the Operator's mode.	0.0 % ENTER IN OP.MODE YES OR NO
	About two seconds after that, the screen will indicate the damping time constant display.	0.0 % * DAMPING 003.0s
2	Scroll to the Maintenance mode selection screen by pressing the [⇧] key as often as necessary.	0.0 % * MODE ENTER MAINTENANCE
3	Touch the [⇨] key once.	0.0 % * MODE ENTER MAINTENANCE
4	Touch the [⇧] key, and the display will change to the Maintenance mode.	0.0 % > MAINTENANCE MODE
5	After two seconds, you will see a display similar to the sample shown at right.	0.0 % > OUTPUT CHECK MODE OFF

4.2.3 Summary of the DOP Modes

Outline of DOP's four modes

Table 4-5 explains the four modes available through the DOP.

Table 4-5 DOP Modes

Mode	Explanation
Measuring Mode	***The default mode.*** It is the mode which constantly monitors the process and indicates the measuring status.
Operator's Mode	Used for general operating purposes. This mode is used for information that is registered or changed frequently. Settings can be changed at start-up and on other occasions when write protect is set to level 0, 1, or 2. With level 3, only configuration data monitoring is available. Includes damping time constant, auto zero adjustment, counter reset, counter preset value. **CAUTION** Registered or changed data is temporarily written into memory when input, but will return to the previous status within two minutes unless it is saved. (The only exception is the counter reset which will not return to the previous status even after two minutes.) To save the data, be sure to press the [**MODE**] key to open the Measuring Mode. When the mode changes to the Measuring Mode, the data will be written into memory.
Engineering Mode	This mode is used for information that is registered or changed less frequently than in the Operator's Mode. Settings can be registered or changed when write protect is set to level 0 or 1. When the level is 2 or 3, only configuration data monitoring is available. Includes ID function setting, detector data, flow rate span, hysteresis width, pulse data, low flow cutoff, and output at error. **CAUTION** When registering or changing data, be sure to press the [**MODE**] key to write it to non-volatile memory. Rewriting occurs only after the [**MODE**] key is pressed and the mode changes to the Measuring Mode.

Continued on next page

Outline of DOP's four modes, continued

Table 4-5 DOP Modes, Continued

Mode	Explanation
Maintenance Mode	This mode is used for troubleshooting and general maintenance purposes. In this mode you can access diagnostic messages and perform verification procedures. Settings can be adjusted or confirmed only when the write protect level is set at 0. Includes loop check, output adjustment, gain adjustment. This mode is further divided into the following three modes: OUTPUT MODE CALIBRATION MODE CRITICAL MODE **CAUTION** • Calibration Mode and Critical Mode contain adjustments and operations that are very important for flow rate measurement. When operating these modes, carefully check the details of the adjustments to be made. Improper setting will prevent measurement. • When registering or changing data, be sure to press the [**MODE**] key to write it to non-volatile memory. Rewriting occurs only after the [**MODE**] key is pressed and the mode changes to the Measuring Mode.

Continued on next page

Details of Operator's mode

The Operator's mode includes the settings and adjustments given in Table 4-6. To enter the Operator's mode, touch the [**MODE**] key for more than one second.

CAUTION Settings and adjustments made in the Operator's mode are temporarily written into memory when input. The settings will return to their previous status unless the changes are saved within two minutes. Be sure to save the data by pressing the [**MODE**] key at the end of a setting/adjustment.

Table 4-6 Operator's Mode Screens

Screen Display	Description	Indicated Conditions
DAMPING	Sets the damping time constant.	
AUTO ZERO	Performs zero adjustment.	
CNT-RESET VALUE	Sets the reset value of the built-in flow counter.	Selection of pulse output and TOTAL display.
CNT-RESET	Resets the built-in flow counter to the reset value.	Selection of pulse output and the TOTAL display.
COUNTER PRESET	Sets the preset value of the built-in flow counter.	Selection of pulse output (in selective specifications) and setting of counter preset (in function setting).
DISPLAY SELECT	Sets the flow rate display.	
MODE ENTER ENGINEERING	Enters the Engineering mode.	
MODE ENTER MAINTENANCE	Enters the Maintenance mode.	Setting of write protect to level 0.

Details of the screens using concrete examples are explained in the Configuration section.

Continued on next page

Details of Engineering mode

The Engineering mode includes the settings and adjustments given in Table 4-7. The Engineering mode is accessed through the Operator's mode. To enter the Operator's mode, touch the [**MODE**] key for more than one second.

CAUTION To write data set in the Engineering mode to non-volatile memory, press the [**MODE**] key.

Table 4-7 Engineering Mode Screens

Screen Display	Description	Indicated Conditions
`ID SET`	Sets the ID.	
`FUNC SET`	Sets the functions.	
`EX, MGG, DIA`	Sets detector data.	
`DUMMY`	Sets the number of dummy detectors.	Selection of an NNK detector in the detector data setting.
`SPAN`	Sets the range.	
`HYSTERESIS`	Sets the hysteresis.	Selection of normal direction automatic double range or normal/reverse direction automatic double range in function setting.
`I.OUT RANGE`	Selects the electromagnetic output method.	Selection of normal direction automatic double range or normal/reverse direction automatic double range in function setting.
`GRAVITY`	Selects the specific gravity.	Selection of a weight unit (t, kg, g, lb) in range setting.
`COEFFICIENT`	Selects the coefficient of compensation.	
`PLS SCL`	Sets the pulse scale.	Selection of pulse output (optional).
`PLS WID`	Selects the pulse width.	Selection of pulse output (optional).
`DROP OUT`	Sets the drop out.	Selection of pulse output (optional).
`HI-ALM/LO-ALM`	Sets high/low limit alarms.	Selection of alarm output and high/low limit alarms in function setting (optional).
`LO-ALM/LO-ALM2`	Sets the 2-stage low limit alarm.	Selection of 2-stage low alarm in function setting (optional).

Continued on next page

Details of Engineering mode, continued

Table 4-7 Engineering Mode Screens, Continued

Screen Display	Description	Indicated Conditions
HI-ALM/HI-ALM2	Sets the 2-stage high limit alarm.	Selection of 2-stage high limit alarm in function setting (optional).
LOW-FLOW CUT	Sets the low flow cutoff.	
ERROR OUT MODE P.OUT	Determines the pulse output failsafe direction.	Selection of pulse output (optional).
ERROR OUT MODE I.OUT	Determines the analog output failsafe direction.	
ST.OUT MODE	Sets the contact output status.	Selection of contact input/output (optional).

Details of the screens are explained in the Configuration section.

Details of Maintenance mode

The Maintenance mode is broken down into three modes:

- Output mode
- Calibration mode
- Critical mode

The following tables (Table 4-8 through 4-10) give the adjustments and items to be checked for each mode. The Maintenance mode is accessed through the Operator's mode. To enter the Operator's mode, touch the [**MODE**] key for more than one second.

Refer to *Section 7* for operating details.

Continued on next page

Output check mode

The items that can be checked in the Output mode are given in Table 4-8.

Table 4-8 Output Mode Screens

Screen Display	Description	Indicated Conditions
OUTPUT CHECK I.OUT	Checks the analog output loop.	
OUTPUT CHECK P.OUT	Checks the pulse output loop.	Selection of pulse output.
ST.IN OPEN ST.OUT CLOSE	Checks the contact input/output loop.	Selection of 1-contact input and 1-contact output.
ST.IN1 OPEN ST.IN2 OPEN	Checks the 2-contact input loop.	Selection of 2-contact inputs.
ST.OUT1 CLOSE ST.OUT2 CLOSE	Checks the 2-contact output loop.	Selection of 2-contact outputs.
EX CHECK	Checks the excitation source.	

Calibration mode

The items that can be adjusted in the Calibration mode are given in Table 4-9.

Table 4-9 Calibration Mode Screens

Screen Display	Description	Indicated Conditions
CAL EX	Adjusts the excitation current.	
CAL I.OUT	Adjusts the analog output.	
CAL GAIN	Adjusts the converter gain.	

Continued on next page

Critical mode

The items that can be checked or adjusted in the Critical mode are given in Table 4-10.

Table 4-10 Critical Mode Screens

Screen Display	Description	Indicated Conditions
ROM VER.	Checks the ROM version.	
ERROR HISTORY	Checks the error history.	
SHIPPING DATA RECOVERY	Restores the internal data to the status at shipment.	
INITIAL DATA RECOVERY	Initializes the internal data.	

4.3 Configuration with the DOP

Introduction

Each MagneW 3000 ***PLUS*** includes a configuration database which defines its particular operating characteristics. Depending upon the features you specified when you ordered your flowmeter and the particular characteristics of your measurement application, you can use the integral Digital Operator Panel (DOP), an SFC, or displays at the Universal Station to change selected parameters within a given flowmeter's database to alter those operating characteristics. This process of viewing and/or changing database parameters is called "configuration".

CAUTION Settings and adjustments made while configuring the flowmeter are temporarily written into memory. The settings will return to their previous status unless the information is saved within two minutes. Be sure to save the data by pressing the [**MODE**] key at the end of setting/adjustment.

What to configure

Table 4-11 summarizes the parameters that are included in the configuration database for a MagneW 3000 ***PLUS*** when configured through a DOP.

Table 4-11 Summary of Configuration Parameters

Configuration Data	Setting or Selection	Page No.
Damping Time Constant	The damping time can be set to any value from 000.5 to 199.9.	105
Flowrate Display Reading	Select flow rate display reading to represent one of these selections. % (instantaneous percent flow rate) RATE (instantaneous actual flow rate) TOTAL (totalized value)	106
Flowmeter Tag Number	Up to eight alphanumeric characters, using any combination of letters (A to Z), numbers (0 to 9), - (hyphen), / (slash), space, and period.	107

Continued on next page

What to configure, continued

Table 4-11 Summary of Configuration Parameters, Continued

Configuration Data	Setting or Selection	Page No.
Function Setting	Define these converter functions, as applicable. Range Function: 0: Single Range 1: Automatic switching double range 2: External switching double range 3: Normal/reverse automatic switching range 4: Normal/reverse external switching range Totalizer Function: X: Not activated A: Addition B: Addition with preset C: Normal/reverse flow integration Contact Input Function: X: Not activated 1: External 0% lock input 2: External auto zero adjustment input 3: External range switching input 4: Built-in counter reset input 5: External 0% lock input and external auto zero adjustment input 6: External 0% lock input and external range switching input 7: External 0% lock input and built-in counter reset input 8: External auto zero adjustment input and external range switching input 9: External auto zero adjustment input and built-in counter reset input A: External range switching input and built-in counter reset input Contact Output Function: X: Not activated 1: Alarm contact output 2: Range switching output 3: Counter preset status output 4: Self-check result output 5: Empty detection function 6: High/low limit alarm 7: Alarm contact output and range switching output 8: Self-diagnostic result output and range switching output 9: Empty detection function and range switching output A: High/low limit alarm and range switching output B: Range switching output and counter preset status output C: Range switching output and either self-check result output or empty detection D: Alarm contact output and counter preset status output E: 2-stage flow rate alarm output **ATTENTION** These functions can be specified when the flowmeter is ordered and then set at the factory before the flowmeter is shipped. If function settings were not specified on the order, you must set them through the DOP. Note that function selections are automatically restricted based on other function selections and what hardware features were ordered. See Tables 4-17 through Table 4-20 for a summary of function setting restrictions.	108

Continued on next page

What to configure, continued

Table 4-11 Summary of Configuration Parameters, Continued

Configuration Data	Setting or Selection	Page No.
Detector Data Setup	Set or select the excitation current rating, the detector model, and the detector size based on the nominal diameter in millimeters. Model selections: MGG, NNK, NNM, KID Diameter sizes: 002.5 040.0 125.0 350.0 005.0 050.0 150.0 400.0 010.0 065.0 200.0 450.0 015.0 080.0 250.0 500.0 025.0 100.0 300.0 600.0 Excitation current rating: Matches the rating specified on detector's nameplate.	121
Number of Dummy Submerged Detectors	Number of "dummy" submerged detectors to be used in conjunction with your active submersible detector model (NNK version only). Range: 0 to 9	123
Span and Engineering Units	Define span (Upper Range Value) and engineering units to be used for flow rate measurement. Span: 0.0001 to 99999 Engineering Units: Select unit and time combination that is applicable for your flow rate measurement. Velocity of the measured flow, in meters per second, is displayed in the range set-up screen. **Units** **Per** **Time** m^3 (cubic meters) s (second) l (liters) min (minute) cm^3 (cubic centimeters) h (hour) t* (tons) d (day) kg* (kilograms) g* (grams) B (barrels) kG (kilogallons) G (gallons) mG (milligallons) lb* (pounds) **Units for mass flow measurement; require a specific gravity input.* **ATTENTION** For dual range or direct/reverse range applications, you must define the span for both ranges (SPN1/SPN2 or SPN+/SPN–). For more information on velocity, refer to *Section 5.3.12 – Velocity and Span Data.*	124

Continued on next page

What to configure, continued

Table 4-11 Summary of Configuration Parameters, Continued

Configuration Data	Setting or Selection	Page No.
Hysteresis	Set hysteresis for transfer point between two ranges. Setting: 0 to 20% of span	125
Current Output Method	Select how to output the 4-20 mA analog current when using a range function of either normal direction dual range or normal/reverse direction dual range. AUTO (switches automatically between two ranges) WIDE (outputs either range 1 or range 2 whichever has the larger span)	126
Specific Gravity	Set the specific gravity for the selected weight unit. Range: 0.0001 to 9.9999	127
Pulse Weight and Engineering Units	Define pulse scaling for pulse output and per pulse engineering units. Span: Within the range where the frequency does not exceed 20000 Hz. Engineering Units: Select unit that is applicable for your per pulse measurement and pulse counting instrument. **Units** g (grams) B (barrels) kG (kilogallons) G (gallons) mG (milligallons) lb (pounds) m^3 (cubic meters) l (liters) cm^3 (cubic meters) t (tons) kg (kilograms) g (grams) **ATTENTION** For dual range or direct/reverse range applications, you must use the larger range.	128
Compensation Coefficient	Set a value between 0.0001 to 9.9999 to be used as a compensation factor (e.g., for a leak in the pipeline).	129

Continued on next page

What to configure, continued

Table 4-11 Summary of Configuration Parameters, Continued

Configuration Data	Setting or Selection	Page No.
Pulse Width	Select pulse width (duration) to define pulse duty ratio in percent. Selections: NUM Range: 000.00 to 999.99 ms (Cannot exceed 70% of flow rate) DUTY Pulse width fixed at 50% of flow rate **ATTENTION** For dual range or direct/reverse range applications, you must use the larger range.	130
Dropout	Set dropout point for pulse output. 0 to 10% of span	132
High and Low Alarm Set Points	Define high and low alarm set points when status output contact is configured for high/low limit alarm. Range: –115 to +115% of span	133
2-stage Alarm Set Points	Define two high and two low alarm set points when status output contact is configured for 2-stage high/low limit alarm. Range: –115 to +115% of span	134
Low Flow Cutoff	Enable or disable low flow cutoff and set cutoff point as applicable. OFF (disable) ON (enable)—Setting Range: 0 to 10%	136
Failsafe Mode for Current Output	Select failsafe mode for analog current output signal. LOW HOLD HIGH	137
Failsafe Mode for Pulse Output	Select failsafe mode for pulse output signal. LOW HOLD	138
Contact Output Status Mode	Select the mode for status output contact for normal operation. CLOSE OPEN **ATTENTION** When 2-contact outputs are used, you must select the mode for both (ST.OUT1/ST.OUT2).	139

4.3.1 Quick Set-up

Introduction

Table 4-12 gives procedures to be performed for six instructions which will allow you to get the flowmeter configured and running quickly. Page references are provided for additional details on each procedure, if needed.

CAUTION Settings and adjustments made while configuring the flowmeter are temporarily written into memory. The settings will return to their previous status unless the information is saved within two minutes. Be sure to save the data by pressing the [**MODE**] key at the end of setting/adjustment.

Table 4-12 Quick Set-up Procedure

Instruction	Procedure	Page No.
Set the damping value.	• Enter the Operator's mode. • Press the [⇨] key three times. • Press and hold the [⇧] or [⇩] key to choose a value between 000.5 to 199.9 seconds. • Press the [⇨] key two times.	105
Set the display engineering parameter.	• Enter the Operator's mode. • Scroll to the DISPLAY SELECT screen by pressing the [⇧] key. • Press the [⇨] key once. • Press either the [⇧] or [⇩] key to select either %, RATE, or TOTAL. • Press the [⇨] key once.	106
Set the ID tag.	• Enter the Operator's mode. • Scroll to the MODE ENTER ENGINEERING screen by pressing the [⇧] key. • Press the [⇨] key then the [⇧] key to enter the Engineering mode. • Press the [⇨] key once to move the cursor to the first X (default setting: XXXXXXXX). • Press either the [⇧] or [⇩] key to scroll through alphanumeric characters. • Repeat the last two steps for the remaining letters, as needed. • Press the [⇨] key move the cursor to the # sign.	107

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Introduction, continued

Table 4-12 Quick Set-up Procedure, Continued

Instruction	Procedure	Page No.
Confirm/set the excitation and detector diameter values. (This information should match the information listed on the detector nameplate.)	• Enter the Operator's mode. • Scroll to the MODE ENTER ENGINEERING screen by pressing the [⇧] key. • Press the [⇨] key then the [⇧] key to enter the Engineering mode. • Press the [⇧] key to scroll to the detector data setup screen. • Press the [⇨] key to select the excitation current value. Use the [⇧] or [⇩] key to change the value as needed. • Press the [⇨] key to select the type of detector. Use the [⇧] or [⇩] key to change if needed. Selections: MGG, NNK, NNM, KID. • Press the [⇨] key to select the detector diameter. Use the [⇧] or [⇩] key to change the value as needed. • Press the [⇨] key move the cursor to the # sign.	121
Set the span and engineering units.	• Enter the Operator's mode. • Scroll to the MODE ENTER ENGINEERING screen by pressing the [⇧] key. • Press the [⇨] key then the [⇧] key to enter the Engineering mode. • Press the [⇧] key to scroll to the range setup screen. • Press the [⇨] key to select the desired digit(s). Use the [⇧] or [⇩] key to change the value. • Press the [⇨] key to select the flow rate unit. Use the [⇧] or [⇩] key to scroll to desired unit. Selections: m^3, l, cm^3, t, kg, g, B, kG, G, mG, lb. • Press the [⇨] key to select the time unit. Use the [⇧] or [⇩] key to scroll to desired unit. Selections: s, min, h, d. • Press the [⇨] key move the cursor to the # sign.	124

Continued on next page

Introduction, continued

Table 4-12 Quick Set-up Procedure, Continued

Instruction	Procedure	Page No.
Perform a zero adjustment.	• Apply power to loop and converter. • Fill detector with fluid to be measured and be sure there is no flow. Allow process to stabilize. • Enter the Operator's mode. • Press the [⇧] key to scroll to the AUTO ZERO screen. • Press the [⇨] key once. • Press the [⇧] key to start zero adjustment. During the adjustment the main display (e.g., flow rate in percent—0.0%) will flash. When zero adjustment is completed, flashing stops and ON message returns to READY (approximately 30 seconds). • Press the [⇨] key once.	145

4.3.2 Setting the Damping Time Constant

Introduction

You can adjust the damping time constant to reduce output noise. The larger the value, the slower the flowmeter response time to a frequency change, thus reducing the electrical noise effect on the output signal. We suggest setting the damping to the largest value the system can accept.

Default setting

At shipment, the damping time constant is set to 3 seconds.

Setting range

The time constant can be set to any value from 000.5 to 199.9 seconds.

Procedure

Table 4-13 gives the procedure for setting the damping time constant.

Table 4-13 Procedure for Setting the Damping Time Constant

Step	Procedure	Screen
1	Enter the Operator's mode by pressing the [**MODE**] key for more than one second. Press the [⇨] key to select YES, then press the [⇧] key to start the Operator's mode.	0.0 % ENTER IN OP.MODE YES OR NO
	About two seconds after that, the screen will indicate the damping time constant display.	0.0 % * DAMPING 003.0s
2	Press the [⇨] key three times.	0.0 % * DAMPING 003.0s
3	Press the [⇧] or [⇩] key to raise or lower the damping value. EXAMPLE: In the screen at right the damping time has been changed to 10 seconds by pressing the [⇧] key seven times.	0.0 % * DAMPING 010.0s
4	Press the [⇨] key twice.	0.0 % * DAMPING 010.0s

4.3.3 Setting/Changing the Flow Rate Indication

Introduction

You can set the main display flow rate to indicate the instantaneous flow rate in percent, the instantaneous actual flow rate, or the totalized value.

Default setting

The default setting is the percent display.

Setting range

Select either %, RATE, or TOTAL.

Procedure

Table 4-14 gives the procedure for setting or changing the flow rate indication for the main display.

Table 4-14 Procedure for Selecting the Flow Rate Indication

Step	Procedure	Screen
1	Enter the Operator's mode by pressing the [**MODE**] key for more than one second. Press the [⇨] key then the [⇧] key to start the Operator's mode.	
2	Press the [⇧] key to scroll to the flow rate display set-up screen.	0.0 % * DISPLAY SELECT %
3	Press the [⇨] key once.	0.0 % * DISPLAY SELECT %
4	Press the [⇧] or [⇩] key to select the desired flow rate display (%, RATE, TOTAL). EXAMPLE: The % has been changed to RATE by pressing the [⇧] key once.	0.0 % * DISPLAY SELECT RATE
5	Press the [⇨] key once.	0.0 % * DISPLAY SELECT RATE

4.3.4 Entering the ID Number

Introduction

You can enter a unique 8-digit alphanumeric code for the flowmeter.

Default setting

XXXXXXXX

Setting range

Up to eight alphanumeric characters using any combination of letters (A to Z), numbers (0 to 9), - (dash), / (slash), space, and period.

Procedure

Table 4-15 gives the procedure for entering an ID number.

Table 4-15 Procedure for Entering the ID Number

Step	Procedure	Screen
1	Enter the Operator's mode by pressing the [**MODE**] key for more than one second. Press the [⇨] key then the [⇧] key to start the Operator's mode.	
2	Scroll to the MODE ENTER ENGINEERING screen by pressing the [⇧] key.	
3	Enter the Engineering mode by pressing the [⇨] key then the [⇧] key. Three seconds later the ID set-up screen appears.	12.3 % # ID SET XXXXXXXX
4	Press the [⇨] key to move the cursor to the character to be changed.	12.3 % # ID SET XXXXXXXX
5	Press the [⇧] or [⇩] key to change the characters as desired.	
6	Repeat Steps 4 and 5 as needed. EXAMPLE: The default setting has been changed to FIC-0001 using the [⇨], [⇧], and [⇩] keys.	12.3 % # ID SET FIC-0001
7	Press the [⇨] key once.	12.3 % # ID SET FIC-0001

4.3.5 Selecting Function Settings

Introduction

Table 4-16 outlines the steps for selecting the function settings to define the operating characteristics of the flowmeter. Since settings interact and vary depending upon hardware features ordered, be sure you review the appropriate function setting restrictions table (Tables 4-17 through 4-20) before beginning this procedure.

The function settings code appears on the function set-up screen as F followed by four alphanumeric characters (e.g., F0A11).

Table 4-16 Procedure for Selecting Function Settings

Step	Procedure	Screen
1	Enter the Operator's mode by pressing the [**MODE**] key for more than one second. Press the [⇨] key then the [⇧] key to start the Operator's mode.	
2	Scroll to the MODE ENTER ENGINEERING screen by pressing the [⇧] key.	
3	Enter the Engineering mode by pressing the [⇨] key then the [⇧] key. Scroll to the function set-up screen by pressing the [⇧] key.	12.3 % # FUNC SET F0A11
4	Press the [⇨] key to select the desired function setting. In the example, F0A11 indicates the following: • F—function code/cannot be changed • 0—range setting (single) • A—built-in counter setting (addition) • 1—contact input setting (external 0% lock) • 1—contact output setting (alarm output)	12.3 % # FUNC SET F0A11 SINGLE RANGE
5	Press the [⇧] or [⇩] key to select the desired function. EXAMPLE: SINGLE RANGE has been changed to DIR AUTO DUAL RG.	12.3 % # FUNC SET F1A11 DIR AUTO DUAL RG
6	Repeat Steps 4 and 5 as needed.	
7	Press the [⇨] key once.	

Continued on next page

Function setting restrictions

Tables 4-17 through 4-20 list the possible combinations and restrictions for the range, built-in counter, contact input, and contact output function settings.

Table 4-17 Function Setting Restrictions for 1-contact Input and 1-contact Output (DI/DO)

Range Function	Built-in Counter Function	Contact Input Function	Contact Output Function
0: Single range	X: Not activated	X: Not activated	X: Not activated 1: Alarm output 4: Self-check result output 5: Empty detection function 6: High/low limit alarm
		1: External 0% lock	X: Not activated 1: Alarm output 4: Self-check result output 5: Empty detection function 6: High/low limit alarm
		2: External auto zero adjustment	X: Not activated 1: Alarm output 4: Self-check result output 5: Empty detection function 6: High/low limit alarm
	A: Addition	X: Not activated	X: Not activated 1: Alarm output 4: Self-check result output 5: Empty detection function 6: High/low limit alarm
		1: External 0% lock	X: Not activated 1: Alarm output 4: Self-check result output 5: Empty detection function 6: High/low limit alarm
		2: External auto zero adjustment	X: Not activated 1: Alarm output 4: Self-check result output 5: Empty detection function 6: High/low limit alarm
		4: Counter reset	X: Not activated 1: Alarm output 4: Self-check result output 5: Empty detection function 6: High/low limit alarm
	B: Addition with preset	X: Not activated 1: External 0% lock 2: External auto zero adjustment	3: Preset output

Continued on next page

Function setting restrictions, continued

Table 4-17 Function Setting Restrictions for 1-contact Input and 1-contact Output (DI/DO), Continued

Range Function	Built-in Counter Function	Contact Input Function	Contact Output Function
1: Automatic switching double range	X: Not activated	X: Not activated 1: External 0% lock 2: External auto zero adjustment	2: Range switching output
	A: Addition	X: Not activated 1: External 0% lock 2: External auto zero adjustment 4: Counter reset	2: Range switching output
2: External switching double range	X: Not activated	3: External range switching	X: Not activated 1: Alarm output 4: Self-check result output 5: Empty detection function 6: High/low limit alarm
	A: Addition	3: External range switching	X: Not activated 1: Alarm output 4: Self-check result output 5: Empty detection function 6: High/low limit alarm
	B: Addition with preset	3: External range switching	3: Preset output
3: Normal/reverse automatic switching range	X: Not activated	X: Not activated 1: External 0% lock 2: External auto zero adjustment	2: Range switching output
	A: Addition	X: Not activated 1: External 0% lock 2: External auto zero adjustment 4: Counter reset	2: Range switching output
	C: Normal/reverse flow integration	X: Not activated 1: External 0% lock 2: External auto zero adjustment 4: Counter reset	2: Range switching output
4: Normal/reverse external switching range	X: Not activated	3: External range switching	X: Not activated 1: Alarm output 4: Self-check result output 5: Empty detection function 6: High/low limit alarm
	A: Addition	3: External range switching	X: Not activated 1: Alarm output 4: Self-check result output 5: Empty detection function 6: High/low limit alarm
	B: Addition with preset	3: External range switching	3: Preset output
	C: Normal/reverse flow integration	3: External range switching	X: Not activated 1: Alarm output 4: Self-check result output 5: Empty detection function 6: High/low limit alarm

Continued on next page

4.3.5 Selecting Function Settings, Continued

Function setting restrictions, continued

Table 4-18 Function Setting Restrictions for 2-contact Input (DI/DI)

Range Function	Built-in Counter Function	Contact Input Function	Contact Output Function
0: Single range	X: Not activated	X: Not activated 1: External 0% lock 2: External auto zero function 5: External 0% lock + auto zero adjustment	X: Not activated
	A: Addition	X: Not activated 1: External 0% lock 2: External auto zero function 4: Counter reset 5: External 0% lock + auto zero adjustment 7: External 0% lock + counter reset 9: External auto zero + counter reset	X: Not activated
2: External switching double range	X: Not activated	3: External range switching 6: External 0% lock + range switching 8: External auto zero adjustment + range switching	X: Not activated
	A: Addition	3: External range switching 6: External 0% lock + range switching 8: External auto zero adjustment + range switching A: External range switching + counter reset	X: Not activated
4: Normal/reverse external switching range	X: Not activated	3: External range switching 6: External 0% lock + range switching 8: External auto zero adjustment + range switching	X: Not activated
	A: Addition	3: External range switching 6: External 0% lock + range switching 8: External auto zero adjustment + range switching A: External range switching + counter reset	X: Not activated
	C: Normal/reverse flow integration	3: External range switching 6: External 0% lock + range switching 8: External auto zero adjustment + range switching A: External range switching + counter reset	X: Not activated

Continued on next page

Function setting restrictions, continued

Table 4-19 Function Setting Restrictions for 2-contact Output (DO/DO)

Range Function	Built-in Counter Function	Contact Input Function	Contact Output Function
0: Single range	X: Not activated	X: Not activated	X: Not activated 1: Alarm output 4: Self-check result output 5: Empty detection function 6: High/low limit alarm
	A: Addition	X: Not activated	X: Not activated 1: Alarm output 4: Self-check result output 5: Empty detection function 6: High/low limit alarm
	B: Addition with preset	X: Not activated	3: Preset D: Alarm + preset output
1: Automatic switching double range	X: Not activated	X: Not activated	2: Range switching output 7: Alarm + range switching output 8: Self-check result + range switching output 9: Empty detection function + range switching output A: High/low limit alarm + range switching output C: Range switching + Self-check empty detection function
	A: Addition	X: Not activated	2: Range switching output 7: Alarm + range switching output 8: Self-check result + range switching output 9: Empty detection function + range switching output A: High/low limit alarm + range switching output C: Range switching + Self-check empty detection function
	B: Addition with preset	X: Not activated	B: Range switching + preset output
3: Normal/reverse automatic switching range	X: Not activated	X: Not activated	2: Range switching output 7: Alarm + range switching output 8: Self-check result + range switching output 9: Empty detection function + range switching output A: High/low limit alarm + range switching output C: Range switching + Self-check empty detection function
	A: Addition	X: Not activated	2: Range switching output 7: Alarm + range switching output 8: Self-check result + range switching output 9: Empty detection function + range switching output A: High/low limit alarm + range switching output C: Range switching + Self-check empty detection function
	B: Addition with preset	X: Not activated	B: Range switching + preset output
	C: Normal/ reverse flow integration	X: Not activated	2: Range switching output 7: Alarm + range switching output 8: Self-check result + range switching output 9: Empty detection function + range switching output A: High/low limit alarm + range switching output C: Range switching + Self-check empty detection function

Continued on next page

Function setting restrictions, continued

Table 4-20 Function Setting Restrictions without DI/DO

Range Function	Built-in Counter Function	Contact Input Function	Contact Output Function
0: Single range	X: Not activated	X: Not activated	X: Not activated
	A: Addition	X: Not activated	X: Not activated

Range functions

The range function setting is the second digit of the FXXXX code on the function set-up screen. There are five available choices:

- 0—Single range
- 1—Normal direction, automatic, dual range
- 2—Normal direction, external switching, dual range
- 3—Normal/reverse direction, automatic switching, dual range
- 4—Normal/reverse direction, external switching, dual range

Normal (or direct) direction means the same direction as the arrow on the detector.

Dual range is dependent on the current output method selection.

- AUTO—switches automatically between range 1 and range 2
- WIDE—uses range with wide (larger) span

Single range

With the single range function, a flowmeter measures a single range in the normal direction.

The output for a reverse flow is as follows:

- *Analog output:* Possible to approximately –20% (0.8 mA); with SFC communication approximately –5% (3.2 mA).
- *Pulse output:* No output.
- *Display:* A minus (–) symbol appears.

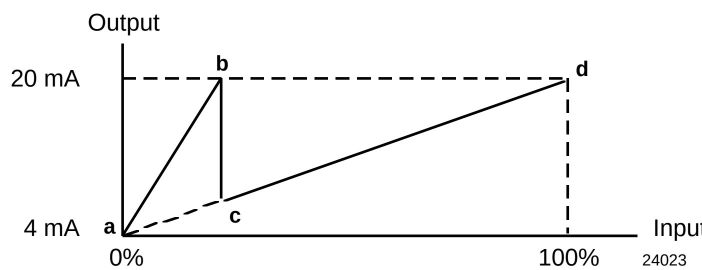
Continued on next page

Normal direction, automatic, dual range

With this function you can configure two flow measurement ranges, with transfer between the ranges triggered automatically when flow exceeds or drops below the upper range value for the first range.

Analog Output Method		**Pulse Output**	**Contact Output**
AUTO	**WIDE**		
Both ranges 4-20 mA dc	4-20 mA dc is output on range with larger span	Pulse weight is same for both ranges.	At shipment— Range 1: Open Range 2: Closed Reverse setting is also possible.

EXAMPLE:



1. AUTO
   - Range 1 (small): Outputs 4-20 mA for 0-10 m^3/h (a–b)
   - Range 2 (large): Outputs 4-20 mA for 0-40 m^3/h (a–d)
2. WIDE
   - Range 1 (small): Outputs 4-8 mA for 0-10 m^3/h (a–c)
   - Range 2 (large): Outputs 8-20 mA for 0-40 m^3/h (c–d)

Normal direction, external, dual range

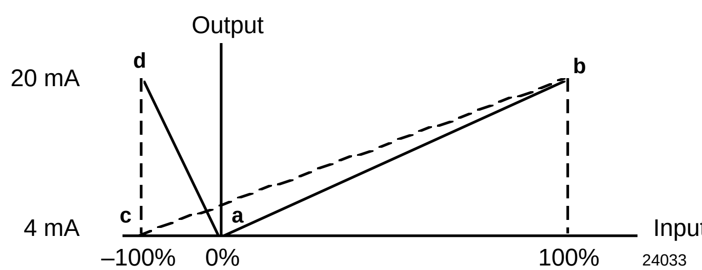
With this function you can configure two flow measurement ranges, with transfer between the ranges triggered manually through a contact input.

Analog Output Method		**Pulse Output**	**Contact Input/Output**
AUTO	**WIDE**		
Both ranges 4-20 mA dc	4-20 mA dc is output on range with larger span	Pulse weight is same for both ranges.	*Input:* Range 1: Open Range 2: Closed *Output:* At shipment— Range 1: Open Range 2: Closed Reverse setting is also possible.

Continued on next page

Normal/reverse, automatic, dual range

With this function you can configure two flow measurement ranges—one range for flow in normal direction and another range for flow in reverse direction. Transfer between ranges will be triggered automatically when direction of flow changes. A minus (–) sign will appear on the flow rate display when the flow is in the reverse direction.

<table>
<tr><th colspan="2">Analog Output Method</th><th rowspan="2">Pulse Output</th><th rowspan="2">Contact Output</th></tr>
<tr><th>AUTO</th><th>WIDE</th></tr>
<tr><td>Both ranges
4-20 mA dc</td><td>4-20 mA dc is output on range with larger span</td><td>Pulse weight is same for both ranges.
The built-in counter totalizes the flow rate without distinguishing normal and reverse directions. However, when normal/reverse differential flow integration is selected, the difference between the normal and reverse flows is totalized.</td><td>At shipment—
Direct: Open
Reverse: Closed
Reverse setting is also possible.</td></tr>
<tr><td colspan="4">EXAMPLE:

1. AUTO
• Range 1 (small): Outputs 4-20 mA for 0-10 m³/h (a–d)
• Range 2 (large): Outputs 4-20 mA for 0-43 m³/h (a–b)
2. WIDE
• Range 1 (small): Outputs 4-8 mA for 0-10 m³/h (a–d)
• Range 2 (large): Outputs 8-20 mA for 0-30 m³/h (c–b)</td></tr>
</table>

Continued on next page

Normal/reverse direction, external, dual range

With this function you can configure two flow measurement ranges—one range for flow in normal direction and another range for flow in reverse direction. Transfer between ranges will be triggered manually through a contact input when direction of flow changes. A minus (–) sign will appear on the flow rate display when the flow is in the reverse direction.

Analog Output Method		Pulse Output	Contact
AUTO	WIDE		Input/Output
Both ranges 4-20 mA dc	4-20 mA dc is output on range with larger span	Pulse weight is same for both ranges. The built-in counter totalizes the flow rate without distinguishing normal and reverse directions. However, when normal/reverse differential flow integration is selected, the difference between the normal and reverse flows is totalized.	*Input:* Direct: Open Reverse: Closed *Output:* At shipment— Direct: Open Reverse: Closed Reverse setting is also possible.

Built-in counter function

The built-in counter (totalizer) function setting is the third digit of the FXXXX code on the function set-up screen. There are four available choices:

- X—Not activated (no output)
- A—Addition counter
  Counter totalizes the flow in both the normal and reverse directions.
- B—Addition counter with preset
  The present value ranges from 0000000000 to 9999999999. Counter totalizes the flow in both the normal and reverse directions.
- C—Normal/reverse differential flow rate integration display
  Displays the difference between totalized flows in normal and reverse directions.

Continued on next page

Contact input function

The contact input function setting is the fourth digit of the FXXXX code on the function set-up screen. This function can be set when either 1- or 2-contact input has been selected. There are 11 available choices:

- X—Not activated
- 1—External 0% lock input
  Used to completely halt the flow rate signal (display, analog output, or pulse output) at 0%.
- 2—External auto zero adjustment input
  Initiates a zero adjustment from a remote location. Zero adjustment is possible when the contact is ON for 0.2 seconds or more. When the contact is ON for 15 seconds or more, the status will be become ON again. *Be sure to stop the flow.*
- 3—External range switching input
  Switching between ranges can be initiated externally.
  Range 1 or normal direction: when opened
  Range 2 or reverse direction: when closed
- 4—Built-in counter reset input
  Effective when there is a pulse output.
  Reset takes effect when the contact is ON for 0.2 seconds or more, and counting starts from the counter reset value when the contact turns OFF.
- 5—External 0% lock input and external auto zero adjustment input
  Terminal ST IN1 is set to external 0% lock input and terminal ST IN2 to external auto zero adjustment input.
- 6—External 0% lock input and external range switching input
  Terminal ST IN1 is set to external 0% lock input and terminal ST IN2 to external range switching input.
- 7—External 0% lock input and built-in counter reset input
  Terminal ST IN1 is set to external 0% lock input and terminal ST IN2 to external range switching input.
- 8—External auto zero adjustment input and external range switching input
  Terminal ST IN1 is set to external auto zero adjustment input and terminal ST IN2 to external range switching input.
- 9—External auto zero adjustment input and built-in counter reset input
  Terminal ST IN1 is set to auto zero adjustment input and terminal ST IN2 to built-in counter reset input.
- A—External range switching input and built-in counter reset input
  Terminal ST IN1 is set to external range switching input and terminal ST IN2 to built-in counter reset input.

Continued on next page

Contact output function

The contact output function setting is the fifth digit of the FXXXX code on the function set-up screen. This function can be set when either 1- or 2-contact output has been selected. There are 15 available choices:

- X—Not activated
- 1—Alarm contact output
  An alarm is output when an abnormal condition occurs with one of the following items:
  – Self-diagnostics
    • Coil disconnection
    • ROM error
    • RAM error
    • NVM error
    • ADC error

    Output failure selection

Mode selection	Burnout high	Hold	Burnout low
Analog output 4-20 mA dc	Burnout high	Hold	Burnout low
Pulse output	——	Hold	Burnout low
Contact output	Abnormal status (open/closed can be freely selected)		

CAUTION If the power supply is turned OFF with the “burnout high” setting, the 4-20 mA dc output will emit a burnout high output once. Pay close attention when turning the power supply OFF.

  – Empty detection function
    When the detector is empty of measured fluid, the output signals will be as follows:

Output Signal	Status when the detector is empty
Analog output 4-20 mA dc	4 mA dc
Pulse output	0%
Contact output	Abnormal status (open/closed can be freely selected)

This function can be used only when the electrical conductivity of the measured fluid is 150 µS/cm (equivalent to that of water) or higher. The empty detection function selector switch determines whether this function is activated or not. (The empty detection function switch is set to “NOT activated” at shipment.)

ATTENTION Using the empty detection function with a conductivity of less than 150 µS/cm will cause measurement errors.

Continued on next page

Contact output function, continued

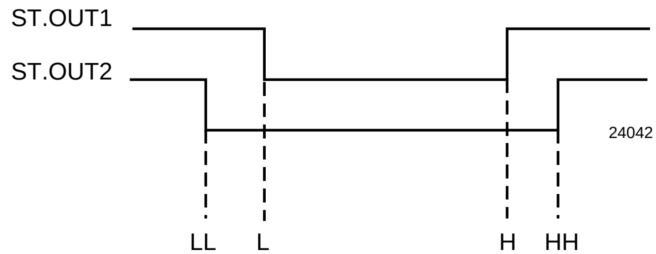
- 2—Range switching output
  The contact output status at shipment is as follows:
  Range 1 or normal direction: Open
  Range 2 or reverse direction: Closed
  Reverse setting is also possible.
- 3—Counter preset status output
  Activated when the counter reaches the preset value.
- 4—Self-check result output
  Activated only when a self-diagnostic abnormality occurs in the alarm contact output of code 1.
- 5—Empty detection function
  Activated only when an empty status is detected in the alarm contact output of code 1.
- 6—High/low limit alarm
  Activated when a high/low limit alarm occurs in the alarm contact output of code 1.
- 7—Alarm contact output and range switching output (2-contact output)
  The alarm contact output is set to terminal ST.OUT1 and the range switching output is set to terminal ST.OUT2.
- 8—Self-diagnostic result output and range switching output (2-contact output)
  The self-diagnostic result output is set to terminal ST.OUT1 and the range switching output is set to terminal ST.OUT2.
- 9—Empty detection function and range switching output (2-contact output)
  The empty detection function is set to terminal ST.OUT1 and the range switching output is set to terminal ST.OUT2.
- A—High/low limit alarm and range switching output (2-contact output)
  The high/low limit alarm is set to terminal ST.OUT1 and the range switching output to terminal ST.OUT2.
- B—Range switching output and counter preset status output (2-contact output)
  The range switching output is set to terminal ST.OUT1 and the preset status output to terminal ST.OUT2.
- C—Range switching output and self-check result output or empty detection (2-contact output)
  The range switching output is set to terminal ST.OUT1 and the output when either a self-check result or empty detection abnormality occurs to terminal ST.OUT2.
- D—Alarm contact output and counter preset status output (2-contact output)
  The alarm contact output is set to terminal ST.OUT1 and the counter preset status output to terminal ST.OUT2.

Continued on next page

Contact output function, continued

• E—2-stage flow rate alarm output

The high/low limit alarm (H/L) is set to terminal ST.OUT1 and the 2-stage high/log limit alarm (HH/LL) to terminal ST.OUT2.



4.3.6 Setting/Confirming Detector Data

Introduction

With this function you can set or confirm pertinent detector data—excitation frequency, model type, and diameter of the detector.

Default setting

When there is no detector setting, EX300.0, MGG, DIA 050.0 will be selected.

CAUTION When you purchase the converter and detector together, the converter will contain the detector data that was set during actual flow calibration. Do not change the data or the flowmeter output will be incorrect.

Procedure

Table 4-21 outlines the steps for confirming or setting detector data.

Table 4-21 Procedure for Setting/Confirming Detector Data

Step	Procedure	Screen
1	Enter the Operator's mode by pressing the [**MODE**] key for more than one second. Press the [⇨] key then the [⇧] key to start the Operator's mode.	
2	Scroll to the MODE ENTER ENGINEERING screen by pressing the [⇧] key.	
3	Enter the Engineering mode by pressing the [⇨] key then the [⇧] key. Scroll to the detector data set-up screen by pressing the [⇧] key.	12.3 % # EX 300.0 MGG DIA 050.0
4	Press the [⇨] key to select the excitation frequency. Use the [⇧] or [⇩] key to enter the numerical value printed on the flowmeter's nameplate.	12.3 % # EX 320.0 MGG DIA 050.0
5	Press the [⇨] key to select the detector type. Use the [⇧] or [⇩] key to select the model number printed on the flowmeter's nameplate.	12.3 % # EX 320.0 KID DIA 050.0

Continued on next page

Procedure, continued

Table 4-21 Procedure for Setting/Confirming Detector Data, Continued

Step	Procedure	Screen
6	Press the [⇨] key to select the diameter size. Use the [⇧] or [⇩] key to select the diameter of the detector to be used.	12.3 % # EX 320.0 KID DIA 100.0
7	Press the [⇨] key once to move the cursor to the # sign.	

Combinations

Table 4-22 lists the possible converter/detector combinations, by diameter sizes, that can be used with the MagneW 3000 ***PLUS***.

Table 4-22 Converter and Detector Combinations

Detector Diameter Size—mm (in)	MGG	KID	NNM	NNK
2.5 (0.1)	•	•		
5 (0.2)	•	•		
10 (0.4)	•	•		
15 (0.6)	•	•		
25 (1)	•	•	•	
40 (1.6)	•	•	•	
50 (2)	•	•	•	•
65 (2.6)	•			
80 (3.1)	•	•	•	
100 (3.9)	•	•	•	•
125 (4.9)	•			
150 (5.9)	•	•	•	
200 (7.9)	•	•	•	•
250 (9.8)	•	•	•	
300 (11.8)	•	•	•	
350 (13.8)	•	•	•	
400 (15.8)	•	•	•	•
450 (17.7)	•			
500 (19.7)	•	•	•	
600 (23.6)	•	•	•	•

4.3.7 Setting the Number of Dummy Detectors

Introduction

This function is used to set the number of dummy detectors installed with the NNK submersible type detector.

Default setting

0

Setting range

0 to 9

Procedure

Table 4-23 gives the procedure for setting the number of submersible dummy detectors used with the NNK detector.

Table 4-23 Procedure for Setting Number of Dummy Detectors

Step	Procedure	Screen
1	Enter the Operator's mode by pressing the [**MODE**] key for more than one second. Press the [⇨] key then the [⇧] key to start the Operator's mode.	
2	Scroll to the MODE ENTER ENGINEERING screen by pressing the [⇧] key.	
3	Enter the Engineering mode by pressing the [⇨] key then the [⇧] key. Scroll to the dummy detector set-up screen by pressing the [⇧] key.	12.3 % # DUMMY 0
4	Press the [⇨] key once.	12.3 % # DUMMY 0
5	Press the [⇧] or [⇩] key to enter the number of dummy detectors. EXAMPLE: The number of dummy detectors has been changed from 0 to 3.	12.3 % # DUMMY 3
6	Press the [⇨] key once to move the cursor to the # sign.	

4.3.8 Setting the Range

Introduction

This function is used to set the flow rate measurement range. The lower limit of the range is zero. The upper limit, which is the value when the output reaches 100%, is entered here along with the selection of engineering and time units.

Selections

Flow rate setting: 0.0001 to 99999

Engineering units: m^3, l, cm^3, t, kg, g, B, kG, G, mG, lb

Time units: s, min, h, d

Procedure

Table 4-24 gives the procedure for setting the range (span) and associated units.

Table 4-24 Procedure for Setting the Range

Step	Procedure	Screen
1	Enter the Operator's mode by pressing the [**MODE**] key for more than one second. Press the [⇨] key then the [⇧] key to start the Operator's mode.	
2	Scroll to the MODE ENTER ENGINEERING screen by pressing the [⇧] key.	
3	Enter the Engineering mode by pressing the [⇨] key then the [⇧] key. Scroll to the range set-up screen by pressing the [⇧] key.	12.3 % # 1.4147 m/s SPAN 10.000 m3/h
4	Press the [⇨] key to move the cursor to the desired number. Use the [⇧] or [⇩] key to enter the desired span.	12.3 % # 2.8294 m/s SPAN 20.000 m3/h
5	Press the [⇨] key to move the cursor to the flow rate unit. Use the [⇧] or [⇩] key to select the desired unit.	12.3 % # 2.8294 m/s SPAN 20000.0 l/h
6	Press the [⇨] key to move the cursor to the time unit. Use the [⇧] or [⇩] key to select the desired unit.	12.3 % # 2.8294 m/s SPAN 333.33 l/min
7	Press the [⇨] key once to move the cursor to the # sign.	

4.3.9 Setting Hysteresis

Introduction

This function is used to the set hysteresis for the transfer point of a dual range configuration with automatic switching.

Default setting

0

Setting range

0 to 20% of span

Procedure

Table 4-25 outlines the steps for setting the hysteresis.

Table 4-25 Procedure for Setting Hysteresis

Step	Procedure	Screen
1	Enter the Operator’s mode by pressing the [**MODE**] key for more than one second. Press the [⇨] key then the [⇧] key to start the Operator’s mode.	
2	Scroll to the MODE ENTER ENGINEERING screen by pressing the [⇧] key.	
3	Enter the Engineering mode by pressing the [⇨] key then the [⇧] key. Scroll to the hysteresis set-up screen by pressing the [⇧] key.	12.3 % # HYSTERESIS 05 %
4	Press the [⇨] key once.	12.3 % # HYSTERESIS 05 %
5	Press the [⇧] or [⇩] key to enter the desired hysteresis value. EXAMPLE: The hysteresis has been changed from 5% to 10%.	12.3 % # HYSTERESIS 10 %
6	Press the [⇨] key once to move the cursor to the # sign.	

4.3.10 Selecting the Current Output Method

Introduction

This function is used to select how to output the 4-20 mA analog output: with either the range switching method or with the wider range method. It is used with the normal direction, dual range functions or normal/reverse direction, dual range functions.

Default setting

AUTO

Selections

AUTO or WIDE

Procedure

Table 4-26 outlines the steps for selecting the current output method for dual range functions.

Table 4-26 Procedure for Selecting the Current Output Method

Step	Procedure	Screen
1	Enter the Operator's mode by pressing the [**MODE**] key for more than one second. Press the [⇨] key then the [⇧] key to start the Operator's mode.	
2	Scroll to the MODE ENTER ENGINEERING screen by pressing the [⇧] key.	
3	Enter the Engineering mode by pressing the [⇨] key then the [⇧] key. Scroll to the current output method selection screen by pressing the [⇧] key.	12.3 % # I.OUT RANGE AUTO
4	Press the [⇨] key once.	12.3 % # I.OUT RANGE AUTO
5	Press the [⇧] or [⇩] key to select the desired current output method.	12.3 % # I.OUT RANGE WIDE
6	Press the [⇨] key once to move the cursor to the # sign.	

4.3.11 Setting the Specific Gravity

Introduction

This function is used to set the specific gravity when selecting a weight unit (e.g., kg) in the range setting. Output errors may result without this setting.

Default setting

1.0000

Setting range

0.0001 to 9.9999

Procedure

Table 4-27 gives the procedure for setting the specific gravity value for the weight unit selected in the range setting function.

Table 4-27 Procedure for Setting the Specific Gravity

Step	Procedure	Screen
1	Enter the Operator’s mode by pressing the [**MODE**] key for more than one second. Press the [⇨] key then the [⇧] key to start the Operator’s mode.	
2	Scroll to the MODE ENTER ENGINEERING screen by pressing the [⇧] key.	
3	Enter the Engineering mode by pressing the [⇨] key then the [⇧] key. Scroll to the specific gravity set-up screen by pressing the [⇧] key.	12.3 % # GRAVITY 1.0000
4	Press the [⇨] key to move the cursor to the desired number.	12.3 % # GRAVITY 1.0000
5	Press the [⇧] or [⇩] key to enter the desired value.	12.3 % # GRAVITY 1.0050
6	Repeat Steps 4 and 5 as necessary.	
7	Press the [⇨] key once to move the cursor to the # sign.	

4.3.12 Setting the Pulse Scale

Introduction

This function is used to set the flow rate per pulse and associated units for a flowmeter with an optional pulse output. The pulse scale (weight) should be set so that the frequency (shown in upper right of the auxiliary display) will not exceed 2,000 Hz. When changing the pulse scale of a flowmeter with a dual range, use the larger range.

Default setting

100.00 cm^3/p

Setting range

Within the range where the frequency does not exceed 2,000 Hz.
Unit: m^3, l, cm^3, t, kg, g, B, kG, G, mG, lb

Procedure

Table 4-28 gives the procedure for setting the pulse scale function.

Table 4-28 Procedure for Setting the Pulse Scale

Step	Procedure	Screen
1	Enter the Operator's mode by pressing the [**MODE**] key for more than one second. Press the [⇨] key then the [⇧] key to start the Operator's mode.	
2	Scroll to the MODE ENTER ENGINEERING screen by pressing the [⇧] key.	
3	Enter the Engineering mode by pressing the [⇨] key then the [⇧] key. Scroll to the pulse scale set-up screen by pressing the [⇧] key.	12.3 % # PLS 27.780 Hz SCL 100.00 l/p
4	Press the [⇨] key to move the cursor to the desired number.	12.3 % # PLS 27.780 Hz SCL 100.00 l/p
5	Press the [⇧] or [⇩] key to enter the desired value.	12.3 % # PLS 13.890 Hz SCL 200.00 l/p
6	Repeat Steps 4 and 5 as necessary.	
7	Press the [⇨] key once to move the cursor to the # sign.	

4.3.13 Setting/Changing the Compensation Coefficient

Introduction

This function is used to set or change the compensation coefficient which is used to multiply the output flow rate as required.

Default setting

1.0000

Setting range

0.0001 to 9.9999

Procedure

Table 4-29 gives the procedure for setting the compensation coefficient.

Table 4-29 Procedure for Setting the Compensation Coefficient

Step	Procedure	Screen
1	Enter the Operator's mode by pressing the [**MODE**] key for more than one second. Press the [⇨] key then the [⇧] key to start the Operator's mode.	
2	Scroll to the MODE ENTER ENGINEERING screen by pressing the [⇧] key.	
3	Enter the Engineering mode by pressing the [⇨] key then the [⇧] key. Scroll to the compensation coefficient set-up screen by pressing the [⇧] key.	12.3 % # COEFFICIENT 1.0000
4	Press the [⇨] key to move the cursor to the desired number.	12.3 % # COEFFICIENT 1.0000
5	Press the [⇧] or [⇩] key to enter the desired value.	12.3 % # COEFFICIENT 1.0050
6	Repeat Steps 4 and 5 as necessary.	
7	Press the [⇨] key once to move the cursor to the # sign.	

4.3.14 Setting the Pulse Width

Introduction

This function is used to set the pulse width for a flowmeter with an optional pulse output. The pulse width determines the pulse duty ratio. The ratio basically defines the pulse ON time versus the pulse OFF time as a percentage of the total pulse cycle. For optimum pulse counting, the on or off pulse duty ratio must not exceed 70%. (The duty ratio is displayed in the upper right of the auxiliary display.)

When changing the pulse scale of a flowmeter with a dual range, use the larger range.

Default setting

NUM 010.00ms

Setting range

NUM—pulse width can be set freely
DUTY—duty ratio is fixed at 50% and the pulse width varies according to the flow rate

Pulse width: 000.00 to 999.99 ms

Procedure

Table 4-30 gives the procedure for setting the pulse width.

Table 4-30 Procedure for Setting the Pulse Width

Step	Procedure	Screen
1	Enter the Operator's mode by pressing the [**MODE**] key for more than one second. Press the [⇨] key then the [⇧] key to start the Operator's mode.	
2	Scroll to the MODE ENTER ENGINEERING screen by pressing the [⇧] key.	
3	Enter the Engineering mode by pressing the [⇨] key then the [⇧] key. Scroll to the pulse width set-up screen by pressing the [⇧] key.	12.3 % # PLS 27.778 % WID NUM 010.00ms
4	Press the [⇨] key to move the cursor to NUM.	12.3 % # PLS 27.778 % WID NUM 010.00ms

Continued on next page

4.3.14 Setting the Pulse Width, Continued

Procedure, continued

Table 4-30 Procedure for Setting the Pulse Width, Continued

Step	Procedure	Screen
5	Press the [⇧] key once. The screen used to enter a numerical value for pulse width will change to the screen used to fix the duty ratio at 50%.	12.3 % # PLS WID DUTY 50%
6	To enter the pulse width using a numerical value, return to the numerical value entry screen by using the [⇧] key.	
7	Move the cursor to the desired digit by using the [⇨] key.	12.3 % # PLS 27.778 % WID NUM 010.00ms
8	Press the [⇧] or [⇩] key to enter the desired value.	12.3 % # PLS 13.889 % WID NUM 005.00ms
9	Repeat Steps 7 and 8 as necessary.	
10	Press the [⇨] key once to move the cursor to the # sign.	

4.3.15 Setting the Dropout Value

Introduction

This function is used to set the dropout value for the pulse output. The pulse output will be cut off at this point to avoid flow pulsation in range values close to zero, thus preventing incorrect totalization of the flow rate. Pulse counting pauses when the flow rate reaches this preset percentage of the set range.

Default setting

2%

Setting range

0 to 10%

Procedure

Table 4-31 lists the steps for setting the dropout value.

Table 4-31 Procedure for Setting the Dropout Value

Step	Procedure	Screen
1	Enter the Operator's mode by pressing the [**MODE**] key for more than one second. Press the [⇨] key then the [⇧] key to start the Operator's mode.	
2	Scroll to the MODE ENTER ENGINEERING screen by pressing the [⇧] key.	
3	Enter the Engineering mode by pressing the [⇨] key then the [⇧] key. Scroll to the dropout set-up screen by pressing the [⇧] key.	12.3 % # DROP OUT 02 %
4	Press the [⇨] key once.	12.3 % # DROP OUT 02 %
5	Press the [⇧] or [⇩] key to enter the desired value.	12.3 % # DROP OUT 05 %
6	Press the [⇨] key once to move the cursor to the # sign.	

4.3.16 Setting High and Low Limit Alarms

Introduction

This function is used to set the high and low alarm set points when the status output is configured for the alarm function. An alarm is output when the instantaneous percent flow rate exceeds these preset high and low limits.

Default setting

HI-ALM: +100%
LO-ALM: –100%

Setting range

HI-ALM: –115 to +115%
LO-ALM: –115 to +115%

Procedure

Table 4-32 lists the steps for setting the high and low limit alarm set points.

Table 4-32 Procedure for Setting the High and Low Limit Alarms

Step	Procedure	Screen
1	Enter the Operator's mode by pressing the [**MODE**] key for more than one second. Press the [⇨] key then the [⇧] key to start the Operator's mode.	
2	Scroll to the MODE ENTER ENGINEERING screen by pressing the [⇧] key.	
3	Enter the Engineering mode by pressing the [⇨] key then the [⇧] key. Scroll to the high and low limit alarm screen by pressing the [⇧] key.	12.3 % # HI-ALM +100 % LO-ALM –100 %
4	Press the [⇨] key to move the cursor to the desired number.	12.3 % # HI-ALM +100 % LO-ALM –100 %
5	Press the [⇧] or [⇩] key to enter the desired value.	12.3 % # HI-ALM +080 % LO-ALM –100 %
6	Repeat Steps 4 and 5 as necessary.	
7	Press the [⇨] key once to move the cursor to the # sign.	

4.3.17 Setting a 2-stage Flow Rate Alarm

Introduction

This function is used to set the 2-stage high and low limit alarm set points when the status output is configured for 2-stage high/low limit alarm. A first alarm is output when the instantaneous percent flow rate exceeds the first preset high or low limit. A second alarm is output when the flow rate exceeds the second preset high or low limit.

Default setting

HI-ALM1, HI-ALM2: +100%
LO-ALM1, LO-ALM2: –100%

Setting range

HI-ALM1, HI-ALM2: –115 to +115%
LO-ALM1, LO-ALM2: –115 to +115%

Procedure

Table 4-33 lists the steps for setting the 2-stage high and low limit alarm set points.

Table 4-33 Procedure for Setting the 2-stage High and Low Limit Alarms

Step	Procedure	Screen
1	Enter the Operator’s mode by pressing the [**MODE**] key for more than one second. Press the [⇨] key then the [⇧] key to start the Operator’s mode.	
2	Scroll to the MODE ENTER ENGINEERING screen by pressing the [⇧] key.	
3	Enter the Engineering mode by pressing the [⇨] key then the [⇧] key. Scroll to the 2-stage high and low limit alarm screen by pressing the [⇧] key.	12.3 % # LO-ALM1 –100 % LO-ALM2 –100 %
4	Press the [⇨] key to move the cursor to the desired number.	12.3 % # LO-ALM1 –100 % LO-ALM2 –100 %

Continued on next page

Procedure, continued

Table 4-33 Procedure for Setting the 2-stage High and Low Limit Alarms, Continued

Step	Procedure	Screen
5	Press the [⇧] or [⇩] key to enter the desired value.	12.3 % # LO-ALM1 +020 % LO-ALM2 –100 %
6	Repeat Steps 4 and 5 as necessary.	
7	Press the [⇨] key to move the cursor to the # sign.	12.3 % # LO-ALM1 +020 % LO-ALM2 +010 %
8	Press the [⇧] key to set the 2-stage high limit alarms.	12.3 % # HI-ALM1 +100 % HI-ALM2 +100 %
9	Press the [⇨] key to move the cursor to the desired number.	12.3 % # HI-ALM1 +100 % HI-ALM2 +100 %
10	Press the [⇧] or [⇩] key to enter the desired value.	12.3 % # HI-ALM1 +090 % HI-ALM2 +100 %
11	Repeat Steps 9 and 10 as necessary.	
12	Press the [⇨] key to move the cursor to the # sign.	

4.3.18 Setting the Low Flow Cutoff

Introduction

This function is used to set the low flow cutoff value. When the flow rate reaches the entered value, the current output is cut off to avoid errors due to flow pulsation in range value close to zero.

Default setting

OFF

Setting range

OFF
ON from 0 to 10%

Procedure

Table 4-34 lists the steps for setting the low flow cutoff point.

Table 4-34 Procedure for Setting Low Flow Cutoff

Step	Procedure	Screen
1	Enter the Operator's mode by pressing the [**MODE**] key for more than one second. Press the [⇨] key then the [⇧] key to start the Operator's mode.	
2	Scroll to the MODE ENTER ENGINEERING screen by pressing the [⇧] key.	
3	Enter the Engineering mode by pressing the [⇨] key then the [⇧] key. Scroll to the low flow cut set-up screen by pressing the [⇧] key.	12.3 % # LOW-FLOW CUT OFF
4	Press the [⇨] key once.	12.3 % # LOW-FLOW CUT OFF
5	Press the [⇧] key to change low flow cutoff from OFF to ON. Now you can enter the low flow cutoff numerical value.	12.3 % # LOW-FLOW CUT ON 00 %
6	Press the [⇨] key once. Use the [⇧] or [⇩] key to select the desired value.	12.3 % # LOW-FLOW CUT ON 05 %
7	Press the [⇨] key to move the cursor to the # sign.	

4.3.19 Selecting Failsafe Mode for Current Output

Introduction

This function is used to determine the analog output direction when the flowmeter detects a critical status condition.

CAUTION The failsafe mode is very important for the overall safety of the control process. Choose the failsafe direction carefully, as equipment damage can result from a wrong choice.

Default setting

LOW

Setting range

LOW: Current output signal is driven to low scale value
HIGH: Current output signal is driven to high scale value
HOLD: Current output signal is held at its last good value

Procedure

Table 4-35 lists the steps for selecting the analog output failsafe mode direction.

Table 4-35 Procedure for Selecting Current Output Failsafe Mode

Step	Procedure	Screen
1	Enter the Operator's mode by pressing the [**MODE**] key for more than one second. Press the [⇨] key then the [⇧] key to start the Operator's mode.	
2	Scroll to the MODE ENTER ENGINEERING screen by pressing the [⇧] key.	
3	Enter the Engineering mode by pressing the [⇨] key then the [⇧] key. Scroll to the analog output failsafe mode set-up screen by pressing the [⇧] key.	12.3 % # ERROR OUT MODE I.OUT LOW
4	Press the [⇨] key once.	12.3 % # ERROR OUT MODE I.OUT LOW
5	Press the [⇧] or [⇩] key to select the desired setting.	12.3 % # ERROR OUT MODE I.OUT HIGH
6	Press the [⇨] key to move the cursor to the # sign.	

4.3.20 Selecting Failsafe Mode for Pulse Output

Introduction

This function is used to determine the pulse output direction when the flowmeter detects a critical status condition.

CAUTION The failsafe mode is very important for the overall safety of the control process. Choose the failsafe direction carefully, as equipment damage can result from a wrong choice.

Default setting

LOW

Setting range

LOW: Outputs no pulse
HOLD: Pulse output signal held at its present state

Procedure

Table 4-36 lists the steps for selecting the pulse output failsafe mode direction.

Table 4-36 Procedure for Selecting Pulse Output Failsafe Mode

Step	Procedure	Screen
1	Enter the Operator's mode by pressing the [**MODE**] key for more than one second. Press the [⇨] key then the [⇧] key to start the Operator's mode.	
2	Scroll to the MODE ENTER ENGINEERING screen by pressing the [⇧] key.	
3	Enter the Engineering mode by pressing the [⇨] key then the [⇧] key. Scroll to the pulse output failsafe mode set-up screen by pressing the [⇧] key.	12.3 % # ERROR OUT MODE P.OUT LOW
4	Press the [⇨] key once.	12.3 % # ERROR OUT MODE P.OUT LOW
5	Press the [⇧] or [⇩] key to select the desired setting.	12.3 % # ERROR OUT MODE P.OUT HOLD
6	Press the [⇨] key to move the cursor to the # sign.	

4.3.21 Setting the Contact Output Status

Introduction

This function is used to set the contact output status for normal operation. The contact output status function is displayed only when contact output has been selected.

Default setting

CLOSE

Setting range

CLOSE
OPEN

Procedure 1

Table 4-37 lists the steps for setting the contact output status for 1-contact input and 1-contact output.

Table 4-37 Procedure for Setting the Contact Output Status for 1-contact Input and 1-contact Output

Step	Procedure	Screen
1	Enter the Operator's mode by pressing the [**MODE**] key for more than one second. Press the [⇨] key then the [⇧] key to start the Operator's mode.	
2	Scroll to the MODE ENTER ENGINEERING screen by pressing the [⇧] key.	
3	Enter the Engineering mode by pressing the [⇨] key then the [⇧] key. Scroll to the contact output status set-up screen by pressing the [⇧] key.	12.3 % # ST.OUT MODE NORMAL CLOSE
4	Press the [⇨] key once.	12.3 % # ST.OUT MODE NORMAL CLOSE
5	Press the [⇧] or [⇩] key to select the desired setting.	12.3 % # ST.OUT MODE NORMAL OPEN
6	Press the [⇨] key to move the cursor to the # sign.	

Continued on next page

Procedure 2

Table 4-38 lists the steps for setting the contact output status for 2-contact output.

Table 4-38 Procedure for Setting the Contact Output Status for 2-contact Output

Step	Procedure	Screen
1	Enter the Operator's mode by pressing the [**MODE**] key for more than one second. Press the [⇨] key then the [⇧] key to start the Operator's mode.	
2	Scroll to the MODE ENTER ENGINEERING screen by pressing the [⇧] key.	
3	Enter the Engineering mode by pressing the [⇨] key. Scroll to the contact output status set-up screen by pressing the [⇧] key.	12.3 % # ST.OUT1 MODE NORMAL CLOSE
4	Press the [⇨] key once.	12.3 % # ST.OUT1 MODE NORMAL CLOSE
5	Press the [⇧] or [⇩] key to select the desired setting for contact output 1.	12.3 % # ST.OUT1 MODE NORMAL OPEN
6	Press the [⇨] key to move the cursor to the # sign.	12.3 % # ST.OUT1 MODE NORMAL OPEN
7	Press the [⇧] key to display the screen for contact output 2.	12.3 % # ST.OUT2 MODE NORMAL CLOSE
8	Repeat Steps 4, 5, and 6.	

4.3.22 Setting Write Protection

Introduction

The MagneW 3000 ***PLUS*** is shipped so that settings can be made in any mode. Write protection is possible, through switches located on the main card, to protect data from being accidentally changed after start-up.

Levels of write protection

Table 4-39 explains the available write-protect levels. The flowmeter is set to level 0 when shipped.

Table 4-39 Write Protection Levels

Level	Operator's Mode	Engineering Mode	Maintenance Mode
0	O	O	O
1	O	O	——
2	O	X	——
3	X	X	——
LEGEND O Both data confirmation and manipulation are possible. X Data confirmation only is possible. —— Neither data confirmation nor manipulation is possible.			

Procedure

To set/change the write-protect level, follow the procedure in Table 4-40.

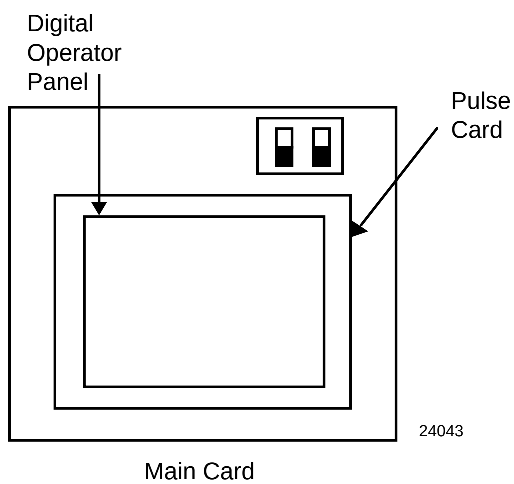
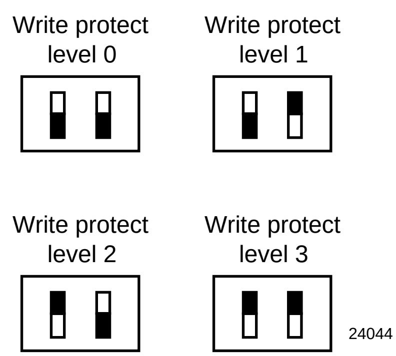
Table 4-40 Setting Write Protection Level

Step	Action
1	If applicable, remove the display by removing the four screws at the corners and pulling it straight out. **CAUTION** The display is connected via a connector and must be pulled straight out, otherwise the display could break.

Continued on next page

Procedure, continued

Table 4-40 Setting Write Protection Level, Continued

Step	Action
2	With main card visible, locate the switches at the top right of the main card. 
3	Set switches to the level of protection desired, as shown below. (Move the switches to the blackened positions.) 
4	Replace the display if applicable.

4.4 Start-up and Operation Using the DOP

Summary

Once you have installed and configured a MagneW 3000 flowmeter, you are ready to start up the process loop. To do this, you will need to:

- Fill the pipe with fluid.
- Zero the meter.
- Stabilize the zero output function, taking into account
  - Analog outputs
  - I/O functions

You can also run an optional output check to “ring out” an analog loop prior to start-up. If your converter is equipped with a pulse board, you can also simulate a pulse output to check the operation of the pulse output circuit as well as check status inputs and outputs.

4.4.1 Starting and Stopping Flowmeter Operation

Start-up procedure

Follow the steps in Table 4-41 for starting up the flowmeter.

Table 4-41 Procedure for Starting Up the System

Step	Action
1	Make sure that the detector is properly installed on the pipe.
2	Make sure the wiring between the remote detector and converter has been completed properly, if applicable.
3	Fill the flowmeter with the fluid to be measured and let the fluid stabilize.
4	Make sure there are no leaks from the flanges.
5	Turn the power to the flowmeter ON.
6	Make sure a display similar to the one below appears on the DOP. 0.0 % 0.00 m3/h 0000123456 TOTAL Start-up has been completed.

Stopping the system

CAUTION Before stopping the flowmeter operation and shutting off the output to the control equipment, be sure to switch the control equipment to manual control. This will prevent the powering down of the flowmeter from directly affecting the control equipment.

Follow the procedure in Table 4-42 for stopping flowmeter operation.

Table 4-42 Procedure for Stopping Flowmeter Operation

Step	Action
1	Switch the control equipment connected to the flowmeter to the manual control mode.
2	Turn the power switch of the flowmeter OFF.

4.4.2 Zeroing the Meter

Introduction

After the detector is filled with pipe fluid, the meter needs to be adjusted for zero flow. The process is called zeroing the meter. It is required for proper operation and must be performed any time the process fluid is changed.

CAUTION

- A zero adjustment is very important for accurate flow rate measurement. Be sure to zero the flowmeter before initial start-up.
- Before a zero adjustment, make sure the detector is correctly grounded (Class 3), that the detector is filled with the fluid to be measured, and that the fluid in the detector is standing still. Zero adjustment is possible when the flow speed is 0.2 m/s or less, but for an accurate adjustment wait until the fluid completely stops (flow speed: 0.0 m/s). Otherwise, output errors may result.

Procedure

The procedure in Table 4-43 outlines the typical steps for zeroing the meter.

Table 4-43 Procedure for Zeroing the Flowmeter

Step	Procedure	Screen
1	Enter the Operator's mode by pressing the [**MODE**] key for more than one second. Press the [⇨] key then the [⇧] key to start the Operator's mode.	
2	Scroll to the auto zero screen by pressing the [⇧] key. **ATTENTION** This is the screen that will appear when the main display is set to % units.	0.0 % * AUTO ZERO READY
3	Press the [⇨] key once.	0.0 % * AUTO ZERO READY

Continued on next page

4.4.2 Zeroing the Meter, Continued

Procedure, continued

Table 4-43 Procedure for Zeroing the Flowmeter, Continued

Step	Procedure	Screen
4	Press the [⇧] key to start zero adjustment. During zero adjustment the main display (0.0) will be flashing.	0.0 % * AUTO ZERO ON
	When zero adjustment is finished, the flashing stops and the ON message returns to READY. Zero adjustment takes about 30 seconds.	0.0 % * AUTO ZERO READY
5	Press the [⇨] key once.	
6	Press the [**MODE**] key for more than one second to return to the Measuring mode (measuring status). The zero value will be written into non-volatile memory.	

4.4.3 Checking the Analog Output

Introduction

The analog output can be checked by using the flowmeter as a constant-current generator. Other instruments in the current output loop, such as recorders, controllers, and positioners, can be checked. Using the DOP, you can instruct the converter to change its output to any value between 0 (4mA or 1V) and 100 (20mA or 5V) percent and maintain that output. This makes it easy to verify loop operation through accurate simulation of converter output signals before bringing the loop on line. This mode is referred to as the Output mode.

Default setting

000.0%

Setting range

000.0% to 115.0% (percentage is the ratio of the preset range)

Procedure

The procedure in Table 4-44 outlines the typical steps for checking the analog output. If you want to verify loop calibration, connect a precision milliammeter or voltmeter in the loop to compare readings. Refer to Figure 4-2 for sample meter connections in a typical analog loop using the converter's internal power supply.

Table 4-44 Procedure for Checking the Analog Output

Step	Procedure	Screen
1	Enter the Operator's mode by pressing the [**MODE**] key for more than one second. Press the [⇨] key then the [⇧] key to start the Operator's mode.	
2	Scroll to the MODE ENTER MAINTENANCE screen by pressing the [⇧] key.	
3	Enter the Maintenance mode by pressing the [⇨] key then the [⇧] key. Scroll to the analog output check screen by pressing the [⇧] key.	12.3 % > OUTPUT CHECK I.OUT 000.0 %
4	Press the [⇨] key to move the cursor to the numerical value to be checked. The current corresponding to the percentage of the preset I.OUT will be output.	12.3 % > OUTPUT CHECK I.OUT 000.0 %

Continued on next page

4.4.3 Checking the Analog Output, Continued

Procedure, continued

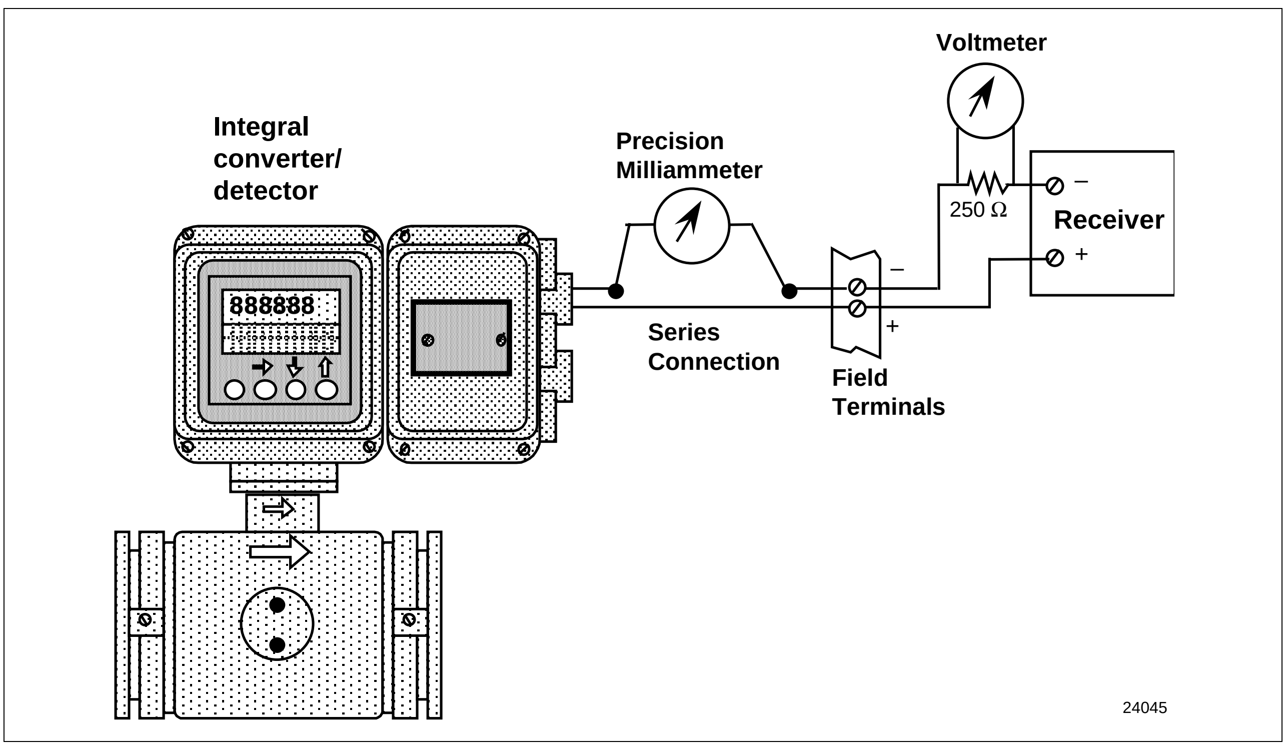
Table 4-44 Procedure for Checking the Analog Output, Continued

<table>
<tr><th>Step</th><th>Procedure</th><th>Screen</th></tr>
<tr><td>5</td><td>Press the [⇧] or [⇩] key to change the percentage to the desired one.

In the example, an analog output of 100% (20 mA) of the range is output.

Repeat, as necessary, to check indications at these output percentages.
<table><tr><th>If output is…</th><th>Then meter reads…</th></tr><tr><td>0%</td><td>4.0 mA/1.0V</td></tr><tr><td>25%</td><td>8.0 mA/2V</td></tr><tr><td>50%</td><td>12.0 mA/3V</td></tr><tr><td>60%</td><td>13.6 mA/3.4V</td></tr><tr><td>80%</td><td>16.6 mA/4.2V</td></tr><tr><td>100%</td><td>20.0 mA/5.0V</td></tr></table></td><td>12.3 %
> OUTPUT CHECK
I.OUT 100.0 %</td></tr>
<tr><td>6</td><td>Press the [⇨] key to move the cursor to > symbol. The analog output will return to the value corresponding to the percentage of the actual flow rate indicated on the main display.</td><td></td></tr>
</table>

Figure 4-2 Typical DOP and Meter Connections for Output Mode



4.4.4 Checking the Pulse Output

Introduction

The converter can be used as a pulse generator to simulate a pulse output to a counter. You can tell the convert to change its pulse output to any value between 0 to 115%.

Default setting

000.0%

Setting range

000.0% to 115.0%

Procedure

The procedure in Table 4-45 outlines the typical steps for checking the pulse output.

Table 4-45 Procedure for Checking the Pulse Output

Step	Procedure	Screen
1	Enter the Operator's mode by pressing the [**MODE**] key for more than one second. Press the [⇨] key then the [⇧] key to start the Operator's mode.	
2	Scroll to the MODE ENTER MAINTENANCE screen by pressing the [⇧] key.	
3	Enter the Maintenance mode by pressing the [⇨] key then the [⇧] key. Scroll to the pulse output check screen by pressing the [⇧] key.	12.3 % > OUTPUT CHECK P.OUT 000.0 %
4	Press the [⇨] key to move the cursor to the numerical value to be checked. The pulse of the frequency corresponding to the indication will be generated.	12.3 % > OUTPUT CHECK P.OUT 000.0 %
5	Press the [⇧] or [⇩] key to change the percentage to the desired one. In the example, a pulse of the frequency corresponding to a flow rate of 100% will be generated.	12.3 % > OUTPUT CHECK P.OUT 100.0 %
6	Press the [⇨] key to move the cursor to > symbol. The pulse will be generated according to the indication the main display.	

4.4.5 Checking the Contact Input/Output Loop

Introduction

You can check the contact input terminal status on the display by turning ON/OFF the contact input terminal of the flowmeter. You can also check the loop of the contact output signal by turning ON/OFF the contact output terminal of the flowmeter. The screen that will be displayed depends on what contact input/output functions have been selected.

Default setting

CLOSE

Setting range

CLOSE
OPEN

Procedure 1

Table 4-46 outlines the steps for checking the I/O loop when 1-contact input and 1-contact output is selected.

Table 4-46 Checking Contact I/O Loop for 1-contact Input and 1-contact Output

Step	Procedure	Screen
1	Enter the Operator's mode by pressing the [**MODE**] key for more than one second. Press the [⇨] key then the [⇧] key to start the Operator's mode.	
2	Scroll to the MODE ENTER MAINTENANCE screen by pressing the [⇧] key.	
3	Enter the Maintenance mode by pressing the [⇨] key then the [⇧] key. Scroll to the input/output loop check screen by pressing the [⇧] key.	12.3 % > ST.IN OPEN ST.OUT CLOSE
4	Press the [⇨] key to move the cursor to the CLOSE or OPEN status indication of ST.OUT (contact output).	12.3 % > ST.IN OPEN ST.OUT CLOSE

Continued on next page

4.4.5 Checking the Contact Input/Output Loop, Continued

Procedure 1, continued

Table 4-46 Checking Contact I/O Loop for 1-contact Input and 1-contact Output, Continued

Step	Procedure	Screen
5	Press the [⇧] key to select the contact output status to be checked. While this screen is being displayed, the contact status is output as indicated.	12.3 % > ST.IN OPEN ST.OUT OPEN
	The contact input status indication of OPEN or CLOSE will change according to the contact input terminal status.	12.3 % > ST.IN CLOSE ST.OUT OPEN
6	Press the [⇨] key to move the cursor to > symbol.	

Procedure 2

Table 4-47 outlines the steps for checking the input loop when 2-contact input is selected.

Table 4-47 Checking Contact Input Loop for 2-contact Input

Step	Procedure	Screen
1	Enter the Operator's mode by pressing the [**MODE**] key for more than one second. Press the [⇨] key then the [⇧] key to start the Operator's mode.	
2	Scroll to the MODE ENTER MAINTENANCE screen by pressing the [⇧] key.	
3	Enter the Maintenance mode by pressing the [⇨] key then the [⇧] key. Scroll to the contact input loop check screen by pressing the [⇧] key. There is no cursor movement with this display. The indication of OPEN or CLOSE changes only when the connected contact input terminal status changes accordingly.	12.3 % > ST.IN1 CLOSE ST.IN2 CLOSE

Continued on next page

Procedure 3

Table 4-48 outlines the steps for checking the output loop when 2-contact output is selected.

Table 4-48 Checking Contact Output Loop for 2-contact Output

Step	Procedure	Screen
1	Enter the Operator's mode by pressing the [**MODE**] key for more than one second. Press the [⇨] key then the [⇧] key to start the Operator's mode.	
2	Scroll to the MODE ENTER MAINTENANCE screen by pressing the [⇧] key.	
3	Enter the Maintenance mode by pressing the [⇨] key then the [⇧] key. Scroll to the output loop check screen by pressing the [⇧] key.	12.3 % > ST.OUT1 CLOSE ST.OUT2 CLOSE
4	Press the [⇨] key to move the cursor to the CLOSE or OPEN status indication of the contact output.	12.3 % > ST.OUT1 CLOSE ST.OUT2 CLOSE
5	Press the [⇧] key to select the contact output status to be checked. The two contact output terminals close or open simultaneously. While this screen is being displayed, the contact status is output as indicated. It is possible to change the status of only one contact output terminal.	12.3 % > ST.OUT1 OPEN ST.OUT2 OPEN
6	Press the [⇨] key to move the cursor to > symbol.	

4.4.6 Resetting the Internal Counter

Introduction

You can reset the internal counter of a pulse output flowmeter. The built-in counter indicates “0000000000” at power-up.

ATTENTION The flowrate display indication must represent TOTAL to initiate this function.

Procedure

Table 4-49 outlines the steps for resetting a flowmeter’s internal counter.

Table 4-49 Procedure for Resetting the Built-in Flow Counter

Step	Procedure	Screen
1	Enter the Operator’s mode by pressing the [**MODE**] key for more than one second. Press the [⇨] key then the [⇧] key to start the Operator’s mode.	
2	Scroll to the internal counter reset screen by pressing the [⇧] key.	123456 TOTAL *CNT-RESET READY PREV 0000000000
3	Press the [⇨] key once.	123456 TOTAL *CNT-RESET READY PREV 0000000000
4	Press the [⇧] key to reset the counter.	0.0 TOTAL *CNT-RESET ON PREV 0000123456
	About 0.5 seconds later, the ON message will return to READY, and resetting is completed.	0.0 TOTAL *CNT-RESET READY PREV 0000123456

4.4.7 Setting/Changing the Preset Value of the Internal Counter

Introduction

You can change the contact output status of a pulse output flowmeter from H to L or from L to H when the internal counter reaches a preset value.

ATTENTION The flowrate display indication must represent TOTAL and the totalizer function set for PRESET COUNTER to initiate this function.

Procedure

Table 4-50 outlines the steps for setting/changing the preset value of a flowmeter's internal counter.

Table 4-50 Procedure for Setting/Changing the Preset Value of the Internal Counter

Step	Procedure	Screen
1	Enter the Operator's mode by pressing the [**MODE**] key for more than one second. Press the [⇨] key then the [⇧] key to start the Operator's mode.	
2	Scroll to the internal counter preset value screen by pressing the [⇧] key.	123456 TOTAL *COUNTER PRESET 0000200000
3	Press the [⇨] key to move the cursor to the desired number. EXAMPLE: Moved cursor to "2" position by pressing the [⇨] key five times.	123456 TOTAL *COUNTER PRESET 0000200000
4	Press the [⇧] or [⇩] key to set the desired number.	123456 TOTAL *COUNTER PRESET 0000500000
5	After counter reset value has been changed, press the [⇨] key to move the cursor to back to the * symbol.	

Section 5 – Configuration, Start-up, and Operation with SFC

5.1 Overview

Section contents

This section contains the following topics:

About this section

This section applies to the user of the SFC Smart Field Communicator as the MagneW 3000 ***PLUS*** interface. The section covers connecting the SFC, how to configure, start-up, and operate the MagneW 3000 ***PLUS*** using the SFC only.

- *If you are using the DOP to configure and operate the flowmeter*, refer to Section 4.
- *If you are using the Universal Station to configure and operate the flowmeter*, refer to Appendix A.

Compatibility

ATTENTION If you are using an SFC model STS103 with an earlier software version than 5.0 or a model STS102, Honeywell strongly recommends that you use the DOP to configure the MagneW 3000 ***PLUS***, as some functions will be limited. There are some parameters that can be changed at the SFC, but if they are downloaded to the flowmeter, output errors occur.

5.2 SFC Smart Field Communicator

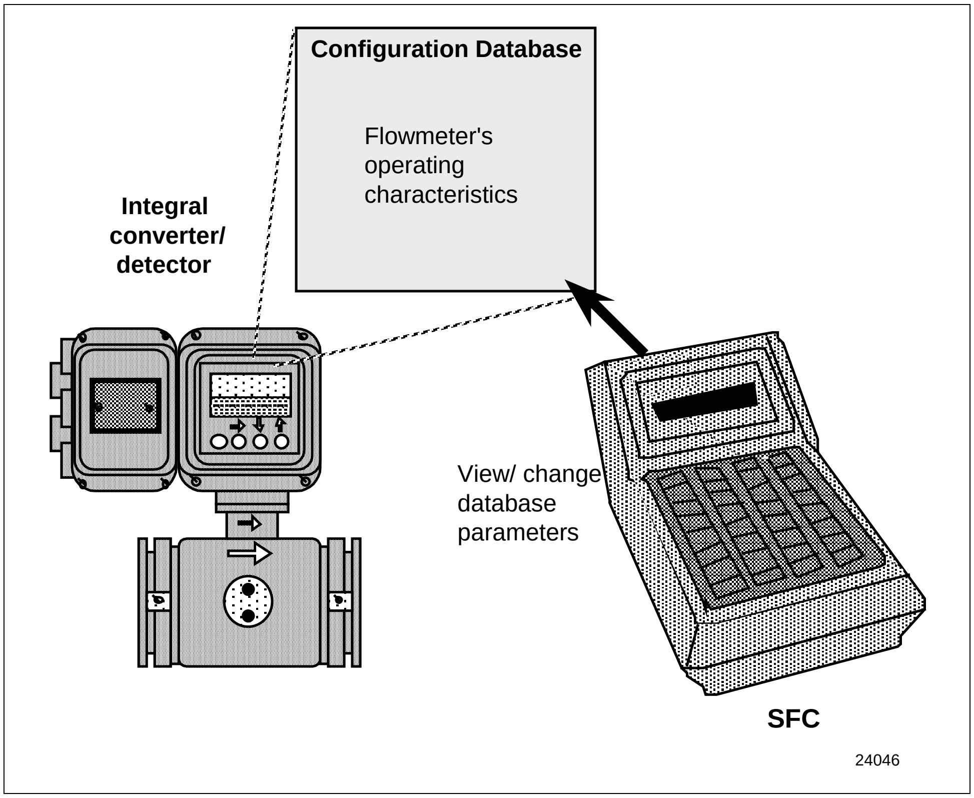
5.2.1 Communications Summary

Introduction

If your flowmeter is configured for DE/SFC communications with external power supply, you can use an SFC to change selected parameters within a given transmitter's database.

Figure 5-1 shows a graphic summation of the DE/SFC configuration process.

Figure 5-1 Summary of DE/SFC Configuration Process



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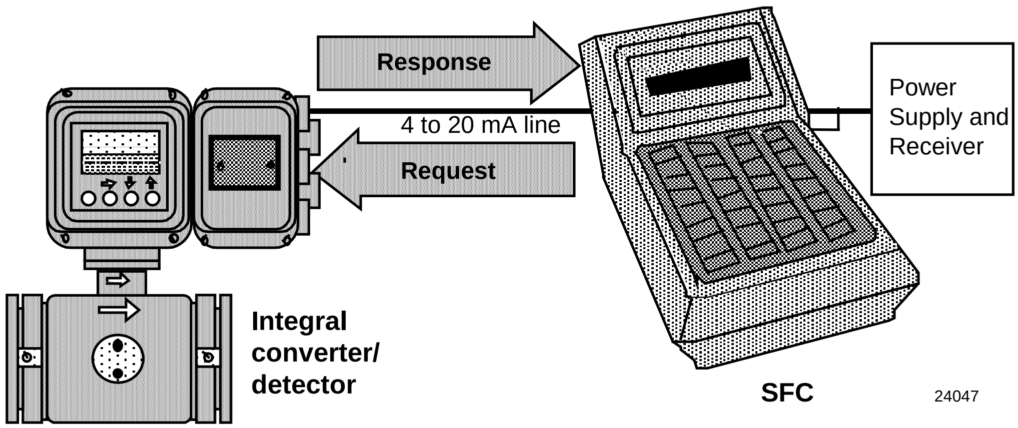
Request/response message

The portable, battery-powered SFC serves as the common communication interface device for all of Honeywell's family of smart transmitters with DE communications capability. It communicates with a transmitter through serial digital signals over the 4 to 20 milliampere line used to power the current output loop. A request/response format is the basis for the communication operation. The transmitter's microprocessor receives a communication signal from the SFC, identifies the request, and sends a response message.

Figure 5-2 shows a simplified view of the communication interface provided by an SFC.

Figure 5-2 Typical SFC Communication Interface



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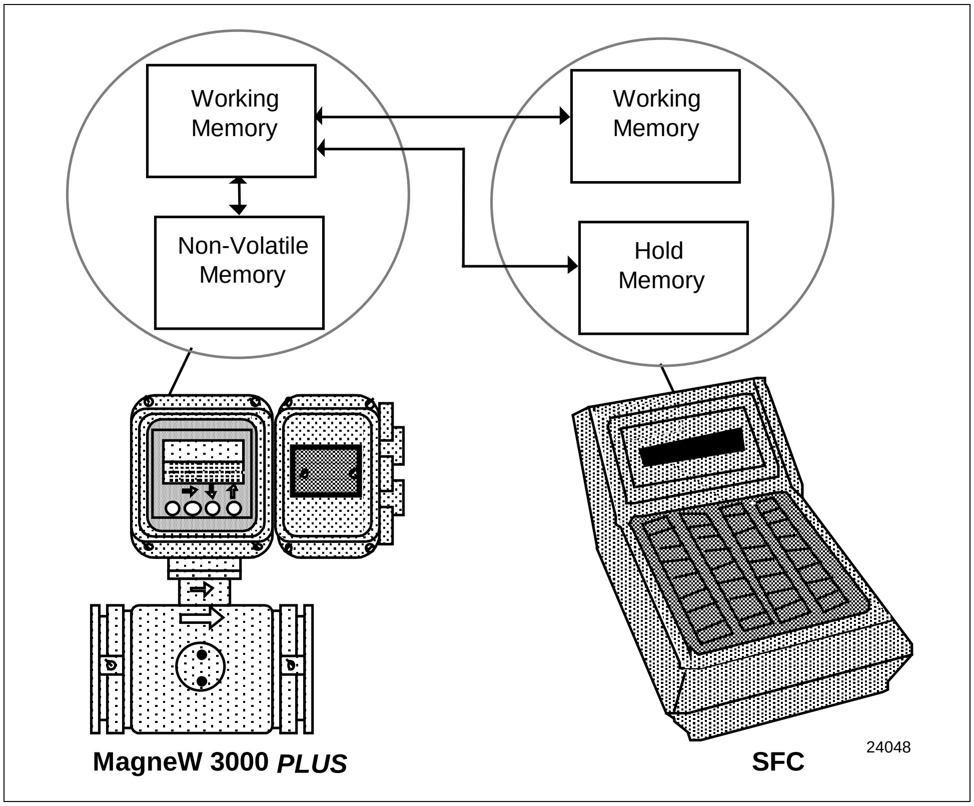
SFC and flowmeter memories

Figure 5-3 illustrates a simplified view of the SFC and MagneW 3000 ***PLUS*** memories.

Figure 5-3 SFC and MagneW 3000 ***PLUS*** Memories



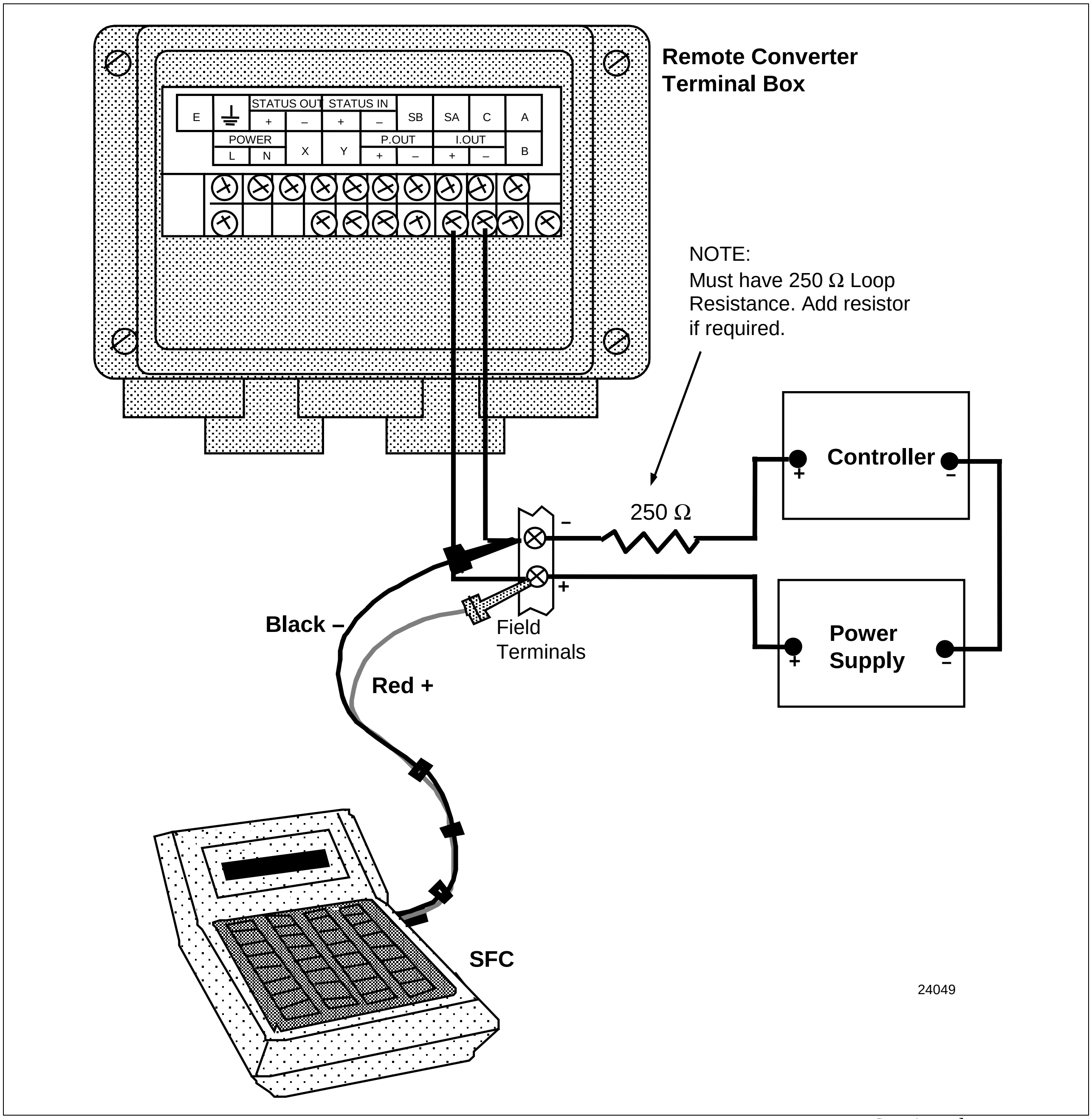
5.2.2 Operating the SFC

Connecting SFC

Using the leads with either the alligator clips or the easy-hooks supplied with the SFC, you connect the SFC directly to current signal terminals on the converter's terminal block or at any convenient location in the 4 to 20 milliampere line. Observing polarity, connect the red lead to positive and the black lead to negative.

Figure 5-4 shows typical SFC connections across field terminals for current output loop wiring to converter.

Figure 5-4 Typical SFC Connections



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5.2.2 Operating the SFC, Continued

SFC connection rules

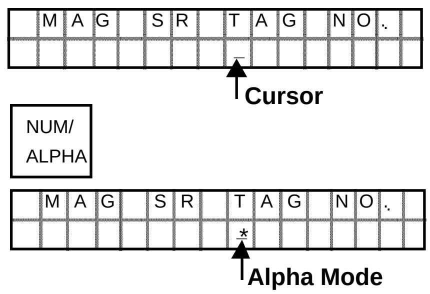
- Always plug the SFC leads into the jack on the SFC before you connect them to the converter.
- Use this formula to find the maximum filter capacitance allowed across the sense resistor (250 ohm minimum) for SFC communications to work.

$$C\ (\mu F) = \frac{\text{Rsense (ohms)}}{104}$$

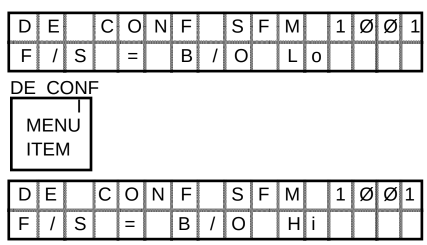
SFC interface characteristics

Keep three basic interface characteristics in mind when you use the SFC to configure a flowmeter.

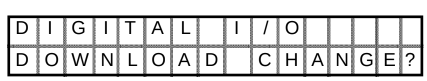
- If the displayed prompt contains a cursor, you can key in a number or an alphabetic character in that space. However, to key in an alphabetic character, you must first press the [**NUM/ALPHA**] key to initiate the alphabet selection or alpha mode.
  - EXAMPLE:



- If the displayed prompt includes an equal sign (=), you can make another selection after the equal sign by pressing the [**MENU ITEM**] key to call up the next selection Note that you can use the [▲ **NEXT**] key to call up the next parameter or the [▼ **PREV**] key to return to the previous parameter.
  - EXAMPLE:



- If the displayed prompt contains a question mark (?), you can initiate the action in question by pressing the [**ENTER**] key to answer yes or abort it by pressing the [**CLR**] key to answer no.
  - EXAMPLE:



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5.2.2 Operating the SFC, Continued

SFC interface characteristics, continued

To initiate download of configuration changes, press NON-VOL [ENTER (Yes)]

- To abort download of configuration changes, press [CLR (NO)]

Identifying mode of operation and software version

Before configuring a flowmeter, it is a good idea to identify the flowmeter's mode of operation and check the version of software being used in the SFC and the flowmeter.

Table 5-1 outlines the steps for quickly identifying the flowmeter's mode of operation and checking software versions of the SFC and the flowmeter.

ATTENTION If the prompt "IN LOCAL MODE" appears in the SFC when trying to communicate with the flowmeter, it means the flowmeter is equipped with a DOP and the DOP is in a mode other than Measuring mode (its default). You can only use the SFC to overwrite data in the flowmeter's memory when the DOP is in its Measuring mode. Press the [**MODE**] key on the DOP to return it to its Measuring mode.

Continued on next page

Identifying mode of operation and software version, continued

Table 5-1 Identifying Mode of Operation and Checking Software Versions

Step	Press Key	Read Display or Action	Description
1		Slide power switch on left side of SFC to ON position.	SFC runs its self check and displays initial prompt.
		PUT LOOP IN MAN	If this prompt appears, flowmeter is in Analog mode of operation. This is the factory default mode of operation setting. Put your control loop in the manual mode of operation to avoid signal bumps caused by SFC communications.
		OR	
		DE–XMTR PRESS ID	If this prompt appears, flowmeter is in Digital (DE) mode of operation.
2	DE READ A ID	TAG NO. TRIPS SECURED??	Be sure any switches that may trip alarms or interlocks associated with analog loop are secured or turned off. Go to Step 3.
		OR Go to Step 4	This prompt does not appear for flowmeters operating in DE mode. See DE flowmeter display response in Step 4.
3	NON-VOL ENTER (Yes)	Confirms that "TRIPS" are secured. Go to Step 4 for display response.	Required for flowmeters operating in analog mode only.
4		TAG NO. SFC WORKING. . .	Message exchange is taking place. Note that communications with flowmeter are blocked until [**ID**] key is pressed.
		Analog MAG SR TAG NO. XXXXXXXX	Flowmeter is in analog transmission mode. "MAG" lets you know that you have established communication with a MagneW 3000 flowmeter and "SR" tells you that it is configured for Single Range operation. Note that "DR" appears when flowmeter is configured for Dual Range operation. Eight X's means no tag number has been assigned to this flowmeter. Factory default.
		OR	
		Digital DE–XMTR TAG NO. XXXXXXXX	Transmitter is in digital (DE) transmission mode. Eight X's means no tag number has been assigned to this flowmeter. Factory default.

Continued on next page

Identifying mode of operation and software version, continued

Table 5-1 Identifying Mode of Operation and Checking Software Versions, Continued

Step	Press Key	Read Display or Action	Description
5	^ SHIFT	MAG SR TAG NO. SHIFT –	Initiates shift key selection.
	SW VER X 3	S/W NO. XXXXXXXX SFC=3.1 XMTR=3.Ø	Both SFC and XMTR software versions appear in display. Note that only SFC version appears when SFC is not connected to flowmeter.
6	CLR (NO)	MAG SR XXXXXXXX READY...	Exit function. SFC is “READY” for next operation. Note that tag number for flowmeter will also appear in top row of display when assigned.

Analog and DE modes

In the analog transmission mode, the flowmeter sends a proportional 4 to 20 milliampere output signal that can be used as a compatible analog input signal to a controller or a recorder in the control room

A flowmeter in the digital (DE) mode can communicate in a direct digital fashion with a Universal Station in Honeywell’s TPS system. The digital signal can include process variable as well as configuration database data depending upon the broadcast format selected during configuration.

Software version compatibility

SFC model STS103 with software version 5.0 or greater is fully compatible with MagneW 3000 ***PLUS*** flowmeter. SFC model STS103 with software version earlier than 5.0 and model STS102 will operate with the MagneW 3000 ***PLUS*** flowmeters, but some functions will be limited. The SFC will display the INVALID REQUEST message if you try to invoke a function that is not supported by the flowmeter’s software.

ATTENTION If you are using an SFC model STS103 with software version earlier than 5.0 or a model STS102, Honeywell recommends that you use the DOP to configure the MagneW 3000 ***PLUS***, as some functions will be limited. These functions can be changed at the SFC, but if they are downloaded to the flowmeter, output errors can occur.

5.2.2 Operating the SFC, Continued

Changing mode of operation

If you need to change your flowmeter's mode of operation, use the steps in Table 5-2 to change the mode from analog to digital or digital to analog.

Table 5-2 Changing Mode of Operation

Step	Press Key	Read Display or Action	Description
1	[^ SHIFT]	MAG SR XXXXXXXX SHIFT –	Initiates shift key selection. Note that flowmeter tag number appears in top row instead of Xs when assigned.
	A <–>DE [Q ←]	A/DE XXXXXXXX CHNG TO DE?	Asks if you want to change to DE (digital) mode. *If you want to change mode,* go to Step 2. *If you do not want to change mode,* press [**CLR**] key to exit function.
		OR	
		A/DE XXXXXXXX CHNG TO ANALOG?	Asks if you want to change to analog mode. *If you want to change mode,* go to Step 2. *If you do not want to change mode,* press [**CLR**] key to exit function.
2	NON-VOL [ENTER (Yes)]	A/DE XXXXXXXX ARE YOU SURE?	Prompt asks for confirmation of mode change.
3	NON-VOL [ENTER (Yes)]	A/DE XXXXXXXX SFC WORKING...	Message exchange is working.
		A/DE XXXXXXXX DE XMTR	Mode of operation is now DE (digital).
		OR	
		A/DE XXXXXXXX ANALOG XMTR	Mode of operation is now analog.
		MAG SR XXXXXXXX READY...	Ready for next function.
			ATTENTION The prompt IN LOCAL MODE may appear momentarily in display when data change is entered in memory.

5.3 Configuration with the SFC

Introduction

Each MagneW 3000 ***PLUS*** includes a configuration database which defines its particular operating characteristics. Depending upon the features you specified when you ordered your flowmeter and the particular characteristics of your measurement application, you can use the integral Digital Operator Panel (DOP), an SFC, or displays at the Universal Station to change selected parameters within a given flowmeter's database to alter those operating characteristics. This process of viewing and/or changing database parameters is called "configuration".

ATTENTION SFC model STS103 with software version 5.0 or greater is fully compatible with MagneW 3000 ***PLUS*** flowmeters. If you are using an earlier model, or an STS102 model, you should use the DOP to configure the flowmeter to avoid output errors.

What to configure

Table 5-3 summarizes the parameters that are included in the configuration database for a MagneW 3000 ***PLUS*** in either the analog or DE mode of operation. These parameters are very similar to the ones listed in Table 4-12 for the DOP interface, but they are repeated here to illustrate those prompts that are unique to the SFC interface.

ATTENTION Since the SFC is compatible with other Honeywell smart transmitters, be sure all configuration data applies to a magnetic flowmeter.

Table 5-3 Summary of SFC Configuration Parameters

Configuration Data	Setting or Selection	Page No.
Transmitter Tag Number	Up to eight characters	177
Damping Time Constant	Any one of these value selections in seconds: 0.0 2.0 5.0 100 0.5 3.0 10 1.0 4.0 50	179

Continued on next page

What to configure, continued

Table 5-3 Summary of SFC Configuration Parameters, Continued

Configuration Data	Setting or Selection	Page No.
Unit of Measurement	<table><tr><th>If type of flow measurement is…</th><th>Then engineering unit selections are…</th></tr><tr><td>Velocity</td><td>m/sec (meters per second) ft/sec (feet per second)</td></tr><tr><td>Volume Flow</td><td>m^3/h (cubic meters per hour) gal/h (gallons per hour) l/h (liters per hour) cc/h (cubic centimeters per hour) m^3/min (cubic meters per minute) gal/min (gallons per minute) l/min (liters per minute) cc/min (cubic centimeters per minute) m^3/day (cubic meters per day) gal/day (gallons per day) Kgal/day (kilogallons per day) bbl/day (barrels per day) m^3/sec (cubic meters per second)</td></tr><tr><td>Mass Flow</td><td>Kg/min (kilograms per minute) lb/min (pounds per minute) Kg/h (kilograms per hour) lb/h (pounds per hour) Kg/sec (kilograms per second) lb/sec (pounds per second) t/h (tonnes per hour) t/min (tonnes per minute) t/sec (tonnes per second) g/h (grams per hour) g/min (grams per minute) g/sec (grams per second) ton/h (tons per hour) ton/min (tons per minute) ton/sec (tons per second)</td></tr></table> **ATTENTION** The selected engineering unit is saved as “user preferred” in the flowmeter. This means that the engineering unit is automatically recalled and used for value displays whenever the SFC is connected.	180

Continued on next page

What to configure, continued

Table 5-3 Summary of SFC Configuration Parameters, Continued

Configuration Data	Setting or Selection	Page No.
Type of Flow Measurement	VELOCITY VOLUME FLOW MASS FLOW (Requires entry of specific gravity rating for fluid.) **ATTENTION** This selection determines what engineering units are available for value displays when [**UNITS**] key is pressed.	183
Range and Flowrate Display Data	Define these converter functions, as applicable. Range Function: SINGLE AUTODUAL EXT DUAL AUTO +/– EXT +/– Hysteresis: Set hysteresis for automatic transfer point between two ranges. Setting Range: 0 to 20% Low-Flow Cutoff: Enable or disable low-flow cutoff and set cutoff point as applicable. OFF (disable) ON (enable) – Setting Range = 0 to 10% Flowrate Display: Select converter's flowrate in DOP display reading to represent one of these selections. % FLOW RATE TOTAL NO DISPLAY **ATTENTION** The range function can be specified when the flowmeter is ordered and then set at the factory before the flowmeter is shipped. If the range function was not specified on the order, you must set it through the SFC. Note that other configuration selections are automatically restricted based on the range selection and what hardware features were ordered. See Table 5-10 for a summary of SFC configuration restrictions.	185

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What to configure, continued

Table 5-3 Summary of SFC Configuration Parameters, Continued

Configuration Data	Setting or Selection	Page No.
Detector Data	Confirm this configuration data for detector. Excitation Current: Matches excitation current rating specified on detector's nameplate—usually between 200 and 300 milliamperes. Detector Model: Select code that matches detector model. KID All smart models except submersible. NNM Conventional models – No longer supplied. NNK Submersible models only. (Can specify up to 9 dummy submerged detectors to be used in conjunction with your real submersible model.) Detector Size: Matches detector size based on nominal diameter in millimeters. 002.5 040.0 200.0 500.0 005.0 050.0 250.0 600.0 010.0 080.0 300.0 700.0* 015.0 100.0 350.0 025.0 150.0 400.0	191
High and Low Alarm Set Points	Define high and low alarm set points when status output contact (DO) is configured for ALARM function. –115 to +115% of range.	193
Failsafe Modes for Outputs	Select failsafe mode for these outputs, as applicable. Current Output: LOW HOLD HIGH Pulse Output: LOW HOLD	195

*If display reads "TYPE DIAMETER MISMATCH" this pipe diameter is not currently supported.

Continued on next page

What to configure, continued

Table 5-3 Summary of SFC Configuration Parameters, Continued

Configuration Data	Setting or Selection	Page No.
Contact Input/Output	Define status input and status output contact functions, as applicable. Contact Input: NOT USED 0% LOCK AUTO–ZERO CNTR RESET EXT RANGE Contact Output: NOT USED ALARM RANGE ID PRESET MTCH Contact Output Status: CLOS (Normally Closed) OPEN (Normally Open) **ATTENTION** The contact input/output functions can be specified when the flowmeter is ordered and then set at the factory before the flowmeter is shipped. If the contact input/output functions were not specified on the order, you must set them through the SFC. Note that other configuration selections are automatically restricted based on the range selection and what hardware features were ordered. See Table 5-10 for a summary of SFC configuration restrictions.	197

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What to configure, continued

Table 5-3 Summary of SFC Configuration Parameters, Continued

Configuration Data	Setting or Selection	Page No.
Totalizer and Pulse Output Data	Configure and monitor totalizer (built-in counter) and pulse output functions. Totalizer Function: NO PULSE CARD / ADD / PRESET / +/– DIFF Engineering Units: Select unit that is applicable for your per pulse measurement and pulse counting instrument. Units l/p (liters per pulse) cc/p (cubic centimeters per pulse) BRL/p (barrels per pulse) kgal/p (kilogallons per pulse) Gal/p (gallons per pulse) mGal/p (milligallons per pulse) m^3/p (cubic meters per pulse) Pulse Weight: Define pulse scaling for pulse output per pulse engineering units. 0.0001 to 99999 Pulse Width: Select pulse width (duration) to define pulse duty ratio in percent. 0.3 7.0 30 0.5 10 50 1.0 15 100 Pulse Dropout: Set pulse dropout point for pulse output. 02 to 10% of range. **ATTENTION** For dual range or direct/reverse range applications, you can also check the pulse scaling and pulse width for the second or reverse range.	201
LRV (Lower Range Value) (Process input for 4 mA dc (0%) output)	LRV is fixed at 0 (zero) and cannot be changed. Zero percent output means that measured fluid is stationary.	—

Continued on next page

What to configure, continued

Table 5-3 Summary of SFC Configuration Parameters, Continued

<table>
<tr><th>Configuration Data</th><th>Setting or Selection</th><th>Page No.</th></tr>
<tr><td>URV 1
(Upper Range Value)
(Process input for 20 mA dc (100%) output)</td><td>Key in desired URV (span) for single range or range 1 of a dual range flowmeter through SFC keyboard.</td><td>210</td></tr>
<tr><td>URV 2 1
(Upper Range Value)
(Process input for 20 mA dc (100%) output)</td><td>Key in desired URV (span) for range 2 of a dual range flowmeter through SFC keyboard.</td><td>210</td></tr>
<tr><td colspan="3">The following parameters are for transmitters in DE mode of operation only.</td></tr>
<tr><td>Mode of Output Signal Indication</td><td>Any one of these selections based on control system information needs:
<table>
<tr><td>Single Range</td><td>Sends the PV value corresponding to the flowmeter’s working range (PVw) to the TPS system for display. For systems using STDC card or STI IOP module.</td></tr>
<tr><td>Dual Range (STDC)</td><td>Sends the PV values corresponding to the flowmeter’s full range (PVt) and working range (PVw) measurements to the TPS system for display. For systems using STDC card only.</td></tr>
<tr><td>Single Rng W/SV</td><td>Sends PV value corresponding to the flowmeter’s working range (PVw) and totalizer value to the TPS system for display. For systems using STDC card or STI IOP module.</td></tr>
</table></td><td>216</td></tr>
<tr><td>Message Format</td><td>Choose one of these broadcast types for data transmission to the digital control system:
<table>
<tr><td>w/oDB (4 Byte)</td><td>Byte 1 is output signal mode
Bytes 2 to 4 are PV value
<table><tr><th>1</th><th>2</th><th>3</th><th>4</th></tr><tr><td>FLAG</td><td>PV</td><td>PV</td><td>PV</td></tr></table></td></tr>
<tr><td>w/DB (6 Byte)</td><td>Byte 1 is output signal mode
Bytes 2 to 4 are PV value
Byte 5 is data type identifier (LRV, URV span, etc.)
Byte 6 is data being sent
<table><tr><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th></tr><tr><td>FLAG</td><td>PV</td><td>PV</td><td>PV</td><td>ID</td><td>DB</td></tr></table></td></tr>
</table>
ATTENTION The approximate rates of transmission in repeats per second are:
<table><tr><th>Data</th><th>4 - Byte</th><th>6 - Byte</th></tr><tr><td>PV value</td><td>3 rpts/sec</td><td>2.5 rpts/sec</td></tr></table></td><td>217</td></tr>
</table>

Continued on next page

What to configure, continued

Table 5-3 Summary of SFC Configuration Parameters, Continued

<table>
<tr><th>Configuration Data</th><th>Setting or Selection</th><th>Page No.</th></tr>
<tr><td>Failsafe Mode</td><td>
ATTENTION An STI IOP module has built-in failsafe capabilities and ignores this parameter.
Any one of the following selections set the failsafe action for the STDC card in the controller—not the flowmeter. Note that there are two types of failsafe modes—one is for the input side of the STDC card and the other is for the output side. Each type is available with either low limit, high limit or hold burnout setting.
<table>
<tr><th>Type of Failsafe Mode Setting</th><th>Selection</th><th>Burnout</th></tr>
<tr><td>STDC input side setting</td><td>F/S = B/O Lo</td><td>Low Limit</td></tr>
<tr><td>STDC input side setting</td><td>F/S = B/O Hi</td><td>High Limit</td></tr>
<tr><td>STDC input side setting</td><td>F/S = LKG</td><td>Hold</td></tr>
<tr><td>STDC output side setting*</td><td>F/S = FSO, B/O Lo</td><td>Low Limit</td></tr>
<tr><td>STDC output side setting*</td><td>F/S = FSO, B/O Hi</td><td>High Limit</td></tr>
<tr><td>STDC output side setting*</td><td>F/S = FSO, B/O Hi</td><td>Hold</td></tr>
</table>
*The STDC input signal is held at the value read just before the flowmeter failed.
F/S = Failsafe
B/O = Burnout
LKG = Last Known Good Value
FSO = Freeze Slot Output
</td><td>218</td></tr>
</table>

5.3.1 Quick Set-up

Introduction

Table 5-4 Gives procedures to be performed for six instructions which will allow you to get the flowmeter configured and running quickly. Page references are provided for additional details on each procedure, if needed.

Table 5-4 Quick Set-up Procedure

Instruction	**Procedure**			**Page No.**
	Press	**Display** (example only)	**Description**	
Set the damping value.	DAMP (C) ▲ NEXT (H) OR ▼ PREV (L)	DAMP X (tag no.) X.X SECONDS	Present damping time in seconds is displayed. To change the value, press the [▲ **NEXT**] or [▼ **PREV**] key to select the desired damping value.	179
Set the display engineering parameter.	CONF (B)	SFM CONFIG UNITS KEY?	Calls up the configuration function.	185
	▲ NEXT (H)	SFM CONFIG RANGE CONFIG?	Calls up the range configuration function.	
	ENTER (Yes)	SFM CONFIG RANGE = SINGLE	Calls up first range selection.	
	▲ NEXT (H)	RANGE CONFIG DISP = %	Press [▲ **NEXT**] key as often as necessary to scroll to the flowrate selection display.	
	MENU ITEM (I)		Press [**MENU ITEM**] key to scroll to desired flowrate display selection.	
	ENTER (Yes)		Enters change in SFC.	
	ENTER (Yes)		Downloads changes into flowmeter.	

Continued on next page

Introduction, continued

Table 5-4 Quick Set-up Procedure, Continued

Instruction	Procedure			Page No.
	Press	Display (example only)	Description	
Set the ID tag.	[ID]	TAG NO. TRIPS SECURED??	Be sure switches that may trip alarms or interlocks associated with analog loop are secured or turned off. **Appears only for analog mode.**	177
	[ENTER (Yes)]	MAG SR TAG NO. XXXXXXXX	Confirms that TRIPS are secured and establishes transmitter communications. **For DE mode**, prompt would show DE - XMTR in top row.	
	[NUM ALPHA] as needed plus alpha-numeric characters		Press the [**NUM ALPHA**] key as necessary to activate either the alpha or numeric SFC keyboard mode. Enter any combination of eight letters (A to Z), numbers (0 to 9), - (dash), / (slash), space, or period.	
	[ENTER (Yes)]		Loads tag number into transmitter's working memory.	
	[SHIFT] [ID]		**For DE mode**, uploads the flowmeter's configuration database to the control system.	

Continued on next page

Introduction, continued

Table 5-4 Quick Set-up Procedure, Continued

Instruction	Procedure			Page No.
	Press	**Display** (example only)	**Description**	
Confirm/set the excitation and detector diameter values.	CONF	SFM CONFIG UNITS KEY?	Calls up the configuration function.	191
	▲ NEXT	SFM CONFIG DETECTOR CONFIG?	Press [▲ **NEXT**] key as necessary to scroll to the detector configuration display.	
	ENTER (Yes)	DETECTOR CONFIG 300.0 mA(EX)	Calls up excitation parameter. This should match the rating specified on the detector's nameplate. (If not, key in new value.)	
	ENTER (Yes)	DETECTOR CONFIG ENTERED IN SFC DETECTOR CONFIG TYPE KID	Enters change in SFC and calls up next parameter.	
	▲ NEXT	DETECTOR CONFIG DIAMETER = 50mm	Calls up detector diameter display.	
	MENU ITEM		*If detector size is incorrect,* press [**MENU ITEM**] as needed to scroll to desired size.	
	ENTER (Yes)		Enters change in SFC.	
	ENTER (Yes)		Downloads change to flowmeter.	

Continued on next page

Introduction, continued

Table 5-4 Quick Set-up Procedure, Continued

Instruction	Procedure			Page No.
	Press	Display (example only)	Description	
Set the span and engineering units.	[URV 100%]	URV 1 SFM 1001 1200.3 gal/min	Present URV (span) setting for range 1. Key in desired URV setting.	210
	[SHIFT] [URV 100%]	URV 2 1 SFM 1001 3.2108 gal/min	Present URV (span) setting for range 2. Key in desired URV setting. **This step not necessary for single range operation.**	
	[ENTER (Yes)]		Enters change in SFC.	
	[SHIFT] [ENTER (Yes)]		Downloads change to flowmeter.	
Perform a zero adjustment.	[SHIFT] [OUT-PUT]	INPUT 1 (tag no.) 0.0000 Kg/h	The detector must be filled with stationary fluid (flow velocity less than 0.2 m/s).	223
	[COR-RECT]	INPUT 1 (tag no.) ZERO INPUT?	Confirmation required for request to perform a zero input. (Press the [**CLR**] key to exit.)	
	[ENTER (Yes)]	INPUT 1 (tag no.) INPUT ZEROED	Zero adjustment is done automatically within approximately 20 seconds after pressing the [**ENTER**] key. When the INPUT ZEROED display appears, the zero point adjustment is complete.	

5.3.2 Entering Tag Number

Entering tag number The procedure in Table 5-5 shows how to enter a tag number (e.g., SFM 1001) into the flowmeter’s configuration database.

Table 5-5 Entering Tag Number

Step	Press Key	Read Display or Action	Description
1	DE READ A ID	TAG NO. TRIPS SECURED??	Be sure any switches that may trip alarms or interlocks associated with analog loop are secured or turned off. *This prompt only appears for transmitters in analog mode.*
2	NON-VOL ENTER (Yes)	TAG NO. SFC WORKING... MAG SR TAG NO. XXXXXXXX	Confirms that “TRIPS” are secured and establish transmitter communications **ATTENTION** This procedure also applies for flowmeters in DE mode. The prompt shows DE - XMTR instead of MAG SR in top row.
	NUM/ ALPHA	MAG SR TAG NO. *	Puts SFC keyboard into alpha mode. Activates alphabetic characters in upper right hand corner of keys.
3	S 5 F URV 100% M → SCR PAD → ■	MAG SR TAG NO. S * MAG SR TAG NO. SF * MAG SR TAG NO. SFM * MAG SR TAG NO. SFM *	EXAMPLE: Key in S, F, M, and space as first characters in tag number. **ATTENTION** Cursor moves automatically after key press.
4	NUM/ ALPHA	MAG SR TAG NO. SFM _	Takes SFC keyboard out of alpha mode and put it into numeric mode.

Continued on next page

5.3.2 Entering Tag Number, Continued

Entering tag number, continued

Table 5-5 Entering Tag Number, Continued

Step	Press Key	Read Display or Action	Description
5	[1 V]	MAG SR TAG NO. SFM 1_	EXAMPLE: Key in “1001” as numbers in Tag number.
	[0 Z]	MAG SR TAG NO. SFM 1Ø_	
	[0 Z]	MAG SR TAG NO. SFM 1ØØ_	
	[1 V]	MAG SR TAG NO. SFM 1ØØ1	
6	NON-VOL [ENTER (Yes)]	MAG SR TAG NO. SFC WORKING... MAG SR TAG NO. SFM 1ØØ1	Message exchange is working. Loads tag number into transmitter’s working memory.

ATTENTION If the flowmeter is in the DE mode, press the [**SHIFT**] key and then the [**ID**] key to upload (read) the configuration database currently in converter EPROM before you make any other configuration entries.

- EXAMPLE:

Press Key	Display
[SHIFT ^]	DE–XMTR TAG NO. SHIFT–
DE READ [ID A]	TAG NO. SFC WORKING–.33%
	MAG SR TAG NO. SFM 1ØØ1

5.3.3 Adjusting Damping Time

Adjusting damping time

You can adjust the damping time to reduce the output noise. We suggest that you set the damping to the largest time interval that the control system can accept.

ATTENTION The damping time sets the unit of time—establishing the upper limit of frequency response and the response time characteristics of the flowmeter. This is useful in reducing the noise effect on the output signal or widely varying PVs.

The procedure in Table 5-6 outlines the keystrokes used to adjust the damping time.

Table 5-6 Adjusting Damping Time

Step	Press Key	Read Display or Action	Description
1	[C DAMP]	DAMP 1 SFM 1ØØ1 1.Ø SECONDS	Present damping time in seconds
2	[▲ H NEXT]	DAMP 1 SFM 1ØØ1 SFC WORKING... DAMP 1 SFM 1ØØ1 2.Ø SECONDS	Message exchange is working. Next highest damping time value in seconds. **ATTENTION** The [▲ **NEXT**] key raises the setting while the [▼ **PREV**] key lowers the setting. Or, you can key in a number that will be converted to closest damping value listed in Table 5-3.
3		Repeat Step 2 until display shows desired value. DAMP 1 SFM 1ØØ1 3.Ø SECONDS	EXAMPLE: Flowmeter's damping time is now set to three seconds. **ATTENTION** You do not need to press the [**ENTER**] key to store the damping time in the flowmeter's memory.

5.3.4 Selecting Unit of Measurement

Selecting unit of measurement

You can choose to have the flowmeter measurements displayed in one of the pre-programmed engineering units in the SFC depending upon type of flow measurement configuration.

ATTENTION These units will not be displayed on the MagneW 3000 ***PLUS***.

Table 5-7 lists the pre-programmed units that you can select.

Table 5-7 Pre-Programmed Engineering Units for Selection

If type of flow measurement (UNITS KEY) configuration is . . .	And you want URV, LRV, etc. displayed in …	THEN sequentially press [D UNITS] key until display shows…
VELOCITY	meters per second	UNITS 1 SFM 1ØØ1 m/sec
	feet per second	UNITS 1 SFM 1ØØ1 ft/sec
VOLUME FLOW	cubic meters per hour	UNITS 1 SFM 1ØØ1 m3/h
	gallons per hour	UNITS 1 SFM 1ØØ1 gal/h
	liters per hour	UNITS 1 SFM 1ØØ1 l/h
	cubic centimeters per hour	UNITS 1 SFM 1ØØ1 cc/h
	cubic meters per minute	UNITS 1 SFM 1ØØ1 m3/min
	gallons per minute	UNITS 1 SFM 1ØØ1 gal/min
	liters per minute	UNITS 1 SFM 1ØØ1 l/min
	cubic centimeters per minute	UNITS 1 SFM 1ØØ1 cc/min
	cubic meters per day	UNITS 1 SFM 1ØØ1 m3/day
	gallons per day	UNITS 1 SFM 1ØØ1 gal/day

Continued on next page

Selecting unit of measurement, continued

Table 5-7 Pre-Programmed Engineering Units for Selection, Continued

If type of flow measurement (UNITS KEY) configuration is . . .	And you want URV, LRV, etc. displayed in …	THEN sequentially press D UNITS key until display shows…
VOLUME FLOW (continued)	kilogallons per day	UNITS 1 SFM 1ØØ1 Kgal/day
	barrels per day	UNITS 1 SFM 1ØØ1 bbl/day
	cubic meters per second	UNITS 1 SFM 1ØØ1 m3/sec
MASS FLOW*	kilograms per minute	UNITS 1 SFM 1ØØ1 kg/min
	pounds per minute	UNITS 1 SFM 1ØØ1 lb/min
	kilograms per hour	UNITS 1 SFM 1ØØ1 kg/h
	pounds per hour	UNITS 1 SFM 1ØØ1 lb/h
	kilograms per second	UNITS 1 SFM 1ØØ1 kg/sec
	pounds per second	UNITS 1 SFM 1ØØ1 lb/sec
	tonnes per hour	UNITS 1 SFM 1ØØ1 t/h
	tonnes per minute	UNITS 1 SFM 1ØØ1 t/min
	tonnes per second	UNITS 1 SFM 1ØØ1 t/sec
	grams per hour	UNITS 1 SFM 1ØØ1 g/h

*Mass flow requires density input.

Continued on next page

Selecting unit of measurement, continued

Table 5-7 Pre-Programmed Engineering Units for Selection, Continued

If type of flow measurement (UNITS KEY) configuration is . . .	And you want URV, LRV, etc. displayed in …	THEN sequentially press [D UNITS] until display shows…
MASS FLOW* (continued	grams per minute	UNITS 1 SFM 1ØØ1 g/min
	grams per second	UNITS 1 SFM 1ØØ1 g/sec
	tons per hour	UNITS 1 SFM 1ØØ1 ton/h
	tons per minute	UNITS 1 SFM 1ØØ1 ton/min
	tons per seconds	UNITS 1 SFM 1ØØ1 ton/sec

*Mass flow requires density input.

5.3.5 Selecting Type of Flow Measurement

Selecting type of flow measurement

You can select the type of flow measurement operation you want to monitor through the SFC. This selection also determines what preprogrammed engineering units are available for measurement values as listed in Table 5-7.

Table 5-8 gives the procedure for selecting the type of flow measurement as part of the flowmeter's configuration function. While this procedure covers how to configure the "units key" parameter individually, you can access all MagneW 3000 ***PLUS*** configuration parameters serially without exiting the function once you call up the SFM CONFIG function. Just use the [▲ **NEXT**] and [▼ **PREV**] keys to step through the parameter selections.

ATTENTION The procedure in Table 5-8 assumes that you have established communications with the flowmeter and the SFC is ready to accept the next operation.

Table 5-8 Selecting Type of Flow Measurement Through Units Key

<table>
<tr><th>Step</th><th>Press Key</th><th>Read Display or Action</th><th>Description</th></tr>
<tr><td>1</td><td>B
CONF</td><td>SFM CONFIG
UNITS KEY?</td><td>Calls up configuration function.</td></tr>
<tr><td>2</td><td>NON-VOL
ENTER
(Yes)</td><td>UNITS KEY
VOLUME FLOW</td><td>Accesses configuration selections.</td></tr>
<tr><td>3</td><td>DE_CONF
I
MENU
ITEM</td><td>UNITS KEY
MASS FLOW

UNITS KEY
VELOCITY</td><td>Calls up next type of measurement selection with each key press. This action will continue to step through all selections listed in Table 5-7.</td></tr>
<tr><td>4</td><td>NON-VOL
ENTER
(Yes)</td><td>UNITS KEY
ENTERED IN SFC

UNITS KEY
1.ØØØØ SpecGr

OR

UNITS KEY
DOWNLOAD CHANGE?

<table><tr><th>If…</th><th>Then…</th></tr><tr><td>"Spec Gr" display appears</td><td>go to Step 5.</td></tr><tr><td>"DOWNLOAD CHANGE" display appears</td><td>go to Step 6.</td></tr></table></td><td>Enters change in SFC and calls up next parameter or function. This action only applies if selection is changed. Otherwise, you must press [CLR] key to exit function or [▲ NEXT] key to call up next parameter.</td></tr>
</table>

Continued on next page

Selecting type of flow measurement, continued

Table 5-8 Selecting Type of Flow Measurement Through Units Key, Continued

Step	Press Key	Read Display or Action	Description
5	W 2	UNITS KEY 2 SpecGr	This only appears if UNITS KEY selection is MASS FLOW.
	NON-VOL ENTER (Yes)	UNITS KEY ENTERED IN SFC UNITS KEY DOWNLOAD CHANGE?	Enters change in SFC. Prompt asks if change entered in SFC is to be downloaded to flowmeter. *If you want to download change,* go to Step 6. *If you do not want to download change,* press [**CLR**] key to exit function.
6	NON-VOL ENTER (Yes)	UNITS KEY SFC WORKING. . . SFM CONFIG UNITS KEY?	Message exchange is working. Parameter change is loaded in flowmeter, but this parameter really only affects SFC operation. Press [**ENTER**] key to access configuration function again or [**CLR**] key to exit function.

5.3.6 Setting Range and Display Data

Setting range and display data

You must specify range function and display data settings to define the basic operating characteristics of your flowmeter. The procedure in Table 5-9 outlines the steps for setting range and display data.

Refer to Table 5-10 for a summary of the SFC configuration restrictions based on interactive configuration selections and hardware features. For details on function settings, refer to *Section 4.3.5 – Selecting Function Settings* on pages 109 through 120.

Table 5-9 Setting Range and Display Data

Step	Press Key	Read Display or Action	Description
1	[B CONF]	SFM CONFIG UNITS KEY?	Calls up configuration function.
2	[H ▲ NEXT]	SFM CONFIG RANGE CONFIG?	Calls up next configuration menu selection.
3	NON-VOL [ENTER (Yes)]	SFM CONFIG SFC WORKING. . .	Message exchange is working, if applicable.
		RANGE CONFIG RANGE = SINGLE	Calls up first range selection. “SINGLE” equals normal direction, single range selection which is factory default setting.
	DE CONF [I MENU ITEM]	RANGE CONFIG RANGE = AUTODUAL	Calls up next range selection. “AUTODUAL” equals normal direction, dual range, automatic transfer selection. This means you can configure two flow measurement ranges with transfer between ranges triggered automatically when flow exceeds or drops below upper range value for first range. Flow must be in same direction as arrow on detector—normal (direct) direction.

Continued on next page

Setting range and display data, continued

Table 5-9 Setting Range and Display Data, Continued

Step	Press Key	Read Display or Action	Description
3	DE_CONF [MENU ITEM]	RANGE CONFIG RANGE = EXT DUAL	Calls up next range selection. “EXT DUAL” equals normal direction, dual range, external transfer selection. This is same as previous selection “AUTODUAL” except transfer between ranges is triggered manually through contact input to converter’s status input terminals.
	DE_CONF [MENU ITEM]	RANGE CONFIG RANGE = AUTO +/–	Calls up next range selection. “AUTO +/–” equals normal/reverse direction, dual range, automatic transfer selection. This means you can configure two flow measurement ranges—one range for flow in normal direction and another range for flow in reverse direction. Transfer between ranges will be triggered automatically when direction of flow changes. Flow can be in same direction as arrow on detector — normal direction, or in opposite direction to arrow on detector—reverse direction.
	DE_CONF [MENU ITEM]	RANGE CONFIG RANGE = EXT +/– **ATTENTION** Use [⇐] key to step backwards through selections or [⇒] key to step forward through selections again to choose desired setting.	Calls up next range selection. “EXT +/–” equals normal/reverse direction, dual range, external transfer selection. This is same as previous selection “AUTO +/–” except transfer between ranges is triggered manually through contact input to converter’s status input terminals.

Continued on next page

Setting range and display data, continued

Table 5-9 Setting Range and Display Data, Continued

Step	Press Key	Read Display or Action	Description
4	NON-VOL ENTER (Yes)	RANGE CONFIG ENTERED IN SFC RANGE CONFIG HYSTERESIS = ØØ% OR RANGE CONFIG CUT–OFF = OFF **If…** / **Then…** "HYSTERESIS" display appears / go to Step 5. "CUT-OFF" display appears / go to Step 7.	Enters change in SFC and calls up next parameter. This action only applies if selection is changed. Otherwise, only calls up next parameter.
5	DE_CONF MENU ITEM	RANGE CONFIG HYSTERESIS = Ø1% **ATTENTION** Can also use [⇐] key to lower setting or [⇒] key to raise setting.	Changes setting value by "1" with each key press. Note that setting range is 0 to 20%. **ATTENTION** This parameter is only available with AUTODUAL or AUTO +/– range selection.
6	NON-VOL ENTER (Yes)	RANGE CONFIG ENTERED IN SFC RANGE CONFIG CUT–OFF = OFF	Enters change in SFC and calls up next parameter. This action only applies if selection is changed. Otherwise, press [**CLR**] key to exit function or [▲ **NEXT**] key to call up next parameter.
7	DE_CONF MENU ITEM	RANGE CONFIG CUT–OFF = ON ØØ% **ATTENTION** Use [⇐] key to step backwards through selections or [⇒] key to step forward through selections again.	Changes selection from disabled (OFF) to enabled (ON) and changes setting value for enabled function by "1" with each key press. Note that setting range is 0 to 10%. **ATTENTION** When enabled, this function will cut off the current output when flowrate reaches the entered value to avoid errors due to flow pulsations in range values close to 0.

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5.3.6 Setting Range and Display Data, Continued

Setting range and display data, continued

Table 5-9 Setting Range and Display Data, Continued

Step	Press Key	Read Display or Action	Description
8	NON-VOL ENTER (Yes)	RANGE CONFIG ENTERED IN SFC RANGE CONFIG DISP = % **ATTENTION** If DISP = NO DISPLAY, the converter is not equipped with a DOP. In this case, no other selections are possible. Skip Step 9 and go to Step 10.	Enters change in SFC and calls up next parameter. This action only applies if selection is changed. Otherwise, press [**CLR**] key to exit function or [▲ **NEXT**] key to call up next parameter.
9	DE_CONF MENU ITEM	RANGE CONFIG DISP = FLOW RATE RANGE CONFIG DISP = TOTAL **ATTENTION** Use [⇐] key to step backwards through selections or [⇒] key to step forward through selections again.	Steps through flowrate display selections one at a time with each key press.
10	NON-VOL ENTER (Yes)	RANGE CONFIG ENTERED IN SFC RANGE CONFIG DOWNLOAD CHANGE?	Enters change in SFC. Prompt asks if changes entered in SFC are to be downloaded to flowmeter. *If you want to download changes,* go to Step 11. *If you do not want to download changes,* press [**CLR**] key to exit function or [▲ **NEXT**] key to call up next parameter.
11	NON-VOL ENTER (Yes)	RANGE CONFIG SFC WORKING. . . SFM CONFIG RANGE CONFIG?	Parameter changes are loaded into flowmeter and prompt returns to menu selection. Press [**ENTER**] key to access configuration function again or [**CLR**] key to exit function.

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SFC range configuration restrictions

Table 5-10 summarizes the SFC range configuration restrictions based on interactive configuration selections and hardware features. Note that these are similar to the function setting restrictions listed in Table 4-18, but prompts have been changed to agree with those that appear in the SFC display.

Table 5-10 Summary of SFC Range Configuration Restrictions

Range Function	Totalizer/ Pulse Function	Contact Input Function	Contact Output Function
SINGLE	NO PULSE CARD	NOT USED 0 % LOCK AUTO ZERO	NOT USED ALARM
	ADD	NOT USED 0 % LOCK AUTO ZERO CNTR RESET	NOT USED ALARM
	PRESET	NOT USED 0 % LOCK AUTO ZERO CNTR RESET	PRESET MTCH
AUTODUAL	NO PULSE CARD	NOT USED 0 % LOCK AUTO ZERO	RANGE ID
	ADD	NOT USED 0 % LOCK AUTO ZERO CNTR RESET	RANGE ID
EXT DUAL	NO PULSE CARD	EXT RANGE	NOT USED ALARM
	ADD	EXT RANGE	NOT USED ALARM RANGE ID
	PRESET	EXT RANGE	PRESET MTCH
AUTO +/–	NO PULSE CARD	NOT USED 0 % LOCK AUTO ZERO	RANGE ID
	ADD	NOT USED 0 % LOCK AUTO ZERO CNTR RESET	RANGE ID
	+/– DIF	NOT USED 0 % LOCK AUTO ZERO CNTR RESET	RANGE ID

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5.3.6 Setting Range and Display Data, Continued

SFC range configuration restrictions, continued

Table 5-10 Summary of SFC Range Configuration Restrictions, Continued

Range Function	Totalizer/ Pulse Function	Contact Input Function	Contact Output Function
EXT +/–	NO PULSE CARD	EXT RANGE	NOT USED ALARM RANGE ID
	ADD	EXT RANGE	NOT USED ALARM RANGE ID
	PRESET	EXT RANGE	PRESET MTCH
	+/– DIF	EXT RANGE	NOT USED ALARM RANGE ID

5.3.7 Setting Detector Data

Setting detector data

The procedure in Table 5-11 outlines the steps for setting data pertinent to the detector connected to the converter. The accuracy of this data is critical to the overall operation of your flowmeter.

Table 5-11 Setting Detector Data

Step	Press Key	Read Display or Action	Description
1	B CONF	SFM CONFIG UNITS KEY?	Calls up configuration function.
2	▲ H NEXT	SFM CONFIG DETECTOR CONFIG?	Calls up next configuration menu selection with each key press. Scroll to detector configuration display.
3	NON-VOL ENTER (Yes)	SFM CONFIG SFC WORKING... DETECTOR CONFIG 3ØØ.Ø mA(EX)	Message exchange is working, if applicable. Calls up first detector parameter.
4		Compare excitation current rating shown in bottom row of display with same rating specified on detector's nameplate. **If…** / **Then…** current ratings match / go to Step 6. current ratings do not match / go to Step 5.	
5	W 2 T 6 S 5	DETECTOR CONFIG 2 mA(EX) DETECTOR CONFIG 26 mA(EX) DETECTOR CONFIG 265 mA(EX)	The matching mA rating specified on detector's nameplate is entered. EXAMPLE: Excitation current rating of 265 mA is keyed in.
6	NON-VOL ENTER (Yes)	DETECTOR CONFIG ENTERED IN SFC DETECTOR CONFIG TYPE KID	Enters change in SFC and calls up next parameter. This action only applies if selection is changed. Otherwise, press [**CLR**] key to exit function or [▲ **NEXT**] key to call up next parameter.

Continued on next page

Setting detector data, continued

Table 5-11 Setting Detector Data, Continued

Step	Press Key	Read Display or Action	Description
7	DE_CONF MENU ITEM	DETECTOR CONFIG TYPE NNM DETECTOR CONFIG TYPE NNK DUMMY=Ø **ATTENTION** Use [⇐] key to step backwards through selections or [⇒] key to step forward through selections again.	Steps through detector type selections one at a time with each key press including up to 9 dummy detector selections for a submersible model. See Table 5-3 for explanation of selections.
8	NON-VOL ENTER (Yes)	DETECTOR CONFIG ENTERED IN SFC DETECTOR CONFIG DIAMETER = 5Ømm	Enters change in SFC and calls up next parameter. This action only applies if selection is changed. Otherwise, you can press [**CLR**] key to exit function or [▲ **NEXT**] key to call up next parameter.
9	DE_CONF MENU ITEM	DETECTOR CONFIG DIAMETER = 8Ømm **ATTENTION** Use [⇐] key to step backwards through selections or [⇒] key to step forward through selections again.	Steps through detector size selections one at a time with each key press. See Table 5-3 for complete list of detector sizes.
10	NON-VOL ENTER (Yes)	DETECTOR CONFIG ENTERED IN SFC DETECTOR CONFIG DOWNLOAD CHANGE?	Enters change in SFC. Prompt asks if changes entered in SFC are to be downloaded to flowmeter. *If you want to download changes,* go to Step 11. *If you do not want to download changes,* press [**CLR**] key to exit function or [▲ **NEXT**] key to call up next parameter.
11	NON-VOL ENTER (Yes)	DETECTOR CONFIG SFC WORKING... SFM CONFIG DETECTOR CONFIG?	Parameter changes are loaded into flowmeter and prompt returns to menu selection. Press [**ENTER**] key to access configuration function again or [**CLR**] key to exit function.

5.3.8 Setting Alarm Set Points

Setting alarm set points

The procedure in Table 5-12 outlines the steps for entering the high and low alarm set points to trigger a status output for alarm purposes.

ATTENTION The ALARM CONFIG? menu selection only appears when the status output (DO) selection is configured for ALARM.

Table 5-12 Setting Alarm Set Points

Step	Press Key	Read Display or Action	Description
1	B CONF	SFM CONFIG UNITS KEY?	Calls up configuration function.
2	H ▲ NEXT	SFM CONFIG ALARM CONFIG?	Calls up next configuration menu selection with each key press. Scroll to alarm configuration display.
3	NON-VOL ENTER (Yes)	SFM CONFIG SFC WORKING. . . ALARM CONFIG 85 % HI ALM	Message exchange is working, if applicable. Calls up first alarm parameter which is high alarm set point setting.
4	V 1 Z 0 Z 0	ALARM CONFIG 1 % HI ALM ALARM CONFIG 1Ø % HI ALM ALARM CONFIG 1ØØ % HI ALM	**ATTENTION** If you want to indicate value as positive or negative, alternately press [**+/–**] key with cursor in first digit position. Note that no sign means the value is positive. EXAMPLE: High alarm set point setting has been changed from 85% to 100%.
5	NON-VOL ENTER (Yes)	ALARM CONFIG ENTERED IN SFC ALARM CONFIG Ø5 % LO ALM	Enters change in SFC and calls up next parameter. This action only applies if selection is changed. Otherwise, you can press [**CLR**] key to exit function or [**▲ NEXT**] key to call up next parameter.

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5.3.8 Setting Alarm Set Points, Continued

Setting alarm set points, continued

Table 5-12 Setting Alarm Set Points, Continued

Step	Press Key	Read Display or Action	Description
6	+/– 5 S	ALARM CONFIG – _ % LO ALM ALARM CONFIG – 5 _ % LO ALM	EXAMPLE: Low alarm set point setting has been changed from 5% to –5%.
7	NON-VOL ENTER (Yes)	ALARM CONFIG ENTERED IN SFC ALARM CONFIG DOWNLOAD CHANGE?	Enters change in SFC. Prompt asks if changes entered in SFC are to be downloaded to flowmeter. *If you want to download changes,* go to Step 8. *If you do not want to download changes,* press [**CLR**] key to exit function or [▲ **NEXT**] key to call up next parameter.
8	NON-VOL ENTER (Yes)	ALARM CONFIG SFC WORKING. . . SFM CONFIG ALARM CONFIG?	Parameter changes are loaded into flowmeter and prompt returns to menu selection. Press [**ENTER**] key to access configuration function again or [**CLR**] key to exit function.

5.3.9 Selecting Failsafe Modes

Selecting failsafe modes

The procedure in Table 5-13 outlines the steps for selecting the failsafe mode for the current output and/or pulse output during a critical flowmeter status condition.

Table 5-13 Selecting Failsafe Modes for Current Output and Pulse Output

Step	Press Key	Read Display or Action	Description
1	B CONF	SFM CONFIG UNITS KEY?	Calls up configuration function.
2	H ▲ NEXT	Press next key until this display appears. SFM CONFIG FAILSAFE CONFIG?	Calls up failsafe mode menu selection.
3	NON-VOL ENTER (Yes)	SFM CONFIG SFC WORKING... F/S SET UP 4–2ØmA F/S = LOW	Message exchange is working, if applicable. Calls up first failsafe mode parameter which is current output selection. “LOW” means current output signal will go to its low scale value during a critical status condition.
4	DE_CONF I MENU ITEM	F/S SET UP 4–2ØmA F/S =HOLD F/S SET UP 4–2ØmA F/S =HIGH **ATTENTION** Use [⇐] key to step backwards through selections or [⇒] key to step forward through selections again.	Steps through current output failsafe mode selections one at a time with each key press. “HOLD” means current output signal will be held at its last good value during a critical status condition. “HIGH” means current output signal will be driven to its high scale value during a critical status condition.
5	NON-VOL ENTER (Yes)	F/S SET UP ENTERED IN SFC F/S SET UP PULSE OUT = LOW **ATTENTION** This display only appears if converter is equipped with a pulse card.	Enters change in SFC and calls up next parameter which is pulse output selection. This action only applies if selection is changed. Otherwise, press [**CLR**] key to exit function or [▲ **NEXT**] key to call up next parameter. “LOW” means pulse output signal will be clamped at its low state during a critical status condition.

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5.3.9 Selecting Failsafe Modes, Continued

Selecting failsafe modes, continued

Table 5-13 Selecting Failsafe Modes for Current Output and Pulse Output, Continued

Step	Press Key	Read Display or Action	Description
6	DE_CONF I [MENU ITEM]	F / S SET UP PULSE OUT = HOLD	Calls up next selection. "HOLD" means pulse output signal will be held at its present state during a critical status.
7	NON-VOL [ENTER (Yes)]	F / S SET UP ENTERED IN SFC F / S SET UP DOWNLOAD CHANGE?	Enters change in SFC. Prompt asks if changes entered in SFC are to be downloaded to flowmeter. *If you want to download changes,* go to Step 8. *If you do not want to download changes,* press [**CLR**] key to exit function or [▲ **NEXT**] key to call up next parameter.
8	NON-VOL [ENTER (Yes)]	F / S SET UP SFC WORKING... SFM CONFIG FAILSAFE CONFIG?	Parameter changes are loaded into flowmeter and prompt returns to menu selection. Press [**ENTER**] key to access configuration function again or [**CLR**] key to exit function.

5.3.10 Selecting Digital (Relay) I/O Functions

Selecting I/O functions

The procedure in Table 5-14 outlines the steps for selecting the status input and/or status output operation that the flowmeter will support. Since the digital I/O selections interact with the range configuration selections and also vary depending upon hardware features ordered, be sure you review the range configuration setting restrictions listed in Table 5-10 before you begin this procedure.

Table 5-14 Selecting Digital I/O Functions

Step	Press Key	Read Display or Action	Description
1	B CONF	SFM CONFIG UNITS KEY?	Calls up configuration function.
2	H ▲ NEXT	Sequentially press key until this display appears. SFM CONFIG DIGITAL I/O?	Calls up digital I/O function menu selection.
3	NON-VOL ENTER (Yes)	SFM CONFIG SFC WORKING. . . DIGITAL I/O DI = NOT USED	Message exchange is working, if applicable. Calls up first digital I/O parameter which is digital input or status input selection. "NOT USED" equals status input not used. Thus, no connections are made to converter's status input terminals.
4	DE_CONF I MENU ITEM	DIGITAL I/O DI = Ø% LOCK DIGITAL I/O DI = AUTO-ZERO DIGITAL I/O DI = CNTR RESET	Steps through digital input selections one at a time with each key press. "0% LOCK" equals zero percent signal lock. This means you can lock current output and pulse output signals at zero through an external contact connected to status input terminals. "AUTO-ZERO" equals external automatic zero. This means you can initiate automatic zero adjustment through an external contact connected to status input terminals. "CNTR RESET" equals counter reset. This means you can trigger a reset of internal counter through an external contact connected to status input terminals. Counter is reset when contact is closed for 0.2 seconds or more and starts counting when contact is opened.

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Selecting I/O functions, continued

Table 5-14 Selecting Digital I/O Functions, Continued

Step	Press Key	Read Display or Action	Description
4 (continued)		DIGITAL I/O DI = EXT RANGE **ATTENTION** Use [⇐] key to step backwards through selections or [⇒] key to step forward through selections again.	"EXT RANGE" equals external ranging input. This means you can switch between two ranges through an external contact connected to status input terminals. Range select signal is factory set as OPEN contact for range 1 or direct (normal) range and CLOSED contact for range 2 or reverse range. This function only appears when range function selection is for dual range with external transfer selection. In this case, it is only selection available. **ATTENTION** You cannot call up contact input functions that are restricted by hardware feature or range function selection. See Table 5-10.
5	NON-VOL ENTER (Yes)	DIGITAL I/O ENTERED IN SFC DIGITAL I/O DO = NOT USED	Enters change in SFC and calls up next parameter which is digital output or status output selection.This action only applies if selection is changed. Otherwise, press [**CLR**] key to exit function or [▲ **NEXT**] key to call up next parameter. "NOT USED" equals status output not used. No connections are made to converter's status output terminals.
6	DE_CONF MENU ITEM	DIGITAL I/O DO = ALARM	Steps through digital output selections one at a time with each key press. "ALARM" equals error and high/low alarm. This means an internal error or high/low measurement condition can trigger a contact output through the status output terminals.

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Selecting I/O functions, continued

Table 5-14 Selecting Digital I/O Functions, Continued

Step	Press Key	Read Display or Action	Description
6 **(continued)**		DIGITAL I/O DO = RANGE ID DIGITAL I/O DO = PRESET MTCH DIGITAL I/O DO = EMPTY PIPE **ATTENTION** Use [⇐] key to step backwards through selections or [⇒] key to step forward through selections again.	"RANGE ID" equals ranging output identification. This means you can use contact output through status output terminals for active range indication. Range indication signal is factory set as OPEN contact for range 1 or direct range and CLOSED contact for range 2 or reverse range. "PRESET MTCH" equals preset counter output. This means you can use contact output to signal when counter's preset value is reached through status output terminals. "EMPTY PIPE" equals empty pipe status. This means you can use contact output through status output terminals to signal empty pipe condition. **CAUTION** Hardware jumper for empty pipe function must be in enabled position for this selection to appear. **ATTENTION** You cannot call up contact output functions that are restricted by hardware feature or range function selection. See Table 5-10.
7	NON-VOL ENTER (Yes)	DIGITAL I/O ENTERED IN SFC DIGITAL I/O DO NORM = CLOS	Enters change in SFC and calls up next parameter which is digital output or status output contact state selection. This action only applies if selection is changed. Otherwise, press [**CLR**] key to exit function or [▲ **NEXT**] key to call up next parameter. "CLOS" means status output contact will assume a normally closed state.

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Selecting I/O functions, continued

Table 5-14 Selecting Digital I/O Functions, Continued

Step	Press Key	Read Display or Action	Description
8	DE_CONF [MENU ITEM]	DIGITAL I/O DO NORM = OPEN	Calls up next digital output contact state selection. "OPEN" means status output contact will assume a normally opened state.
9	NON-VOL [ENTER (Yes)]	DIGITAL I/O ENTERED IN SFC DIGITAL I/O DOWNLOAD CHANGE?	Enters change in SFC. Prompt asks if changes entered in SFC are to be downloaded to flowmeter. *If you want to download changes,* go to Step 10. *If you do not want to download changes,* press [**CLR**] key to exit function or [▲ **NEXT**] key to call up next parameter.
10	NON-VOL [ENTER (Yes)]	DIGITAL I/O SFC WORKING... SFM CONFIG DIGITAL I/O?	Parameter changes are loaded into flowmeter and prompt returns to menu selection. Press [**ENTER**] key to access configuration function again or [**CLR**] key to exit function.

5.3.11 Totalizer and Pulse Output Selections

Totalizer and pulse output selections

The procedure in Table 5-15 outlines the steps for making totalizer and pulse output configuration selections. Since the totalizer and pulse output selections interact with the range configuration selections and also vary depending upon hardware features ordered, be sure you review the range configuration setting restrictions listed in Table 5-10 before you begin this procedure.

Table 5-15 Totalizer and Pulse Output Selections

Step	Press Key	Read Display or Action	Description
1	CONF (B)	SFM CONFIG UNITS KEY?	Calls up configuration function.
2	▲ NEXT (H)	Press key until this display appears. SFM CONFIG TOTALIZER MENU?	Calls up totalizer function menu selection.
3	NON-VOL ENTER (Yes)	SFM CONFIG SFC WORKING. . . TOTALIZER MENU NO PULSE CARD OR TOTALIZER MENU READ TOTAL?	Message exchange is working, if applicable. If this display appears, converter is not equipped with a pulse card and all other totalizer menu selections are void. If this display appears, converter is equipped with a pulse card and prompt asks if you want to read current counter total.
4	▲ NEXT (H)	TOTALIZER MENU PULSE OUTPUT?	Calls up next menu selection which is for pulse output viewing and simulation.
5	▲ NEXT (H)	TOTALIZER MENU PULSE CONFIG?	Calls up next menu selection which is for pulse output configuration.
6	NON-VOL ENTER (Yes)	TOTALIZER MENU SFC WORKING. . . PULSE CONFIG PULSE = ADD	Message exchange is working, if applicable. Calls up first pulse configuration parameter which is built-in counter function. “ADD” equals normal adding counter which is factory default setting for converter with pulse card installed. Counter totalizes flow in both direct and reverse directions.

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Totalizer and pulse output selections, continued

Table 5-15 Totalizer and Pulse Output Selections, Continued

Step	Press Key	Read Display or Action	Description
7	DE_CONF MENU ITEM	PULSE CONFIG PULSE = PRESET PULSE CONFIG PULSE = +/–DIFF	Steps through built-in counter selections one at a time with each key press. “PRESET” equals preset function for adding counter. Counter totalizes flow in both direct and reverse directions. “+/–DIFF” equals differential type counter that reads difference between totalized flows in direct and reverse directions; i.e., + Pos/For, - Neg/Rev. **ATTENTION** You cannot call up built-in counter functions that are restricted by hardware feature or range function selection. See Table 5-10.
8	NON-VOL ENTER (Yes)	PULSE CONFIG ENTERED IN SFC PULSE CONFIG OPEN COLLECTOR	Enters change in SFC and calls up next parameter which is pulse output type. This action only applies if selection is changed. Otherwise, press [**CLR**] key to exit function or [▲ **NEXT**] key to call up next parameter. This is a read only display. For the MagneW 3000 ***PLUS*** model MGG the pulse output is an open collector. For previous MagneW 3000 models (KID, NNM, and NNK), the pulse output can also be a magnetic counter drive. This is determined by a hardware jumper on the pulse card.
9	NON-VOL ENTER (Yes)	PULSE CONFIG l / p	Calls up next pulse configuration parameter which is engineering units selection for pulse measurement.

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5.3.11 Totalizer and Pulse Output Selections, Continued

Totalizer and pulse output selections, continued

Table 5-15 Totalizer and Pulse Output Selections, Continued

Step	Press Key	Read Display or Action	Description
10	DE_CONF MENU ITEM	PULSE CONFIG cc/p PULSE CONFIG BRL/p PULSE CONFIG kgal/p PULSE CONFIG Gal/p PULSE CONFIG mGal/p PULSE CONFIG m^3/p **ATTENTION** Use [⇐] key to step backwards through selections or [⇒] key to step forward through selections again.	Steps through engineering units selections one at a time with each key press. See Table 5-3 for description of units.
11	NON-VOL ENTER (Yes)	PULSE CONFIG ENTERED IN SFC PULSE CONFIG 196.3 Gal/p	Enters change in SFC and calls up next parameter which is pulse weight setting. This action only applies if selection is changed. Otherwise, press [**CLR**] key to exit function or [▲ **NEXT**] key to call up next parameter. Desired pulse weight can be entered.
12	NON-VOL ENTER (Yes)	PULSE CONFIG ENTERED IN SFC PULSE CONFIG P–WIDTH = Ø.3ms	Enters change in SFC and calls up next parameter which is pulse width setting. This action only applies if selection is changed. Otherwise, press [**CLR**] key to exit function or [▲ **NEXT**] key to call up next parameter.

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5.3.11 Totalizer and Pulse Output Selections, Continued

Totalizer and pulse output selections, continued

Table 5-15 Totalizer and Pulse Output Selections, Continued

Step	Press Key	Read Display or Action	Description
13	DE CONF MENU ITEM	PULSE CONFIG P–WIDTH = Ø.5ms PULSE CONFIG P–WIDTH = 1.Øms PULSE CONFIG P–WIDTH = 7.Øms PULSE CONFIG P–WIDTH = 1Øms PULSE CONFIG P–WIDTH = 15ms PULSE CONFIG P–WIDTH = 3Øms PULSE CONFIG P–WIDTH = 5Øms PULSE CONFIG P–WIDTH = 1ØØms **ATTENTION** Use [⇐] key to step backwards through selections or [⇒] key to step forward through selections again.	Steps through pulse width selections one at a time with each key press. **ATTENTION** Pulse duty ratio must not exceed 70 %. This ratio basically defines the pulse ON time versus the pulse OFF time as a percentage of the total pulse cycle. If required, change the pulse width to lower the pulse duty ratio. Also, the lowest pulse width setting allowed for a magnetic type counter drive is "30".
14	NON-VOL ENTER (Yes)	PULSE CONFIG ENTERED IN SFC PULSE CONFIG P–DROP OUT = Ø2%	Enters change in SFC and calls up next parameter which is pulse dropout setting. This action only applies if pulse selection is changed. Otherwise, press [**CLR**] key to exit function or [▲ **NEXT**] key to call up next parameter.
15	DE CONF MENU ITEM	PULSE CONFIG P–DROP OUT = Ø3%	Changes setting value by "1" with each key press. Note that setting range is 2 to 10% of measurement range. **ATTENTION** The pulse output will be cut off at this dropout point to avoid flow pulsations in range values close to zero.

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5.3.11 Totalizer and Pulse Output Selections, Continued

Totalizer and pulse output selections, continued

Table 5-15 Totalizer and Pulse Output Selections, Continued

Step	Press Key	Read Display or Action	Description
16	NON-VOL ENTER (Yes)	PULSE CONFIG ENTERED IN SFC PULSE CONFIG DOWNLOAD CHANGE?	Enters change in SFC. Prompt asks if changes entered in SFC are to be downloaded to flowmeter. *If you want to download changes,* go to Step 17. *If you do not want to download changes,* press [**CLR**] key to exit function or [▲ **NEXT**] key to call up next parameter.
17	NON-VOL ENTER (Yes)	PULSE CONFIG SFC WORKING... TOTALIZER MENU PULSE CONFIG?	Parameter changes are loaded into flowmeter and prompt returns to menu selection.
18	▲ H NEXT	TOTALIZER MENU SET TRIP VALUE?	Calls up next totalizer menu selection which is trip value setting. This only applies for built-in counter with preset function.
19	NON-VOL ENTER (Yes)	TOTALIZER MENU SFC WORKING... TRIP VALUE 1ØØØØØ COUNTS	Message exchange is working, if applicable. Calls up present trip value setting.
20	NON-VOL ENTER (Yes)	TRIP VALUE ENTERED IN SFC TRIP VALUE DOWNLOAD CHANGE?	Enters change in SFC. Prompt asks if change entered in SFC is to be downloaded to flowmeter. *If you want to download change,* go to Step 21. *If you do not want to download changes,* press [**CLR**] key to exit function or [▲ **NEXT**] key to call up next parameter.

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5.3.11 Totalizer and Pulse Output Selections, Continued

Totalizer and pulse output selections, continued

Table 5-15 Totalizer and Pulse Output Selections, Continued

Step	Press Key	Read Display or Action	Description
21	NON-VOL ENTER (Yes)	TRIP VALUE SFC WORKING... TOTALIZER MENU SET TRIP VALUE?	Parameter change is loaded into flowmeter and prompt returns to menu selection.
22	▲ NEXT (H)	TOTALIZER MENU RESET TOTALIZE?	Calls up next totalizer menu selection which is reset total of built-in counter to zero. This action is not required for configuration.
23	CLR (No)	SFM CONFIG TOTALIZER MENU?	Exits totalizer menu and returns to main configuration menu. Press [**CLR**] key again to exit function or [▲ **NEXT**] key to call up next parameter.

5.3.12 Velocity and Span Data

About span and URV

The MagneW 3000 ***PLUS*** flowmeter is a velocity measurement device which calculates the volumetric flowrate based on the rate of flow and the nominal diameter of the detector. The speed limit or maximum velocity rate for a MagneW 3000 ***PLUS*** flowmeter is 10 meters per second or 32 feet per second. The size of the detector and the flow velocity determine the Upper Range Value (URV) or span limit.

Since the Lower Range Value (LRV) is fixed at zero to represent a stationary flow condition in the flowmeter, the span and the URV terms are used interchangeably. However, span is technically defined as URV minus LRV, but with the LRV fixed at zero the URV and the span are the same.

Velocity and span data

You can use the following formula to calculate the flow velocity for a given flowrate in meters per second. Refer to Table 5-16 for the flow conversion factor and URV/span range data for a given detector size. Note that the default base engineering units for flowrate measurement are cubic meters per hour.

- V = K x Q

  V = Flow velocity in meters per second

  K = Flow conversion factor $\frac{1}{3600} \times \frac{4}{\pi D^2}$

  Q = Flowrate in cubic meters per hour

- EXAMPLE: Calculate velocity for a 50 millimeter (2 inch) size detector with a 20 cubic meters per hour flowrate. Substituting the flow conversion factor for a 50 millimeter size detector from Table 5-16 into the equation, yields:

  V = 0.1415 x 20 m^3/h = 2.803 m/s

ATTENTION To convert meters per second to feet per second, multiply meters per second by 3.281. Thus, 2.803 m/s x 3.281 = 9.285 ft/s.

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5.3.12 Velocity and Span Data, Continued

Velocity and span data, continued

Table 5-16 lists flow conversion factors and URV/span data for reference. Note that the SFC and DOP automatically convert the display values to the selected engineering units as applicable for the selected type of measurement.

Table 5-16 URV/Span Range Data and Flow Conversion Factor Reference

Detector Size (D)		URV/Span Ranges		Flow Conversion Factor (K)
mm	in	gpm	m^3/h	
2.5	0.1	0.0078 to 0.779	0.00177 to 0.1767	56.59
5	0.2	0.031 to 3.11	0.0071 to 0.7069	14.15
10	0.4	0.124 to 12.41	0.0282 to 2.820	3.537
15	0.6	0.28 to 27.98	0.0636 to 6.360	1.572
25	1.0	0.778 to 77.75	0.1767 to 17.670	0.5659
40	1.6	1.99 to 199.1	0.4524 to 45.239	0.2210
50	2.0	3.11 to 311.02	0.7069 to 70.686	0.1415
80	3.1	7.97 to 796.2	1.810 to 180.956	0.05526
100	3.9	12.45 to 1,244.07	2.827 to 282.744	0.03537
150	5.9	28.01 to 2,799.17	6.362 to 636.174	0.01572
200	7.9	49.8 to 4,976.29	11.31 to 1,130.976	0.008842
250	9.8	80 to 8,000	18 to 1,800	0.005659
300	11.8	100 to 10,000	23 to 2,300	0.00393
350	13.8	150 to 15,000	34 to 3,400	0.002887
400	15.8	200 to 20,000	45 to 4,500	0.002210
500	19.7	300 to 30,000	68 to 6,800	0.001415
600	23.6	450 to 45,000	100 to 10,000	0.0009824

5.3.13 Upper and Lower Range Limits

About URL and LRL

The Lower Range Limit (LRL) and Upper Range Limit (URL) identify the minimum and maximum flowrates for the given detector. The LRL, like the LRV, is fixed at zero. The URL, like the URV, depends on the rate of flow and nominal diameter of the detector. It is expressed as the maximum flowrate at a velocity of one meter per second. This means you would multiply the URL by 10 to get the URL for a maximum velocity of 10 meters per second.

You can use the following formula to calculate the URL for a given-size detector at the flow velocity of one meter per second.

- URL = D^2 x 0.0028274

  D^2 = Detector size in millimeters

  0.0028274 = Conversion factor

  URL = Upper Range Limit in cubic meters per hour

- EXAMPLE: Calculate the URL for a 50 millimeter size detector at a velocity of 10 meters per second. Substituting 50 into the formula, yields:

  URL = 2500 x 0.0028274 = 7.0685 x 10 = 70.685m^3/h

ATTENTION For a submersible type (NNK type) detector with “dummies” configured, you must modify the formula for calculating URL by adding the term “x (N+1)”, where N equals the number of dummies configured.

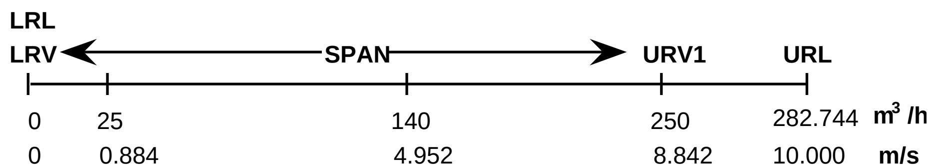
5.3.14 Setting Upper Range Values (URV)

Setting URV/span values

You set the URV/span by keying in the desired values through the SFC keyboard for URV1 (and URV2 1 for dual range functions). The URV1 sets the desired span point for your single measurement range (or range 1 or positive range for a dual measurement range) as shown in Figures 5-5 and 5-6.

Figure 5-5 Typical Single Range Setting Values

Typical Single Range Configuration for 100 mm Detector



Range Limits	Measurement Range	Lower Range Value	Upper Range Value	Span
0 to 282 m^3/h	0 to 250 m^3/h	0	250 m^3/h	250 m^3/h

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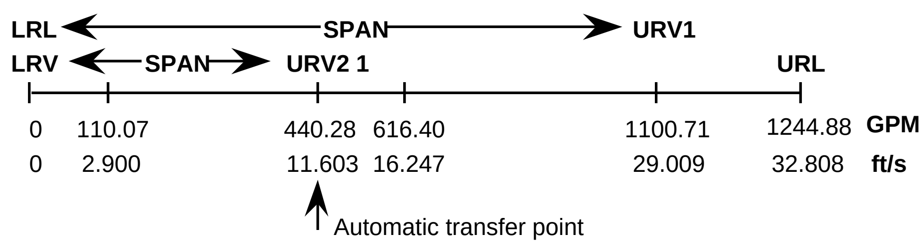
Figure 5-6 shows typical dual range settings that use URV2 1 to set the desired span point for range 2 or negative range.

Figure 5-6 Typical Dual Range Setting Values

Typical Automatic Dual Range Configuration for 100 mm Detector



Range Limits	Measurement Range	Lower Range Value	Upper Range Value	Span
0 to 1244.88 GPM	1: 0 to 1100.71 GPM 2: 0 to 440.28 GPM	0	1: 1100.71 GPM 2: 440.28 GPM	1: 1100.71 GPM 2: 440.28 GPM

Note that the automatic transfer will occur at 440 GPM with an increasing flowrate and at about 417 GPM with a decreasing flowrate and a hysteresis setting of 5%.

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Continued on next page

Setting URV/span values, continued

ATTENTION For dual range operation, be sure the receiving device in the current output loop is compatible with dual range operation so it will provide appropriate full scale indication for each range.

Table 5-17 gives the procedure for keying in the URVs for a sample dual range in a 100 millimeter size detector. The steps for URV1 also apply for keying in the URV for a single range function.

ATTENTION The procedure in Table 5-17 assumes that the type of measurement is volume flow and the engineering units selection is gallons per minute.

Table 5-17 Keying in URV1 and URV2 1

Step	Press Key	Read Display or Action	Description
1	F URV 100%	URV 1 SFM 1ØØ1 12ØØ.3 gal/min	Present URV setting for range 1 (flowrate for 20 mA dc (100%) output)
2	V 1 V 1 Z 0 Z 0 SCR PAD → ■ N 7	URV 1 SFM 1ØØ1 1_ gal/min URV 1 SFM 1ØØ1 11_ gal/min URV 1 SFM 1ØØ1 11Ø_ gal/min URV 1 SFM 1ØØ1 11ØØ_ gal/min URV 1 SFM 1ØØ1 11ØØ._ gal/min URV 1 SFM 1ØØ1 11ØØ.7 gal/min	Desired URV setting is entered. (It is not necessary to key in a decimal point and zeros for a whole number.) EXAMPLE: 1100.7 gal/min is entered as URV setting for range 1.
3	NON-VOL ENTER (Yes)	URV 1 SFM 1ØØ1 SFC WORKING... URV 1 SFM 1ØØ1 11ØØ.7 gal/min	Message exchange is working. New URV setting is stored in flowmeter's working memory.

Continued on next page

5.3.14 Setting Upper Range Values, Continued

Setting URV/span values, continued

Table 5-17 Keying in URV1 and URV2 1, Continued

Step	Press Key	Read Display or Action	Description
4	^ SHIFT F URV 100%	URV 1 SFM 1ØØ1 SHIFT– URV2 1 SFM 1ØØ1 3.21Ø8 gal/min	Initiates shift key selection. Present URV setting for range 2 (flowrate for 20 mA dc (100%) output)
5	R 4 R 4 Z 0 SCR PAD → ■ W 2 O 8	URV2 1 SFM 1ØØ1 4_ gal/min URV2 1 SFM 1ØØ1 44_ gal/min URV2 1 SFM 1ØØ1 44Ø_ gal/min URV2 1 SFM 1ØØ1 44Ø._ gal/min URV2 1 SFM 1ØØ1 44Ø.2_ gal/min URV2 1 SFM 1ØØ1 44Ø.28 gal/min	Desired URV setting is entered. EXAMPLE: 440.28 gal/min is entered as URV setting for range 2.
6	NON-VOL ENTER (Yes)	URV2 1 SFM 1ØØ1 SFC WORKING... URV2 1 SFM 1ØØ1 44Ø.28 gal/min	Message exchange is working. New URV setting is stored in flowmeter's working memory.
7	^ SHIFT NON-VOL ENTER (Yes)	URV 2 1 SFM 1ØØ1 SHIFT– URV2 1 SFM 1ØØ1 SFC WORKING... URV 2 1 SFM 1ØØ1 DATA NONVOLATILE MAG DR SFM 1ØØ1 READY...	Initiates shift key selection. Saves data in flowmeter's non-volatile memory. This takes approximately 8 seconds.

5.3.15 Converting Engineering Units

Converting engineering units

While the SFC automatically converts range display values to the selected engineering units, you can use the following formula to calculate various engineering units for reference. Since this data is for reference only, you may choose to skip it now and note it for later reference.

- $Y = mX + B$

m = Conversion multiplier from Table 5-18.

X = Present value in base engineering units (m^3/hr)

B = Conversion offset from Table 5-18.

Y = Conversion value in preferred engineering units.

Table 5-18 lists some common conversion multipliers for volume, mass, and velocity measurements based on the default base engineering unit of cubic meters per hour.

Table 5-18 Conversion Multipliers for Preferred Engineering Units

Preferred Engineering Units	Conversion Multiplier (m)	Conversion Offset	Notes
gal/hr	261.172	0	
l/hr	1,000	0	
cc/hr	1,000,000	0	
m^3/min	0.01666667	0	
gal/min	4.402867	0	
l/min	16.66667	0	
cc/min	16,666.67	0	
m^3/day	24	0	
gal/day	6340.129	0	
Kgal/day	6.340129	0	
bbl/day	150.9554	0	
m^3/sec	0.002777778	0	
m^3/hr	1.0	0	

Continued on next page

5.3.15 Converting Engineering Units, Continued

Converting engineering units, continued

Table 5-18 Conversion Multipliers for Preferred Engineering Units, Continued

Preferred Engineering Units	Conversion Multiplier (m)	Conversion Offset	Notes
kg/h	1,000	0	Must correct conversion multiplier by multiplying it by the specific gravity value of the fluid.
kg/min	16.66667	0	
kg/sec	0.2777778	0	
g/sec	277.7778	0	
lb/h	2,204.62	0	
lb/min	36.74371	0	
lb/sec	0.6123951	0	
ft/sec	3.28084	0	Must correct conversion multiplier by dividing it by the URL value at 1 m/sec.
m/sec	1	0	

- EXAMPLE: Convert a volumetric flowrate of 1.50 m^3/h to gal/min. Substituting values into the conversion formula, yields:

  Y = (4.402867) (1.5) + 0 = 6.6043 gal/min

- EXAMPLE: Convert a volumetric flowrate of 1.50 m^3/h to a mass flowrate of lb/min for fluid with specific gravity rating of 1.02. Substituting values into the conversion formula, yields:

  Y = (36.74371 x 1.02) (1.5) + 0 = 56.218 lb/min

- EXAMPLE: Convert a volumetric flowrate of 1.50 m^3/h in a flowmeter with a URL of 28.274 to a velocity flowrate of ft/sec. Substituting values into the conversion formula, yields:

  Y = (3.28084/28.274) (1.5) + 0 = 0.174 ft/sec

5.3.16 DE Configuration Parameters

DE configuration parameters

You must configure these additional parameters for a flowmeter in the DE mode of operation.

- Mode of Output Signal Indication
- Message Format
- Failsafe Mode

The following paragraphs cover how to configure these parameters individually. However, once you enter the DE configuration function, you can access all DE configuration parameters serially without exiting the function. Just use the [▲ **NEXT**] and [▼ **PREV**] keys to step through the parameter selections.

Continued on next page

5.3.16 DE Configuration Parameters, Continued

Selecting output signal mode

You can select the output signal mode for digital transmission to be one of these three modes as described in Table 5-19.

- Single Range
- Single Range W/SV
- Dual Range (STDC)

Table 5-19 Selecting Mode of Output Signal Indication

Step	Press Key	Read Display or Action	Description
1	^ SHIFT	MAG SR SFM 1ØØ1 SHIFT –	Initiates shift key selection.
	DE CONF MENU ITEM	DE CONF SFM 1ØØ1 SFC WORKING. . .	Calls up DE CONF menu. Output signal mode selection appears.
		DE CONF SFM 1ØØ1 Single Range	
2	DE CONF MENU ITEM	DE CONF SFM 1ØØ1 Single Rng w/SV	Calls up next output signal mode selection.
	DE CONF MENU ITEM	DE CONF SFM 1ØØ1 Dual Range(STDC)	Press [**MENU ITEM**] key to scroll to desired output signal mode selection (listed in Table 5-3).
3	NON-VOL ENTER (Yes)	DE CONF SFM 1ØØ1 ENTERED IN SFC	Enters change in SFC and calls up next DE configuration parameter. This action only applies if selection is changed. Otherwise, must press [**CLR**] key to exit function or [▲ **NEXT**] key to call up next parameter.
		DE CONF SFM 1ØØ1 w/oDB (4 Byte)	
4	CLR (NO)	DE CONF SFM 1ØØ1 DOWNLOAD CHANGE?	Prompt asks if change entered in SFC is to be downloaded to flowmeter. *If you want to download change,* go to Step 5. *If you do not want to download change,* press [**CLR**] key to exit function. This action only applies when Step 3 is valid. Otherwise, this keystroke exits DE CONF function.
5	NON-VOL ENTER (Yes)	DE CONF SFM 1ØØ1 SFC WORKING. . .	Message exchange is working.
		MAG DR SFM 1ØØ1 READY. . .	Parameter change is loaded into flowmeter. SFC is ready for next function.

Continued on next page

Selecting message format

You can select one of these broadcast formats for the digital signal transmission as described in Table 5-20.

- 4-byte type
- 6-byte type

Table 5-20 Selecting Message Format

Step	Press Key	Read Display or Action	Description
1	[SHIFT ^] DE CONF [MENU ITEM I]	MAG SR SFM 1ØØ1 SHIFT – DE CONF SFM 1ØØ1 SFC WORKING... DE CONF SFM 1ØØ1 Single Range	Initiates shift key selection. Calls up DE CONFIG menu. Output signal mode selection appears.
2	[▲ NEXT H]	DE CONF SFM 1ØØ1 w/oDB (4 Byte)	Calls up next DE CONF menu item. Message format selection appears.
3	DE CONF [MENU ITEM I]	DE CONF SFM 1ØØ1 w/DB (6 Byte)	Calls up next message format selection. Alternately press [**MENU ITEM**] key to cycle between two format selections. See Table 5-3 for details.
4	NON-VOL [ENTER (Yes)]	DE CONF SFM 1ØØ1 ENTERED IN SFC DE CONF SFM 1ØØ1 F/S = B/O Lo	Enters change in SFC and calls up next DE configuration parameter. This action only applies if selection is changed. Otherwise, must press [**CLR**] key to exit function, [▲ **NEXT**] key to call up next parameter, or [▼ **PREV**] key to call up previous parameter.
5	[CLR (NO)]	DE CONF SFM 1ØØ1 DOWNLOAD CHANGE?	Prompt asks if change entered in SFC is to be downloaded to flowmeter. *If you want to download change,* go to Step 6. *If you do not want to download change,* press [**CLR**] key to exit function. This action only applies when Step 4 is valid. Otherwise, this keystroke exits DE CONF function.
6	NON-VOL [ENTER (Yes)]	DE CONF SFM 1ØØ1 SFC WORKING... MAG DR SFM 1ØØ1 READY...	Message exchange is working. Parameter change is loaded into flowmeter. SFC is ready for next function.

Continued on next page

Selecting failsafe mode

You can select the failsafe action (mode) to be initiated by the STDC card in a controller which is communicating with the flowmeter. The failsafe mode can be one of these selections as described in Table 5-3.

- FS = B/O Lo - burnout low (drives PV value to the downscale limit).
- F/S = B/O Hi - burnout high (drives PV value to the upscale limit).
- F/S = LKG - last known good PV value.
- F/S = FSO, B/O Lo - freeze slot output and burnout low.
- F/S = FSO, B/O Hi - freeze slot output and burnout high.
- F/S = FSO, LKG - freeze slot output and last known good PV.

ATTENTION For F/S = FSO, XXX the ST/DC card tells the controller to hold the memory block output at the preset value and to drive the input to the controller in the desired direction.

Table 5-21 Selecting Failsafe Mode

Step	Press Key	Read Display or Action	Description
1	^ SHIFT DE CONF I MENU ITEM	MAG SR SFM 1ØØ1 SHIFT– DE CONF SFM 1ØØ1 SFC WORKING... DE CONF SFM 1ØØ1 Single Range	Initiates shift key selection. Calls up DE CONF menu. Output signal mode selection appears.
2	H NEXT	DE CONF SFM 1ØØ1 w/oDB (4 Byte)	Calls up next DE CONF menu item. Message format selection appears.
3	H NEXT	DE CONF SFM 1ØØ1 F/S = B/O Lo	Calls up next DE CONF menu item. Failsafe mode selection appears.

Continued on next page

Selecting failsafe mode, continued

Table 5-21 Selecting Failsafe Mode, Continued

Step	Press Key	Read Display or Action	Description
4	DE CONF MENU ITEM	DE CONF SFM 1ØØ1 F/S = B/O Hi DE CONF SFM 1ØØ1 F/S = LKG DE CONF SFM 1ØØ1 F/S = FSO, B/O Lo DE CONF SFM 1ØØ1 F/S = FSO, B/O Hi DE CONF SFM 1ØØ1 F/S = FSO, LKG	Calls up next failsafe mode selection. Alternately press [**MENU ITEM**] key to step through all failsafe mode selections listed in Table 5-3 in sequence. Stop when desired selection is on display.
5	NON-VOL ENTER (Yes)	DE CONF SFM 1ØØ1 ENTERED IN SFC DE CONF SFM 1ØØ1 DOWNLOAD CHANGE?	Enters selection change in SFC. Prompt asks if change entered in SFC is to be downloaded to flowmeter. *If you want to download change,* go to Step 6. *If you do not want to download change,* press [**CLR**] key to exit function, [▲ **NEXT**] key to call up output signal mode parameter, or [▼ **PREV**] key to return to this parameter. This action only applies if selection is changed. Otherwise, must press [**CLR**] key to exit function, [▲ **NEXT**] key to call up next parameter, or [▼ **PREV**] key to call up previous parameter. **ATTENTION** If [**CLR**] key press results in a DOWNLOAD CHANGE? prompt, a change was entered in the SFC for one of the other DE CONF parameters. Press [**CLR**] key to abort download or [**ENTER**] key to continue with download.

Continued on next page

Selecting failsafe mode, continued

Table 5-21 Selecting Failsafe Mode, Continued

Step	Press Key	Read Display or Action	Description
6	NON-VOL ENTER (Yes)	DE CONF SFM 1ØØ1 SFC WORKING...	Message exchange is working.
		MAG DR SFM 1ØØ1 READY...	Parameter change is loaded into flowmeter. SFC is ready for next function. This action only applies when Step 5 is valid. Otherwise, this keystroke results in no action.

5.4 Disconnecting the SFC

SFC disconnection checklist

Before disconnecting the SFC, perform the following checks to ensure that the flowmeter is operating properly.

- Be sure a “#” character does not appear on the right side of the SFC display indicating that the flowmeter is in its current output mode.

– EXAMPLE:

```
LRV 1   SFM 1ØØ#
 Ø.ØØØØ m3/h
```

If the # character is on the display, press the [**OUTPUT**] key and then the [**CLR**] key to remove the flowmeter from the current output mode.

– EXAMPLE:

[INPUT J OUT-PUT]

```
OUTP 1  SFM 1ØØ#
SFC WORKING...
```

```
OUTP 1  SFM 1ØØ#
   5Ø.ØØ %
```

[CLR (NO)]

```
OUTP 1  SFM 1ØØ#
SFC WORKING...
```

```
 MAG DR SFM 1ØØ1
 READY...
```

- Be sure to store all changes in the flowmeter’s non-volatile memory by pressing the [**SHIFT**] key and then the [**ENTER**] key.

– EXAMPLE:

[^ SHIFT]

```
 MAG SR SFM 1ØØ1
     SHIFT–
```

[NON-VOL ENTER (Yes)]

```
 MAG SR SFM 1ØØ1
SFC WORKING...
```

```
 MAG SR SFM 1ØØ1
DATA NONVOLATILE
```

```
 MAG SR SFM 1ØØ1
 READY...
```

- Be sure to disconnect the SFC leads from the flowmeter before unplugging them from the SFC.
- Be sure the SFC is disconnected from a flowmeter in the analog mode before returning the loop to the automatic operating mode.

5.5 Start-up and Operation Using the SFC

Summary

Once you have installed and configured a MagneW 3000 ***PLUS*** flowmeter, you are ready to start up the process loop. To do this, you will need to:

- Fill the pipe with fluid.
- Zero the meter.
- Stabilize the zero output function, taking into account
  - Analog outputs
  - I/O functions

You can also run an optional output check to “ring out” an analog loop prior to start-up. If your converter is equipped with a pulse board, you can also simulate a pulse output to check the operation of the pulse output circuit as well as check status inputs and outputs.

5.5.1 Zeroing the Meter

Zeroing the meter

After the detector is filled with pipe fluid, the meter needs to be adjusted for zero flow. This process is called zeroing the meter (Table 5-22). It is required for proper operation and must be performed any time the process fluid is changed.

Table 5-22 Starting Up and Zeroing the Meter

Step	Press Key	Read Display or Action	Description
1		Apply power to loop and converter.	
2		Connect SFC across loop wiring. If possible, locate SFC where you can also view receiver instrument in loop.	See Figure 5-7 for sample SFC connections. Meter connections are optional in case you want to verify converter output.
3		Fill detector with fluid and be sure there is no flow.	Allow process to stabilize at starting point. Flowrate indicator on converter should be reading zero.
4		Turn ON SFC.	
5	DE READ A ID	TAG NO. TRIPS SECURED??	Be sure any switches that may trip alarms or interlocks associated with analog loop are secured or turned off.
6	NON-VOL ENTER (Yes)	TAG NO. SFC WORKING... MAG SR TAG NO. SFM 1ØØ1	Confirms that "TRIPS" are secured and establishes communications with flowmeter. Confirm flowmeter ID to be sure you are connected to correct flowmeter.
7	^ SHIFT INPUT J OUT-PUT	MAG SR SFM 1ØØ1 SHIFT – INPUT 1 SFM 1ØØ1 SFC WORKING... INPUT 1 SFM 1ØØ1 Ø.ØØØ m3/h .	Initiates shift key selection. Read applied input signal in desired engineering units that is equivalent to process zero point. Reading is updated every six seconds.
8	RESET K COR-RECT	INPUT 1 SFM 1ØØ1 ZERO INPUT?	Prompt asks if you want to initiate zero input function.
9	NON-VOL ENTER (Yes)	INPUT 1 SFM 1ØØ1 INPUT ZEROED	Initiates automatic zero adjustment. Prompt appears when adjustment is completed.

Continued on next page

5.5.1 Zeroing the Meter, Continued

Zeroing the meter, continued

Table 5-22 Starting Up and Zeroing the Meter, Continued

Step	Press Key	Read Display or Action	Description
10	INPUT J OUT- PUT	OUTP 1 SFM 1ØØ1 SFC WORKING... OUTP 1 SFM 1ØØ1 Ø.ØØ %	Calls up output for display. Read 0% output on display for corresponding zero input signal. For analog transmission, check that milliammeter reading is 4 mA (0%) output and/or receiver indication is at its zero point.
11		Bring process to its full scale (100%) flowrate.	Allow process to stabilize at full scale operating point.
12	^ SHIFT INPUT J OUT- PUT	OUTP 1 SFM 1ØØ1 SHIFT – INPUT 1 SFM 1ØØ1 SFC WORKING... INPUT 1 SFM 1ØØ1 25Ø.Ø6 m3/h .	Initiates shift key selection. Read applied input signal in desired engineering units that is equivalent to process full scale point. Reading is updated every six seconds.
13	INPUT J OUT- PUT	OUTP 1 SFM 1ØØ1 1ØØ.ØØ %	Read 100% output on display for corresponding full scale input signal. For analog transmission, check that milliammeter reading is 20 mA (100%) output and/or receiver indication is at its full scale point.
14		Return process to its no flow condition.	
15		**If …** → **Then ...** reading errors exist → verify calibration of receiving device. errors still exist after calibration of receiving device → verify converter's configuration and URV setting. If required, adjust converter output through output calibration to compensate for small errors.	
16		Remove SFC and optional meter from loop.	

5.5.2 Checking the Analog Output

Optional analog output check

You can put the converter into an output mode to check out other instruments in the loop, such as recorders, controllers, and positioners. Using the SFC, you can tell the transmitter to change its output to any value between 0% (4mA or 1V) and 100% (20mA or 5V) and maintain that output. This makes it easy to verify loop operation through the accurate simulation of current output signals before bringing the loop on line.

ATTENTION The converter does not measure the input or update the output while it is in the output mode.

The procedure in Table 5-23 outlines the steps for using a converter in its output mode and clearing the output mode.

Table 5-23 Using Converter in Output Mode

Step	Press Key	Read Display or Action	Description
1		Connect SFC across loop wiring and turn it on. If possible, locate SFC where you can also view receiver instrument in loop. If you want to verify loop calibration, connect a precision milliammeter or voltmeter in loop to compare readings.	See Figure 5-7 for sample SFC and meter connections in a typical analog loop.
2	DE READ A ID	TAG NO. TRIPS SECURED??	Be sure any switches that may trip alarms or interlocks associated with analog loop are secured or turned off.
3	NON-VOL ENTER (Yes)	TAG NO. SFC WORKING... MAG SR TAG NO. SFM 1ØØ1	Confirms that “TRIPS” are secured and establishes communications with sample flowmeter SFM 1001.
4	INPUT J OUT- PUT	MAG SR SFM 1ØØ1 SFC WORKING... OUTP 1 SFM 1ØØ1 32.4Ø %	Display shows current transmitter output level and it will update every six seconds. Be sure to time your next key press with an updated display. **ATTENTION** For dual range operation, the bottom row of the display will identify which range the output represents—RNG1 or RNG2.
5	SW VER X 3 Z 0	OUTP 1 SFM 1ØØ1 3_ % OUTP 1 SFM 1ØØ1 3Ø_ %	Key in 30% for desired output signal level of 8.8 mA (2.2V).

Continued on next page

5.5.2 Checking the Analog Output, Continued

Optional analog output check, continued

Table 5-23 Using Converter in Output Mode, Continued

<table>
<tr><th>Step</th><th>Press Key</th><th>Read Display or Action</th><th>Description</th></tr>
<tr><td>6</td><td>NON-VOL
ENTER (Yes)</td><td>OUTP 1 SFM 1ØØ1
SFC WORKING...

OUTP 1 SFM 1ØØ#
3Ø.ØØ %</td><td>Output signal is set at 30% (8.8 mA/2.2 V). A “#” character appears on right side of display to remind you that transmitter is in its Output mode.</td></tr>
<tr><td>7</td><td></td><td>Check that receiving device indication is at its 30% point. If applicable, check that milliammeter reading is 8.8 mA or voltmeter reading is 2.2 V.

If indication is inaccurate, check calibration of receiving device.</td><td></td></tr>
<tr><td>8</td><td></td><td>Repeat Steps 5 and 6 to check indications at these output percentages.
<table>
<tr><th>If output is … reads…</th><th>Then meter</th></tr>
<tr><td>0%</td><td>4.0mA/1.0V</td></tr>
<tr><td>25%</td><td>8.0mA/2V</td></tr>
<tr><td>50%</td><td>12.0mA/3V</td></tr>
<tr><td>60%</td><td>13.6mA/3.4V</td></tr>
<tr><td>80%</td><td>16.6mA/4.2V</td></tr>
<tr><td>100%</td><td>20.0mA/5.0V</td></tr>
</table></td><td>Use transmitter output as a calibration input source for instruments in loop.</td></tr>
<tr><td>9</td><td>INPUT
J
OUT-PUT

CLR (NO)</td><td>OUTP 1 SFM 1ØØ#
SFC WORKING...

OUTP 1 SFM 1ØØ#
1ØØ.ØØ %

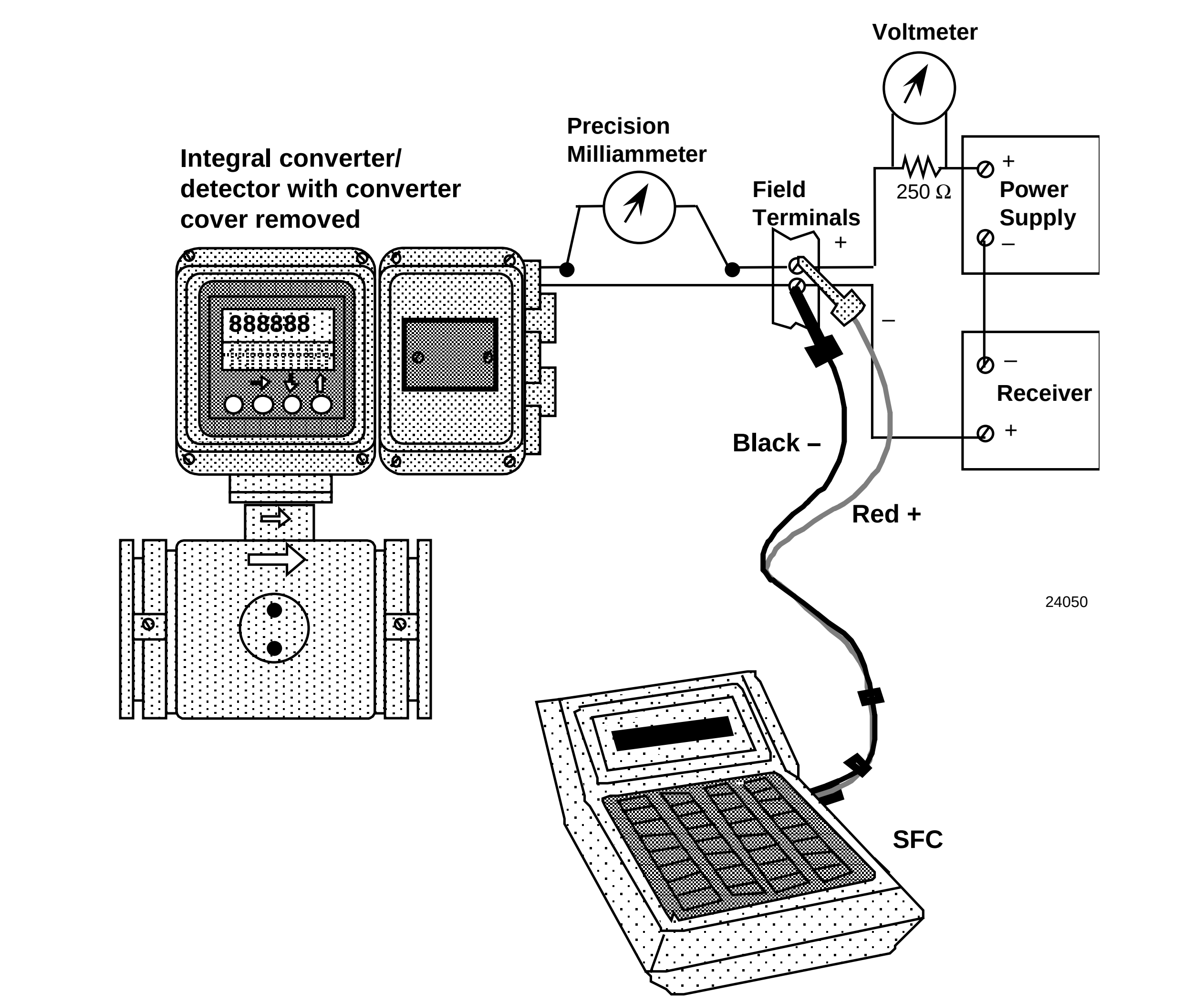
OUTP 1 SFM 1ØØ#
SFC WORKING...

MAG SR SFM 1ØØ1
READY...</td><td>Exits Output mode. Check that # character disappears from right side of display since converter is no longer in Output mode.</td></tr>
</table>

Continued on next page

Optional analog output check, continued

Figure 5-7 Typical SFC and Meter Connections for Output Mode



5.5.3Checking the Optional Pulse Output

Optional pulse output check

You can use the converter as a pulse generator to simulate pulse output to a counter. Using the SFC, you can tell the converter to change its pulse output to any value between 0 to 125%.

The procedure in Table 5-24 outlines the steps for using a converter in its pulse output mode.

ATTENTION The procedure in Table 5-24 assumes that you have established communications with the flowmeter and the converter is equipped with a pulse board.

Table 5-24 Using Converter Pulse Output

Step	Press Key	Read Display or Action	Description
1	CONF (B)	SFM CONFIG SFC WORKING. . . SFM CONFIG UNITS KEY?	Calls up configuration menu selections.
2	▲ NEXT (H)	Press key until this display appears. SFM CONFIG TOTALIZER MENU?	Calls up totalizer menu.
3	NON-VOL ENTER (Yes)	TOTALIZER MENU READ TOTAL?	Calls up first totalizer menu parameter
4	▲ NEXT (H)	TOTALIZER MENU PULSE OUTPUT?	Calls up next totalizer parameter which is pulse output.
5	NON-VOL ENTER (Yes)	PULSE OUTPUT PULSE RANGE #1	For dual range function, shows current active range number.
6	NON-VOL ENTER (Yes)	PULSE OUTPUT SFC WORKING. . . PULSE OUTPUT Ø.Ø% PLS 1	Calls up current pulse output for active range. Reading is updated every four seconds.
7	SW VER 3 (X) 0 (Z)	PULSE OUTPUT 3_ . % PLS 1 PULSE OUTPUT 3Ø_ . % PLS 1	Key in “30” as desired pulse output signal.

Continued on next page

Optional pulse output check, continued

Table 5-24 Using Converter Pulse Output, Continued

Step	Press Key	Read Display or Action	Description
8	NON-VOL ENTER (Yes)	PULSE OUTPUT SFC WORKING... PULSE OUTPUT # 3Ø,Ø % PLS 1	Pulse output is set to 30%. Check counter in pulse output circuit for required response. Note that # symbol appears as last character in top row of display to show that Pulse Output is being simulated.
9	NON-VOL ENTER (Yes)	TOTALIZER MENU PULSE OUTPUT?	Exits Pulse Output mode and returns to totalizer menu selections.

5.5.4 Accessing Operation Data

Accessing operation data

Table 5-25 summarizes the keystrokes required to access given operation data from the flowmeter using an SFC. These keystrokes assume that SFC communications have been established with the flowmeter by pressing the [**ID**] key. The values shown in displays are for example purposes only.

Table 5-25 Keystroke Summary for Accessing Operation Data

IF you want to view…	THEN use these keystrokes…
the present input signal in selected engineering units, which is updated every six seconds	[^ SHIFT] → MAG SR SFM 1ØØ1 SHIFT – INPUT [J OUT-PUT] → INPUT 1 SFM 1ØØ1 SFC WORKING. . . INPUT 1 SFM 1ØØ1 186.7Ø m3/h .
the present flowmeter current output in percent, which is updated every six seconds	INPUT [J OUT-PUT] → OUTP 1 SFM 1ØØ1 SFC WORKING. . . OUTP 1 SFM 1ØØ1 65.74 %
the span, which is the URV minus the LRV	URL [Y SPAN] → SPAN 1 SFM 1ØØ1 272.62m3/h
the Lower Range Value of the flowmeter, which is fixed at zero	[E LRV 0%] → LRV 1 SFM 1ØØ1 Ø.ØØØØ m3/h
the Upper Range Value for single range or range 1 of dual range	[F URV 100%] → URV 1 SFM 1ØØ1 272.62m3/h
the Upper Range Value for range 2 of dual range	[^ SHIFT] → MAG SR SFM 1ØØ1 SHIFT – [F URV 100%] → URV2 1 SFM 1ØØ1 .72924 m3/h
the Upper Range Limit of the flowmeter, which is maximum flowrate at velocity of 1 meter per second	[^ SHIFT] → MAG SR SFM 1ØØ1 SHIFT – URL [Y SPAN] → URL 1 SFM 1ØØ1 28.274 m3/h

Continued on next page

Accessing operation data, continued

Table 5-25 Keystroke Summary for Accessing Operation Data, Continued

IF you want to view…	THEN use these keystrokes…
the present flow totalization value, which is updated every six seconds	B CONF — SFM CONFIG UNITS KEY? H NEXT — SFM CONFIG TOTALIZER MENU? NON-VOL ENTER (Yes) — TOTALIZER MENU READ TOTAL? NON-VOL ENTER (Yes) — READ TOTAL SFC WORKING. . . READ TOTAL 137444 COUNTS
the present pulse output in percent, which is updated every four seconds	B CONF — SFM CONFIG UNITS KEY? H NEXT — SFM CONFIG TOTALIZER MENU? NON-VOL ENTER (Yes) — TOTALIZER MENU READ TOTAL? H NEXT — TOTALIZER MENU PULSE OUTPUT? NON-VOL ENTER (Yes) — PULSE OUTPUT PULSE RANGE #1 NON-VOL ENTER (Yes) — PULSE OUTPUT SFC WORKING. . . PULSE OUTPUT Ø.Ø% PLS 1

Continued on next page

5.5.4 Accessing Operation Data, Continued

Accessing operation data, continued

Table 5-25 Keystroke Summary for Accessing Operation Data, Continued

<table>
<tr><th>IF you want to view…</th><th colspan="2">THEN use these keystrokes…</th></tr>
<tr><td rowspan="8">the present reset trip value for the preset counter function</td><td>CONF (B)</td><td>SFM CONFIG
UNITS KEY?</td></tr>
<tr><td>▲ NEXT (H)</td><td>SFM CONFIG
TOTALIZER MENU?</td></tr>
<tr><td>NON-VOL
ENTER (Yes)</td><td>TOTALIZER MENU
READ TOTAL?</td></tr>
<tr><td>▲ NEXT (H)</td><td>TOTALIZER MENU
PULSE OUTPUT?</td></tr>
<tr><td>▲ NEXT (H)</td><td>TOTALIZER MENU
PULSE CONFIG?</td></tr>
<tr><td>▲ NEXT (H)</td><td>TOTALIZER MENU
SET TRIP VALUE?</td></tr>
<tr><td>NON-VOL
ENTER (Yes)</td><td>TRIP VALUE
SFC WORKING. . .</td></tr>
<tr><td></td><td>TRIP VALUE
5ØØØ COUNTS</td></tr>
</table>

Continued on next page

5.5.4 Accessing Operation Data, Continued

Accessing operation data, continued

Table 5-25 Keystroke Summary for Accessing Operation Data, Continued

IF you want to view…	THEN use these keystrokes…
the reset total value and reset the internal counter to zero	B CONF → SFM CONFIG / UNITS KEY? H ▲ NEXT → SFM CONFIG / TOTALIZER MENU? NON-VOL ENTER (Yes) → TOTALIZER MENU / READ TOTAL? H ▲ NEXT → TOTALIZER MENU / PULSE OUTPUT? H ▲ NEXT → TOTALIZER MENU / PULSE CONFIG? H ▲ NEXT → TOTALIZER MENU / SET TRIP VALUE? H ▲ NEXT → TOTALIZER MENU / RESET TOTALIZE? NON-VOL ENTER (Yes) → RESET TOTALIZE / SFC WORKING... RESET TOTALIZE / Ø6Ø694 RESET? NON-VOL ENTER (Yes) → RESET TOTALIZE / SFC WORKING... TOTALIZER MENU / RESET TOTALIZE?
the PROM serial number	B CONF → SFM CONFIG / UNITS KEY? H ▲ NEXT → SFM CONFIG / SER# 2Ø99999937

Continued on next page

5.5.4 Accessing Operation Data, Continued

Accessing operation data, continued

Table 5-25 Keystroke Summary for Accessing Operation Data, Continued

IF you want to view…	THEN use these keystrokes…
the status of transmitter operation at the present time	F/S DIR [U STAT] STATUS SFM 1ØØ1 SFC WORKING... STATUS SFM 1ØØ1 STATUS CHECK=OK MAG SR SFM 1ØØ1 READY...
the present message in the scratch pad area of memory	[^ SHIFT] MAG SR SFM 1ØØ1 SHIFT– SCR PAD [→ ■] SCR PAD SFM 1ØØ1 SFC WORKING... SCRATCH PAD 1 CAL IB ON 3/22/93 [H ▲ NEXT] SCRATCH PAD 2 BY JOHN 2nd SHFT

5.5.5 Writing Data in Scratch Pad

Writing scratch pad message

You can enter or edit a message consisting of two groups of 16 characters each through the SFC's scratch pad area of memory.

The procedure in Table 5-26 outlines the steps for editing a sample message in the scratch pad area. This procedure assumes that SFC communications have been established with the transmitter by pressing the [**ID**] key

Table 5-26 Writing Data in Scratch Pad Area

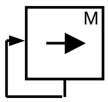
Step	Press Key	Read Display or Action	Description
1	SHIFT ^	MAG SR SFM 1ØØ1 SHIFT –	Initiates shift key selection.
	SCR PAD ■ →	SCR PAD SFM 1ØØ1 SFC WORKING. . .	Calls up first group of 16 characters.
		SCRATCH PAD 1 CAL IB ON 3/22/93	
2	▲ NEXT H	SCRATCH PAD 2 BY JOHN 2nd SHFT	Calls up second group of 16 characters.
3	→ M	SCRATCH PAD 2 BY JOHN 2nd SHFT	Cursor is moved to 6th character "H". Cursor moves one character space to right with each press. Use [←] key to move cursor one character space to left with each press. Note that cursor keys will automatically toggle between pad 1 and 2 when moving forward or backward through message as applicable.
4	NUM/ ALPHA	SCRATCH PAD 2 BY JO*N 2nd SHFT	Enters alpha mode so you can use SFC keyboard to enter alphabetic characters.
5	E LRV 0%	SCRATCH PAD 2 BY JOE* 2nd SHFT	"E" and "space" are entered to change name from JOHN to JOE
	SCR PAD ■ →	SCRATCH PAD 2 BY JOE *2nd SHFT	
6	NUM/ ALPHA	SCRATCH PAD 2 BY JOE _2nd SHFT	Exits alpha mode.
7	▲ NEXT H	SCRATCH PAD 1 CAL IB ON 3/22/93	Returns to first group of 16 characters.

Continued on next page

5.5.5 Writing Data in Scratch Pad, Continued

Writing scratch pad message, continued

Table 5-26 Writing Data in Scratch Pad Area, Continued

Step	Press Key	Read Display or Action	Description
8		SCRATCH PAD 1 CALIB ON 3/22/93	Cursor is moved to 10th character “3”.
9	SEC VAR T 6	SCRATCH PAD 1 CALIB ON 6/22/93	Changes “3” to “6” to reflect revised calibration date.
10	NON-VOL ENTER (Yes) OR CLR (NO)	SCR PAD SFC WORKING... SCRATCH PAD 1 CALIB ON 6/22/93 MAG SR SFM 1ØØ1 READY...	Saves changes in message. Exits scratch pad without saving changes in message.

5.5.6 Saving and Restoring a Database

Saving and restoring a database

If it becomes necessary to replace a damaged flowmeter with a spare, you could save the configuration database from the damaged flowmeter to the HOLD memory in the SFC and then restore the saved configuration database from the HOLD memory in the spare flowmeter.

The procedure in Table 5-27 outlines the steps for saving a database from one flowmeter and restoring it in another.

Table 5-27 Saving and Restoring a Database

Step	Press Key	Read Display or Action	Description
1		Connect SFC across loop wiring for flowmeter with database to be saved and turn it on.	Be sure to put analog loop into manual mode.
2	DE READ A ID	TAG NO. TRIPS SECURED??	Be sure any switches that may trip alarms or interlocks associated with analog loop are secured or turned off.
3	NON-VOL ENTER (Yes)	TAG NO. SFC WORKING... MAG SR TAG NO. SFM 1ØØ1	Confirms that “TRIPS” are secured and establishes communications with flowmeter.
4	B CONF	SFM CONFIG UNITS KEY?	Calls up configuration function.
5	H ▲ NEXT	Press key until this prompt appears on display. SFM CONFIG SAVE/RESTORE?	Calls up save/restore menu selection.
6	NON-VOL ENTER (Yes)	SAVE/RESTORE SAVE DATA?	Calls up save/restore function. Prompt asks if you want to save database from this flowmeter.
7	NON-VOL ENTER (Yes)	SAVE DATA ARE YOU SURE?	Prompt asks for confirmation of database save function.
8	NON-VOL ENTER (Yes)	SAVE DATA SFC WORKING... SAVE DATA DATA SAVED SAVE/RESTORE SAVE DATA?	Answers yes to prompt and initiates database save function. Database saved to SFC HOLD memory.

Continued on next page

Saving and restoring a database, continued

Table 5-27 Saving and Restoring a Database, Continued

Step	Press Key	Read Display or Action	Description
9	CLR (No)	SFM CONFIG SAVE/RESTORE?	Returns to save/restore menu selection.
10		Disconnect SFC and connect it to loop wiring for flowmeter whose database is to be restored. **CAUTION** Be sure to leave SFC power on. The saved database will be lost if the SFC power is turned off.	Be sure to put analog loop into manual mode.
11	DE READ A ID	TAG NO. TRIPS SECURED??	Be sure any switches that may trip alarms or interlocks associated with analog loop are secured or turned off.
12	NON-VOL ENTER (Yes)	TAG NO. SFC WORKING... MAG SR TAG NO. XXXXXXXX	Confirms that “TRIPS” are secured and establishes communications with sample transmitter without a tag number (ID) whose database is to be restored.
13	B CONF	SFM CONFIG UNITS KEY?	Calls up configuration function.
14	▲ H NEXT	Press key until this prompt appears on display. SFM CONFIG SAVE/RESTORE?	Calls up save/restore menu selection.
15	NON-VOL ENTER (Yes)	SAVE/RESTORE SAVE DATA?	Prompt asks if you want to save database from this flowmeter.
16	▲ H NEXT	SAVE/RESTORE RESTORE DATA?	Calls up prompt for restore function. It asks if you want to restore saved database in this flowmeter.
17	NON-VOL ENTER (Yes)	RESTORE DATA ARE YOU SURE?	Prompt asks for confirmation of database restore function.

Continued on next page

Saving and restoring a database, continued

Table 5-27 Saving and Restoring a Database, Continued

Step	Press Key	Read Display or Action	Description
18	NON-VOL ENTER (Yes)	RESTORE DATA SFC WORKING. . . RESTORE DATA DATA RESTORED SAVE/RESTORE RESTORE DATA?	Answers yes to prompt and initiates database restore function. Saved database has been restored (written) to flowmeter's memory.
19	CLR (No)	SFM CONFIG SAVE/RESTORE?	Returns to save/restore menu selection.
20	CLR (No)	MAG SR SFM 1ØØ1 READY. . .	Exits configuration and verifies that flowmeter's ID now reflects ID from restored database. Tag number SFM 1001 is used for example purposes only. Change tag number and other configuration data as required.

It is possible to restore the saved configuration database in any number of flowmeters as long as you change the tag number (ID) in the restored database.

Section 6 – Maintenance

6.1 Maintenance Routines and Schedules

Section contents

This section contains the following topics:

Topic	See Page

Maintenance routines and schedules

You must periodically inspect and clean the MagneW 3000 ***PLUS*** detector's electrodes. Since the electrodes are in direct contact with the fluid, they can become coated with a thin film that impairs their operation. How often you must check the electrodes will be dictated by the characteristics of the given process.

The MagneW 3000 ***PLUS*** converter does not require any specific maintenance routine at regularly scheduled intervals. However, you may want to periodically check connections and mounting means to be sure they are secure.

6.2 Inspecting Electrodes

Introduction

In most models, the detector's electrodes are externally accessible which means you do not have to remove the detector from the line to access them.

The procedure in Table 6-1 outlines the typical steps for inspecting and cleaning an electrode assembly.

Table 6-1 Inspecting and Cleaning an Electrode Assembly

Step	Action
1	Turn OFF converter power.
2	Drain fluid from detector, so it will not leak from detector when electrode is removed.
3	Remove screws holding electrode cover to side of detector and remove cover. Inspect cover O-ring for damage and replace if needed.
4	Remove screw holding signal lead to electrode and push lead aside.
5	Unscrew electrode assembly holder using removal key accessory.
6	Remove electrode assembly from holder. Remove gasket from end of electrode, then remove spacer, spring, spacer, and tube from other side of electrode.
7	Use a thinner, alcohol, or detergent to clean electrode. **CAUTION** Be sure to follow manufacturer's precautions when handling solvents.
8	After electrode is totally dry, reverse actions in steps 3 to 6 to install electrode. **ATTENTION** We recommend that you always replace the electrode gasket whenever the electrode is removed for inspection and cleaning.
9	Repeat steps 3 to 8 to inspect and clean electrode assembly on other side of detector.
10	Fill detector with fluid and check for leaks from electrode covers.
11	Turn on converter and let it warm-up for 15 minutes.
12	Use SFC or DOP to do an input/auto zero adjustment.

Section 7 – Signal Simulation and Verification (Calibration)

7.1 Calibration Summary

Section contents

This section contains the following topics:

Topic	See Page

About calibration

The MagneW 3000 ***PLUS*** Electromagnetic Flowmeter does not typically require recalibration at periodic intervals to maintain accuracy. If you think the flowmeter converter needs recalibration, we recommend that you do a bench verification using the MagneW Calibrator with the flowmeter removed from the process and located in a controlled environment to get the best accuracy.

If the flowmeter will be operating in the analog mode, you must calibrate its output signal before you calibrate the flowmeter's flow spans using the DOP or the SFC. While it is not required to calibrate the output signal first for flowmeter's operating in the DE mode, you can do it by using the SFC to read the output in percent.

7.2 Calibration with the DOP

7.2.1 Verifying the Output Signal

Output signal verification

You can verify (calibrate) the flowmeter's analog output circuit at its 0 and 100% levels by using the flowmeter in its Output mode. It is not necessary to remove the flowmeter from service.

The procedure in Table 7-1 shows the steps for calibrating the output signal for a flowmeter in the analog mode with a DOP.

Table 7-1 Verifying Output Signal for Flowmeter in Analog Mode

Step	Procedure	Screen
1	Connect a precision milliammeter or voltmeter (0.03% accuracy or better) in loop to check readings. Refer to Figure 4-2, page 148 for sample test equipment hookup.	
2	Turn ON converter power. **ATTENTION** Be sure to put analog control loop into manual mode while configuring flowmeter.	
3	After converter runs self-check and starts up in Measuring mode, enter the Operator's mode by pressing the [**MODE**] key for more than one second.	
4	Scroll to the MODE ENTER MAINTENANCE screen by pressing the [⇧] key.	
5	Enter the Maintenance mode by pressing the [⇨] key then the [⇧] key. Scroll to the calibration mode screen by pressing the [⇧] key.	`>̲ CALIBRATION` `  MODE    OFF`
6	Press the [⇨] key to move cursor to mode state parameter.	`> CALIBRATION` `  MODE    O̲FF`
7	Pressing the [⇧] key, scroll to the high current output calibration parameter.	`>̲ CAL I.OUT OFF` `  LOW   4.000 mA`

Continued on next page

7.2.1 Verifying the Output Signal, Continued

Output signal verification, continued

Table 7-1 Verifying Output Signal for Flowmeter in Analog Mode, Continued

<table>
<tr><th>Step</th><th>Procedure</th><th>Screen</th></tr>
<tr><td>8</td><td>Press the [⇨] key to move the cursor to current output calibration state.</td><td>> CAL I.OUT OFF
LOW 4.000 mA</td></tr>
<tr><td>9</td><td>Check that milliammeter or voltmeter reading is 4 mA or 1V.
<table><tr><th>If reading is...</th><th>Then go to…</th></tr><tr><td>correct</td><td>Step 12.</td></tr><tr><td>lower than 4 mA or 1V</td><td>Step 10.</td></tr><tr><td>higher than 4 mA or 1V</td><td>Step 11.</td></tr></table></td><td></td></tr>
<tr><td>10</td><td>Press the [⇧] key, watching for milliammeter or voltmeter reading to increase. Repeat this step until reading is correct, then go to Step 12.</td><td></td></tr>
<tr><td>11</td><td>Press the [⇩] key, watching for milliammeter or voltmeter reading to decrease. Repeat this step until reading is correct, then go to Step 12.</td><td></td></tr>
<tr><td>12</td><td>Press the [⇨] key to move the cursor to > symbol.</td><td></td></tr>
<tr><td>13</td><td>Press the [⇧] key to call up the high current output calibration parameter.</td><td>> CAL I.OUT OFF
HIGH 20.000 mA</td></tr>
<tr><td>14</td><td>Press the [⇨] key to move the cursor to high current output calibration state.</td><td>> CAL I.OUT OFF
HIGH 20.000 mA</td></tr>
</table>

Continued on next page

Output signal verification, continued

Table 7-1 Verifying Output Signal for Flowmeter in Analog Mode, Continued

<table>
<tr><th>Step</th><th>Procedure</th><th>Screen</th></tr>
<tr><td>15</td><td>Check that milliammeter or voltmeter reading is 20 mA or 5V.<table><tr><th>If reading is...</th><th>Then go to…</th></tr><tr><td>correct</td><td>Step 18.</td></tr><tr><td>lower than 20 mA or 5V</td><td>Step 16.</td></tr><tr><td>higher than 20 mA or 5V</td><td>Step 17.</td></tr></table></td><td></td></tr>
<tr><td>16</td><td>Press the [⇧] key, watching for milliammeter or voltmeter reading to increase. Repeat this step until reading is correct, then go to Step 18.</td><td></td></tr>
<tr><td>17</td><td>Press the [⇩] key, watching for milliammeter or voltmeter reading to decrease. Repeat this step until reading is correct, then go to Step 18.</td><td></td></tr>
<tr><td>18</td><td>Press the [MODE] key to exit the Calibration mode and return to Measuring mode display.</td><td></td></tr>
</table>

7.2.2 Checking Excitation Current

Excitation current check

Before doing a flow spans verification, we recommend that you check the flowmeter's excitation current value. This check is for remote models only.

Table 7-2 gives the procedure for checking the flowmeter's excitation current value using its DOP.

Table 7-2 Checking Excitation Current

Step	Procedure	Screen
1	Remove cover from the converter. Connect a digital multimeter between terminals X and Y.	
2	Turn ON converter power. **ATTENTION** Be sure to put analog control loop into manual mode while configuring flowmeter.	
3	Enter the Operator's mode by pressing the [**MODE**] key for more than one second.	
4	Scroll to the MODE ENTER MAINTENANCE screen by pressing the [⇧] key.	
5	Enter the Maintenance mode by pressing the [⇨] key then the [⇧] key. Output check parameter display appears.	`> OUTPUT CHECK` `  MODE    OFF`
6	Press the [⇨] key to move cursor to mode status selection.	`> OUTPUT CHECK` `  MODE    OFF`
7	Press the [⇧] key once to turn on output check mode, activating the current output function. Continue pressing the [⇧] key to scroll to the excitation current check function.	`> EX CHECK` `  EXX      160.0`

Continued on next page

7.2.2 Checking Excitation Current, Continued

Excitation current check, continued

Table 7-2 Checking Excitation Current, Continued

Step	Procedure	Screen
8	Press the [⇨] key to move cursor to function selection initiating X to Y excitation current flow. Make sure current reaches 160.0 mA. If it does not, you must do an excitation current calibration.	`> EX CHECK` `EXX 160.0`
9	Press the [⇧] key to initiate Y to X excitation current flow. Make sure current reaches 160.0 mA. If it does not, you must do an excitation current calibration.	`> EX CHECK` `EXY 160.0`
10	Press the [⇨] key to move cursor to the > symbol.	
11	Press the [**MODE**] key to return to Measuring mode display.	
12	Disconnect digital multimeter leads from X and Y terminals unless you have to adjust excitation current.	

7.2.3 Verifying and Adjusting Excitation Current

Excitation current calibration

If the results of the excitation current check call for excitation current calibration, use the procedure in Table 7-3 to calibrate the excitation current with a DOP.

ATTENTION The procedure in Table 7-3 assumes that the digital multimeter leads are still connected to the X and Y terminals and that the DOP is in its measuring mode.

Table 7-3 Verifying and Adjusting Excitation Current

Step	Procedure	Screen
1	Enter the Operator's mode by pressing the [**MODE**] key for more than one second.	
2	Scroll to the MODE ENTER MAINTENANCE screen by pressing the [⇧] key.	
3	Enter the Maintenance mode by pressing the [⇨] key then the [⇧] key.	
4	Pressing the [⇧] key, scroll to the Calibration mode screen.	`> CALIBRATION` `MODE    OFF`
5	Press the [⇨] key to move the cursor to mode status parameter.	`> CALIBRATION` `MODE    OFF`

6	Press the [⇧] key to change the Calibration mode state to ON and call up first calibration parameter which is low excitation current setting.	`> CALIBRATION`
		`MODE    ON`
		
		`> CAL EX    OFF`
		`LOW   150.0 mA`

7	Press the [⇨] key to move the cursor to function selection.	`> CAL EX    OFF` `LOW   150.0 mA`

Continued on next page

Excitation current calibration, continued

Table 7-3 Verifying and Adjusting Excitation Current, Continued

<table>
<tr><th>Step</th><th>Procedure</th><th>Screen</th></tr>
<tr><td>8</td><td>Check that digital multimeter reading is 150 mA.
<table><tr><th>If reading is...</th><th>Then go to…</th></tr><tr><td>correct</td><td>Step 11.</td></tr><tr><td>lower than 150 mA</td><td>Step 9.</td></tr><tr><td>higher than 150 mA</td><td>Step 10.</td></tr></table></td><td></td></tr>
<tr><td>9</td><td>Pressing the [⇧] key watch for multimeter reading to increase.

Repeat this step until reading is correct, then go to Step 11.</td><td></td></tr>
<tr><td>10</td><td>Pressing the [⇩] key watch for multimeter reading to decrease.

Repeat this step until reading is correct, then go to Step 11.</td><td></td></tr>
<tr><td>11</td><td>Press the [⇨] key to return the cursor to the > symbol.</td><td></td></tr>
<tr><td>12</td><td>Press the [⇧] key to call up the high excitation current setting.</td><td><pre>> CAL EX   OFF
  HIGH 160.0 mA</pre></td></tr>
<tr><td>13</td><td>Press the [⇨] key to move the cursor to function selection.</td><td><pre>> CAL EX   OFF
  HIGH 160.0 mA</pre></td></tr>
<tr><td>14</td><td>Check that digital multimeter reading is 160 mA.
<table><tr><th>If reading is...</th><th>Then go to…</th></tr><tr><td>correct</td><td>Step 17.</td></tr><tr><td>lower than 160 mA</td><td>Step 15.</td></tr><tr><td>higher than 160 mA</td><td>Step 16.</td></tr></table></td><td></td></tr>
</table>

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7.2.3 Verifying and Adjusting Excitation Current, Continued

Excitation current calibration, continued

Table 7-3 Verifying and Adjusting Excitation Current, Continued

Step	Procedure	Screen
15	Pressing the [⇧] key watch for multimeter reading to increase. Repeat this step until reading is correct, then go to Step 17.	
16	Pressing the [⇩] key watch for multimeter reading to decrease. Repeat this step until reading is correct, then go to Step 17.	
17	Press the [**MODE**] key to return to Measuring mode display.	
18	Disconnect multimeter leads from terminals.	

7.2.4 Calibrating Flow Spans

Calibration of flow spans

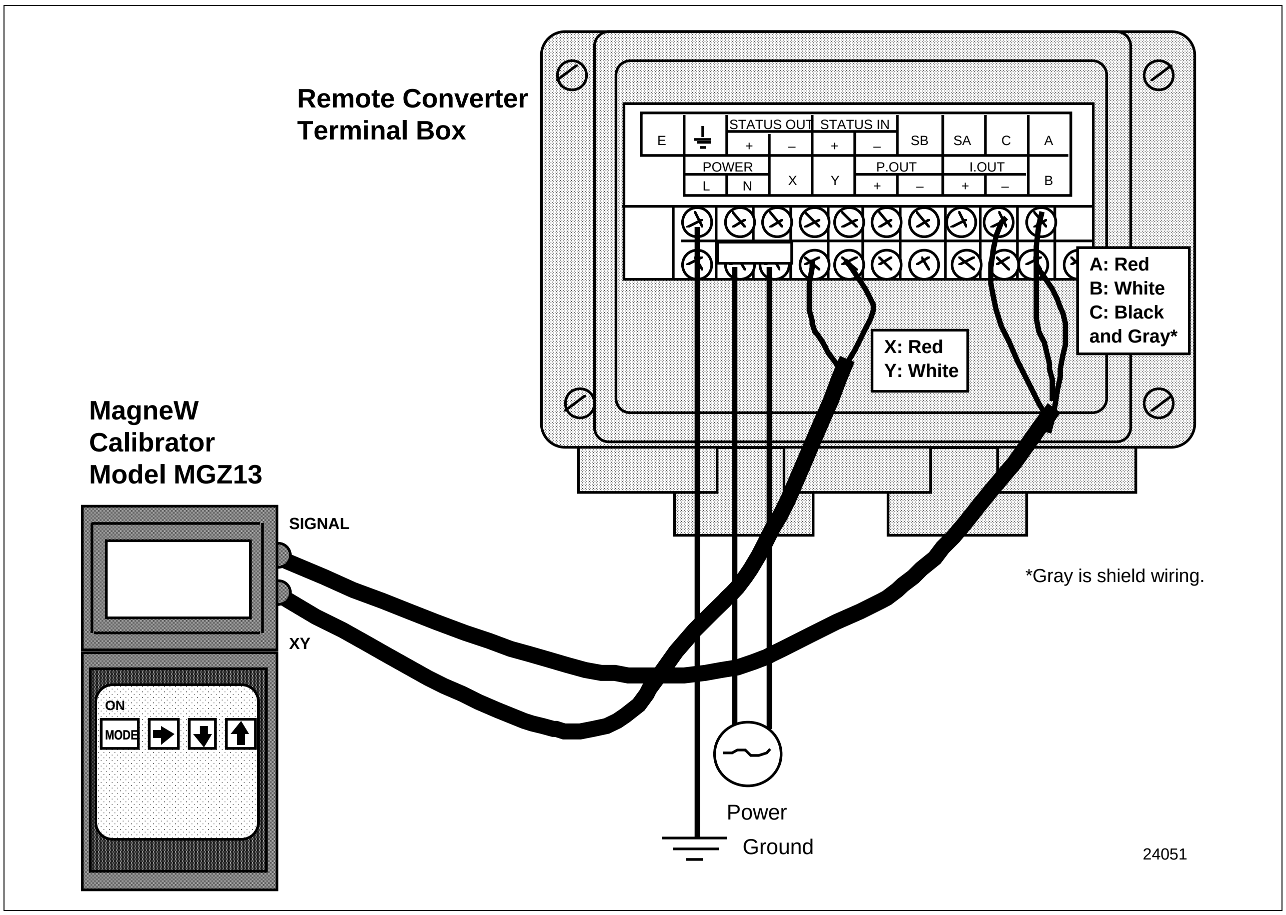
You can do a “dry” calibration of the flow spans using a Model MGZ13 MagneW Calibrator to simulate the flow velocity settings.

The procedure in Table 7-4 shows the steps for calibrating a flowmeter with a DOP. This procedure assumes that the flowmeter is removed from the process and located in a controlled environment.

ATTENTION You must have a Model MGZ13 MagneW Calibrator to do a “dry” flow spans calibration.

Before doing a flow spans verification, we recommend that you check that the flowmeter’s excitation current value using the procedure given previously in Table 7-2.

Figure 7-1 Calibration Set-up with DOP



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Calibration of flow spans, continued

Table 7-4 Calibrating Flow Spans

Step	Procedure	Screen
1	Remove cover from converter terminal box. Connect MagneW calibrator to converter as shown in Figure 7-1. **ATTENTION** • Be sure converter and calibrator are turned OFF before making any connections. • This procedure assumes that field wiring for current output and pulse output circuits has been disconnected.	
2	Turn ON converter and calibrator. Let them warm-up for at least 10 minutes. **ATTENTION** Be sure no transceivers are used within one meter (three feet) of the calibration set-up during calibration. Keep potential sources of “noise” as far as possible from the calibration set-up during calibration. Converter runs self-check and starts up in the Measuring mode.	
3	Enter the Operator’s mode by pressing the [**MODE**] key for more than one second.	
4	Scroll to the MODE ENTER MAINTENANCE screen by pressing the [⇧] key.	
5	Enter the Maintenance mode by pressing the [⇨] key and then the [⇧] key.	
6	Pressing the [⇧] key, scroll to the Calibration mode screen.	`> CALIBRATION` `MODE    OFF`
7	Press the [⇨] key to move the cursor to mode status parameter.	`> CALIBRATION` `MODE    OFF`

Continued on next page

Calibration of flow spans, continued

Table 7-4 Calibrating Flow Spans, Continued

Step	Procedure	Screen

8	Press the [⇧] key to change the Calibration mode state to ON and call up first calibration parameter which is low excitation current setting.	`> CALIBRATION`
		`  MODE    ON`
		
		`> CAL EX    OFF`
		`  LOW   150.0 mA`

9	Pressing the [⇧] key scroll to the first flow span or gain calibration for zero parameter.	`> CAL GAIN` `  ZERO     READY`
10	Use up/down keys on calibrator to set value in its flowrate velocity indicator to zero (00.00). Wait one minute for signal to stabilize.	
11	Press the [⇨] key to move the cursor to function selection.	`> CAL GAIN` `  ZERO     READY`

12	Press the [⇧] key to initiate zero gain calibration function. Note that the flowrate display flashes during calibration which takes about 35 seconds.	`> CAL GAIN`
		`  ZERO     ON`
		
		`> CAL GAIN`
		`  ZERO     READY`

13	Press the [⇨] key to move the cursor to > symbol.	
14	Press the [⇧] key to call up next flow span or gain calibration parameter which is for 0.4 meters per second flowrate.	`> CAL GAIN1` ` 00.40 m/s READY`
15	Use up/down keys on calibrator to set value in its flowrate velocity indicator to 0.4 (00.40) m/s. Wait one minute for signal to stabilize.	
16	Press the [⇨] key to move the cursor to function selection.	`> CAL GAIN1` ` 00.40 m/s READY`

Continued on next page

Calibration of flow spans, continued

Table 7-4 Calibrating Flow Spans, Continued

Step	Procedure	Screen

17	Press the [⇧] key to initiate 0.4 gain calibration function. Note that the flowrate display flashes during calibration which takes about 35 seconds.	`> CAL GAIN1`
		`00.40 m/s ON`
		
		`> CAL GAIN1`
		`00.40 m/s READY`

18	Press the [⇨] key to move the cursor to > symbol.	
19	Press the [⇧] key to call up next flow span or gain calibration parameter which is for 1.2 meters per second flowrate.	`> CAL GAIN2` `01.20 m/s READY`
20	Use up/down keys on calibrator to set value in its flowrate velocity indicator to 1.2 (01.20) m/s. Wait one minute for signal to stabilize.	
21	Press the [⇨] key to move the cursor to function selection.	`> CAL GAIN2` `01.20 m/s READY`

22	Press the [⇧] key to initiate 1.2 gain calibration function. Note that the flowrate display flashes during calibration which takes about 35 seconds.	`> CAL GAIN2`
		`01.20 m/s ON`
		
		`> CAL GAIN2`
		`01.20 m/s READY`

23	Press the [⇨] key to move the cursor to > symbol.	
24	Press the [⇧] key to call up next flow span or gain calibration parameter which is for 3.6 meters per second flowrate.	`> CAL GAIN3` `03.60 m/s READY`
25	Use up/down keys on calibrator to set value in its flowrate velocity indicator to 3.6 (03.60) m/s. Wait one minute for signal to stabilize.	

Continued on next page

Calibration of flow spans, continued

Table 7-4 Calibrating Flow Spans, Continued

Step	Procedure	Screen
26	Press the [⇨] key to move the cursor to function selection.	> CAL GAIN3 03.60 m/s READY
27	Press the [⇧] key to initiate 3.6 gain calibration function. Note that the flowrate display flashes during calibration which takes about 35 seconds.	> CAL GAIN3 03.60 m/s ON > CAL GAIN3 03.60 m/s READY
28	Press the [⇨] key to move the cursor to > symbol.	
29	Press the [⇧] key to call up next flow span or gain calibration parameter which is for 10 meters per second flowrate.	> CAL GAIN4 10.00 m/s READY
30	Use up/down keys on calibrator to set value in its flowrate velocity indicator to 10 (10.00) m/s. Wait one minute for signal to stabilize.	
31	Press the [⇨] key to move the cursor to function selection.	> CAL GAIN4 10.00 m/s READY
32	Press the [⇧] key to initiate 10 gain calibration function. Note that the flowrate display flashes during calibration which takes about 35 seconds.	> CAL GAIN4 10.00 m/s ON > CAL GAIN4 10.00 m/s READY
33	Press the [⇨] key to move the cursor to > symbol.	
34	Press the [⇧] key to exit gain calibration and return to calibration mode screen.	

Continued on next page

7.2.4 Calibrating Flow Spans, Continued

Calibration of flow spans, continued

Table 7-4 Calibrating Flow Spans, Continued

Step	Procedure	Screen
35	Press the [**MODE**] key to exit Maintenance mode and return to Measuring mode display.	
36	Turn OFF converter and calibrator and remove calibration connections. Return flowmeter to process.	

7.2.5 Shipping Data Recovery

Shipping data recovery

You can return the flowmeter to factory settings/default values for pertinent operational and configuration parameters. These parameters are entered before the unit is shipped, so they are commonly referred to as “shipping data”. They include factory calibration data and factory settings or initial default settings for customer configuration data.

The procedure in Table 7-5 shows how to recover shipping data through a DOP.

Table 7-5 Recovering Shipping Data

Step	Procedure	Screen
1	Turn ON converter power. Be sure to put analog control loop into manual mode while configuring flowmeter.	
2	Enter the Operator’s mode by pressing the [**MODE**] key for more than one second.	
3	Scroll to the MODE ENTER MAINTENANCE screen by pressing the [⇧] key.	
4	Enter the Maintenance mode by pressing the [⇨] key and then the [⇧] key.	
5	Pressing the [⇧] key, scroll to the Critical mode screen.	`> CRITICAL` `  MODE    OFF`
6	Press the [⇨] key to move the cursor to function selection.	`> CRITICAL` `  MODE    OFF`

7	Press the [⇧] key to turn ON Critical mode function and call up read only ROM version and date display.	`> CRITICAL`
		`  MODE    ON`
		
		`> ROM VER.  3.40`
		`  DATE  95-12-19`

8	Press the [⇧] key to call up shipping data recovery function.	`> SHIPPING DATA` `  RECOVERY READY`

Continued on next page

Shipping data recovery, continued

Table 7-5 Recovering Shipping Data, Continued

Step	Procedure	Screen
9	Press the [⇨] key to move the cursor to function selection.	> SHIPPING DATA RECOVERY READY
10	Press the [⇧] key for **8 seconds** and then release. This activates recovery of shipping data. Then, converter runs its self-check routine and automatically returns to the Measuring mode.	
11	Check and change configuration data as required.	

Initial data recovery note

The initial data recovery function lets you erase the configuration and calibration data from the Random Access Memory (RAM) and the Non-volatile Memory (NVM) by replacing it with initial configuration data from the Read Only Memory (ROM). This means you must recalibrate and reconfigure the flowmeter after this function is invoked. Thus, we recommend that you do not invoke the initial data recovery function in the field and we are omitting the procedures for doing so from this manual.

Special mode note

The Special mode function is primarily intended for factory use and is only accessible through the DOP. We recommend that you not invoke this function in the field and we are omitting the procedures for doing so from this manual.

7.3 Calibration with the SFC

7.3.1 Verifying the Output Signal

Output signal verification

You can verify (calibrate) the flowmeter's analog output circuit at its 0 and 100% levels by using the flowmeter in its Output mode. It is not necessary to remove the flowmeter from service.

The procedure in Table 7-6 shows the steps for calibrating the output signal for a flowmeter in the analog mode with an SFC. Note that the procedure is similar for a flowmeter in the DE mode, but the SFC must be used to read the output in percent in place of the milliammeter or voltmeter readings.

Table 7-6 Verifying Output Signal for Flowmeter in Analog Mode

Step	Press Key	Read Display or Action	Description
1		Connect SFC across loop wiring and turn it on. Connect a precision milliammeter or voltmeter (0.03% accuracy or better) in loop to check readings.	See Figure 4-2, page 148 for sample test equipment hookup. **ATTENTION** Be sure the accuracy of the resistor is 0.03% or better for current measurements made by voltage drop.
2	DE READ A ID	TAG NO. TRIPS SECURED??	Be sure any switches that may trip alarms or interlocks associated with analog loop are secured or turned off.
3	NON-VOL ENTER (Yes)	TAG NO. SFC WORKING... MAG SR TAG NO. SFM 1ØØ1	Confirms that "TRIPS" are secured and establishes communications with sample flowmeter SFM 1001.
4	INPUT J OUT-PUT	MAG SR SFM 1ØØ1 SFC WORKING... OUTP 1 SFM 1ØØ1 32.4Ø %	Display shows current flowmeter output level and it will update every six seconds. Be sure to time your next key press with an updated display. **ATTENTION** For dual range operation, the bottom row of the display will identify which range the output represents—RNG1 or RNG2.
5	Z 0	OUTP 1 SFM 1ØØ1 Ø_ %	0 (zero) is keyed in as desired output signal level in percent.
6	NON-VOL ENTER (Yes)	OUTP 1 SFM 1ØØ# SFC WORKING... OUTP 1 SFM 1ØØ# Ø.ØØ %	Puts transmitter into Output mode as noted by "#" sign in display and sets output to 0%.

Continued on next page

7.3.1 Verifying the Output Signal, Continued

Output signal verification, continued

Table 7-6 Verifying Output Signal for Flowmeter in Analog Mode, Continued

<table>
<tr><th>Step</th><th>Press Key</th><th>Read Display or Action</th><th>Description</th></tr>
<tr><td>7</td><td>RESET
K
COR-
RECT</td><td>OUTP 1 SFM 1ØØ#
SFC WORKING...

OUTP 1 SFM 1ØØ#
CORRECT DAC ZERO</td><td>Calibrates output signal to 0%.</td></tr>
<tr><td>8</td><td></td><td>Check that milliammeter or voltmeter reading is 4mA or 1V.</td><td><table><tr><th>If reading is …</th><th>Then go to…</th></tr><tr><td>correct</td><td>Step 11.</td></tr><tr><td>lower than 4mA or 1V</td><td>Step 9.</td></tr><tr><td>higher than 4mA or 1V</td><td>Step 10.</td></tr></table></td></tr>
<tr><td>9</td><td>▲ H
NEXT</td><td>OUTP 1 SFM 1ØØ#
INC   1 COUNTS

OUTP 1 SFM 1ØØ#
SFC WORKING...

OUTP 1 SFM 1ØØ#
 INCREASED 4mA

OUTP 1 SFM 1ØØ#
CORRECT DAC ZERO</td><td>Gradually raises output to 4mA or 1V reading. Repeat this step as required.</td></tr>
<tr><td>10</td><td>▼ L
PREV</td><td>OUTP 1 SFM 1ØØ#
DEC   1 COUNTS

OUTP 1 SFM 1ØØ#
SFC WORKING...

OUTP 1 SFM 1ØØ#
 DECREASED 4mA

OUTP 1 SFM 1ØØ#
CORRECT DAC ZERO</td><td>Gradually decreases output to 4mA or 1V reading. Repeat this step as required.</td></tr>
<tr><td>11</td><td>INPUT
J
OUT-
PUT</td><td>OUTP 1 SFM 1ØØ#
SFC WORKING...

OUTP 1 SFM 1ØØ#
Ø.ØØ %</td><td>Calls up output for display.

Present output signal level in percent.</td></tr>
</table>

Continued on next page

Output signal verification, continued

Table 7-6 Verifying Output Signal for Flowmeter in Analog Mode, Continued

<table>
<tr><th>Step</th><th>Press Key</th><th>Read Display or Action</th><th>Description</th></tr>
<tr><td>12</td><td>V
1

Z
0

Z
0</td><td>OUTP 1 SFM 1ØØ#
1_ %

OUTP 1 SFM 1ØØ#
1Ø_ %

OUTP 1 SFM 1ØØ#
1ØØ_ %</td><td>100 is keyed in as desired output level in percent.</td></tr>
<tr><td>13</td><td>NON-VOL
ENTER
(Yes)</td><td>OUTP 1 SFM 1ØØ#
SFC WORKING...

OUTP 1 SFM 1ØØ#
1ØØ.ØØ %</td><td>Sets output to 100%.</td></tr>
<tr><td>14</td><td>RESET
K
COR-
RECT</td><td>OUTP 1 SFM 1ØØ#
SFC WORKING...

OUTP 1 SFM 1ØØ#
CORRECT DAC SPAN</td><td>Calibrates output to 100%.</td></tr>
<tr><td>15</td><td></td><td>Check that milliammeter or voltmeter reading is 20mA or 5V.</td><td><table><tr><th>If reading is …</th><th>Then go to…</th></tr><tr><td>correct</td><td>Step 18.</td></tr><tr><td>lower than 20mA or 5V</td><td>Step 16.</td></tr><tr><td>higher than 20mA or 5V</td><td>Step 17.</td></tr></table></td></tr>
<tr><td>16</td><td>H
▲
NEXT</td><td>OUTP 1 SFM 1ØØ#
INC 1 COUNTS

OUTP 1 SFM 1ØØ#
SFC WORKING...

OUTP 1 SFM 1ØØ#
INCREASED 2ØmA

OUTP 1 SFM 1ØØ#
CORRECT DAC SPAN</td><td>Gradually raises output to 20mA or 5V reading. Repeat this step as required.</td></tr>
</table>

Continued on next page

Output signal verification, continued

Table 7-6 Verifying Output Signal for Flowmeter in Analog Mode, Continued

Step	Press Key	Read Display or Action	Description
17	▼ PREV (L)	OUTP 1 SFM 1ØØ# DEC 1 COUNTS OUTP 1 SFM 1ØØ# SFC WORKING... OUTP 1 SFM 1ØØ# DECREASED 2ØmA OUTP 1 SFM 1ØØ# CORRECT DAC SPAN	Gradually decreases output to 20mA or 5V reading. Repeat this step as required.
18	SHIFT (^) NON-VOL ENTER (Yes)	OUTP 1 SFM 1ØØ# SHIFT– OUTP 1 SFM 1ØØ# SFC WORKING... OUTP 1 SFM 1ØØ# DATA NONVOLATILE MAG SR SFM 1ØØ# READY...	Initiates shift key selection. Saves data in transmitter's non-volatile memory. This takes approximately 8 seconds.
19	INPUT OUT-PUT (J)	OUTP 1 SFM 1ØØ# SFC WORKING... OUTP 1 SFM 1ØØ# 1ØØ.ØØ %	Calls up output for display. Present output signal level in percent.
20	CLR (NO)	OUTP 1 SFM 1ØØ# SFC WORKING... MAG SR SFM 1ØØ1 READY...	Exits Output mode.

7.3.2 Checking Excitation Current

Excitation current check

Before doing a flow spans verification, we recommend that you check the flowmeter's excitation current value.

Table 7-7 gives the procedure for checking the flowmeter's excitation current value using the SFC.

Table 7-7 Checking Excitation Current

Step	Press Key	Read Display or Action	Description
1		Remove cover from converter. Connect a digital multimeter between terminals X and Y.	
2		Turn ON converter power. **ATTENTION** Be sure to put analog control loop into manual mode while configuring flowmeter.	
3		Connect SFC across loop wiring and turn it on.	
4	DE READ A ID	TAG NO. TRIPS SECURED??	Be sure any switches that may trip alarms or interlocks associated with analog loop are secured or turned off.
5	NON-VOL ENTER (Yes)	TAG NO. SFC WORKING... MAG SR TAG NO. SFM 1ØØ1	Confirms that "TRIPS" are secured and establishes communications with sample flowmeter SFM 1001.
6	B CONF	SFM CONFIG UNITS KEY?	Calls up configuration function.
7	H ▲ NEXT	Press key until this display appears. SFM CONFIG CALIBRATE MENU?	Calls up calibration function menu selection.
8	NON-VOL ENTER (Yes)	CALIBRATE MENU EXCIT CUR CHECK?	Prompt asks if you want to initiate excitation current check.
9	NON-VOL ENTER (Yes)	CALIBRATE MENU SFC WORKING... EX CURRENT CHK ARE YOU SURE?	Communication exchange is working. Prompt asks for confirmation of check function.

Continued on next page

7.3.2 Checking Excitation Current, Continued

Excitation current check, continued

Table 7-7 Checking Excitation Current, Continued

Step	Press Key	Read Display or Action	Description
10	NON-VOL ENTER (Yes)	EX CURRENT CHK 16Ø.Ø EX X–>Y?	Prompt asks if you want to initiate X-to-Y excitation current check.
11	NON-VOL ENTER (Yes)	EX CURRENT CHK SFC WORKING... EX CURRENT CHK # EXCIT X–>Y SET	Initiates excitation current flow.
12		Note reading on digital multimeter.	Reading should match rating shown in SFC display. If reading does not match, you must do an excitation current calibration.
13	CLR (No)	EX CURRENT CHK # 16Ø.Ø EX Y–>X?	Prompt asks if you want to initiate Y-to-X excitation current flow.
14	NON-VOL ENTER (Yes)	EX CURRENT CHK # SFC WORKING... EX CURRENT CHK # EXCIT Y–>X SET	Initiates excitation current flow.
15		Note reading on digital multimeter.	Reading should match rating shown in SFC display. If reading does not match, you must do an excitation current calibration.
16	CLR (No)	EX CURRENT CHK # 16Ø.Ø EX OFF?	Prompt asks if you want to turn excitation current OFF.
17	NON-VOL ENTER (Yes)	EX CURRENT CHK # SFC WORKING... EX CURRENT CHK # EXCIT CUR OFF	Turns excitation current OFF.

Continued on next page

7.3.2 Checking Excitation Current, Continued

Excitation current check, continued

Table 7-7 Checking Excitation Current, Continued

Step	Press Key	Read Display or Action	Description
18	CLR (No)	EX CURRENT CHK # SFC WORKING... EX CURRENT CHK # CLR CHECK MODE?	Prompt asks if you want to clear check mode.
19	NON-VOL ENTER (Yes)	EX CURRENT CHK SFC WORKING... CALIBRATE MENU EXCIT CUR CHECK?	Exits current check mode and returns to configuration menu.
20		Disconnect multimeter unless you have to calibrate excitation current.	

7.3.3 Verifying and Adjusting Excitation Current

Excitation current calibration

If the results of the excitation current check call for excitation current calibration, use the procedure in Table 7-8 to calibrate the excitation current with an SFC.

ATTENTION The procedure in Table 7-8 assumes that the digital multimeter leads are still connected to the X and Y terminals and that you have established communications with the flowmeter through the SFC.

Table 7-8 Verifying and Adjusting Excitation Current

<table>
<tr><th>Step</th><th>Press Key</th><th>Read Display or Action</th><th>Description</th></tr>
<tr><td>1</td><td>B
CONF</td><td>SFM CONFIG
UNITS KEY?</td><td>Calls up configuration function.</td></tr>
<tr><td>2</td><td>H
▲
NEXT</td><td>Press key until this display appears.
SFM CONFIG
CALIBRATE MENU?</td><td>Calls up calibration function menu selection.</td></tr>
<tr><td>3</td><td>NON-VOL
ENTER
(Yes)</td><td>CALIBRATE MENU
EXCIT CUR CHECK?</td><td>Prompt asks if you want to initiate excitation current check.</td></tr>
<tr><td>4</td><td>H
▲
NEXT</td><td>CALIBRATE MENU
EXCIT CUR CAL?</td><td>Calls up next calibration menu selection which is excitation current calibration function.</td></tr>
<tr><td>5</td><td>NON-VOL
ENTER
(Yes)</td><td>EX CALIBRATION
ARE YOU SURE?</td><td>Prompt asks for confirmation of excitation calibration function.</td></tr>
<tr><td>6</td><td>NON-VOL
ENTER
(Yes)</td><td>EX CALIBRATION
LOW CAL = 15ØmA?</td><td>Prompt asks if you want to initiate low excitation current calibration signal.</td></tr>
<tr><td>7</td><td>NON-VOL
ENTER
(Yes)</td><td>EX CALIBRATION
SFC WORKING...

LOW CAL = 15ØmA#
INC/DEC Ø.Ø3 mA</td><td>Initiates low excitation current calibration signal.</td></tr>
<tr><td>8</td><td></td><td>Check that digital multimeter reading is 150 mA.</td><td><table><tr><th>If reading is …</th><th>Then go to…</th></tr><tr><td>correct</td><td>Step 11.</td></tr><tr><td>lower than 150 mA</td><td>Step 9.</td></tr><tr><td>higher than 150 mA</td><td>Step 10.</td></tr></table></td></tr>
</table>

Continued on next page

Excitation current calibration, continued

Table 7-8 Calibrating Excitation Current, Continued

<table>
<tr><th>Step</th><th>Press Key</th><th>Read Display or Action</th><th>Description</th></tr>
<tr><td>9</td><td>▲ H
NEXT</td><td>LOW CAL = 15Øm A #
SFC WORKING...

LOW CAL = 15Øm A #
INC/DEC Ø.Ø3 mA

ATTENTION You can change INC/DEC amount by sequentially pressing [MENU ITEM] key to select one of these other values: 0.10, 0.50, 1.00, or 5.00 mA.</td><td>Raises reading by amount indicated in bottom row of display. Repeat step until reading is correct.</td></tr>
<tr><td>10</td><td>▼ L
PREV</td><td>LOW CAL = 15Øm A #
SFC WORKING...

LOW CAL = 15Øm A #
INC/DEC Ø.Ø3 mA

ATTENTION You can change INC/DEC amount by sequentially pressing [MENU ITEM] key to select one of these other values: 0.10, 0.50, 1.00, or 5.00 mA.</td><td>Lowers reading by amount indicated in bottom row of display. Repeat step until reading is correct.</td></tr>
<tr><td>11</td><td>CLR
(No)</td><td>EX CALIBRATION #
HIGH CAL= 16Øm A?</td><td>Exits low excitation current calibration and prompt asks if you want to initiate high excitation calibration signal.</td></tr>
<tr><td>12</td><td>NON-VOL
ENTER
(Yes)</td><td>EX CALIBRATION #
SFC WORKING...

HIGH CAL= 16Øm A #
INC/DEC Ø.Ø3 mA</td><td>Initiates high excitation current calibration signal.</td></tr>
<tr><td>13</td><td></td><td>Check that digital multimeter reading is 160 mA.</td><td><table><tr><th>If reading is …</th><th>Then go to…</th></tr><tr><td>correct</td><td>Step 16.</td></tr><tr><td>lower than 160 mA</td><td>Step 14.</td></tr><tr><td>higher than 160 mA</td><td>Step 15.</td></tr></table></td></tr>
</table>

Continued on next page

7.3.3 Verifying and Adjusting Excitation Current, Continued

Excitation current calibration, continued

Table 7-8 Calibrating Excitation Current, Continued

Step	Press Key	Read Display or Action	Description

14	▲ H
	NEXT
		`HIGH CAL= 16ØmA#`
		`SFC WORKING...`
		
		`HIGH CAL= 16ØmA#`
		`INC/DEC Ø.Ø3 mA`
		
		ATTENTION You can change INC/DEC amount by sequentially pressing [**MENU ITEM**] key to select one of these other values: 0.10, 0.50, 1.00, or 5.00 mA.
			Raises reading by amount indicated in bottom row of display. Repeat step until reading is correct.

15	▼ L
	PREV
		`HIGH CAL= 16ØmA#`
		`SFC WORKING...`
		
		`HIGH CAL= 16ØmA#`
		`INC/DEC Ø.Ø3 mA`
		
		ATTENTION You can change INC/DEC amount by sequentially pressing [**MENU ITEM**] key to select one of these other values: 0.10, 0.50, 1.00, or 5.00 mA.
			Lowers reading by amount indicated in bottom row of display. Repeat step until reading is correct.

16	CLR (No)	`EX CALIBRATION #` `CLR CAL MODE?`	Exits high excitation current calibration and prompt asks if you want clear calibration mode.

17	NON-VOL
	ENTER
	(Yes)
		`EX CALIBRATION #`
		`SFC WORKING...`
		
		`CALIBRATE MENU`
		`EXCIT CUR CAL?`
			Exits calibration mode and returns to calibration menu.

18		Disconnect voltmeter leads from test points.	

7.3.4 Calibrating Flow Spans

Calibration of flow spans

You can do a “dry” calibration of the flow spans using a Model MGZ13 MagneW Calibrator to simulate the flow velocity settings.

The procedure in Table 7-9 shows the steps for calibrating a flowmeter with an SFC. This procedure assumes that the flowmeter is removed from the process and located in a controlled environment.

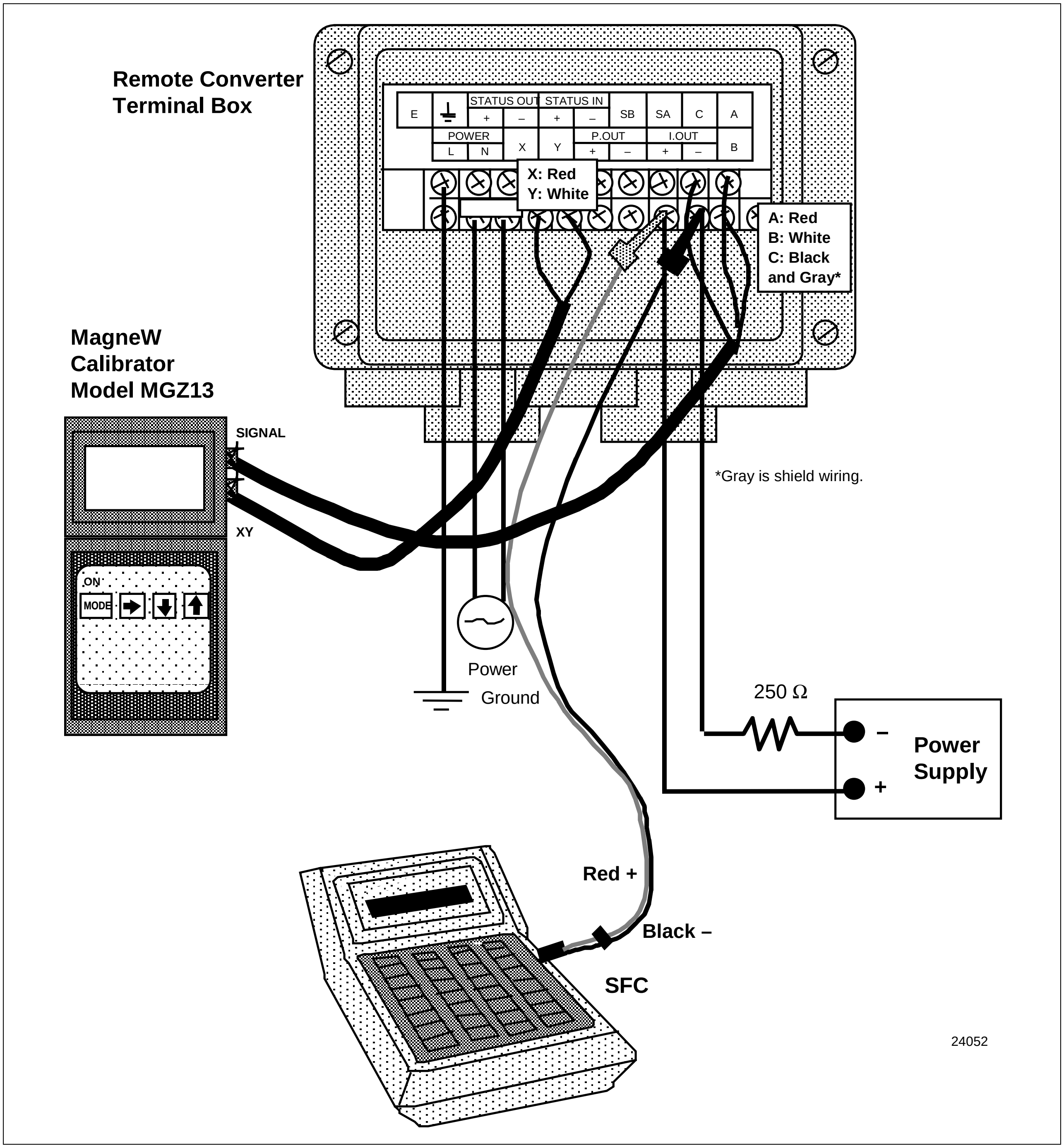
ATTENTION You must have a Model MGZ13 MagneW Calibrator to do a “dry” flow spans calibration.

Before doing a flow spans verification, we recommend that you check the flowmeter’s excitation current value using the procedure given previously in Table 7-7.

Continued on next page

Calibration of flow spans, continued

Figure 7-2 Calibration Set-up with SFC



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7.3.4 Calibrating Flow Spans, Continued

Calibration of flow spans, continued

Table 7-9 Calibrating Flow Spans

Step	Press Key	Read Display or Action	Description
1		Remove cover from converter's terminal box. Connect MagneW Calibrator, current loop power supply, and SFC to converter as shown in Figure 7-2. **ATTENTION** Be sure converter and calibrator are turned OFF before making any connections.	This procedure assumes that field wiring for current output and pulse output circuits has been disconnected.
2		Turn on converter, calibrator, and loop power supply and allow components to warm-up for at least 10 minutes.	
3		Turn on SFC.	
4	DE READ A ID	TAG NO. TRIPS SECURED??	Does not apply for bench calibration.
4	NON-VOL ENTER (Yes)	TAG NO. SFC WORKING... MAG SR TAG NO. SFM 1ØØ1	Acknowledges prompt and establishes communications with sample flowmeter SFM 1001 to be calibrated.
5	B CONF	SFM CONFIG UNITS KEY?	Calls up configuration function.
6	H ▲ NEXT	Press key until this display appears. SFM CONFIG CALIBRATE MENU?	Calls up calibration function menu selection.
7	NON-VOL ENTER (Yes)	CALIBRATE MENU EXCIT CUR CHECK?	Calls up first menu selection. Prompt asks if you want to initiate excitation current check.
8	H ▲ NEXT	CALIBRATE MENU EXCIT CUR CAL?	Calls up next menu selection. Prompt asks if you want to initiate excitation current calibration.
9	H ▲ NEXT	CALIBRATE MENU GAIN CAL?	Calls up next menu selection. Prompt asks if you want to initiate gain calibration.

Continued on next page

Calibration of flow spans, continued

Table 7-9 Calibrating Flow Spans, Continued

Step	Press Key	Read Display or Action	Description
10	NON-VOL ENTER (Yes)	GAIN CALIBRATION ARE YOU SURE?	Prompt asks you to confirm activation of gain calibration function.
11	NON-VOL ENTER (Yes)	GAIN CALIBRATION GAIN CAL=Ø.Øm/s?	Confirms gain calibration and prompt asks if you want to initiate zero gain calibration.
12		Use up/down keys on calibrator to set value in its flowrate velocity indicator to zero (00.00).	Wait one minute for signal to stabilize.
13	NON-VOL ENTER (Yes)	GAIN CALIBRATION SFC WORKING- 39% GAIN CALIBRATION GAIN CAL=Ø.4m/s?	Initiates zero gain calibration and monitors function in terms of percent of completion. When complete, next gain calibration function appears. Prompt asks if you want to initiate 0.4 gain calibration.
14		Use up/down keys on calibrator to set value in its flowrate velocity indicator to 0.4 (00.40) m/s.	Wait one minute for signal to stabilize.
15	NON-VOL ENTER (Yes)	GAIN CALIBRATION SFC WORKING- 39% GAIN CALIBRATION GAIN CAL=1.2m/s?	Initiates 0.4 gain calibration and monitors function in terms of percent of completion. When complete, next gain calibration function appears. Prompt asks if you want to initiate 1.2 gain calibration.
16		Use up/down keys on calibrator to set value in its flowrate velocity indicator to 1.2 (01.20) m/s.	Wait one minute for signal to stabilize.
17	NON-VOL ENTER (Yes)	GAIN CALIBRATION SFC WORKING- 39% GAIN CALIBRATION GAIN CAL=3.6m/s?	Initiates 1.2 gain calibration and monitors function in terms of percent of completion. When complete, next gain calibration function appears. Prompt asks if you want to initiate 3.6 gain calibration.
18		Use up/down keys on calibrator to set value in its flowrate velocity indicator to 3.6 (03.60) m/s.	Wait one minute for signal to stabilize.

Continued on next page

Calibration of flow spans, continued

Table 7-9 Calibrating Flow Spans, Continued

Step	Press Key	Read Display or Action	Description
19	NON-VOL ENTER (Yes)	GAIN CALIBRATION SFC WORKING- 39% GAIN CALIBRATION GAIN CAL =1Øm/s?	Initiates 3.6 gain calibration and monitors function in terms of percent of completion. When complete, next gain calibration function appears. Prompt asks if you want to initiate 10 gain calibration.
20		Use up/down keys on calibrator to set value in its flowrate velocity indicator to 10 (10.00) m/s.	Wait one minute for signal to stabilize.
21	NON-VOL ENTER (Yes)	GAIN CALIBRATION SFC WORKING- 39% GAIN CALIBRATION CLR GAIN MODE?	Initiates 10 gain calibration and monitors function in terms of percent of completion. When complete, next gain calibration function appears. Prompt asks if you want to clear gain calibration.
22	NON-VOL ENTER (Yes)	GAIN CALIBRATION SFC WORKING... CALIBRATE MENU GAIN CAL?	Exits gain calibration mode and returns to calibration menu.
23		Turn OFF components and remove calibration connections. Return flowmeter to process.	

7.3.5 Shipping Data Recovery

Shipping data recovery

You can return the flowmeter to factory settings/default values for pertinent operational and configuration parameters. These parameters are entered before the unit is shipped, so they are commonly referred to as “shipping data”. They include factory calibration data and factory settings or initial default settings for customer configuration data.

The procedure in Table 7-10 shows how to recover shipping data through an SFC. You can also initiate a save function for shipping data that has been recovered through the SFC.

Table 7-10 Recovering and Saving Shipping Data

Step	Press Key	Read Display or Action	Description
1		Connect SFC across loop wiring and turn it on.	
2	DE READ A ID	TAG NO. TRIPS SECURED??	Be sure any switches that may trip alarms or interlocks associated with analog loop are secured or turned off.
3	NON-VOL ENTER (Yes)	TAG NO. SFC WORKING. . . MAG SR TAG NO. SFM 1ØØ1	Confirms that “TRIPS” are secured and establishes communications with sample flowmeter SFM 1001.
4	B CONF	SFM CONFIG UNITS KEY?	Calls up configuration function.
5	H NEXT	Press key until this display appears. SFM CONFIG CALIBRATE MENU?	Calls up calibration function menu selection.
6	NON-VOL ENTER (Yes)	CALIBRATE MENU EXCIT CUR CHECK?	Calls up first calibration menu function.
7	H NEXT	Press key until this display appears. CALIBRATE MENU SHIP DATA RECOV?	Calls up shipping data recovery function.
8	NON-VOL ENTER (Yes)	SHIP DATA RECOV ARE YOU SURE?	Prompt asks for confirmation of recovery function.

Continued on next page

Shipping data recovery, continued

Table 7-10 Recovering and Saving Shipping Data, Continued

Step	Press Key	Read Display or Action	Description
9	NON-VOL ENTER (Yes)	SHIP DATA RECOV SFC WORKING... SHIP DATA RECOV SHIP DATA RECOV CALIBRATE MENU SHIP DATA RECOV?	Initiates recovery function, prompt tells you when data is recovered, and automatically returns to calibration menu function.
10	▲ H NEXT	CALIBRATE MENU SHIP DATA SAVE?	Calls up shipping data save function.
11	NON-VOL ENTER (Yes)	SHIP DATA SAVE ARE YOU SURE?	Prompt asks for confirmation of save function. Only initiate this function if you have just completed shipping data recovery function.
12	NON-VOL ENTER (Yes)	SHIP DATA SAVE SFC WORKING... SHIP DATA SAVE SHIP DATA SAVED CALIBRATE MENU SHIP DATA SAVE?	Initiates save function, prompt tells you when data is saved, and automatically returns to calibration menu function.
13		Check and change configuration data as required.	

Section 8 – Troubleshooting

8.1 Overview

Section contents

This section contains the following topics:

Diagnostic messages summary

The SFC and MagneW 3000 ***PLUS*** flowmeter are constantly running internal diagnostics to monitor the functions and status of the control loop and their communications link. There are additional diagnostics provided by the STI IOP for transmitters integrated with the TPS system as well as error codes and error messages through the flowrate display and the DOP display.

When a diagnostic failure is detected, a corresponding message or error code is generated for the SFC display, DOP's main and auxiliary displays, and/or the Transmitter Status field of the Detail display on the US. See Table 8-10 to run a status check using an SFC.

The diagnostic messages can be grouped into one of these seven categories.

- SFC Non-Critical Failures
- SFC Critical Failures
- SFC Communication Errors
- SFC Invalid Key Entry Errors
- SFC Interrupt Messages
- Display Error Codes and Messages

Troubleshooting summary

Your primary troubleshooting tool is using the SFC to run a status check and then interpreting the diagnostic messages. You should also use the SFC to verify the transmitter's configuration data and check to be sure your process is operating correctly.

8.2 Diagnostic Messages
8.2.1 Non-critical Failures

Summary

Table 8-1 summarizes the non-critical SFC status message displays. All SFC functions remain operational during a non-critical failure and the "#" sign appears on the right hand side of the display for most messages.

Table 8-1 Summary of Diagnostic Messages for Non-Critical Failures

Message	Description
STATUS SFM 1ØØ# BAD CONFIG DATA	Configuration data is incorrect.
STATUS SFM 1ØØ# DO OUTPUT MODE	Checking input/output contact status.
STATUS SFM 1ØØ# EMPTY PI PE	Detector is empty.
STATUS SFM 1ØØ# EXCIT CHECK MODE	Checking excitation current.
STATUS SFM 1ØØ# EXT. ZERO ACTIVE	"External zero percent lock" function is active.
STATUS SFM 1ØØ# FIXED PULSE MODE	Checking pulse output.
STATUS SFM 1ØØ# GAIN CORRECTMODE	Calibrating flow span gain constants.
STATUS SFM 1ØØ# HI<LO ALRM ERROR	High alarm setting is less than low alarm setting.
STATUS SFM 1ØØ# HYSTERESIS ERROR	Hysteresis is too large.
STATUS SFM 1ØØ# IN LOCAL MODE	Converter's DOP is in mode other than Measuring.
STATUS SFM 1ØØ# PLS WEIGHT ERROR	Pulse frequency is too high or too low.
STATUS SFM 1ØØ# PLS WIDTH > 7Ø%	Pulse width is too large. Duty ratio is greater than 70%.
STATUS SFM 1ØØ# SPAN>RANGE	Span setting is too large and results in a flow velocity of 12 meters per second or more.
STATUS SFM 1ØØ# TYPE/DIA ERROR	Configuration mismatch between size and/or type of detector.
STATUS SFM 1ØØ# 4-2ØmAOUTPUTMODE	Converter is in Output mode.

8.2.2 Critical Failures

Summary

Table 8-2 summarizes the critical SFC status message displays. A critical failure has these effects on operation.

- SFC functions remain operational and the "#" sign may appear on the right hand side of the display.
- The critical status message is displayed for three seconds during any keystroke action and before any updated value is displayed. Run the status check to view messages.
- The flowmeter's current output is driven to its failsafe direction—upscale or downscale.

Table 8-2 Summary of Diagnostic Messages for Critical Failures

Message	Description
STATUS SFM 1ØØ# AC POWER LOSS	Displayed briefly when converter loses line power.
STATUS SFM 1ØØ# A/D FAULT	Converter's analog/digital converter is not operating properly.
STATUS SFM 1ØØ# EXCIT COIL FAULT	Detector's coil circuit is not operating properly.
STATUS SFM 1ØØ# NVM FAULT	Converter's non-volatile memory is corrupted.
STATUS SFM 1ØØ# RAM FAULT	Converter's Random Access Memory is faulty.
STATUS SFM 1ØØ# ROM FAULT	Converter's Read Only Memory is faulty.

8.2.3 Communication Errors

Summary

Table 8-3 summarizes the message displays associated with communication errors. A communication error has these effects on SFC operation.

- All the SFC functions are disabled.
- Communication error messages are cycled in the display at two second intervals. Press [**ID**] and then [**ENTER**] to view messages again.

Table 8-3 Summary of Diagnostic Messages for Communication Errors

Message	Description
TAG NO. END AROUND ERR	Communications is unsuccessful.
TAG NO. FAILED COMM CHK	SFC failed a communications diagnostic test.
TAG NO. HI RES/LO VOLT	Loop resistance is too large or supply voltage is too low.
TAG NO. ILLEGAL RESPONSE	Illegal response from flowmeter.
TAG NO. INVALID DATABASE	Flowmeter database was incorrect at power-up.
TAG NO. LOW LOOP RES	Loop resistance is too low.
TAG NO. NACK RESPONSE	Flowmeter sent a negative acknowledgment because one or more commands could not be processed.
TAG NO. NO XMTR RESPONSE	No response from flowmeter.
TAG NO. SFC FAULT	SFC is not operating properly.

8.2.4 DOP Error Messages

Summary

Table 8-4 summarizes error codes that may appear in the converter's flowrate main display and the corresponding error messages that may appear in the auxiliary display.

ATTENTION Diagnostic messages are executed in the Engineering Mode. When a setting is incorrect, the error will be displayed for one second and then the incorrectly-set screen will appear. To view the error contents again, press the [**MODE**] key. Press the [**MODE**] key for more than 5 seconds and the data will return to the status prior to entering the Engineering Mode.

Table 8-4 Summary of DOP Error Codes and Messages

DOP Display **Error Code (Main Display)** **Error Message (Auxiliary Display)**	**Description**
Err-01 EX CHECK ERROR	Detector's coil circuit is not operating properly.
Err-02 ROM CHECK ERROR	Converter's Read Only Memory is faulty.
Err-03 RAM CHECK ERROR	Converter's Random Access Memory is faulty.
Err-04 NVM CHECK ERROR	Converter's non-volatile memory is corrupted.
Err-05 ADC CHECK ERROR	Converter's analog/digital converter is not operating properly.

Continued on next page

Summary, continued

Table 8-4 Summary of DOP Error Codes and Messages, Continued

DOP Display **Error Code (Main Display)** **Error Message (Auxiliary Display)**	**Description**
Err-11 TYPE-DIA MATCHING ERROR	Configuration mismatch between size and/or type of detector.
Err-12 SETTING ERROR HI<LO	High alarm setting is less than low alarm setting.
Err-21 SPAN ERROR OVER 12 m/s	Span setting is too large and results in a flow velocity of 12 meters per second or more.
Err-22 PULSE WEIGHT SETTING ERROR	Pulse frequency is too high or too low.
Err-23 PULSE WIDTH OVER DUTY 70%	Pulse width is too large. Duty ratio is greater than 70%.
Err-24 HYSTERESIS SETTING ERROR	Hysteresis is too large.

8.2.5 Interpreting Diagnostic Messages

Summary

All the diagnostic messages that can be displayed on the SFC, the US Detail display, or the DOP display are listed in alphabetical order, per type, in Table 8-5 along with a description and suggested action to be taken.

Table 8-5 Diagnostic Message Interpretation Table

Message	Description	Possible Cause	Remedy
SFC MESSAGES			
STATUS SFM 1ØØ# AC POWER LOSS	Displayed briefly when converter losses power.	Converter has lost power.	Check power source and restore power.
STATUS SFM 1ØØ# A/D FAULT	Converter's analog/digital converter is not operating properly.	Converter's main board is faulty.	• Cycle converter power OFF then ON. • Replace main board if message still appears.
STATUS SFM 1ØØ# BAD CONFIG DATA	Configuration data is incorrect.	Parameters not configured properly.	Check for a wrong configuration setting/value.
OUTP 1 SFM 1ØØ1 COMM ABORTED	Communications aborted by user.	User has entered wrong function.	Check keystrokes and retry function.
STATUS SFM 1ØØ# DO OUTPUT MODE	Converter is being used to check input/output contact status.	Converter is in DI/DO status check mode.	Remove converter from DI/DO status check mode.
STATUS SFM 1ØØ# EMPTY PIPE	Detector is empty.	Switches on converter's main board are in empty pipe function enabled position.	Fill detector with liquid.
STATUS SFM 1ØØ# EXCESSIVE OUTPUT	Requested output percent in constant current source mode is too high or too low. Range limits are –115% or +115% of span.	Range limits are configured incorrectly.	Press [**CLR**] key and retry function with acceptable value.
STATUS SFM 1ØØ# EXCIT CHECK MODE	Converter is being used to check excitation current.	Converter is in excitation current checking mode.	Remove converter from excitation current checking mode.
STATUS SFM 1ØØ# EXCIT COIL FAULT	Detector's coil circuit is not operating properly.	Bad excitation cable connections. Faulty detector.	• Check excitation cable connections. • Cycle converter power OFF then ON. • If message still appears, replace detector.

Continued on next page

8.2.5 Interpreting Diagnostic Messages, Continued

Summary, continued

Table 8-5 Diagnostic Message Interpretation Table, Continued

Message	Description	Possible Cause	Remedy
SFC MESSAGES (continued)			
STATUS SFM 1ØØ# EXT. ZERO ACTIVE	"External zero percent lock" function is active.	Activated "External zero percent lock" function.	Open external status input contact to deactivate function.
TAG NO. FAILED COMM CHK	SFC failed a communications diagnostic check.	SFC electronic problem or a faulty or dead communication loop.	• Check polarity and try again. • Press [**ID**] key and do any corrective action required and try again. • Check communication loop. • Replace SFC.
STATUS SFM 1ØØ# FIXED PULSE MODE	Converter is being used to check pulse output.	Converter is in pulse output check mode.	Remove converter from pulse output check mode.
STATUS SFM 1ØØ# GAIN CORRECTMODE	Converter is being used to calibrate flow span gain constants.	Calibration of flow span gain constants in progress.	Complete calibration and retry function.
STATUS SFM 1ØØ# HI<LO ALRM ERROR	High alarm setting is less than low alarm setting.	High and low alarm settings configured incorrectly.	Reconfigure high alarm setting to be greater than low alarm setting.
TAG NO. HI RES/LO VOLT	Either there is too much resistance in loop (open circuit), voltage is too low, or both.	Resistance in loop is incorrect.	Check polarity, wiring, and power supply. There must be 11 volts minimum at transmitter to permit operation. Check for defective or misapplied capacitive or inductive devices (filters).
STATUS SFM 1ØØ# HYSTERESIS ERROR	Hysteresis is too large.	Improper configuration of hysteresis.	Reconfigure hysteresis as a lower value.
SAVE/RESTORE H.W. MISMATCH	Hardware mismatch—part of Save/Restore function.	SFC was unsuccessful in completely restoring database.	None—SFC tried to restore as much of database as possible.
TAG NO. ILLEGAL RESPONSE	Transmitter sent illegal response to SFC.	Miscommunication.	Retry communicating.
STATUS SFM 1ØØ# IN LOCAL MODE	Converter's DOP is in mode other than Measuring.	DOP has been placed in another mode.	Press [**MODE**] key on DOP to return converter to default Measuring mode.

Continued on next page

8.2.5 Interpreting Diagnostic Messages, Continued

Summary, continued

Table 8-5 Diagnostic Message Interpretation Table, Continued

Message	Description	Possible Cause	Remedy
SFC MESSAGES (continued)			
TAG NO. INVALID DATABASE	Flowmeter database was incorrect at power-up.	Non-volatile memory has not been updated.	• Try communicating again. • Verify database configuration, gains calibration, and then manually update non-volatile memory.
URV 1 . SFM 1ØØ1 INVALID REQUEST	Trying to change a range value with converter in Output mode or entering a value out of range.	Keystroke is not valid for given transmitter.	• Check that correct range value is entered or that flowmeter is not in Output mode. • Check that keystroke is applicable for a flowmeter.
TAG NO. LOW LOOP RES	Not enough resistance in series with communications loop.	Sensing resistor is too low.	Check sensing resistor and increase resistance to at least 250Ω.
TAG NO. NACK RESPONSE	Flowmeter sent a negative response—could not process command(s).	Flowmeter improperly configured.	Check configuration. Retry.
TAG NO. NO XMTR RESPONSE	No response from transmitter.	Transmitter or loop failure.	• Retry communicating. • Press [ID] key and do any corrective action required and try again. • Check that transmitter's loop integrity has been maintained, that SFC is connected properly, and loop resistance is at least 250Ω.
STATUS SFM 1ØØ# NVM FAULT	Converter's non-volatile memory is corrupted.	Converter's main board is faulty.	• Cycle converter power OFF then ON. • If message still appears, replace converter's main board.
STATUS SFM 1ØØ1 NVM ON SEE MAN	SFC's CPU is misconfigured.	SFC is faulty.	Replace SFC.

Continued on next page

Summary, continued

Table 8-5 Diagnostic Message Interpretation Table, Continued

Message	Description	Possible Cause	Remedy
SFC MESSAGES (continued)			
SAVE/RESTORE OPTION MISMATCH	On a database restore, one or more options do not match.	SFC was unable to reconfigure all of database to original form.	None—SFC tried to restore as much of database as possible.
STATUS SFM 1ØØ# PLS WEIGHT ERROR	Pulse frequency is too high or too low.	Pulse settings are configured incorrectly.	Check pulse weight, span, and type of pulse configuration. Change configuration as required.
STATUS SFM 1ØØ# PLS WIDTH > 7Ø%	Pulse width is too large. Duty ratio is greater than 70%.	Pulse settings are configured incorrectly.	Check pulse weight, pulse width, and span configuration values. Change values as needed.
STATUS SFM 1ØØ# RAM FAULT	Converter's Random Access Memory is faulty.	Converter's main board is not functioning properly.	• Cycle converter power OFF then ON. • If message still appears, replace converter's main board.
SAVE/RESTORE RESTORE FAILED	Database restore function failed.		Check flowmeter and try again.
STATUS SFM 1ØØ# ROM FAULT	Converter's Read Only Memory is faulty.	Converter's main board is not functioning properly.	• Cycle converter power OFF then ON. • If message still appears, replace converter's main board.
TAG NO. SFC FAULT	SFC is operating incorrectly.	SFC is faulty.	Try communicating again. If error still exists, replace SFC.
STATUS SFM 1ØØ# SPAN>RANGE	Span setting is too large and results in a flow velocity of 12 meters per second or more.	Flowmeter span setting is misconfigured.	Check span/URV, size, and type of detector configuration settings. Change settings as required.
STATUS SFM 1ØØ# TYPE/DIA ERROR	Configuration mismatch between size and/or type of detector.	Detector size and type settings are misconfigured.	Check size and type of detector configuration settings—adjust as required.
SAVE/RESTORE TYPE MISMATCH	On database restore, transmitter types do not match.	SFC was unable to reconfigure all of database to original form.	None—SFC tried to restore as much of database as possible.

Continued on next page

Summary, continued

Table 8-5 Diagnostic Message Interpretation Table, Continued

Message	Description	Possible Cause	Remedy
SFC MESSAGES (continued)			
STATUS SFM 1ØØ# UNKNOWN	Problem unknown.	Unknown.	Use troubleshooting procedure to diagnose condition.
STATUS SFM 1ØØ# 4-2ØmA OUTPUT MODE	Converter is operating as a current source.	Converter is in Output mode.	Press [**OUTPUT**] and [**CLR**] keys to tell converter to exit Output mode.
TDC/TPS DETAIL DISPLAY MESSAGES			
COMMAND FAILURE INVALID REQUEST (R300 or later)	Flowmeter cannot process requested command.	Command has not been properly entered.	Verify that correct function has been requested. Retry.
COMMAND FAILURE LOCAL MODE (R300 or later)	Flowmeter did not accept command.	DOP is not in Measuring mode.	Press [**MODE**] key on DOP to return converter to default Measuring mode.
COMMAND FAILURE NVM BAD (R300 or later)	Command failed.	Flowmeter's non-volatile memory is bad.	Replace main board in converter.
COMMAND FAILURE UNSUCCESSFUL COMMUNICATIONS (R300 or later)	Command could not be communicated to flowmeter.	Faulty flowmeter status and communications link.	Retry command. If retry fails, check flowmeter status and communications link.
SFC MODIFIED XMTR DATABASE SYSTEM ACQUIRING DATABASE . . . WAIT (R230 or later)	SFC has been used to change information in the flowmeter's database and the STI IOP is still receiving revised database information.	SFC needs more time to process information.	Wait for message to disappear or initiate an upload or download command.
XMTR DATABASE IS NOT AVAIL SYSTEM ACQUIRING DATABASE . . . WAIT (R230 or later)	STI IOP is still receiving database information from the flowmeter.	STI IOP is still processing information.	No action required. Wait for STI IOP to acquire database.
XMTR DATABASE IS NOT AVAILABLE XMTR FAILED OR IN ANALOG MODE (R230 or later)	STI IOP cannot retrieve database information from the flowmeter.	STI IOP failed or is in its analog mode.	Try to switch to DE mode with 6-byte broadcast format. If you cannot switch, replace flowmeter.
XMTR DATABASE IS NOT AVAILABLE XMTR IN PV MODE W/O DB ACCESS (R230 or later)	Flowmeter in DE mode with 4-byte broadcast format.	Flowmeter is configured for 4-byte broadcast.	No action required. If you want database, switch to 6-byte broadcast format.

Continued on next page

Summary, continued

Table 8-5 Diagnostic Message Interpretation Table, Continued

Message	Description	Possible Cause	Remedy
DOP MESSAGES			
Err-01 EX CHECK ERROR	Detector's coil circuit is not operating properly.	Bad excitation cable connections. Faulty detector.	• Check excitation cable connections. • Measure coil resistance. • Cycle converter power OFF then ON. • If message still appears, replace detector.
Err-02 ROM CHECK ERROR	Converter's Read Only Memory is faulty.	Faulty converter main board.	• Cycle converter power OFF then ON. • If message still appears, replace converter's main board.
Err-03 RAM CHECK ERROR	Converter's Random Access Memory is faulty.	Faulty converter main board.	• Cycle converter power OFF then ON. • If message still appears, replace converter's main board.
Err-04 NVM CHECK ERROR	Converter's non-volatile memory is corrupted.	Faulty converter main board.	• Cycle converter power OFF then ON. • If message still appears, replace converter's main board.
Err-05 ADC CHECK ERROR	Converter's analog/digital converter is not operating properly.	Bad converter main board.	• Cycle converter power OFF then ON. • Replace main board if message still appears.

Continued on next page

Summary, continued

Table 8-5 Diagnostic Message Interpretation Table, Continued

Message	Description	Possible Cause	Remedy
DOP MESSAGES (continued)			
Err-11 TYPE-DIA MATCHING ERROR	Configuration mismatch between size and/or type of detector.	Detector size and type settings configured incorrectly.	Check size and type of detector configuration settings. Change settings as required.
Err-12 SETTING ERROR HI<LO	High alarm setting is less than low alarm setting.	High and low alarm settings configured incorrectly.	Reconfigure high alarm setting to be greater than low alarm setting.
Err-21 SPAN ERROR OVER 12 m/s	Span setting is too large and results in a flow velocity of 12 meters per second or more.	Misconfigured span settings.	Check span/URV, size, type of detector, and dummy configuration settings. Change settings as required.
Err-22 PULSE WEIGHT SETTING ERROR	Pulse frequency is too high or too low.	Misconfigured pulse settings.	Check pulse weight, span, and type of pulse configuration. Change configuration as required.
Err-23 PULSE WIDTH OVER DUTY 70%	Pulse width is too large. Duty ratio is greater than 70%.	Misconfigured pulse settings.	Check pulse weight, pulse width, and span configuration values. Change values as required.
Err-24 HYSTERESIS SETTING ERROR	Hysteresis is too large.	Misconfigured hysteresis values.	Reconfigure hysteresis as a lower value.

8.2.6 TPS/STI Database Discrepancies

Database discrepancy

The STI IOP checks for mismatches in the parameters listed in Table 8-6 between the STI IOP database and the flowmeter database. If the STI IOP detects a parameter mismatch, a DATABASE DISCREPANCY message appears on page 2 of the Detail display listing the parameter or parameters that do not match and a BADPV alarm occurs to keep the control loop from using an erroneous PV. For further information on STI IOP operations see *Appendix A*.

Table 8-6 Database Parameters Checked for Mismatches

Description	STI IOP Parameter Listed on Detail Display
DE mode configuration (4- or 6-byte)	DE_CONF
Flowmeter tag number (ID)	STITAG
MagneW 3000 type transmitter (SFM)	SENSRTYP
Upper Range Limit of flowmeter	URL
Upper and Lower Range Values	URV and LRV
Damping time constant	DAMPING
PV characterization—must be linear in STI IOP database only	PVCHAR
Input filter frequency	FREQ6050

Causes for discrepancies

The three most likely causes for a database mismatch are:

- The SFC was used to change PV-related values in the flowmeter.
- A write operation from the US to the STI IOP was done during a checkpoint restore or point building operation.
- The same flowmeter was reinstalled after bench calibration or main board replacement, and its URV/Span setting was modified.

8.3 Start-up and Normal Operation Problems

Summary There are general problems you may encounter during start-up and normal operation. Table 8-7 lists the most common ones.

Table 8-7 Start-up and Normal Operation Problems

Symptoms	Probable Causes	Remedies
Indication is downscale (output current is less than 4 mA).	Power is not turned on.	Turn on power.
	Bad connection exists in current output line loop (open circuit, broke lead).	Check and repair the loop connection.
	Signal wires polarity is reversed.	Reverse the + and the – current output connections.
	Detector is not filled with liquid/flow line empty.	Fill the detector/flow line with liquid or change detector installation.
	Detector installed backwards—its arrow points against the direction of the process flow.	Reverse detector installation or X and Y terminal connections.
	Electrodes are covered by insulating substance.	Clean the electrodes.
Indication (output current) is unstable.	Detector is not filled with liquid/flow line empty.	Fill the detector/flow line with liquid or change detector installation.
	Incorrect grounding is allowing noise effects on the signal.	Correctly ground instruments.
	Air bubbles are trapped in detector.	Provide air vent or change detector installation.
	Liquid contains highly electrolytic substance.	Apply damping of 5 seconds or longer.
	Electrodes are badly stained.	Clean the electrodes.
Indication is upscale (output current larger than 20 mA).	Flow velocity span is too small.	Change to a larger span so that maximum flow becomes smaller than full scale (100%).
Indication of integrated flow value is abnormal (too small or too large).	Detector constant setting is incorrect.	Correctly set the detector constant.
	Flow velocity span setting is incorrect.	Correctly set the span.
	Scaled constant setting is incorrect.	Correctly set the constant.
	Pipe line leaks.	Repair the pipe line.

Continued on next page

Summary, continued

Table 8-7 Start-up and Normal Operation Problems, Continued

Symptoms	Probable Causes	Remedies
Indication varies erratically.	Electrodes are completely insulated.	Clean electrodes.
	Flow of liquid is pulsating (caused by pump, liquid level change)	Apply damping.
	Liquid leaks around electrodes. Degradation of insulation between electrodes and ground due to collection of moisture on outside of detector.	Disassemble, clean and dry the electrode assemblies.

8.4 Incorrect Grounding Problems

Summary

Table 8-8 lists symptoms that may be associated with incorrect grounding.

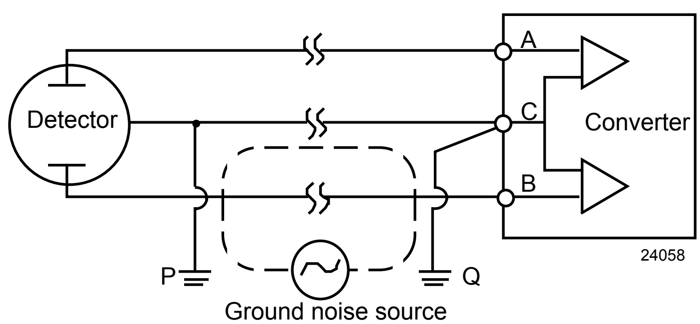
Table 8-8 Incorrect Grounding

Symptoms	Incorrect Grounding	Probable Causes and Failures
• Converter output varies when the flow is constant. • Variation rate exceeds 100%.	On the converter side, the input signal line "C" terminal and "E" terminal are connected to common ground or they are connected to the case from common grounding.	Two-point grounding (both at detector side and converter side) results, external noise is picked up by the input signal line C and the converter output becomes unstable.
	Detector was not grounded or grounding is incorrect.	If the detector is not grounded or if its grounding is incorrect, it is grounded through the process pipe and the grounding resistance becomes unstable (high grounding resistance).
	The grounding wire (earth wire) is too long and acts as an antenna.	The long grounding wire picks up external noise and the detector output becomes unstable.
Converter damaged by surge voltage (current) caused by lightning.	Detector was not grounded or grounding is incorrect.	If the detector is not grounded, surge voltage (current) caused by lightning will flow to the converter which is grounded.

Causes and effects of noise

Table 8-9 outlines various causes and effects of noise.

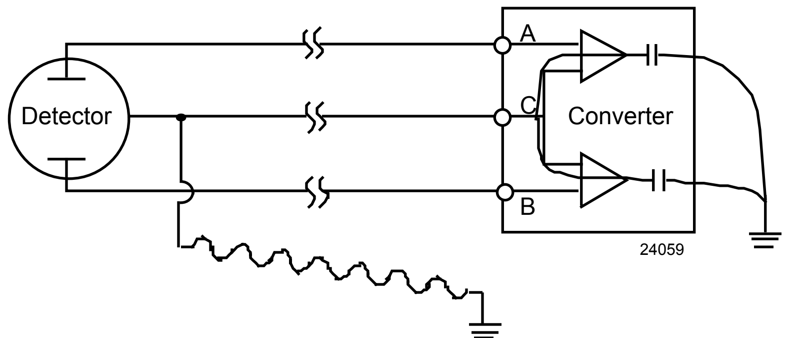
Table 8-9 Causes and Effects of Noise

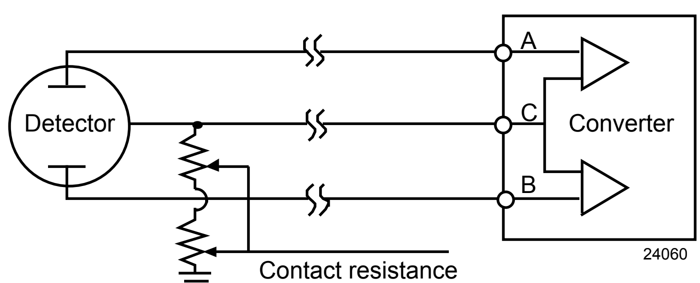
Causes of Noise Trouble	Effects of Noise
	 • The output will be unstable and will vary largely, exceeding the full scale. With this 2-point grounding circuitry, if there is any earth potential difference between P and Q, normal-mode noise is produced between terminals C and A, and terminals C and B in the converter.

Continued on next page

Causes and effects of noise, continued

Table 8-9 Causes and Effects of Noise, Continued

<table>
<tr><th>Causes of Noise Trouble</th><th>Effects of Noise</th></tr>
<tr><td></td><td>

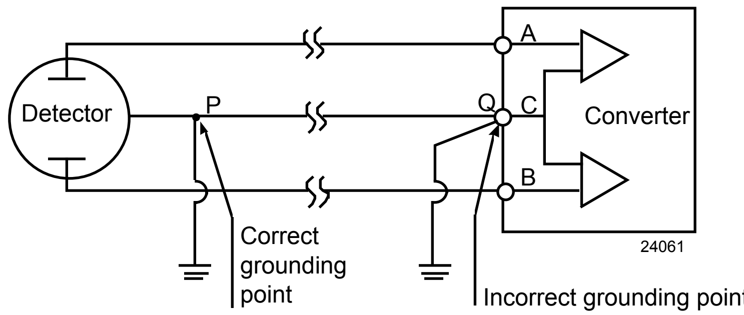
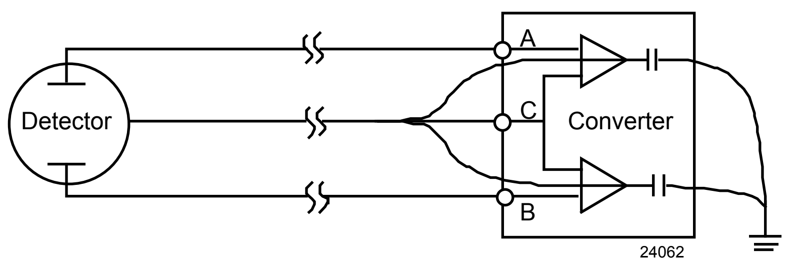
Make the grounding wire (earth wire) as short as possible. If it is abnormally long or if it is run for a long distance above ground:
• It will act as an antenna which will pick up high frequency noise. Since the “antenna will exhibit a substantially high grounding impedance for such high frequency noise, the noise will not be readily grounded to the earth point. Subsequently, such noise will enter the converter through stray capacitance between the primary and secondary windings of the transformer, adversely affecting the measuring accuracy of the converter.
• Its large grounding impedance will not readily release the surge current caused by lightning to the earth point and the current will flow to the converter through the small gap between converter and casing. This results in damage to the amplifier of the converter.</td></tr>
<tr><td>grounding wire (loose terminal screw)</td><td>

• Affected by high frequency noise and low frequency noise.
• Amplifier may be damaged by lightning (the same as the antenna earth as listed above).</td></tr>
</table>

Continued on next page

Causes and effects of noise, continued

Table 8-9 Causes and Effects of Noise, Continued

Causes of Noise Trouble	Effects of Noise
	 Grounding must be done at point P, not at point Q. If the point is incorrect, the grounding wire is long and it is run above the ground for a long distance, or if there is a bad connection: • The output will vary largely and may be deflected over the full scale. • The amplifier may be damaged by lightning. Noise induced on the wire to terminal C is not readily bypassed to the earth, but it is fed through the stray capacitances of the amplifier and converter circuit to the case and ground.
	 • The output will vary largely and may deflect over the full scale (the noise output is largely affected by high frequency noise). • Amplifier may be damaged by lightning. • If point C of the detector is not grounded, noise induced on Cable C (shield cable) is applied to the converter and the effect is the same as that of the antenna earth.

8.5 Running a Status Check

Summary The procedure in Table 8-10 shows how to run a status check using the SFC.

Table 8-10 Running a Status Check With SFC

Step	Press Key	Read Display or Action	Description
1		Connect the SFC across loop wiring for flowmeter whose status is to be checked.	Be sure to put analog loop into manual mode.
2	DE READ A ID	TAG NO. TRIPS SECURED??	Be sure any switches that may trip alarms or interlocks associated with analog loop are secured or turned off.
3	NON-VOL ENTER (Yes)	TAG NO. SFC WORKING... MAG SR TAG NO. SFM 1ØØ1	Confirms that “TRIPS” are secured and establishes communications with sample transmitter SFM 1001. **ATTENTION** If a communications error is detected, applicable diagnostic messages will cycle at two-second intervals in the display and then display returns to the prompt PUT LOOP IN MAN. Repeat Steps 2 and 3 to view messages again. Communications is not established and all SFC functions are disabled.
4	F/S DIR U STAT	STATUS SFM 1ØØ1 SFC WORKING... STATUS SFM 1ØØ1 STATUS CHECK=OK OR STATUS SFM 1ØØ# EXT. ZERO ACTIVE OR STATUS SFM 1ØØ1 CRITICAL STATUS STATUS SFM 1ØØ# A/D FAULT THEN MAG SR SFM 1ØØ1 READY...	Initiates status check. Transmitter and SFC are operating normally. Diagnostic message appears for detected fault. Critical status appears followed by applicable diagnostic messages. Signals end of status messages for display. Press [**STAT**] key to display messages again. When there are two or more messages, they are cycled in display at 5-second intervals.

8.6 Checking SFC Display and Keyboard

Summary The procedure in Table 8-11 shows how to run an SFC display and keyboard test.

Table 8-11 Running SFC Display and Keyboard Test

Step	Press Key	Read Display or Action	Description
1		Turn on SFC.	
2	[^ SHIFT]	PUT LOOP IN MAN SHIFT–	Initiates shift key selection.
	[W 2]	DISPLAY TEST * * DISPLAY OKAY * *	All display segments are working.
		KEYBOARD TEST row * column *	Ready to check operation of individual keys.
3	[E LRV 0%]	KEYBOARD TEST row 2 column 1	Confirms key operation by verifying that its row and column location on keyboard are displayed.
4		Repeat Step 3 as required to check all keys or go to Step 5 to exit test.	
5	NON-VOL [ENTER (Yes)]	KEYBOARD TEST row 8 column 4	Checks [**ENTER**] key location.
		PUT LOOP IN MAN	Ready for operation.

Appendix A – Operation Using the US

A.1 FTA to Flowmeter Wiring

Overview

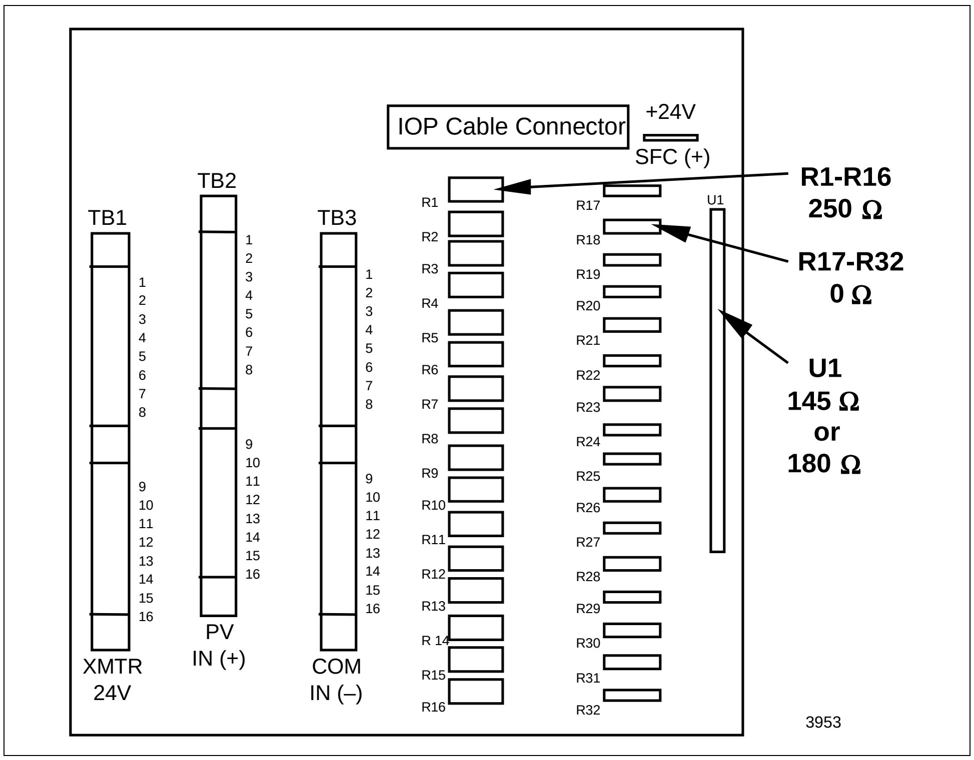
The field termination assembly (FTA) for the MagneW 3000 ***PLUS*** is the same as that used for high level analog inputs. There are two types of FTAs: one supports redundant IOPs and the other does not. The redundant and the nonredundant version of the FTA can use screw-type or Weidmuller compression type termination.

Figures A-1 through A-5 illustrate FTA configurations for redundant and nonredundant STI IOP.

Nonredundant STI IOP FTA physical layout

Figure A-1 shows the FTA physical layout for nonredundant STI IOP.

Figure A-1 FTA Physical Layout for Nonredundant STI IOP



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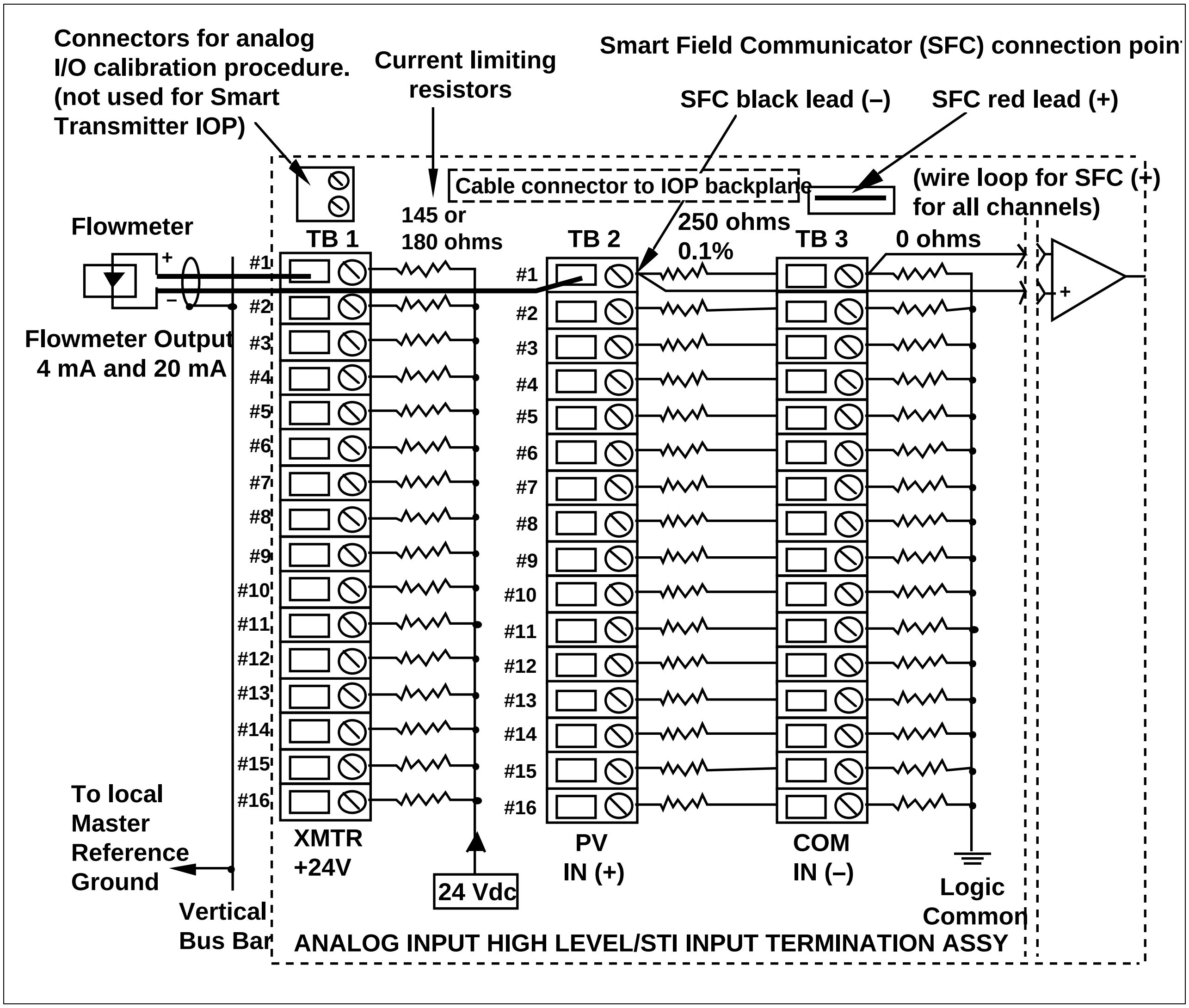
Nonredundant STI IOP FTA schematic

Figure A-2 gives a nonredundant STI IOP FTA schematic.

Figure A-2 Nonredundant STI IOP FTA



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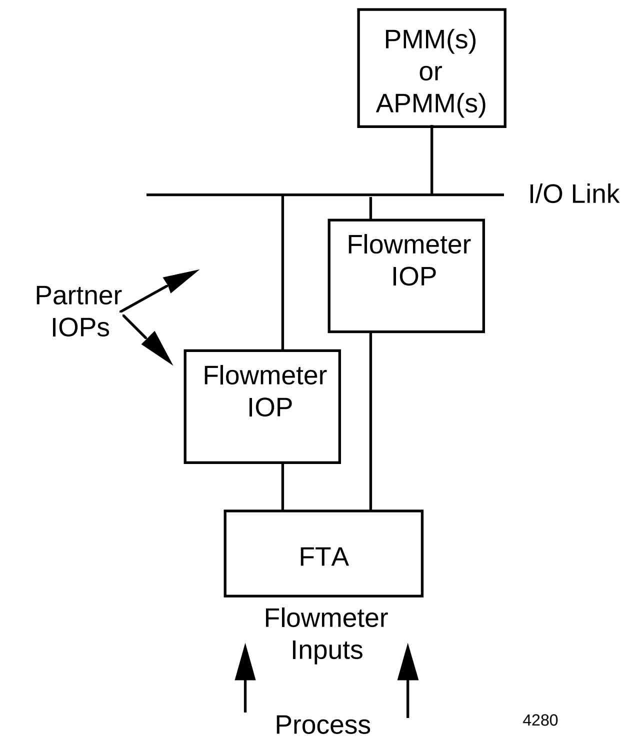
FTA redundant STI IOP signal flow

Figure A-3 shows the FTA redundant STI IOP signal flow.

Figure A-3 FTA Redundant STI IOP Signal Flow



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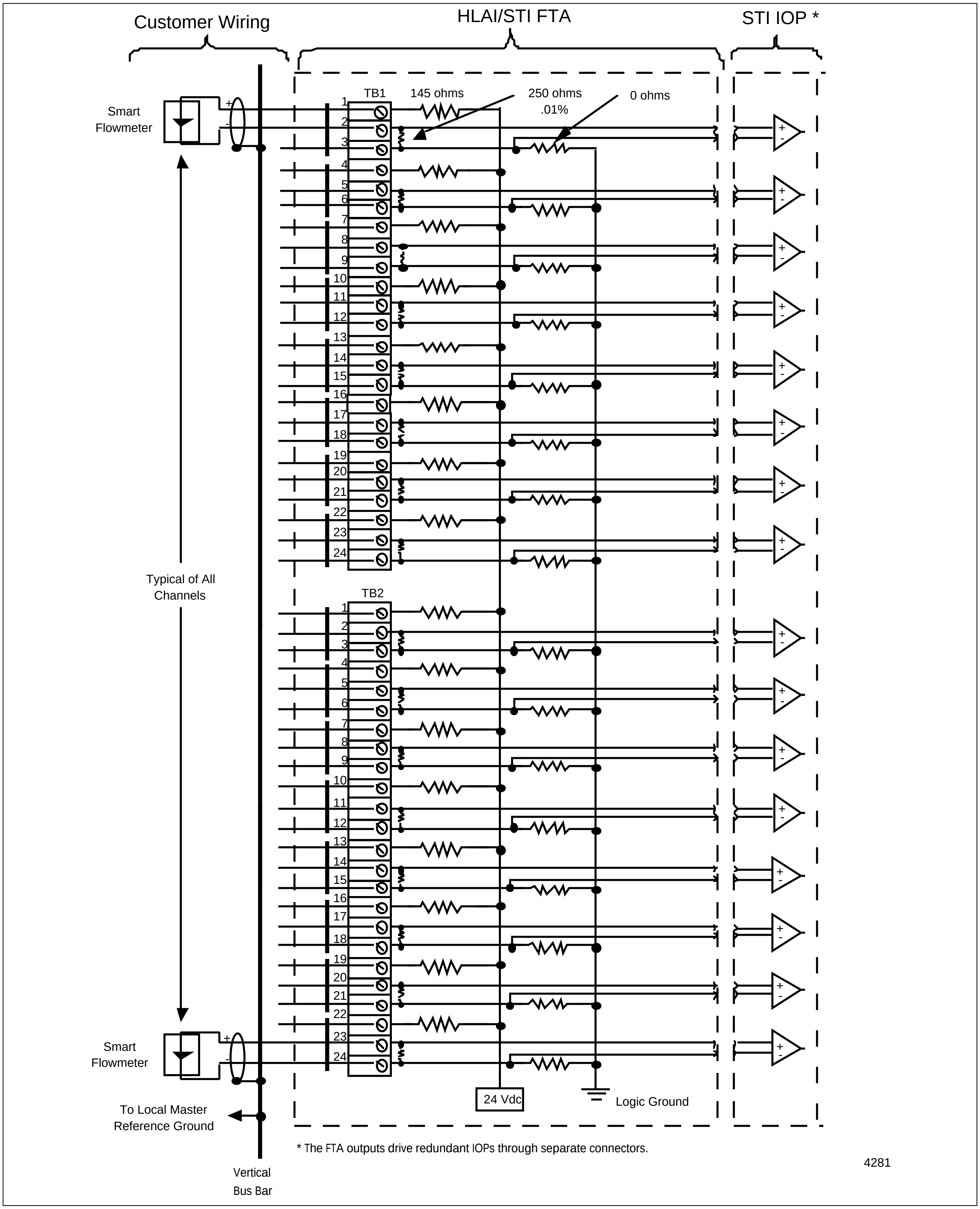
Screw type FTA schematic

Figure A-4 shows the screw type FTA schematic for redundant STI IOP.

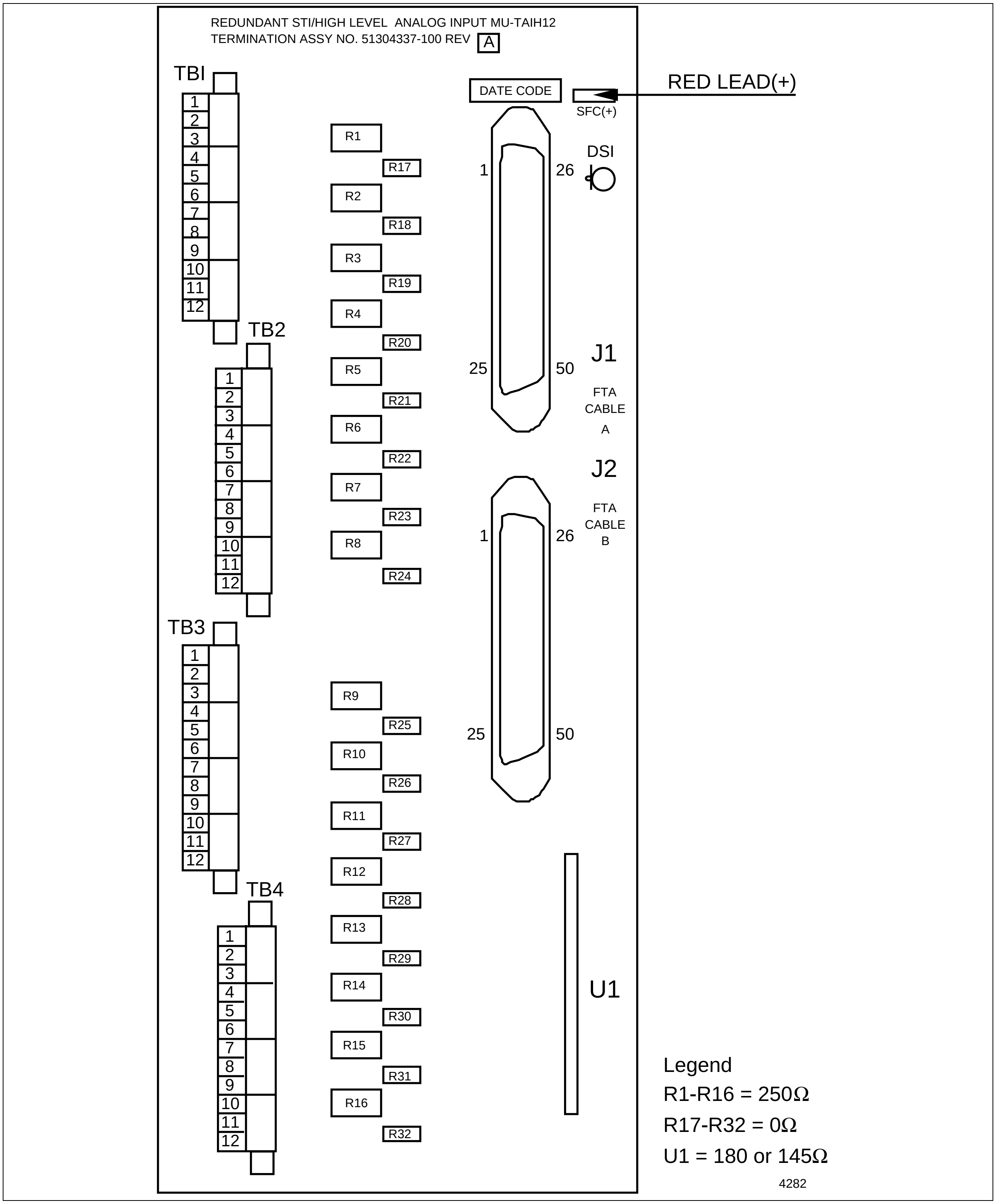
Figure A-4 Screw Type FTA for Redundant STI IOP



Compression type FTA for redundant STI IOP

Figure A-5 shows the compression type FTA schematic for redundant STI IOP.

Figure A-5 Compression Type FTA for Redundant STI IOP



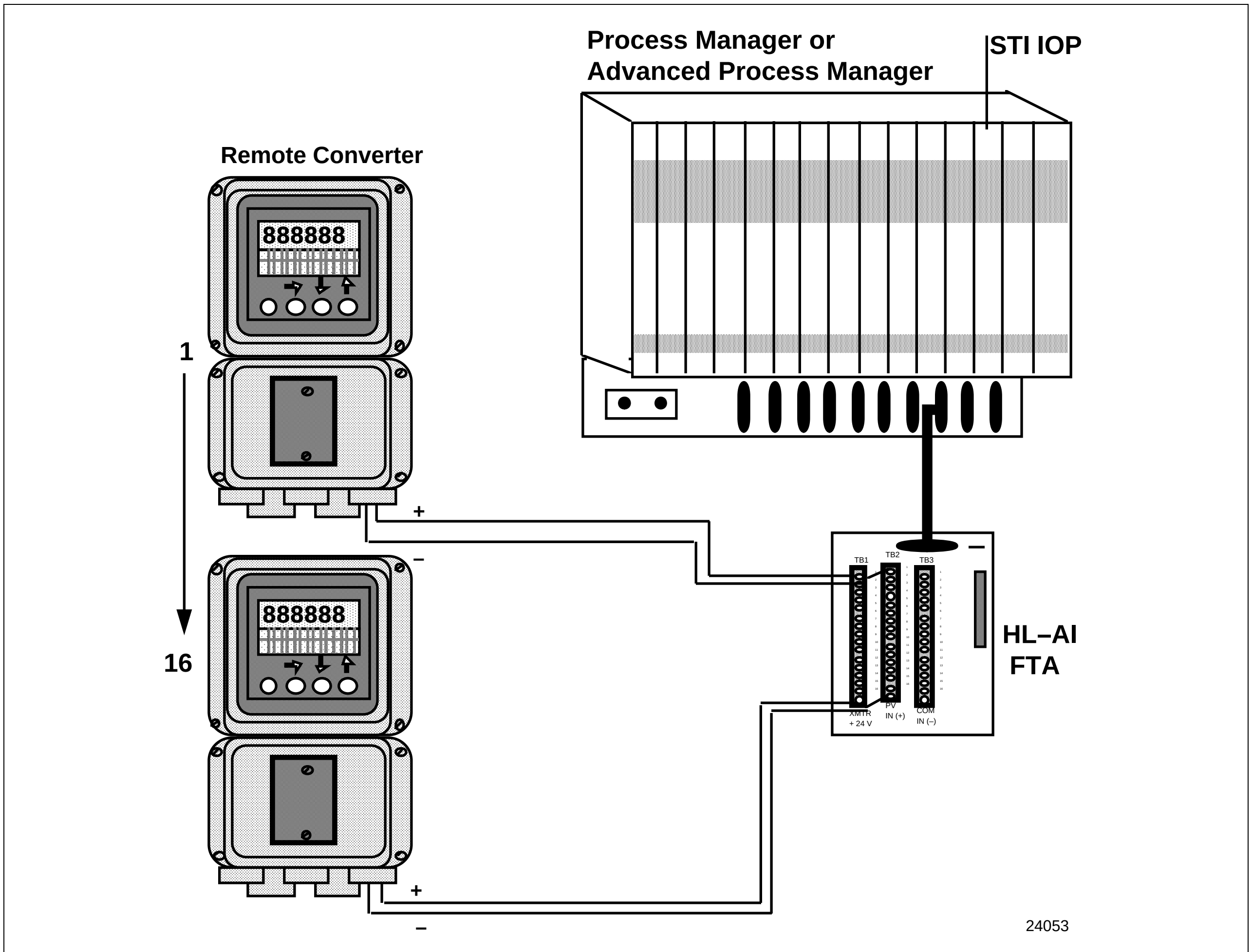
A.2 STI IOP

About STI IOP

The Smart Transmitter Interface Input/Output Processor (STI IOP) is the Process Manager/Advanced Process Manager module that provides the system interface with flowmeters in the DE mode. It handles up to 16 flowmeters with inputs channeled through a Field Termination Assembly. The STI IOP maintains a copy of the flowmeter's basic configuration data and checks for mismatches against the database in the flowmeter when the flowmeter is broadcasting data in the 6-byte format. In this case, any mismatches will result in a BADPV alarm.

The STI IOP is also referred to as the Smart Transmitter Interface Module (STIM). In fact, STIM is used as the module-type identification when building a PM/APM box data point for the system. This is further discussed in *Section A.5 – Configuration from the US*. Figure A-6 shows a typical STI IOP interface with up to 16 MagneW 3000 ***PLUS*** flowmeters.

Figure A-6 Typical STI IOP Interface With MagneW 3000 ***PLUS***



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About STI IOP, continued

The Smart Transmitter Interface I/O Processor (STI IOP) in the PM/APM node provides a digital interface to the MagneW 3000 ***PLUS*** flowmeter. By combining the STI IOP and MagneW ***PLUS*** (operating in the DE communications mode), the flowmeter and database become part of the TPS system. This digital integration provides the capabilities to:

- Upload/download (save/restore) the transmitter database.
- Alarm on flowmeter loop failure.
- Rerange the flowmeter.
- Preconfigure the field system.

STI IOP functions

The STI IOP's primary function is to provide up to sixteen independent bidirectional channels of communication between the PM or APM and the MagneW 3000 ***PLUS***. STI IOP functions include:

- Ground-referenced flowmeter power for each input channel.
- Filtering input signals for high frequency noise suppression and surge limiting.
- Receiving and decoding serial input data on each channel.
- Sending configuration commands to MagneW flowmeters.
- Converting digital input representation into Engineering Units (EUs).
- Making processed input data available to devices on the I/O Link in the form of EUs and/or percent of range.
- Maintaining local database of configuration and processing information.
- Checking received data against specified limits, maintaining alarm flags and generating alarm events.
- Providing an orderly, initialized state of limited operation and accepting downline loaded configuration data from higher-order devices on the I/O Link to establish full functionality.
- Interface to the I/O Link, with full support of the I/O Link protocol.
- PV Source selection.
- Optional IOP redundancy (R300 and later).
- Power-on database validity detection (R300 and later).

The following hardware is required for PM or APM/STI/MagneW 3000 ***PLUS*** subsystem integration:

- STI IOP—the PM's or APM's Smart Transmitter Interface I/O Processor.
- FTA—the Field Termination Assembly that connects the field wiring to the PM or APM.
- FTA Cable—the cable that connects the STI IOP and the FTA.

Continued on next page

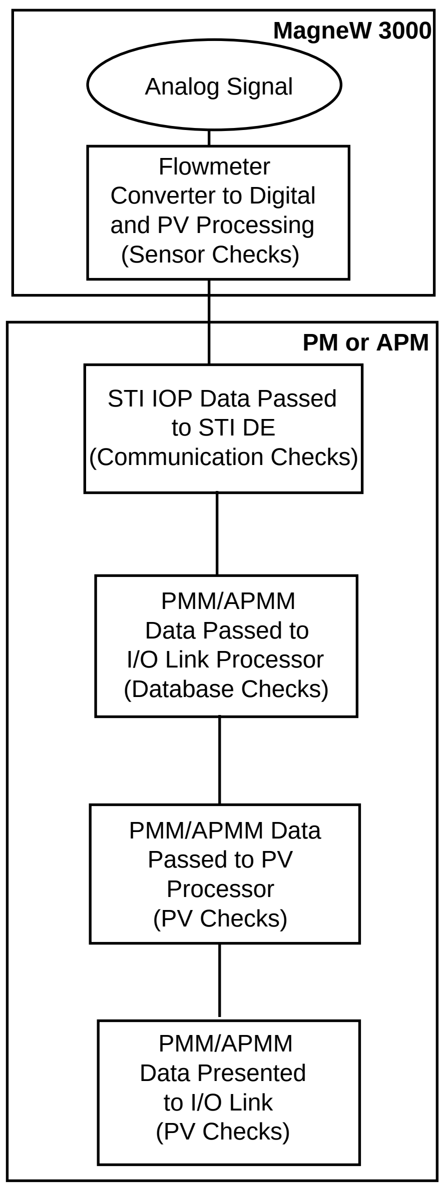
Hardware considerations, continued

MagneW 3000 ***PLUS*** flowmeter.

- Smart Field communicator (optional)—used for local checkout of flowmeter.

The MagneW 3000 ***PLUS*** and STI IOP PV processing is done in the following manner. PV processing digitizes the analog signal from the flowmeter using the A/D converter. This digital signal is passed through a series of algorithms in the flowmeter and then it is broadcast to the PM's or APM's STI IOP. This procedure is shown in Figure A-7.

Figure A-7 PV Processing Data Path



A.3 STI IOP Parameters

Table A-1 lists the basic flowmeter and the mapped STI IOP data parameters, identifies parameter accessibility from SFC or STI IOP, and lists which parameters are part of an upload or a download.

Table A-1 Flowmeter and STI IOP Basic Data Parameters

Basic Data Parameters		Accessibility from		Part of Database	
Transmitter	**STI IOP**	**SFC**	**STI IOP**	**Upload**	**Download**
Software Version	STISWVER	Read Only	Read Only	Yes	No
PROM Identification	SERIALNO	Read Only	Read Only	Yes	No
Diagnostics		Read Only	Read Only	Yes	No
URL* and LRL	URL* and LRL	Read Only	Read Only	Yes	No
Transmitter Type*	SENSRTYP*	Read Only	Read Only	Yes	No
Engineering Units	STI_EU	Read Only	Read Only	Yes	No
Scratch Pad		Read & Write	Read Only	Yes	No
Output Current Mode	See Note 1	Read & Write	Read Only	N/A	N/A
Tag Number*	STITAG*	Read & Write	Read & Write	Yes	Yes
DE Configuration*	DECONF*	Read & Write	Read & Write	Yes	Yes
URV* and LRV*	URV* and LRV*	Read & Write	Read & Write	Yes	Yes
Display Characterization*	PVCHAR*	N/A	Read & Write	N/A	N/A
Damping*	DAMPING*	Read & Write	Read & Write	Yes	Yes
Failsafe Mode	See Note 2	Read & Write	N/A	N/A	N/A

*The STI IOP checks these parameters for mismatches if the flowmeter is broadcasting data in the 6-byte message format.

[1]The output current mode lets you use the flowmeter as a constant-current source. The PV value is set bad in the PM/APM. In R300 and later, the PVRAW value remains as a valid signal from the flowmeter.

[2]The STI IOP has built-in failsafe capabilities (BAD PV Alarm) and ignores this parameter.

A.4 Invalid Key Entry and STI IOP Errors

Table A-2 summarizes the message displays associated with STI IOP errors. These messages appear in the TRANSMITTER STATUS: field of the Detail display on the US.

Table A-2 Summary of Diagnostic Messages for STI IOP Errors

Message	Description
COMMAND FAILURE INVALID REQUEST (R300 or later)	Flowmeter cannot process requested command.
COMMAND FAILURE LOCAL MODE (R300 or later)	Flowmeter did not accept command because DOP is in mode other than Measuring mode.
COMMAND FAILURE NVM BAD (R300 or later)	Command failed because flowmeter's non-volatile memory is bad.
COMMAND FAILURE UNSUCCESSFUL COMMUNICATIONS (R300 or later)	Command could not be communicated to flowmeter.
SFC MODIFIED XMTR DATABASE SYSTEM ACQUIRING DATABASE . . . WAIT (R230 or later)	SFC has been used to change information in the flowmeter's database and the STI IOP is still receiving revised database information.
XMTR DATABASE IS NOT AVAIL SYSTEM ACQUIRING DATABASE . . . WAIT (R230 or later)	STI IOP is still receiving database information from the flowmeter.
XMTR DATABASE IS NOT AVAILABLE XMTR FAILED OR IN ANALOG MODE (R230 or later)	STI IOP cannot retrieve database information from the flowmeter because it failed or is in its analog mode.
XMTR DATABASE IS NOT AVAILABLE XMTR IN PV MODE W/O DB ACCESS (R230 or later)	Flowmeter is in DE mode with 4-byte broadcast format.

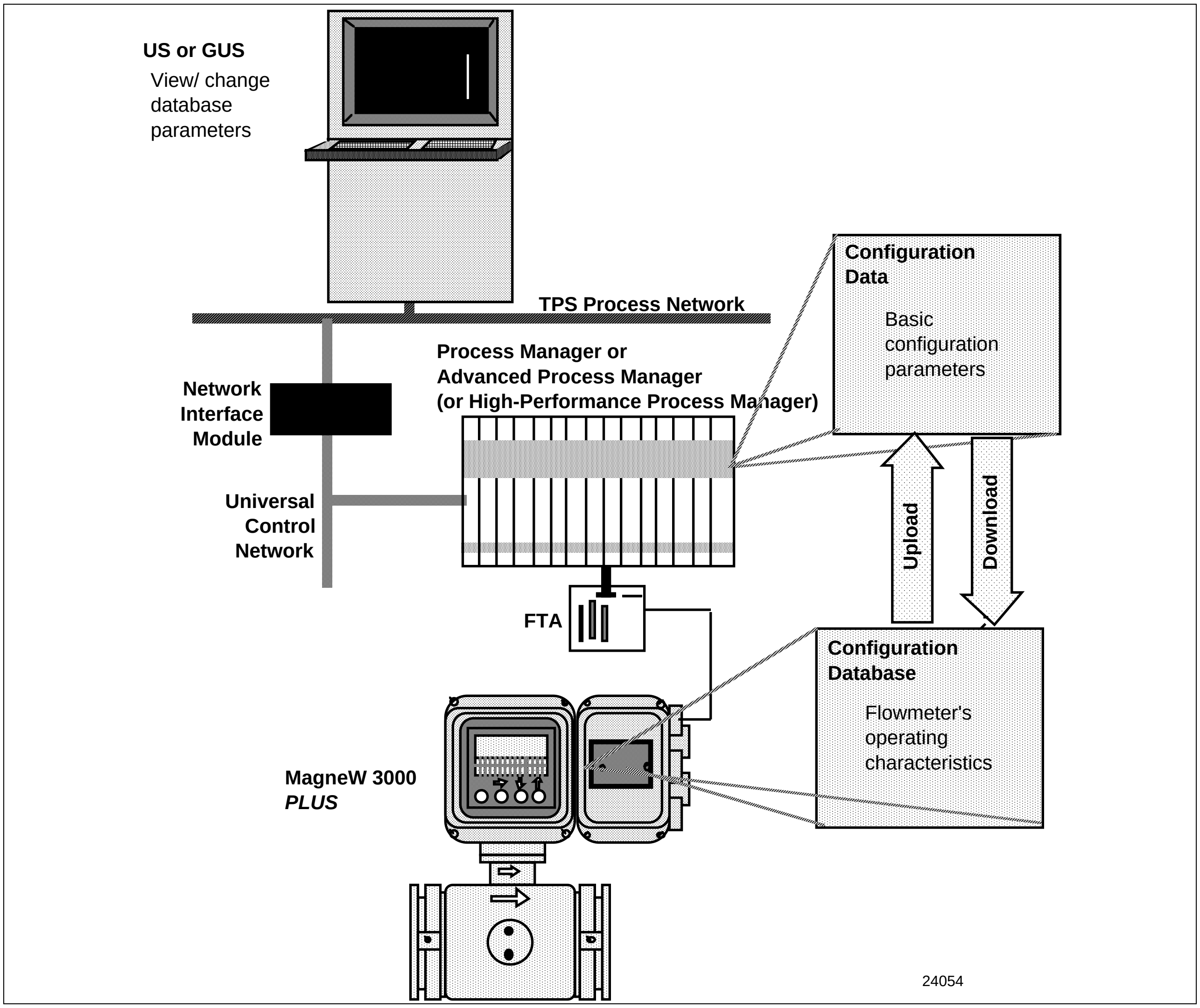
A.5 Configuration from the US

Overview

You can configure some basic parameters in the MagneW 3000 ***PLUS*** flowmeter's configuration database through displays at the Universal Station. This is really matching configuration data for the flowmeter that can be saved as a file to a History Module or to a removable medium (floppy or cartridge). A copy of the configuration data must also reside in the flowmeter's database stored in its non-volatile memory.

The flowmeter does not have to be connected to the system when its basic configuration data is created. You can save the database to a file and download it to the flowmeter later. Or, if the flowmeter has been configured using an SFC, you can upload its database to the control system. See Figure A-8 for a graphic representation of data locations. In either case, the basic configuration data in the flowmeter must match the data in the control system.

Figure A-8 Configuration Data Stored in Two Locations



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You can configure only basic range data for single-range operation through the US displays. You will need a DOP or SFC to configure detector specific, pulse output, and digital I/O data. Because the US displays support only single-range operation, do not configure the transmitter for dual-range operation. For further details on US Configuration, refer to the *MagneW 3000 Implementation and Service Manual—document number AV-305.*

ATTENTION The first digital integration of Smartline Transmitters with Honeywell's TDC control system was through a Smart Transmitter Digital Communications (STDC) card for Data Hiway-based applications. The STDC card was designed for use in a Basic, Extended, or Multifunction controller to give primarily read-only access to the transmitter's PV for Operator Station displays. In this application, an SFC was required to configure the transmitter.

About point building

To locate and identify STIM data within the control system, these points must be built through the engineering personality.

- PM/APM Box Data Point
- STIM Point

A Box Data Point allocates the number and scan rate of the control functions for a given PM or APM. It maps the physical file and card number of each I/O Processor (IOP) to a logical module number. This is how data from an STI IOP is referenced in the various system displays.

A STIM point includes the basic configuration parameters for a given flowmeter connected to the STI IOP through an FTA. It also includes PM/APM-specific database parameters. Each transmitter connected to an STI IOP requires its own STIM point.

ATTENTION The details for building Box Data and STIM points are beyond the scope of this manual and are not covered here.

Starting point assumptions

The procedures in this section are based on the assumption that

the flowmeter is connected to the FTA,

- a Box Data Point is built for the STI IOP, and
- a STIM point is built for the flowmeter with an assigned tag name (FI1001 for example purposes only).

Continued on next page

Using Detail display

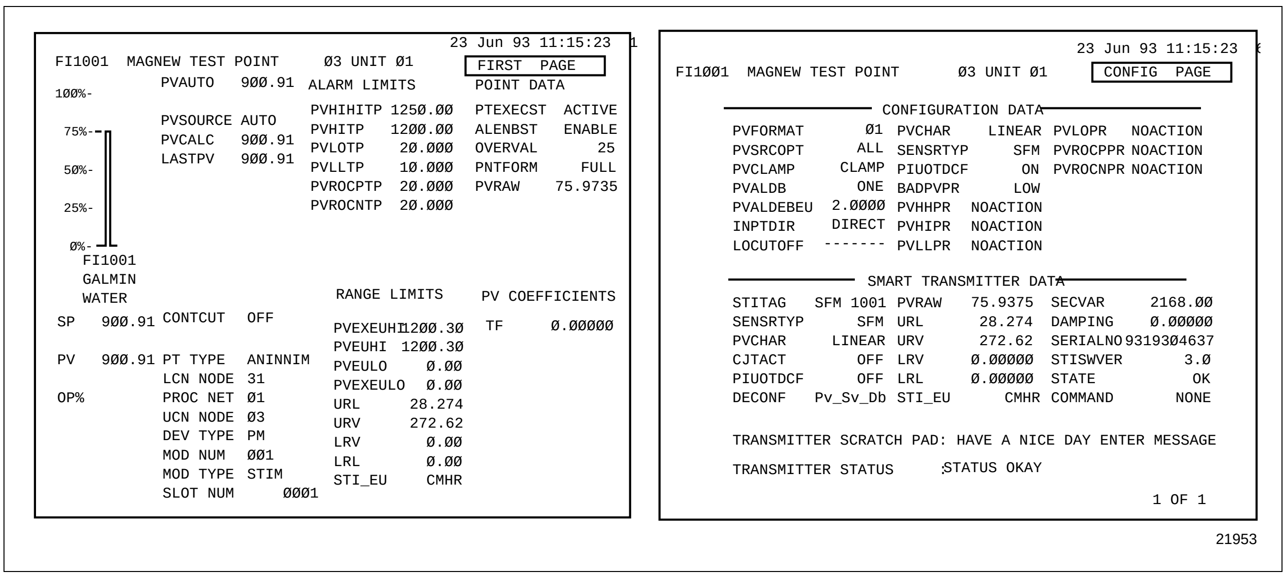
Once a STIM point is built, you can use the Detail display of the STIM point to interface with the given flowmeter's parameters.

The First Page of the Detail display includes general point, alarm, and range data as well as PV indication. You can change the execution state of the point and adjust the alarm limits and the PV range values through this page of the display.

The next page, or Config Page, of the Detail display lists the current PM/APM and transmitter (flowmeter) configuration parameters. You can change selected flowmeter configuration parameters, initiate command actions, view flowmeter scratch pad message, and monitor flowmeter status through this page of the display.

Figure A-9 shows typical First and Config Pages of STIM point Detail display.

Figure A-9 Typical Pages of STIM Point Detail Display



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Initiating upload or download

After you load the STIM point into the system, you either upload the flowmeter's configuration database to the STI IOP or download the configuration data in the STI IOP to the flowmeter. This is to make sure the data in the flowmeter matches the data in the STI IOP.

IF you …	THEN …
used an SFC to configure the database in the flowmeter	upload the flowmeter's configuration database to the STI IOP.
configured the flowmeter data while building the STIM point	download the configuration data in the STI IOP to the flowmeter.

The procedure in Table A-3 shows the steps for uploading or downloading a configuration data for a sample STIM point with the tag name of FI1001.

Table A-3 Uploading or Downloading the Configuration Data

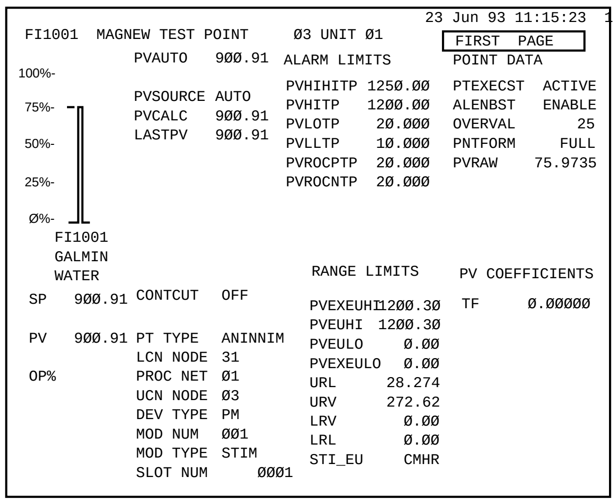
Step	Press Key or Select Target or Parameter	Result and/or Action
1	DETAIL	Prompt to enter point ID appears on display. `ENTER PT ID`
2	F I 1 0 0 1	Tag name for sample STIM point is entered. `ENTER PT ID FI1Ø01`

Continued on next page

Initiating upload or download, continued

Table A-3 Uploading or Downloading the Configuration Data, Continued

<table>
<tr><th>Step</th><th>Press Key or Select Target or Parameter</th><th>Result and/or Action</th></tr>
<tr><td>3</td><td>ENTER</td><td>Calls up Detail display of STIM point FI1001.



21954</td></tr>
<tr><td>4</td><td>PTEXECST</td><td>Calls up point execution state selections on display.

PTEXECST

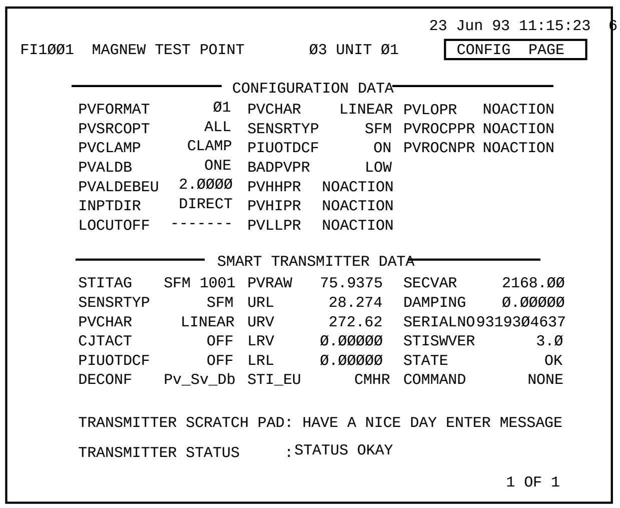
NOT CONFIG
ACTIVE
INACTIVE
READY
DONE
WAITING

ENTER</td></tr>
</table>

Continued on next page

Initiating upload or download, continued

Table A-3 Uploading or Downloading the Configuration Data, Continued

<table>
<tr><th>Step</th><th>Press Key or Select Target or Parameter</th><th>Result and/or Action</th></tr>
<tr><td>5</td><td>INACTIVE
ENTER</td><td>Changes point execution state to inactive. Watch for PTEXECST parameter status to change from ACTIVE to INACTIVE on display.</td></tr>
<tr><td>6</td><td>Page Fwd</td><td>Calls up next page of Detail display.


21955</td></tr>
</table>

Continued on next page

Initiating upload or download, continued

Table A-3 Uploading or Downloading the Configuration Data, Continued

<table>
<tr><th>Step</th><th>Press Key or Select Target or Parameter</th><th>Result and/or Action</th></tr>
<tr><td>7</td><td>COMMAND</td><td>Calls up command selections on display.

COMMAND
NONE
DNLOADDB
UPLOADDB
SET_LRV
SET_URV
COR_LRV
COR_URV
COR_INPT
** MORE **

ENTER

<table><tr><th>If you want to …</th><th>Then…</th></tr><tr><td>upload the database</td><td>go to Step 8.</td></tr><tr><td>download the data</td><td>go to Step 9.</td></tr></table>
ATTENTION If LCN software is R230 and the flowmeter is in its analog mode of operation, you must use the SFC to put the flowmeter into its DE mode with 6-byte format before you can upload the database. This is not necessary if LCN software is R300 or greater. In this case, the flowmeter is automatically switched from analog to DE mode with a 6-byte format when an upload or download operation is initiated.</td></tr>
<tr><td>8</td><td>UPLOADDB

ENTER</td><td>Initiates upload of configuration database from flowmeter to STI IOP. Watch for STATE parameter status to change to LOADCOMP and go to Step 10.

ATTENTION You cannot initiate an upload command with a flowmeter that is configured for DE mode with a 4-byte format.</td></tr>
</table>

Continued on next page

Initiating upload or download, continued

Table A-3 Uploading or Downloading the Configuration Data, Continued

Step	Press Key or Select Target or Parameter	Result and/or Action
9	DNLOADDB ENTER	Initiates download of data from STI IOP to flowmeter. Watch for STATE parameter status to change to LOADCOMP and go to next Step 10.
10	Page Back	Returns to First Page of Detail display. Change point back to active state. See Steps 4 and 5 in this procedure for reference.

The basic configuration parameters in the flowmeter are “mapped” to corresponding parameters in the STI IOP database; however, not all of the parameters are read and write accessible from the SFC and/or the Detail display in the US. Consequently, some of the read-only transmitter database parameters are included in a database upload only because they are preset in the transmitter or they are read and write accessible only through the SFC.

The STI IOP compares several database parameters to check for database mismatches when the transmitter is broadcasting data in the 6-byte message format.

Continued on next page

Table A-4 lists the parameters that you can change for a given MagneW 3000 ***PLUS*** flowmeter through the Detail display for the corresponding STIM point.

Table A-4 MagneW 3000 ***PLUS*** Parameters Changeable From Detail Display

Transmitter Parameter	Setting or Selection
STITAG	Transmitter tag name of up to 16 alphanumeric characters including spaces. **ATTENTION** The SFC and DOP can display up to 8 characters only. Thus, if a tag name of more than 8 characters is entered, the US, STI IOP, and flowmeter will truncate the name.
DAMPING	Numeric value for damping time constant that the STI IOP adjusts to one of these range value selections in seconds. 0.00 2.0 5.0 100.0 0.5 3.0 10.0 1.0 4.0 50.0
STI_EU	Volumetric flowrate readings for LRL, LRV, URL, and URV can be displayed in any one of these engineering units if the software is R300 or later : CMHR cubic meters per hour GALHR gallons per hour LITHR liters per hour CCHR cubic centimeters per hour CMMIN cubic meters per minute GALMIN gallons per minute LITMIN liters per minute CCMIN cubic centimeters per minute CMDAY cubic meters per day GALDAY gallons per day KGALDAY kilogallons per day BRLDAY barrels per day CMSEC cubic meters per second If software is R230, flowrate readings will be displayed in the default engineering unit of CMHR. **ATTENTION** The US does not support mass flowrate or velocity flowrate readings. These readings can be implemented through the SFC or the DOP.
PVCHAR	**ATTENTION** This parameter is changeable only from the Parameter Entry display associated with point building. Defines the display characterization to be used for characterizing the PV input value to the STI IOP. You must use the default selection of LINEAR for the flowmeter.

Continued on next page

Changeable transmitter parameters, continued

Table A-4 MagneW 3000 ***PLUS*** Parameters Changeable From Detail Display, Continued

<table>
<tr><th>Transmitter Parameter</th><th>Setting or Selection</th></tr>
<tr><td>FREQ6050</td><td>ATTENTION This parameter is changeable only from the STI IOP Status Detail display.

Select the rating that matches the power line frequency for the power supply.

50 Hz
60 Hz</td></tr>
<tr><td>LRV (Lower Range Value)
(Process input for 4 mA dc (0%) output)</td><td>Enter desired value through display. This value is fixed at zero for MagneW 3000 PLUS flowmeters.</td></tr>
<tr><td>URV (Upper Range Value)
(Process input for 20 mA dc (100%) output)</td><td>Enter desired value through display.</td></tr>
<tr><td>DECONF</td><td>Choose one of these broadcast types for data transmission between the transmitter and the STI IOP.

<table>
<tr><td>PV</td><td>Transmitter sends the PV value corresponding to the transmitter’s working range (PVw) in 4-byte format to the STI IOP for display.</td></tr>
<tr><td>PV_SV</td><td>4-Byte Format:

Byte 1 is output signal mode
Bytes 2 to 4 are PV or SV value
<table>
<tr><th>1</th><th>2</th><th>3</th><th>4</th></tr>
<tr><td>FLAG</td><td>PV</td><td>PV</td><td>PV</td></tr>
</table></td></tr>
</table>

ATTENTION URL is determined by meter size and velocity. URV can be greater than URL.</td></tr>
</table>

Continued on next page

Changeable transmitter parameters, continued

Table A-4 MagneW 3000 ***PLUS*** Parameters Changeable From Detail Display, Continued

<table>
<tr><th>Transmitter Parameter</th><th colspan="2">Setting or Selection</th></tr>
<tr><td rowspan="3">DECONF (continued)</td><td>PV_DB</td><td>Transmitter sends the PV value corresponding to the transmitter’s working range (PVw) along with database parameters in 6-byte format to the STI IOP for display.</td></tr>
<tr><td>PV_SV_DB</td><td>Transmitter sends PV value corresponding to the transmitter’s working range in 6-byte format to the STI IOP for display.

6-Byte Format:

Byte 1 is output signal mode
Bytes 2 to 4 are PV or SV value
Byte 5 is data type identifier (LRV, URV span, etc.)
Byte 6 is data being sent

<table><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>FLAG</td><td>PV</td><td>PV</td><td>PV</td><td>ID</td><td>DB</td></tr></table></td></tr>
<tr><td colspan="2">ATTENTION The approximate rates of transmission in repeats per second are:
<table><tr><th>Data</th><th>4 - Byte</th><th>6 - Byte</th></tr><tr><td>PV value</td><td>3 rpts/sec</td><td>2.5 rpts/sec</td></tr></table></td></tr>
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