Rosemount 3095FB
tMultiVariable™ Transmitter
with Modbus® Protocol
Read this manual before working with the product. For personal and system safety, and for optimum product performance, make sure you thoroughly understand the contents before installing, using, or maintaining this product.

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

**Customer Central:** 1-800-999-9307 (7:00 a.m. to 7:00 p.m. CST)
Technical support, quoting, and order-related questions.

**North American Response Center:** 1-800-654-7768 (24 hours a day – Includes Canada)
Equipment service needs.

For equipment service or support needs outside the United States, contact your local Rosemount representative.

**CAUTION**

The products described in this document are NOT designed for nuclear-qualified applications.

Using non-nuclear qualified products in applications that require nuclear-qualified hardware or products may cause inaccurate readings.

For information on Rosemount nuclear-qualified products, contact your local Rosemount Sales Representative.
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Section 1 Introduction

USING THIS MANUAL

This manual provides installation, configuration, calibration, troubleshooting, and maintenance instructions for the Rosemount® 3095FB Multivariable™ Transmitter with Modbus™ Protocol and for its operation with the Rosemount 3095FB Configurator User Interface Software. This manual consists of the following chapters:

Section 2 Installation
- Install the 3095FB
- Installation flowchart
- Transmitter configuration data
- Installation considerations
- Field installation
- Options and accessories

Section 3 RTU Communication
Rosemount 3095FB Modbus Protocol Guide, Revision F.

Section 4 Operation
- How to use the configuration software
- Installing the software onto a personal computer
- Establishing communications
- Configuring the transmitter
- Creating a configuration file
- Calibrating the transmitter
- Explains each configurator software menu

Section 5 Transmitter Maintenance and Troubleshooting
- Troubleshooting instructions for dealing with potential mechanical or electrical difficulties.

Section 6 Specifications and Reference Data
- Specification data
- Spare parts information

Appendix A Approvals
- Factory Mutual (FM) certified drawings
- Canada Standards Association (CSA) certified drawings.

Appendix B Product Certifications

Appendix C MODBUS Integration Guide
Section 2  Installation

OVERVIEW

The information in this section covers installation considerations for the 3095FB MultiVariable Transmitter with Modbus protocol. A Quick Installation Guide (document number 00825-0100-4738) is shipped with every transmitter to describe basic pipe-fitting and wiring procedures for initial installation.

SAFETY MESSAGES

Procedures and instructions in this section may require special precautions to ensure the safety of the personnel performing the operation. Review all safety messages covered in this manual before continuing with the operation.

Warnings

⚠️ WARNING
Explosions can result in death or serious injury.
- Do not remove the transmitter covers in explosive environments when the circuit is live.
- Fully engage both transmitter covers to meet explosion-proof requirements.
- Verify that the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.

⚠️ WARNING
Electrical shock can result in death or serious injury.
- Avoid contact with the leads and terminals.

⚠️ WARNING
Process leaks could result in death or serious injury.
- Install and tighten all four flange bolts before applying pressure.
- Do not attempt to loosen or remove flange bolts while the transmitter is in service.

⚠️ WARNING
Replacement equipment or spare parts not approved by Rosemount, Inc. for use as spare parts could reduce the pressure retaining capabilities of the transmitter and may render the instrument dangerous.
- Use only bolts supplied or sold by Rosemount, Inc. as spare parts.
GENERAL CONSIDERATIONS

Measurement accuracy depends upon proper installation of the transmitter and impulse piping. Mount the transmitter close to the process and use minimal impulse piping to achieve best accuracy. Keep in mind the need for easy access, personnel safety, practical field calibration, and a suitable transmitter environment. Install the transmitter to minimize vibration, shock, and temperature fluctuation.

IMPORTANT

Install the enclosed pipe plug in unused conduit openings with a minimum of five threads engaged to comply with Explosion-Proof requirements. The transmitter is shipped with the plug installed on transmitters ordered with CSA Explosion-Proof approval.

MECHANICAL CONSIDERATIONS

"Dimensional Drawings“ beginning on page A-5 show dimensional drawings. Figure 2-4 on page 2-9 shows installation examples.

NOTE

For steam service or for applications with process temperatures greater than the limits of the transmitter, do not blow down impulse piping through the transmitter. Flush lines with the blocking valves closed and refill lines with water before resuming measurement.

NOTE

When the transmitter is mounted on its side, position the Coplanar flange to ensure proper venting or draining. Mount the flange as shown in Figure 2-4 on page 2-9, keeping drain/vent connections on the bottom for gas service and on the top for liquid service.

ENVIRONMENTAL CONSIDERATIONS

The following guidelines can help optimize transmitter performance. Mount the transmitter to minimize ambient temperature changes, vibration, mechanical shock, and external contact with corrosive materials. Appendix A: Range and Sensor Limits on page A-1 lists the transmitter temperature operating limits.
Figure 2-1 details the full procedure for installing a new 3095FB.

Figure 2-1. Rosemount 3095FB Installation Flowchart

START

Unpack the Rosemount 3095FB

Review the 3095FB Product Manual

Hazardous Location?

Yes

Review Appendix B

No

Bench Configure?

Yes

B

No

A

FIELD INSTALLATION

Review Installation Considerations

Mount Transmitter and Install Bolts

(Optional) Install RTD Assembly

Make Field Wiring Connections

Bench Configuration Performed?

Yes

(Optional) Perform Field Calibration Tasks

No

Perform Configuration Tasks

A

BENCH CONFIGURE

Connect Bench Power Supply

Connect Personal Computer

Perform Bench Configuration Tasks

(Optional) Perform Bench Calibration Tasks

B

DONE
Review Installation Considerations

When choosing an installation location and position, take into account the need for access to the transmitter. For dimensional drawing information see page A-6.

Process Flange Orientation
Mount the process flanges with sufficient clearance for process connections. For safety reasons, place the drain/vent valves so the process fluid is directed away from you when the vents are used. In addition, consider the possible need for a testing or calibration input.

Housing Rotation
See “Consider Housing Rotation” on page 2-11.

Terminal Side of Electronics Housing
Mount the transmitter so that the terminal side is accessible. A 0.75-inch (19 mm) clearance is required for cover removal. Use a conduit plug on the unused side of the conduit opening.

Circuit Side of Electronics Housing
Provide 0.75 inches (19 mm) clearance if possible for cover removal. Three inches of clearance is required for cover removal if a display is installed.

Cover Installation
Always install the electronics housing covers metal-to-metal to ensure a proper seal.
Mount the Transmitter

Figure 2-2 illustrates a typical 3095 installation site. Major components of the installation are identified in these figures.

The 3095FB transmitter total weight varies depending on the components ordered (see Table 2-1). This weight must be securely supported.

Table 2-1. Transmitter Weight

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>3095FB Without Options</td>
<td>6 lb (2.7 kg)</td>
</tr>
<tr>
<td>LCD Meter for Aluminum Housing</td>
<td>0.5 lb (0.2 kg)</td>
</tr>
<tr>
<td>SST Mounting Bracket for Coplanar Flange</td>
<td>1.0 lb (0.5 kg)</td>
</tr>
<tr>
<td>12 ft (3.66 m) cable</td>
<td>0.5 lb (0.2 kg)</td>
</tr>
<tr>
<td>24 ft (7.32 m) cable</td>
<td>2.2 lb (1.0 kg)</td>
</tr>
</tbody>
</table>

Mounting Brackets

Optional mounting brackets available with the 3095FB facilitate mounting to a panel, wall, or 2-inch pipe. The bracket option for use with the Coplanar flange is 316 SST with 316 SST bolts. Figure 2-3 shows bracket dimensions and mounting configurations for this option. When installing the transmitter to one of the mounting brackets, torque the bolts to 125 in-lb.
NOTE
Most transmitters are calibrated in the horizontal position. Mounting the transmitter in any other position will shift the zero point to the equivalent amount of liquid head caused by the varied mounting position. To reset zero point, refer to “Sensor Trim” on page 4-16.

Mounting Bolts
The following guidelines have been established to ensure a tight flange, adapter, or manifold seal. Use only bolts supplied with the transmitter or sold by Rosemount Inc. as a spare part to the Rosemount 3095FB transmitter.

The Rosemount 3095FB is shipped with the Coplanar flange installed with four 1.75-inch flange bolts. The following bolts also are supplied to facilitate other mounting configurations:

- Four 2.25-inch manifold/flange bolts for mounting the Coplanar flange on a three-valve manifold. In this configuration, the 1.75-inch bolts may be used to mount the flange adapters to the process connection side of the manifold.
- (Optional) If flange adapters are ordered, four 2.88-inch flange/adapter bolts for mounting the flange adapters to the Coplanar flange.

Figure 2-3 shows the optional mounting bracket and mounting configurations.

Stainless steel bolts supplied by Rosemount Inc. are coated with a lubricant to ease installation. Carbon steel bolts do not require lubrication. No additional lubricant should be applied when installing either type of bolt. Bolts supplied by Rosemount Inc. are identified by their head markings:
Figure 2-3. Optional Mounting Brackets and Mounting Configurations

<table>
<thead>
<tr>
<th>Description</th>
<th>Qty.</th>
<th>Size in. (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flange bolts</td>
<td>4</td>
<td>1.75 (44)</td>
</tr>
<tr>
<td>Flange/adapter bolts</td>
<td>4</td>
<td>2.88 (73)</td>
</tr>
<tr>
<td>Manifold/flange bolts</td>
<td>4</td>
<td>2.25 (57)</td>
</tr>
</tbody>
</table>

NOTE
Dimensions are in inches (millimeters)
Mounting Requirements

Refer to figure 2-4 for examples of the following mounting considerations:

Liquid Flow Measurement
- Place taps to the side of the line to prevent sediment deposits on the transmitter’s process isolators.
- Mount the transmitter beside or below the taps so gases can vent into the process line.
- Mount drain/vent valve upward to allow gases to vent.

Gas Flow Measurement
- Place taps in the top or side of the line.
- Mount the transmitter beside or above the taps so liquid will drain into the process line.

Steam Flow Measurement
- Place taps to the side of the line.
- Mount the transmitter below the taps to ensure that the impulse piping will stay filled with condensate.
- Fill impulse lines with water to prevent the steam from contacting the transmitter directly and to ensure accurate measurement start-up.

NOTE
In steam or other elevated temperature services, it is important that temperatures at the coplanar process flanges not exceed 250 °F (121 °C) for transmitters with silicone fill or 185 °F (85 °C) for inert fill.
Process Connections

The 3095 process connections on the transmitter flange are 1/4–18 NPT. Flange adapter unions with 1/2–14 NPT connections are available as options. These are Class 2 threads; use your plant-approved lubricant or sealant when making the process connections. The process connections on the transmitter flange are on 2 1/8-inch (54-mm) centers to allow direct mounting to a three- or five-valve manifold. By rotating one or both of the flange adapters, connection centers of 2, 2 1/8, or 2 1/4 inches (51, 54, or 57 mm) may be obtained.

Install and tighten all four flange bolts before applying pressure or process leakage will result. When properly installed, the flange bolts will protrude through the top of the module housing. Do not attempt to loosen or remove the flange bolts while the transmitter is in service.
To install adapters to a Coplanar flange, perform the following procedure:

1. Remove the flange bolts.
2. Leaving the flange in place, move the adapters into position with the O-ring installed.
3. Clamp the adapters and the Coplanar flange to the transmitter module using the larger of the bolts supplied.
4. Tighten the bolts. Refer to “Mounting Bolts” on page 2-6 for torque specifications.

**WARNING**

Failure to install proper flange adapter O-rings can cause process leaks, which can result in death or serious injury.

The two flange adapters are distinguished by unique O-ring grooves. Only use the O-ring that is designed for its specific flange adapter, as shown below.

When compressed, Teflon® O-rings tend to cold flow, which aids in their sealing capabilities. Whenever you remove flanges or adapters, visually inspect the Teflon O-rings. Replace them if there are any signs of damage, such as nicks or cuts. If they are undamaged, you may reuse them. If you replace the O-rings, retorque the flange bolts after installation to compensate for cold flow.

**Impulse Piping**

The piping between the process and the transmitter must accurately transfer the pressure to obtain accurate measurements. There are five possible sources of error: pressure transfer, leaks, friction loss (particularly if purging is used), trapped gas in a liquid line, liquid in a gas line, and density variations between the legs.
The best location for the transmitter in relation to the process pipe depends on the process itself. Use the following guidelines to determine transmitter location and placement of impulse piping:

- Keep impulse piping as short as possible.
- For liquid service, slope the impulse piping at least 1 inch per foot (8 cm per m) upward from the transmitter toward the process connection.
- For gas service, slope the impulse piping at least 1 inch per foot (8 cm per m) downward from the transmitter toward the process connection.
- Avoid high points in liquid lines and low points in gas lines.
- Make sure both impulse legs are the same temperature.
- Use impulse piping large enough to avoid friction effects and blockage.
- Vent all gas from liquid piping legs.
- When using a sealing fluid, fill both piping legs to the same level.
- When purging, make the purge connection close to the process taps and purge through equal lengths of the same size pipe. Avoid purging through the transmitter.
- Keep corrosive or hot (above 250 °F [121 °C]) process material out of direct contact with the sensor module and flanges.
- Prevent sediment deposits in the impulse piping.
- Keep the liquid head balanced on both legs of the impulse piping.
- Avoid conditions that might allow process fluid to freeze within the process flange.

Consider Housing Rotation

The electronics housing can be rotated up to 180 degrees (left or right) to improve field access or to better view the optional LCD display. To rotate the housing, perform the following procedure:

1. Loosen the housing rotation set screw using a 5/64-in. hex wrench.
2. Turn the housing up to 180 degrees to the left or right of its original (as shipped) position. Do not rotate the housing more than 180 degrees without first performing a disassembly procedure (see “Disassembly Procedures” on page 5-5). Over-rotation will sever the electrical connection between the sensor module and the electronics module.
3. Retighten the housing rotation set screw.

Set Jumpers

Security

You can prevent changes to the transmitter configuration data with the write protection jumper. Security is controlled by the security (write protect) jumper located on the electronics board or display face. Position the jumper on the transmitter circuit board in the “ON” position to prevent accidental or deliberate change of configuration data.

If the transmitter write protection jumper is in the “ON” position, the transmitter will not accept any “writes” to its memory. Configuration changes, such as digital trim and reranging, cannot take place when the transmitter security is on.

AC Termination (AC)

The RS-485 bus needs to be terminated once at both ends, and should not be terminated elsewhere on the bus. Setting the AC TERMINATION (AC) switch to ON provides AC bus termination.
NOTE
The RTU may already provide one RS-485 bus termination.

Pull-down (B) and Pull-up (A)
These switches are used to put the RS-485 bus into the idle state. Set these switches either to both ON (idle state), or to both OFF (lets the bus float). If a transmitter has multiple communication errors, set these switches to ON (idle state).

NOTE
Only one device on an RS-485 bus should set the bus to the idle state. In some installations, the RTU might maintain the bus in the idle state when the RS-485 bus is inactive.

Baud Rate (S1 and S2)
Table 2-2 identifies four available baud rates for RS-485 Modbus communications.

<table>
<thead>
<tr>
<th>S1</th>
<th>S2</th>
<th>Baud Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>1200</td>
</tr>
<tr>
<td>ON</td>
<td>OFF</td>
<td>2400</td>
</tr>
<tr>
<td>OFF</td>
<td>ON</td>
<td>4800</td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>9600</td>
</tr>
</tbody>
</table>

Configuring RS485 and Security Jumpers
When shipped from the factory, the RS-485 switches are all set to off, and the baud rate switches are set to 9600 (see Table 2-2).

To reposition the jumpers, follow the procedure described below.

1. If the transmitter is installed, remove power.
2. Remove the housing cover opposite the field terminal side. Do not remove the transmitter covers in explosive atmospheres when the circuit is live.
3. Remove the LCD meter if present.
4. Locate the switches on the output electronics board (see Figure 2-5), and then move the switch to the desired setting.
5. Reattach the transmitter cover. Transmitter covers must be fully engaged to meet Explosion-Proof requirements.
Figure 2-5. Output Board Switches

RTD Assembly (Optional)

The Rosemount 3095FB MultiVariable Transmitter is compatible with the Series 68 or Series 78 RTD Assembly.

NOTE
To meet ISSep/CENELEC Flameproof certification, only European Flameproof Cable Assemblies (Process Temperature Input Codes A, B, or C) may be used for RTD cable installation.

RTD Installation Procedure
All RTD Cable Assemblies use the 3095 RTD Cable Connector.
Identify the type of cable being used, and follow the installation steps specific to the type of cable.

- Armored Shielded RTD Cable
- Shielded RTD Cable (intended for conduit use)
- CENELEC Flameproof RTD Cable

**Installing an Armored Shielded RTD Cable**

Figure 2-6 details a standard armored shielded RTD cable.

1. Fully engage the black cable connector to the 3095 RTD connector (figure 2-9).
2. Tighten the cable adapter until metal contacts metal (figure 2-10).
3. Install the compression fitting
4. Use pliers to tighten the cap onto the compression fitting (figure 2-11).

**Installing a Shielded RTD Cable (intended for conduit use)**

Figure 2-7 details a standard shielded RTD cable.

1. Fully engage the black cable connector to the 3095 RTD connector (figure 2-9).
2. Tighten the cable adapter until metal contacts metal (figure 2-10).

**Installing a CENELEC Flameproof RTD Cable**

Figure 2-8 details a CENELEC flameproof RTD cable.
1. Fully engage the black cable connector to the 3095 RTD connector (figure 2-9).
2. Tighten the cable adapter and cable gland until metal contacts metal (figure 2-10).

FIGURE 2-10. Tightening the Cable Adapter
Connecting the RTD to the Assembly

Make all necessary wiring connections inside the RTD Flat Connection Head as explained in the sensor wiring instructions included with the RTD.

Figure 2-12 illustrates a typical wiring configuration of the Rosemount RTD cable assembly with a 4-wire RTD.

Connect Wiring and Power Up

The transmitter terminal block is in the compartment of the electronics housing labeled “FIELD TERMINALS.” The other compartment contains the transmitter electronics module.

Refer to figure 2-13 to assist in wiring connections.
NOTES

- Do not run field wiring in conduit or open trays with other non-transmitter power wiring, or near heavy electrical equipment.
- Shielded wiring is not required, but twisted pairs should be used for best results. Twisted pair is required for RS-485 bus wiring.
- Runs under 1000 feet should be AWG 22 or larger. Runs from 1000 to 4000 feet should be AWG 20 or larger.
- Wiring should not exceed AWG 16.
- For connections in ambient temperatures above 140 °F (60 °C), use wiring rated for at least 194 °F (90 °C).
- All connections should be made before applying power to the device.

CAUTION

Incorrect field wiring connections may damage the Rosemount 3095FB. Do not connect power wiring to the RS-485 terminals.

To make connections, perform the following procedure:

1. Remove the housing cover on the side marked “FIELD TERMINALS.” Do not remove the cover in explosive atmospheres when the circuit is live. All power to the transmitter is supplied over the signal wiring.
2. Connect the lead that originates at the positive side of the power supply to the terminal marked “+” and the lead that originates from the negative side of the power supply to the terminal marked “−”. Avoid contact with the leads and terminals.
3. Connect the lead that originates from the “A” line from the RS-485 bus to the terminal marked “A” and the lead that originates from the “B” line to the terminal marked “B.”
4. Plug and seal unused conduit connections on the transmitter housing to avoid moisture accumulation in the terminal side of the housing. If you do not seal the unused connections, mount the transmitter with the electrical housing positioned downward for drainage. Install wiring with a drip loop. Arrange the drip loop so the bottom is lower than the conduit connections and the transmitter housing.
5. Attach and tighten all housing covers. Transmitter covers must be fully engaged to meet Explosion-Proof requirements and to achieve the proper environmental seal.
Inductive-based transient protectors, including the Rosemount 470, can adversely affect the output of the 3095FB transmitter. Do not use the Rosemount 470 for transient protection with the 3095FB. If your application requires transient protection, install the Transient Protection Terminal Block (Section 5: Troubleshooting).

**Signal Wiring Grounding**

Do not run signal wiring in conduit or open trays with power wiring, or near heavy electrical equipment. You may ground the signal wiring at any one point on the signal loop, or leave it ungrounded. The negative terminal of the power supply is a recommended grounding point. Device must be properly grounded or earthed according to local electric codes.

**Power Supply**

The transmitter requires between 7.5 and 30 V dc to operate and provide complete functionality. The dc power supply should provide power with less than 2% ripple.

**RS-485 Bus**

- The 3095FB does not provide electrical isolation between the RS-485 bus and the transmitter power supply.
- Maintain a bus topology and minimize stub length.
- Figure 2-14 identifies multidrop wiring topology. Up to 32 devices may be wired on one RS-485 bus.
- The RS-485 bus needs to be terminated once at both ends, and should not be terminated elsewhere on the bus. Setting the 3095FB AC termination (AC) switch to ON (see page 2-11) is one method to provide AC bus termination.

**NOTE**

The RTU may already provide one RS-485 bus termination.
The Rosemount 3095FB Transmitter has explosion-proof housing and circuitry. Individual transmitters are clearly marked with a tag indicating the certifications they carry. See Appendix B for specific approval categories and installation drawings.

NOTE
Once a device labeled with multiple approvals is installed, it should not be reinstalled using any other approval type(s). Permanently mark the certification label to distinguish the installed approval type from unused approval types.

Grounding the Transmitter Case

The transmitter case should always be grounded in accordance with national and local electrical codes. The most effective transmitter case grounding method is direct connection to earth ground with minimal impedance.

Methods for grounding the transmitter case include:

- **Internal Ground Connection:** The Internal Ground Connection screw is inside the FIELD TERMINALS side of the electronics housing. This screw is identified by a ground symbol, and is standard on all Rosemount 3095FB transmitters.

- **External Ground Assembly:** This assembly is included with the transient protection terminal block. The External Ground Assembly can also be ordered as a spare part (03031-0398-0001).

NOTE
Do not ground the RS-485 bus at any point on the bus.
NOTE
The transient protection terminal block does not provide transient protection unless the transmitter case is properly grounded. Use the above guidelines to ground the transmitter case. Do not run the transient protection ground wire with field wiring as the ground wire may carry excessive current if a lighting strike occurs. Grounding the transmitter case via threaded conduit connection may not provide sufficient ground.

ROSEMOUNT 305 INTEGRAL MANIFOLD

The Rosemount 3095FB can be fitted with a 305 Integral Manifold. Supported manifolds include:

- Traditional Manifold (Rosemount RM style only)
- 3-Valve Coplanar Manifold
- 5-Valve Coplanar Manifold

Integral Manifold Installation Procedure

To install a Rosemount 305 Integral Manifold to a 3095FB transmitter:

1. Inspect the Teflon sensor module O-rings. If the O-rings are undamaged, reusing them is recommended. If the O-rings are damaged (if they have nicks or cuts, for example), replace them with new O-rings.

   IMPORTANT
   If replacing the O-rings, take care not to scratch or deface the O-ring grooves or the surface of the isolating diaphragm while you remove the damaged O-rings.

2. Install the Integral Manifold on the sensor module. Use the four 2.25-in. manifold bolts for alignment. Finger tighten the bolts, then tighten the bolts incrementally in a cross pattern to final torque value. See “Mounting Bolts” on page 2-6 for complete bolt installation information and torque values. When fully tightened, the bolts should extend through the top of the module housing.

3. If the Teflon O-rings have been replaced, the flange bolts should be re-tightened after installation to compensate for cold flow of the O-rings.

NOTE
Always perform a zero trim on the transmitter/manifold assembly after installation to eliminate mounting effects.
Integral Manifold Operation

In normal operation the two block valves between the process and instrument ports will be open and the equalizing valve(s) will be closed.

To check zero the 3095FB, close the block valve to the low pressure (downstream side) of the transmitter first.

Next, open the center (equalize) valve(s) to equalize the pressure on both sides of the transmitter.
The manifold valves are now in the proper configuration for zeroing the transmitter. To return the transmitter to service, close the equalizing valve(s) first.

Next, open the block valve on the low pressure side of the transmitter.
Section 3 Modbus Communication


Use this document to determine which process variables and status bits you wish to retrieve from the Rosemount 3095FB.

Suggestions and Tips

We recommend that you review the *Modbus Protocol Guide* in the following manner:

1. Read Sections 1–3 to gain an overview of how the Rosemount 3095FB implements the Modbus RTU protocol.
2. Read Sections 4–9 as needed to determine which Rosemount 3095FB registers will require read/write actions in order to meet your process control needs.

**NOTE**

Be sure to consider Section 3: 8.0 in the *Modbus Protocol Guide*. The only way to detect transmitter exceptions is by polling the registers described in this section.

**NOTE**

Additional registers may be added to the *Modbus Protocol Guide* with future software revisions and upgrades.

**NOTE**

The following functions are only available for Rosemount 3095FB Transmitters with software revision 107 or greater:
- Configurable Floating Point Format (Section 3: 3.4)
- Scaled Integers (Section 3: 5.3)
- Duplicate Modbus Register Functionality including 32-bit floating point registers (Section 3: 2.3.1)
Rosemount 3095FB Multivariable Transmitter
with Modbus Protocol

Modbus Protocol Guide

Report Number: D9500114
Revision: F
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1.0 Introduction

The readers of this document are expected to have a general understanding of the Modbus protocol. If you do not have the required knowledge of the Modbus protocol, the Modbus documents referenced in Section 1.2, on page 4 of this document should be of help. Also Section 2.0, on page 6 of this document contains a brief overview of the Modbus protocol.

1.1 Purpose

The purpose of this document is to provide the information required to implement within a host, an effective exchange of data with the Rosemount 3095FB Multivariable Transmitter with Modbus Protocol. This document defines the Modbus interface and register layout in sufficient detail for the 3095FB.

1.2 References

Modicon Modbus Protocol Reference Guide

1.3 Abbreviations, Definitions, and Acronyms

Table 1-1  Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP</td>
<td>absolute pressure - above absolute zero pressure</td>
</tr>
<tr>
<td>C</td>
<td>degrees Celsius ((5 / 9) \times (T(F) - 32))</td>
</tr>
<tr>
<td>coil</td>
<td>A read/write bit register</td>
</tr>
<tr>
<td>Conventional Symbol</td>
<td>A symbol which is commonly used in the gas industry in equations or algorithms or other expressions</td>
</tr>
<tr>
<td>CRC</td>
<td>Cyclic Redundancy Check</td>
</tr>
</tbody>
</table>
| default value         | The initial value set by software. Some of these may be overwritte
| DP                    | differential pressure                                             |
| F                     | degrees Fahrenheit \((9 / 5) \times T(C) + 32\)                    |
| FP                    | IEEE-754 floating point                                            |
| floating point register | Two consecutive 16 bit registers that store an IEEE 754 floating point number |
### Table 1-1 Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FS</td>
<td>full scale</td>
</tr>
<tr>
<td>GP</td>
<td>gage pressure - above atmospheric pressure</td>
</tr>
<tr>
<td>holding register</td>
<td>A read/write 16 bit register</td>
</tr>
<tr>
<td>inH2O</td>
<td>inches of water (at defined temperature)</td>
</tr>
<tr>
<td>input register</td>
<td>A read only 16 bit register</td>
</tr>
<tr>
<td>LCD</td>
<td>liquid crystal display</td>
</tr>
<tr>
<td>psi</td>
<td>pounds per square inch</td>
</tr>
<tr>
<td>psia</td>
<td>pounds per square inch absolute</td>
</tr>
<tr>
<td>psig</td>
<td>pounds per square inch gauge</td>
</tr>
<tr>
<td>PT</td>
<td>process temperature</td>
</tr>
<tr>
<td>PV(s)</td>
<td>process variable(s)</td>
</tr>
<tr>
<td>query</td>
<td>a request from the master (host) device for a slave device to perform an action</td>
</tr>
<tr>
<td>register</td>
<td>a 16 bit memory location that can be read/write or read only</td>
</tr>
<tr>
<td>response</td>
<td>a response from a slave device to a master (host) device</td>
</tr>
<tr>
<td>SP</td>
<td>static pressure</td>
</tr>
<tr>
<td>ST</td>
<td>sensor temperature</td>
</tr>
<tr>
<td>U16</td>
<td>16-bit unsigned integer 0 to 65535</td>
</tr>
<tr>
<td>U32</td>
<td>32-bit unsigned integer 0 to 4294967295</td>
</tr>
<tr>
<td>U8</td>
<td>8-bit unsigned integer</td>
</tr>
<tr>
<td>$</td>
<td>Signifies a hexadecimal number</td>
</tr>
<tr>
<td>%</td>
<td>Signifies a binary number</td>
</tr>
</tbody>
</table>
2.0 Overview of Modbus Conventions

The Rosemount 3095FB is a Modbus compatible measurement device. The transmitter supports 8-bit Remote Terminal Unit (RTU) data transmission mode with a subset of read commands, write commands, and diagnostic commands used by most Modbus compatible host controllers. The transmitter’s microprocessor emulates Modbus read/write and read only coils and registers.

2.1 Physical Communications Layer

The communications parameters are set at 8 data bits, 1 stop bit, and no parity. These parameters are not configurable. The baud rate is selectable using dip switches on the 3095FB output board. Valid baud rates are 1200, 2400, 4800, and 9600.

2.2 Transactions on Modbus Networks

The Modbus protocol uses a master/slave technique, providing for one master and up to 247 slaves. Only the master can initiate a transaction.

Transactions are either a query/response type where only a single slave is addressed, or a broadcast/no response type where all slaves are addressed.

The host (master) controller can produce query frames or broadcast frames. Query frames generate a response frame from one slave device. Broadcast frames address all the slave devices, which do not respond. A query/response message includes one query frame and one response frame. A broadcast message includes one broadcast frame. Each frame has an address field, a function field, a data field, and an error check field.

<table>
<thead>
<tr>
<th>Table 2-1 Format of Query and Response Frame</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address Field(U8)</td>
</tr>
</tbody>
</table>

2.2.1 Address Field

In a query frame, the address field contains a slave’s polling address. In a response frame, the address field contains the polling address of the responding slave device. In a broadcast frame, the address field contains a 0.

2.2.2 Function Field

In a query frame or a broadcast frame, the function field contains a function code, which indicates the read, write, or diagnostic command to be performed.
In a response frame, the function field contains a function code verifying the device’s response to the command. If the most significant bit in the function field is set, the data field contains an exception response that explains any errors encountered while processing the command (see Section 2.5) in the Modbus Protocol Guide.

2.2.3 Data Field

The data field contains information that is specific to each individual function. Section 2.4 gives the data field layout for each function.

2.2.4 Error Check Field

The error check field contains a 16 bit CRC checksum that is used to verify the integrity of the message frame.

2.2.5 Broadcast mode and address 0

Any query message with a slave address of 0 is a broadcast message. Only Modbus function codes that write to a register or coil are valid in a broadcast message. Address 0 is reserved for broadcast messages and therefore is not a valid Modbus slave address.
2.3 Data Types

The transmitter’s mapped addresses store and use data types supported by many Modbus-compatible PLCs and host controllers. Table 2-2 lists those data types according to their mapped addresses and corresponding function codes. To increase compatibility with many different kinds of hosts, the data types have been remapped to several different locations as shown in Table 2-2. The additional Modbus addresses were implemented in the 3095FB output board software beginning with Rev.107.

All the registers in this document are referenced to one. The registers in Modbus messages are referenced to zero. This means the number of the mapped address register (i.e. 0005) is one higher than the actual number (i.e. 0004) that is sent in the Modbus frame message.

There are a number of 8 bit values that are stored in 16 bit registers. The 8 bit value is stored in the Least Significant Byte of the 16 bit register. For example the value $24 would be stored as $0024. This does not apply to ASCII characters which are stored as two characters in each 16 bit register.

Floating point values are stored as single precision IEEE 754 floating point numbers. Since IEEE 754 floating point numbers are 32 bits long, they must be stored as either two 16-bit registers or as one 32-bit register. The 3095FB supports both types of floating point registers. See Section 2.3.1 for a more detailed explanation of the register mapping.
## Table 2-2  Data Types According to Function Code and Mapped Address

<table>
<thead>
<tr>
<th>Address start register</th>
<th>Address end register</th>
<th>Register size in bits</th>
<th>Accessible via function codes</th>
<th>Address type</th>
<th>Access</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 *</td>
<td>1001</td>
<td>1</td>
<td>1</td>
<td>Coil</td>
<td>Read/write</td>
<td>Single ON/OFF bit per coil (Boolean). Shares the same register range with the Discrete Inputs. <strong>See Section 2.3.2.</strong></td>
</tr>
<tr>
<td>10001</td>
<td>10086</td>
<td>1</td>
<td>1</td>
<td>Discrete input</td>
<td>Read-only</td>
<td>Single ON/OFF bit per coil (Boolean). Shares the same register range with the Discrete Inputs. <strong>See Section 2.3.2.</strong></td>
</tr>
<tr>
<td>401 *</td>
<td>7401</td>
<td>16</td>
<td>32</td>
<td>Floating point register</td>
<td>Read-only and read/write</td>
<td>IEEE 754 floating point number. Accessed as either two 16-bit registers or one 32-bit register. <strong>See Section 2.3.1.</strong></td>
</tr>
<tr>
<td>7401</td>
<td>7444</td>
<td>16</td>
<td>16</td>
<td>Input registers</td>
<td>Read-only</td>
<td>One 16 bit unsigned integer per register. Shares the same register range with the Holding registers and ASCII registers. <strong>See Section 2.3.1.</strong></td>
</tr>
<tr>
<td>20401</td>
<td>20488</td>
<td>16</td>
<td>16</td>
<td>Holding register</td>
<td>Read/write</td>
<td>One 16 bit unsigned integer per register. Shares the same register range with the Input registers and ASCII registers. <strong>See Section 2.3.1.</strong></td>
</tr>
<tr>
<td>1 *</td>
<td>3001</td>
<td>16</td>
<td>16</td>
<td>ASCII characters</td>
<td>Read/write</td>
<td>Two ASCII characters per 16 bit register. Shares the same register range with the Input registers and Holding registers. <strong>See Section 2.3.1.</strong></td>
</tr>
</tbody>
</table>

* Base Address. The other register ranges are duplicate addresses for the base registers. Reading and writing to these duplicates is the same as reading and writing to the base registers.

** Floating Point numbers can only be written with function code 6 if the register is a 32-bit register.
2.3.1 Register Map (available for 3095FB output board Rev. 107 or later)

There are two base register blocks used in the register map. These register blocks contain the integer data and the floating point data. To improve connectivity with many different kinds of hosts, these base register blocks appear in other address ranges, as shown in Figure 2-1.

2.3.1.1 Accessing Floating Point Registers

The host can access each floating point register in 3 different locations. To access the 16-bit floating point register pairs in the regions other than the base region, simply add the base register address (i.e. 401) to the desired range (i.e. 20,000), which gives the new register address (i.e. 20,401). The 32-bit floating point numbers do not match up one to one with the base floating point register pairs, because the 32-bit floating point registers take half the register space of the 16-bit floating point register pairs. To access the 32-bit floating point registers (7401-7444) use [Equation 1] or see for the complete layout of the 32-bit register block.

[Equation 1] 32-bit register address = 7401 + (base address - 401) / 2

Examples:

Differential Pressure = 7401 + (401 - 401) / 2 = 7401
Static Pressure = 7401 + (403 - 401) / 2 = 7402
Differential Pressure Damping = 7401 + (441 - 401) / 2 = 7421

For example, the host can read the floating point value for Differential Pressure (DP) from 3 separate register locations. The DP can be read as 16-bit register pairs by reading registers 401-402 or 20401-20402. The DP can also be read as one 32-bit register at location 7401.

2.3.1.2 Accessing Integer Registers

The integer registers consist of the input registers, holding registers, and ASCII registers. The host can access each integer register in 5 different locations. To access the 16-bit registers in the regions other than the base region, simply add the base register address (i.e. 61) to the desired range (i.e. 3,000), which gives the new register address (i.e. 3,061).

For example, the host can read the Static Pressure (SP) Unit Code from 5 separate locations. The transmitter address can be read from registers 61, 3061, 30061, 40061, or 50061.
Figure 2-1  Register Map

<table>
<thead>
<tr>
<th>Base 16-bit Integers</th>
<th>32-bit Float Address</th>
<th>16-bit Float Base Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-214</td>
<td>7401</td>
<td>401</td>
</tr>
<tr>
<td></td>
<td>7402</td>
<td>403</td>
</tr>
<tr>
<td></td>
<td>7403</td>
<td>405</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Base 16-bit Floats</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>401-488</td>
<td>20401</td>
<td>401</td>
</tr>
<tr>
<td></td>
<td>20402</td>
<td>402</td>
</tr>
<tr>
<td></td>
<td>20403</td>
<td>403</td>
</tr>
<tr>
<td></td>
<td>20404</td>
<td>404</td>
</tr>
<tr>
<td></td>
<td>20405</td>
<td>405</td>
</tr>
<tr>
<td></td>
<td>20406</td>
<td>406</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Integers 16-bit</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>3001-3214</td>
<td>7401</td>
<td>401</td>
</tr>
<tr>
<td></td>
<td>7402</td>
<td>403</td>
</tr>
<tr>
<td></td>
<td>7403</td>
<td>405</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Floats 16-bit</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>7401-7444</td>
<td>20401</td>
<td>401</td>
</tr>
<tr>
<td></td>
<td>20402</td>
<td>402</td>
</tr>
<tr>
<td></td>
<td>20403</td>
<td>403</td>
</tr>
<tr>
<td></td>
<td>20404</td>
<td>404</td>
</tr>
<tr>
<td></td>
<td>20405</td>
<td>405</td>
</tr>
<tr>
<td></td>
<td>20406</td>
<td>406</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Floats 32-bit</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>401-488</td>
<td>7401</td>
<td>401</td>
</tr>
<tr>
<td></td>
<td>7402</td>
<td>403</td>
</tr>
<tr>
<td></td>
<td>7403</td>
<td>405</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Integers 16-bit</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>30001-30214</td>
<td>20401</td>
<td>401</td>
</tr>
<tr>
<td></td>
<td>20402</td>
<td>402</td>
</tr>
<tr>
<td></td>
<td>20403</td>
<td>403</td>
</tr>
<tr>
<td></td>
<td>20404</td>
<td>404</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Integers 16-bit</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>40001-40214</td>
<td>20401</td>
<td>401</td>
</tr>
<tr>
<td></td>
<td>20402</td>
<td>402</td>
</tr>
<tr>
<td></td>
<td>20403</td>
<td>403</td>
</tr>
<tr>
<td></td>
<td>20404</td>
<td>404</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Integers 16-bit</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>50001-50214</td>
<td>20401</td>
<td>401</td>
</tr>
<tr>
<td></td>
<td>20402</td>
<td>402</td>
</tr>
<tr>
<td></td>
<td>20403</td>
<td>403</td>
</tr>
<tr>
<td></td>
<td>20404</td>
<td>404</td>
</tr>
<tr>
<td></td>
<td>20405</td>
<td>405</td>
</tr>
<tr>
<td></td>
<td>20406</td>
<td>406</td>
</tr>
</tbody>
</table>
2.3.2 Boolean Map (available for 3095FB output board Rev. 107 or later)

There is one base boolean register block used to store boolean data. To improve connectivity with many different kinds of host, this boolean register block has been duplicated in other address ranges, as shown in Figure 2-2.

2.3.2.1 Accessing Boolean Data

The boolean registers can be accessed in 3 different locations. To access the boolean registers in the regions other than the base region, simply add the base register address (i.e. 1) to the desired range (i.e. 1,000), which gives the new register address (i.e. 1,001).

For example, the host can perform a self test by writing to any of 3 separate coil locations. A self test can be performed by writing to either coil 1, 1001, or 10001. Whichever coil location is most convenient for the host can be used.

**Figure 2-2 Boolean Map**
2.4 Modbus Function Codes

The transmitter supported function codes listed below include read, write, and diagnostic commands. See Section 2.6 for examples on reading and writing data with Modbus function codes.

Table 2-3 Explanation of Function Codes Supported by the Rosemount 3095FB

<table>
<thead>
<tr>
<th>Function code</th>
<th>Command type</th>
<th>Description</th>
<th>Explanation of function code</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Read</td>
<td>Read coil status</td>
<td>Read ON/OFF status of one coil or consecutive coils.</td>
</tr>
<tr>
<td>02</td>
<td>Read</td>
<td>Read input status</td>
<td>Read ON/OFF status of one discrete input or consecutive discrete inputs.</td>
</tr>
<tr>
<td>03</td>
<td>Read</td>
<td>Read holding registers</td>
<td>Read binary values of one or more holding registers.</td>
</tr>
<tr>
<td>04</td>
<td>Read</td>
<td>Read input registers</td>
<td>Read binary values in one or more input registers.</td>
</tr>
<tr>
<td>05</td>
<td>Write</td>
<td>Force coil</td>
<td>Set coil to a specified ON or OFF state.</td>
</tr>
<tr>
<td>06</td>
<td>Write</td>
<td>Load register</td>
<td>Write a binary value to a holding register.</td>
</tr>
<tr>
<td>08</td>
<td>Diagnostic</td>
<td>Loopback diagnostic</td>
<td>Sends diagnostic test message to transmitter to evaluate communications processing.</td>
</tr>
<tr>
<td>16</td>
<td>Write</td>
<td>Load multiple registers</td>
<td>Writes values to consecutive holding registers.</td>
</tr>
<tr>
<td>69</td>
<td>Read</td>
<td>Read multiple floating point registers</td>
<td>Read binary values of one or more 32 bit floating point registers. This function is specific to the 3095FB.</td>
</tr>
<tr>
<td>70</td>
<td>Write</td>
<td>Load multiple floating point registers</td>
<td>Write values to consecutive 32 bit floating point registers. This function is specific to the 3095FB.</td>
</tr>
</tbody>
</table>
### Table 2-4 Format of Modbus Functions

<table>
<thead>
<tr>
<th>START ADDRESS</th>
<th>FUNCTION</th>
<th>DATA</th>
<th>CRC CHECK</th>
<th>END</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5 char times</td>
<td>1 CHAR</td>
<td>1 CHAR</td>
<td>n CHARs</td>
<td>L CHAR, H CHAR</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Query</th>
<th>Start bit H</th>
<th>Start bit L</th>
<th>Byte cnt H</th>
<th>Byte cnt L</th>
<th>Response</th>
<th>Byte cnt</th>
<th>Data H</th>
<th>Data L</th>
<th>Bit 7...Bit 0</th>
<th>Bit 15...Bit 8</th>
<th>Error Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>$01</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$01</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$81</td>
</tr>
<tr>
<td>$02</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$02</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>$82</td>
</tr>
<tr>
<td>$03</td>
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<td></td>
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<td>$03</td>
<td></td>
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<td></td>
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<td>$05</td>
<td></td>
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<td></td>
<td></td>
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<td>$85</td>
</tr>
<tr>
<td>$06</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$06</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$86</td>
</tr>
<tr>
<td>$08</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$08</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$88</td>
</tr>
<tr>
<td>$10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$90</td>
</tr>
</tbody>
</table>

- **Query**: $00 00
- **Response**: $00 00
2.5 Exception Responses

If the transmitter cannot execute a command issued by a query, the most significant bit in the response function field is set, and the data field contains an exception response, which explains why the transmitter cannot execute the command.

If the transmitter receives a query that will take over 250 ms it will respond with the normal reply even though the command has not completed. Any subsequent query from the host will result in a Slave Busy (06) response until the first command finishes processing.

Table 2-5 Exception Responses

<table>
<thead>
<tr>
<th>Exception Response</th>
<th>Description</th>
<th>Explanation of Exception Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Illegal function</td>
<td>The received message function is not an allowable action for the transmitter</td>
</tr>
<tr>
<td>02</td>
<td>Illegal data address</td>
<td>The address referenced in the data field is not an allowable address for the memory location</td>
</tr>
<tr>
<td>03</td>
<td>Illegal data value</td>
<td>The value referenced in the data field is not allowed in the addressed memory location</td>
</tr>
<tr>
<td>04</td>
<td>Slave Device Failure</td>
<td>An unrecoverable error occurred while the slave was attempting to perform the requested action.</td>
</tr>
<tr>
<td>06</td>
<td>Slave device is busy</td>
<td>The slave is engaged in processing a long duration command. The host should retransmit the message later when the slave is free.</td>
</tr>
</tbody>
</table>
2.6 Examples of Modbus Commands

2.6.1 Reading and Writing Floating Point Data

Floating point values must be read or written in a single command to a series of two consecutive registers. If half of a floating point register is written the 3095FB will return the Modbus exception Illegal Data Value(03). There are two ways to read a floating point register pair, using function 03/04 or function 69. When using function 03/04 the user must always read at least 2 registers to get a valid floating point number, unless they are reading a 32-bit floating point register. Function 69 reads a register pair (two consecutive 16 bit registers). Function 03 and function 04 are interchangeable when working with the 3095FB. There are two ways to write a 16-bit register pair, using function 16 and function 70. When writing to a 32-bit register either function 6 or function 16 can be used.

The first three examples show the Modbus message for reading a Differential Pressure (DP) of 100.00. The last four examples show the Modbus message for writing a DP upper operating limit of 230.00.

See Section 3.4 for information on changing the byte transmission order of the floating point registers.

**Function 04: Reading Floating Point Data from a 16-bit Register Pair**

<table>
<thead>
<tr>
<th>Query</th>
<th>Address</th>
<th>Function</th>
<th>Starting register</th>
<th># of registers</th>
<th>Error check</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>04</td>
<td>01 90</td>
<td>00 02</td>
<td>XXXX</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Response</th>
<th>Address</th>
<th>Function</th>
<th>Byte count</th>
<th>Register data bytes</th>
<th>Error check</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>04</td>
<td>04</td>
<td>42 C8 00 00</td>
<td>XXXX</td>
<td></td>
</tr>
</tbody>
</table>

**Function 04: Reading Floating Point Data from a 32-bit Register**

<table>
<thead>
<tr>
<th>Query</th>
<th>Address</th>
<th>Function</th>
<th>Starting register</th>
<th># of registers</th>
<th>Error check</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>04</td>
<td>1C E8</td>
<td>00 01</td>
<td>XXXX</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Response</th>
<th>Address</th>
<th>Function</th>
<th>Byte count</th>
<th>Register data bytes</th>
<th>Error check</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>04</td>
<td>04</td>
<td>42 C8 00 00</td>
<td>XXXX</td>
<td></td>
</tr>
</tbody>
</table>
### Function 69: Reading Floating Point Data using a 32-bit Function

<table>
<thead>
<tr>
<th>Address</th>
<th>Function</th>
<th>Starting register</th>
<th># of register pairs</th>
<th>Error check</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>69</td>
<td>01 90</td>
<td>00 01</td>
<td>XXXX</td>
</tr>
<tr>
<td>Address</td>
<td>Function</td>
<td>Byte count</td>
<td>Register data bytes</td>
<td>Error check</td>
</tr>
<tr>
<td>01</td>
<td>69</td>
<td>04</td>
<td>42 C8 00 00</td>
<td>XXXX</td>
</tr>
</tbody>
</table>

### Function 16: Writing Floating Point Data in a 16-bit Register Pair

<table>
<thead>
<tr>
<th>Address</th>
<th>Function</th>
<th>Starting register</th>
<th># of registers</th>
<th>byte count</th>
<th>Register data bytes</th>
<th>Error check</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>16</td>
<td>01 A0</td>
<td>00 02</td>
<td>04</td>
<td>43 66 00 00</td>
<td>XXXX</td>
</tr>
<tr>
<td>Address</td>
<td>Function</td>
<td>Starting register</td>
<td># of registers</td>
<td>Error check</td>
<td></td>
<td></td>
</tr>
<tr>
<td>01</td>
<td>16</td>
<td>01 A0</td>
<td>00 02</td>
<td>XXXX</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Function 06: Writing Floating Point Data in a single 32-bit Register

<table>
<thead>
<tr>
<th>Address</th>
<th>Function</th>
<th>Starting register</th>
<th>Register data bytes</th>
<th>Error check</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>06</td>
<td>1C F0</td>
<td>43 66 00 00</td>
<td>XXXX</td>
</tr>
<tr>
<td>Address</td>
<td>Function</td>
<td>Starting register</td>
<td>Register data bytes</td>
<td>Error check</td>
</tr>
<tr>
<td>01</td>
<td>06</td>
<td>1C F0</td>
<td>43 66 00 00</td>
<td>XXXX</td>
</tr>
</tbody>
</table>
### Function 16: Writing Floating Point Data in a 32-bit Register

<table>
<thead>
<tr>
<th>Query</th>
<th>Address</th>
<th>Function</th>
<th>Starting register</th>
<th># of registers</th>
<th>byte count</th>
<th>Register data bytes</th>
<th>Error check</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>10</td>
<td>1C F0</td>
<td>00 01</td>
<td>04</td>
<td>43 66 00 00</td>
<td>XXXX</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Response</th>
<th>Address</th>
<th>Function</th>
<th>Starting register</th>
<th># of registers</th>
<th>Error check</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>10</td>
<td>1C F0</td>
<td>00 01</td>
<td>XXXX</td>
<td></td>
</tr>
</tbody>
</table>

### Function 70: Writing Floating Point Data using a 32-bit Function

<table>
<thead>
<tr>
<th>Query</th>
<th>Address</th>
<th>Function</th>
<th>Starting register</th>
<th># of register pairs</th>
<th>byte count</th>
<th>Register data bytes</th>
<th>Error check</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>46</td>
<td>01 A0</td>
<td>00 01</td>
<td>04</td>
<td>43 66 00 00</td>
<td>XXXX</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Response</th>
<th>Address</th>
<th>Function</th>
<th>Starting register</th>
<th># of register pairs</th>
<th>Error check</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>46</td>
<td>01 A0</td>
<td>00 01</td>
<td>XXXX</td>
<td></td>
</tr>
</tbody>
</table>
2.6.2 Reading and Writing 16 Bit Registers

Function 04: Reading 16 Bit Register Data

<table>
<thead>
<tr>
<th>Query</th>
<th>Address</th>
<th>Function</th>
<th>Starting register</th>
<th># of registers</th>
<th>Error check</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>04</td>
<td>00 12</td>
<td>00 01</td>
<td>XXXX</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Response</th>
<th>Address</th>
<th>Function</th>
<th>Byte count</th>
<th>Register data bytes</th>
<th>Error check</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>04</td>
<td>02</td>
<td>00 86</td>
<td>XXXX</td>
<td></td>
</tr>
</tbody>
</table>

Function 16: Writing 16 Bit Register Data

<table>
<thead>
<tr>
<th>Query</th>
<th>Address</th>
<th>Function</th>
<th>Starting register</th>
<th># of registers</th>
<th>byte count</th>
<th>Register data bytes</th>
<th>Error check</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>10</td>
<td>00 30</td>
<td>00 01</td>
<td>02</td>
<td>00 24</td>
<td>XXXX</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Response</th>
<th>Address</th>
<th>Function</th>
<th>Starting register</th>
<th># of registers</th>
<th>Error check</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>10</td>
<td>00 30</td>
<td>00 01</td>
<td>XXXX</td>
<td></td>
</tr>
</tbody>
</table>

2.6.3 Reading and Writing Bit Registers

If the returned input quantity is not a multiple of eight bits, the remaining bits in the final data byte will be padded with zeros (toward the high end of the byte). In this case all four of the bits that were asked for were ON (0000 1111). The rest of the byte was padded with zeros.

Function 02: Reading Bit Registers

<table>
<thead>
<tr>
<th>Query</th>
<th>Address</th>
<th>Function</th>
<th>Starting register</th>
<th># of registers</th>
<th>Error check</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>02</td>
<td>00 3A</td>
<td>00 04</td>
<td>XXXX</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Response</th>
<th>Address</th>
<th>Function</th>
<th>Byte count</th>
<th>Register data bytes</th>
<th>Error check</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>02</td>
<td>01</td>
<td>0F</td>
<td>XXXX</td>
<td></td>
</tr>
</tbody>
</table>
When forcing a coil there are only two valid values that can be sent to the coil. The value $FF00 will force the coil to 1(ON) and $0000 will force the coil to 0(OFF).

**Function 05: Forcing a Single Coil**

<table>
<thead>
<tr>
<th>Address</th>
<th>Function</th>
<th>Coil address</th>
<th>Force data</th>
<th>Error check</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>05</td>
<td>00 02</td>
<td>FF 00</td>
<td>XXXX</td>
</tr>
</tbody>
</table>

**Query**

<table>
<thead>
<tr>
<th>Address</th>
<th>Function</th>
<th>Coil address</th>
<th>Force data</th>
<th>Error check</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>05</td>
<td>00 02</td>
<td>FF 00</td>
<td>XXXX</td>
</tr>
</tbody>
</table>

**Response**
3.0 Communications

3.1 Communication Options

The Transmitter Polling Address is used to identify the Modbus slave device to the host device. No two transmitters on the same multidrop loop can have the same Transmitter Polling Address.

The Turnaround Delay Time is the time in milliseconds that the 3095FB will wait to respond after receiving a query from the host. If the Turnaround Delay Time is set to zero the 3095FB will respond as fast as it can. With a simple polling of the PVs and Status Registers the 3095FB will respond after about 6 milliseconds. This may be too fast for some hosts. The default Turnaround Delay Time is 50 milliseconds.

Table 3-1 Communication Options

<table>
<thead>
<tr>
<th>Address</th>
<th>Address Type</th>
<th>Attributes</th>
<th>Functional Area</th>
<th>Data / Control</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>0016</td>
<td>Holding</td>
<td>R/W, WP</td>
<td>Communications Options</td>
<td>Transmitter Polling Address range: 1 - 247</td>
<td>1</td>
</tr>
<tr>
<td>0131</td>
<td>Holding</td>
<td>R/W, WP</td>
<td></td>
<td>Turnaround Delay Time (ms) range: 0 - 200 ms</td>
<td>50 ms</td>
</tr>
</tbody>
</table>

*Attributes: R/W = Read/Write, RO = Read Only, WP = Write Protected

**These registers are available at multiple Modbus addresses (see Section 2.3 in the Modbus Protocol Guide)
3.2 Communication Statistics

The following registers provide some communication statistics that may be used to gather diagnostic information. The communications statistics will be reset when the 3095FB loses power or if a Master Reset is performed. The registers will be reset to zero when the value of the registers exceed the maximum value for an unsigned 16 bit number.

<table>
<thead>
<tr>
<th>Address</th>
<th>Address Type</th>
<th>Attributes</th>
<th>Functional Area</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0145</td>
<td>Input register</td>
<td>RO</td>
<td>Communication Statistics</td>
<td>Framing Error Count</td>
</tr>
<tr>
<td>0146</td>
<td>Input register</td>
<td>RO</td>
<td></td>
<td>Noise Error Count</td>
</tr>
<tr>
<td>0147</td>
<td>Input register</td>
<td>RO</td>
<td></td>
<td>Overrun Error Count</td>
</tr>
<tr>
<td>0148</td>
<td>Input register</td>
<td>RO</td>
<td></td>
<td>CRC Error Count</td>
</tr>
<tr>
<td>0149</td>
<td>Input register</td>
<td>RO</td>
<td></td>
<td>Busy Count</td>
</tr>
<tr>
<td>0150</td>
<td>Input register</td>
<td>RO</td>
<td></td>
<td>Good Message Count</td>
</tr>
</tbody>
</table>

*Attributes: R/W = Read/Write, RO = Read Only, WP = Write Protected

**These registers are available at multiple Modbus addresses (see Section 2.3 located in the Modbus Protocol Guide)

3.3 Write Protect Jumper

Once the transmitter has been configured, the configuration data can be protected by moving the write protection (WP) to the ON position. This jumper is located on the Output Electronics Board.

If the WP jumper is ON and the host tries to write to a register location that has the attribute Write Protected (WP), the Modbus exception Illegal Data Address (02) will be returned.
3.4 Floating Point Formats (available for 3095FB output board software Rev. 107 or later)

The 3095FB has the capability to rearrange the transmission byte order of the floating point registers. The floating point registers will still be in IEEE 754 format, only the transmission byte order will change. Writing the Floating Point Format Code affects both the reading and writing of the floating point registers. All the floating point registers in the transmitter are affected by this register. The available Floating Point Formats are shown in Table 3-5. Changing the Floating Point Format Code will not affect the transmission byte order of the integer data.

Table 3-3 Floating Point Format Code

<table>
<thead>
<tr>
<th>Modbus Access</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address Type</td>
<td>Address Type</td>
</tr>
<tr>
<td>Attributes</td>
<td>Functional Area</td>
</tr>
<tr>
<td>Data / Control</td>
<td>Floating Point Format Code</td>
</tr>
<tr>
<td>0132 Holding register</td>
<td>RW, WP Communication</td>
</tr>
</tbody>
</table>

*Attributes: R/W = Read/Write, RO = Read Only, WP = Write Protected

**These registers are available at multiple Modbus addresses (see Section 2.3 located in the Modbus Protocol Guide)

Table 3-4 Floating Point Format

<table>
<thead>
<tr>
<th>Notation</th>
<th>Byte Order</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEEE 754 Floating Point Format</td>
<td>A</td>
</tr>
<tr>
<td>SEEE EEEE</td>
<td>EMMM MMMM</td>
</tr>
<tr>
<td>Example Number (100.25)</td>
<td>$42</td>
</tr>
</tbody>
</table>

Legend: S = sign bit; E= exponent bits; M = mantissa bits

Table 3-5 Available Floating Point Formats

<table>
<thead>
<tr>
<th>Floating Point Format Code</th>
<th>Byte Transmission Order</th>
<th>Example Number (100.25)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (default)</td>
<td>A B C D</td>
<td>$42 C8 80 00</td>
</tr>
<tr>
<td>1</td>
<td>C D A B</td>
<td>$80 00 42 C8</td>
</tr>
<tr>
<td>2</td>
<td>D C B A</td>
<td>$00 80 C8 42</td>
</tr>
<tr>
<td>3</td>
<td>B A D C</td>
<td>$C8 42 00 80</td>
</tr>
</tbody>
</table>
Below is an example of a Modbus message for reading DP (register 401) of 100.25 for each of the Floating Point Format Codes.

| Table 3-6  Floating Point Format Code = 0 |
| --- | --- | --- | --- | --- |
| Query | Address | Function | Starting register | # of registers | Error check |
| | 01 | 04 | 01 90 | 00 02 | XXXX |
| Response | Address | Function | Byte count | Register data bytes | Error check |
| | 01 | 04 | 04 | 42 C8 80 00 | XXXX |

| Table 3-7  Floating Point Format Code = 1 |
| --- | --- | --- | --- | --- |
| Query | Address | Function | Starting register | # of registers | Error check |
| | 01 | 04 | 01 90 | 00 02 | XXXX |
| Response | Address | Function | Byte count | Register data bytes | Error check |
| | 01 | 04 | 04 | 80 00 42 C8 | XXXX |

| Table 3-8  Floating Point Format Code = 2 |
| --- | --- | --- | --- | --- |
| Query | Address | Function | Starting register | # of registers | Error check |
| | 01 | 04 | 01 90 | 00 02 | XXXX |
| Response | Address | Function | Byte count | Register data bytes | Error check |
| | 01 | 04 | 04 | 00 80 C8 42 | XXXX |

| Table 3-9  Floating Point Format Code = 3 |
| --- | --- | --- | --- | --- |
| Query | Address | Function | Starting register | # of registers | Error check |
| | 01 | 04 | 01 90 | 00 02 | XXXX |
| Response | Address | Function | Byte count | Register data bytes | Error check |
| | 01 | 04 | 04 | C8 42 00 80 | XXXX |
4.0 Sensor and Transmitter Information

4.1 Overview of Sensor and Transmitter Information

The sensor and transmitter information consists of integer data and ASCII character strings that provide data about the transmitter. The user can review or change sensor and transmitter information without affecting the operation of the transmitter. The transmitter information that are 8 bit values are stored in the Least Significant Byte of their 16 bit register space. For instance the value $24 would be stored as $0024.
### 4.2 Transmitter Info

<table>
<thead>
<tr>
<th>Address</th>
<th>Modbus Access</th>
<th>Attributes</th>
<th>Functional Area</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0017</td>
<td>Input Register</td>
<td>RO</td>
<td>Materials of Construction</td>
<td>DP Sensor Range Code (U8) 2 -250 to 250 in H₂O @ 60 F 3 -830 to 830 in H₂O @ 60 F</td>
</tr>
<tr>
<td>0018</td>
<td>Input Register</td>
<td>RO</td>
<td></td>
<td>SP Sensor Range Code (U8) 3 0 to 800 psi 4 0 to 3,626 psi</td>
</tr>
<tr>
<td>0019</td>
<td>Input Register</td>
<td>RO</td>
<td></td>
<td>PT Sensor Range Code (U8) 2 -40 to 1200 F</td>
</tr>
<tr>
<td>0020</td>
<td>Input Register</td>
<td>RO</td>
<td></td>
<td>Module Isolator Code (U8) 2 316 Stainless Steel 3 Hastelloy C 4 Monel 5 Tantalum 15 Gold/Monel 253 Special</td>
</tr>
<tr>
<td>0021</td>
<td>Input Register</td>
<td>RO</td>
<td></td>
<td>Module Fill Fluid Code (U8) 1 Silicone 2 Inert 250 Not Used 253 Special</td>
</tr>
<tr>
<td>0022</td>
<td>Holding register</td>
<td>R/W, WP</td>
<td></td>
<td>flange material code (U8) 0 Carbon Steel 2 316 Stainless Steel 3 Hastelloy C™ 4 Monel 24 Kynar 252 Unknown 253 Special</td>
</tr>
<tr>
<td>Address</td>
<td>Address Type</td>
<td>Attributes</td>
<td>Functional Area</td>
<td>DESCRIPTION</td>
</tr>
<tr>
<td>---------</td>
<td>--------------</td>
<td>------------</td>
<td>-----------------</td>
<td>-------------</td>
</tr>
<tr>
<td>0023</td>
<td>Holding register</td>
<td>R/W, WP</td>
<td>Materials of Construction</td>
<td>flange type code (U8)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12 Conventional</td>
</tr>
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<td></td>
<td>13 Coplanar</td>
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<td></td>
<td></td>
<td>14 Remote Seal</td>
</tr>
<tr>
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<td></td>
<td></td>
<td>15 Lvl, 3 in, class 150 (ANSI)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>16 Lvl, 4 in, class 150 (ANSI)</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td>17 Lvl, 3 in, class 300 (ANSI)</td>
</tr>
<tr>
<td></td>
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<td>18 Lvl, 4 in, class 300 (ANSI)</td>
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<td>19 Lvl, DN 80, PN 40</td>
</tr>
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<td></td>
<td></td>
<td>20 Lvl, DN 100, PN 40</td>
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<td>21 Lvl, DN 100, PN 10 / 16</td>
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<td>22 Lvl, 2 in, class 150 (ANSI)</td>
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<td>23 Lvl, 2 in, class 300 (ANSI)</td>
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<td>24 Lvl, DN 50, PN 6</td>
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<td>25 Lvl, DN 50, PN 40</td>
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<td>253 Special</td>
</tr>
<tr>
<td>0024</td>
<td>Holding register</td>
<td>R/W, WP</td>
<td>drain/vent code (U8)</td>
<td>2 316 Stainless Steel</td>
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<td></td>
<td>3 Hastelloy C™</td>
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<td></td>
<td></td>
<td></td>
<td>4 Monel</td>
</tr>
<tr>
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<td></td>
<td></td>
<td>253 Special</td>
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<tr>
<td>0025</td>
<td>Holding register</td>
<td>R/W, WP</td>
<td>O-ring gasket material (U8)</td>
<td>10 PTFE (Teflon®)</td>
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<td>11 Viton</td>
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<td>12 Buna-N</td>
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<td>13 Ethyl-Prop</td>
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<td>253 Special</td>
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<td>Address</td>
<td>Address Type</td>
<td>Attributes</td>
<td>Functional Area</td>
<td>DESCRIPTION</td>
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<tr>
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<td>R/W, WP</td>
<td>Materials of Construction</td>
<td>remote seal type (U8)</td>
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<td>2  CTW</td>
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<td>3  EFW</td>
</tr>
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<td></td>
<td>4  PFW</td>
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<td></td>
<td>5  RFW</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>6  RTW</td>
</tr>
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<td></td>
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<td></td>
<td>7  SCW</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8  SSW</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9  High Temperature</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td>10 FFW</td>
</tr>
<tr>
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<td></td>
<td>11 UCW</td>
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<td></td>
<td></td>
<td>253 Special</td>
</tr>
<tr>
<td>0027</td>
<td>Holding register</td>
<td>R/W, WP</td>
<td></td>
<td>remote seal fill fluid (U8)</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td>2  Silicone Oil</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3  Syltherm 800</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4  Inert</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5  Glycerin / H2O</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6  Prop Gly / H2O</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7  Neobee-M20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>251 None</td>
</tr>
<tr>
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<td></td>
<td>252 Unknown</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>253 Special</td>
</tr>
<tr>
<td>0028</td>
<td>Holding register</td>
<td>R/W, WP</td>
<td></td>
<td>remote seal isolator material (U8)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2  316 Stainless Steel</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3  Hastelloy C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5  Tantalum</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9  Cobalt-Chromium-Nickel</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>250 Not Used</td>
</tr>
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<td>251 None</td>
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<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>253 Special</td>
</tr>
</tbody>
</table>
### Table 4-1 Transmitter Info

<table>
<thead>
<tr>
<th>Modbus Access</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Address</strong></td>
<td><strong>Data / Control</strong></td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td><strong>Functional Area</strong></td>
</tr>
<tr>
<td><strong>Attributes</strong></td>
<td><strong>Materials of Construction</strong></td>
</tr>
<tr>
<td>0029</td>
<td>number of remote seals (U8)</td>
</tr>
<tr>
<td>Holding register</td>
<td>1 One Seal</td>
</tr>
<tr>
<td>R/W, WP</td>
<td>2 Two Seal</td>
</tr>
<tr>
<td></td>
<td>250 Not Used</td>
</tr>
<tr>
<td></td>
<td>251 None</td>
</tr>
<tr>
<td></td>
<td>252 Unknown</td>
</tr>
<tr>
<td>0030, 0031</td>
<td>user-entered date (U24)</td>
</tr>
<tr>
<td>Holding register</td>
<td>day/month/year</td>
</tr>
<tr>
<td>R/W, WP</td>
<td>i.e. April 26, 1996 = 0x001a, 0x0460</td>
</tr>
<tr>
<td>0032-0035</td>
<td>user-entered tag (U8x8)</td>
</tr>
<tr>
<td>ASCII</td>
<td>R/W, WP</td>
</tr>
<tr>
<td>0036-0043</td>
<td>user-entered descriptor (U8x16)</td>
</tr>
<tr>
<td>ASCII</td>
<td>R/W, WP</td>
</tr>
<tr>
<td>0044-0059</td>
<td>user entered message (U8x32)</td>
</tr>
<tr>
<td>ASCII</td>
<td>R/W, WP</td>
</tr>
</tbody>
</table>

*Attributes: R/W = Read/Write, RO = Read Only, WP = Write Protected*

**These registers are available at multiple Modbus addresses (see Section 2.3 located in the Modbus Protocol Guide)**
### 4.3 Identify Transmitter

#### Table 4-2 Identify Transmitter

<table>
<thead>
<tr>
<th>Modbus Access</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Address</strong></td>
<td><strong>Functional Area</strong></td>
</tr>
<tr>
<td>0001</td>
<td>Input register</td>
</tr>
<tr>
<td>0002</td>
<td>Input register</td>
</tr>
<tr>
<td>0003</td>
<td>Input register</td>
</tr>
<tr>
<td>0004</td>
<td>Input register</td>
</tr>
<tr>
<td>0005, 0006</td>
<td>Input register</td>
</tr>
<tr>
<td>0007, 0008</td>
<td>Input register</td>
</tr>
<tr>
<td>0009</td>
<td>Input register</td>
</tr>
<tr>
<td>0010</td>
<td>Input register</td>
</tr>
<tr>
<td>0011</td>
<td>Input register</td>
</tr>
</tbody>
</table>

*Attributes: R/W = Read/Write, RO = Read Only, WP = Write Protected

**These registers are available at multiple Modbus addresses (see Section 2.3 located in the Modbus Protocol Guide)
5.0 Process Variables

5.1 Process Variables and Process Variable Unit Codes

Floating point values of process variables, and integer unit codes for the corresponding measurement units can be read from the registers shown below. The unit codes are 8 bit integers that are stored in the Least Significant Byte of their 16 bit register. For instance if the value $0001$ is stored in register 40060 it would represent the unit code 1 (Inches of H$_2$O@ 60° F).

### Table 5-1 Process Variables

<table>
<thead>
<tr>
<th>Modbus Access</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address Type</td>
<td>Attributes</td>
</tr>
<tr>
<td>0401, 0402</td>
<td>FP register</td>
</tr>
<tr>
<td>0403, 0404</td>
<td>FP register</td>
</tr>
<tr>
<td>0405, 0406</td>
<td>FP register</td>
</tr>
</tbody>
</table>

*Attributes: R/W = Read/Write, RO = Read Only, WP = Write Protected
**These registers are available at multiple Modbus addresses (see Section 2.3 located in the Modbus Protocol Guide)

### Table 5-2 Unit Codes

<table>
<thead>
<tr>
<th>Modbus Access</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address Type</td>
<td>Attributes</td>
</tr>
<tr>
<td>0060 R/W, WP</td>
<td>Differen-</td>
</tr>
<tr>
<td></td>
<td>tial Press-</td>
</tr>
<tr>
<td></td>
<td>sure</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>0061 R/W, WP</td>
<td>Static Pres-</td>
</tr>
<tr>
<td></td>
<td>sure</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5.2 Process Variable Limit Checking

There are essentially four different limits for each process variable. These are the Upper Range Limit (URL), Lower Range Limit (LRL), Upper Operating Limit (UOL), and the Lower Operating Limit (LOL). The host can only change the Upper and Lower Operating Limits. The Upper Range Limit and the Lower Range Limit are fixed and depend on the range of the sensor module.

The UOL and LOL cannot cross each other. Here is the formula that the transmitter uses to validate the operating limits sent by the host. The 3095FB will return the Modbus exception Illegal Data Value (03) if invalid operating limits are sent.

**Lower Operating Limit:**

\[ \text{LRL} \leq \text{LOL} \leq (\text{UOL} - \text{min\_span}) \]

**Upper Operating Limit:**

\[ (\text{LOL} + \text{min\_span}) \leq \text{UOL} \leq \text{URL} \]

\[ \text{min\_span} = \text{URL}/100 \]
## Table 5-3 Process Variable Sensor Limits

<table>
<thead>
<tr>
<th>Address Type</th>
<th>Attributes</th>
<th>Functional Area</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address</td>
<td>fp register</td>
<td>RO</td>
<td>Sensor limits</td>
</tr>
<tr>
<td>0413, 0414</td>
<td>RO</td>
<td>Sensor limits</td>
<td>DP upper range limit</td>
</tr>
<tr>
<td>0415, 0416</td>
<td>RO</td>
<td>Sensor limits</td>
<td>DP upper range limit</td>
</tr>
<tr>
<td>0417, 0418</td>
<td>R/W, WP</td>
<td>Sensor limits</td>
<td>DP upper range limit</td>
</tr>
<tr>
<td>0419, 0420</td>
<td>R/W, WP</td>
<td>Sensor limits</td>
<td>DP upper range limit</td>
</tr>
<tr>
<td>0421, 0422</td>
<td>RO</td>
<td>Sensor limits</td>
<td>DP upper range limit</td>
</tr>
<tr>
<td>0423, 0424</td>
<td>RO</td>
<td>Sensor limits</td>
<td>DP upper range limit</td>
</tr>
<tr>
<td>0425, 0426</td>
<td>R/W, WP</td>
<td>Sensor limits</td>
<td>DP upper range limit</td>
</tr>
<tr>
<td>0427, 0428</td>
<td>R/W, WP</td>
<td>Sensor limits</td>
<td>DP upper range limit</td>
</tr>
<tr>
<td>0429, 0430</td>
<td>RO</td>
<td>Sensor limits</td>
<td>DP upper range limit</td>
</tr>
<tr>
<td>0431, 0432</td>
<td>RO</td>
<td>Sensor limits</td>
<td>DP upper range limit</td>
</tr>
<tr>
<td>0433, 0434</td>
<td>R/W, WP</td>
<td>Sensor limits</td>
<td>DP upper range limit</td>
</tr>
<tr>
<td>0435, 0436</td>
<td>R/W, WP</td>
<td>Sensor limits</td>
<td>DP upper range limit</td>
</tr>
</tbody>
</table>

*Attributes: R/W = Read/Write, RO = Read Only, WP = Write Protected

**These registers are available at multiple Modbus addresses (see Section 2.3 located in the Modbus Protocol Guide)
5.3 Integer Scaling of Process Variables (available for 3095FB output board software Rev. 107 or later)

Integer scaling allows the 3095FB to represent the process variables (DP, PT, and SP) as 16 bit integers.

**Figure 5-1 Scaled Integers**

Where: 
- $x_1$ = Minimum Measured Process Variable
- $x_2$ = Maximum Measured Process Variable
- $y_1$ = Minimum Scaled Integer Value
- $y_2$ = Maximum Scaled Integer Value
5.3.1 Defining Scaled Integers

There are two separate ways to configure the Scaled Integers. The next two sections describe the two methods. A holding register is provided to allow the user to choose which of the following methods is used to configure the Scaled Integers. Only the registers needed for that method will be enabled. The Modbus error ILLEGAL DATA VALUE will be returned if an attempt is made to write to a disabled register. See Table 5-4 for implementation examples.

If the Scaled Integers are disabled, all the Scaled Integers will be set to 65535.

Table 5-4 Process Variable Scaled Integers

<table>
<thead>
<tr>
<th>Modbus Access</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address</td>
<td>Address Type</td>
</tr>
<tr>
<td>0116</td>
<td>Input register</td>
</tr>
<tr>
<td>0117</td>
<td>Input register</td>
</tr>
<tr>
<td>0118</td>
<td>Input register</td>
</tr>
</tbody>
</table>

*Attributes: R/W = Read/Write, RO = Read Only, WP = Write Protected

**These registers are available at multiple Modbus addresses (see Section 2.3 located in the Modbus Protocol Guide)

Table 5-5 Scaled Integer Method

<table>
<thead>
<tr>
<th>Modbus Access</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address</td>
<td>Address Type</td>
</tr>
</tbody>
</table>
| 0204 | Holding Register | R/W, WP | | Scaled Integer Method
0 = Disable Scaled Integers (default)
1 = Method 1
2 = Method 2 |

*Attributes: R/W = Read/Write, RO = Read Only, WP = Write Protected

**These registers are available at multiple Modbus addresses (see Section 2.3)
5.3.1.1 Method 1: Define the Endpoints

The host can configure the scaled integers just by defining the endpoints \((x_1,y_1\) and \(x_2,y_2\)) for the line shown Figure 5-1.

The 3095FB will reject endpoints that do not conform to the following limits.

**Table 5-6 Limits for Defining Endpoints**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Valid Range</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(x_1)</td>
<td>(\text{LRL} \leq x_1 \leq (x_2 - \text{min_span}))</td>
<td>F32</td>
<td>Minimum Measured Value</td>
</tr>
<tr>
<td>(x_2)</td>
<td>((x_1 + \text{min_span}) \leq x_2 \leq \text{URL})</td>
<td>F32</td>
<td>Maximum Measured Value</td>
</tr>
<tr>
<td>(y_1)</td>
<td>(0 \leq y_1 &lt; y_2)</td>
<td>U16</td>
<td>Minimum Scaled Integer</td>
</tr>
<tr>
<td>(y_2)</td>
<td>(y_1 &lt; y_2 \leq 65534)</td>
<td>U16</td>
<td>Maximum Scaled Integer</td>
</tr>
</tbody>
</table>

The values for \(x_1\) and \(x_2\) should be configured for the current unit codes. If the host changes unit codes after the scaled integers are configured using Method 1, the values for \(x_1\) and \(x_2\) will be changed to reflect the new unit codes.
### Table 5-7 PV Scaled Integer Y Value

<table>
<thead>
<tr>
<th>Modbus Access</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address Type</td>
<td>Attributes</td>
</tr>
<tr>
<td>0188 Holding register</td>
<td>RW</td>
</tr>
<tr>
<td>0189 Holding register</td>
<td>RW</td>
</tr>
<tr>
<td>0190 Holding register</td>
<td>RW</td>
</tr>
<tr>
<td>0191 Holding register</td>
<td>RW</td>
</tr>
<tr>
<td>0192 Holding register</td>
<td>RW</td>
</tr>
<tr>
<td>0193 Holding register</td>
<td>RW</td>
</tr>
</tbody>
</table>

*Attributes: R/W = Read/Write, RO = Read Only, WP = Write Protected

**These registers are available at multiple Modbus addresses (see Section 2.3 located in the Modbus Protocol Guide)
5.3.1.2 Method 2: Define Scale and Offset

To configure the integer scaling of PVs using Method 2, follow this procedure:

1. Set a maximum integer.
2. Calculate the scale factor for each PV.
3. Calculate the offset for each PV
4. Write the values calculated above to the corresponding registers.

The following formula is used to calculate the scale factor and offset:

\[
y = A(x) - (B - 32,768)
\]

Where:
- \( y \) = scaled integer output (see Table 5-4)
- \( x \) = measured value of PV in current units (see Table 5-1)
- \( A \) = scale factor (see Table 5-10)
- \( B \) = offset of scaled integer (see Table 5-10)
Maximum Integer: The maximum integer is the upper limit for the scaled integer output. If the measured value derives an integer higher than the maximum integer or lower than 0, the maximum integer plus one will be returned. Also, if any of the error conditions described in Section 5.3.2 occur the affected scaled integers will be set to the maximum integer plus one. The maximum integer can be any value from 0 to 65534. The default maximum integer is 65534.

Table 5-9 PV Scaled Integer Maximum Integer

<table>
<thead>
<tr>
<th>Modbus Access</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address</td>
<td>Address Type</td>
</tr>
<tr>
<td>125</td>
<td>Holding register</td>
</tr>
</tbody>
</table>

*Attributes: R/W = Read/Write, RO = Read Only, WP = Write Protected

**These registers are available at multiple Modbus addresses (see Section 2.3 located in the Modbus Protocol Guide)
### Scale Factor

The scale factor is the linear slope of the line represented in Figure 5-1. The scale factor is the ratio of the change of the scaled integers compared to the change of the measured process variable.

The Scale Factor and Offset must be configured for the current unit codes. If the unit codes are changed the Scale Factor and Offset must be recalculated.

\[
A = \frac{(y_2 - y_1)}{(x_2 - x_1)}
\]

**Offset:** The offset is calculated using [Equation 4].

\[
B = A(x_1) + 32768 - y_1
\]

---

**Table 5-10 Scale Factors and Offsets**

<table>
<thead>
<tr>
<th>Modbus Access</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address Type</td>
<td>Attributes</td>
</tr>
<tr>
<td>0198</td>
<td>Holding register</td>
</tr>
<tr>
<td>0199</td>
<td>Holding register</td>
</tr>
<tr>
<td>0200</td>
<td>Holding register</td>
</tr>
<tr>
<td>0201</td>
<td>Holding register</td>
</tr>
<tr>
<td>0202</td>
<td>Holding register</td>
</tr>
<tr>
<td>0203</td>
<td>Holding register</td>
</tr>
</tbody>
</table>

*Attributes: R/W = Read/Write, RO = Read Only, WP = Write Protected

**These registers are available at multiple Modbus addresses (see Section 2.3)
5.3.2 Scaled Integer Error Conditions

If an error occurs the scaled output will be set to either $y_2 + 1$ (Method 1) or maximum integer + 1 (Method 2).

5.3.2.1 General Exceptions that Apply to All Scaled Outputs

Table 5-11 General Sensor Errors

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AD</td>
<td>ST signal is above Upper Internal Limit</td>
</tr>
<tr>
<td>AD</td>
<td>ST signal is below Lower Internal Limit</td>
</tr>
<tr>
<td>AD</td>
<td>Sensor module is NOT updating</td>
</tr>
<tr>
<td>AD</td>
<td>Sensor microprocessor does not respond</td>
</tr>
</tbody>
</table>

If the calculated scaled output is greater than $y_2$ (Method 1) or less than $y_1$ (Method 1) the value returned is $y_2 + 1$.

If the calculated scaled output is greater than the maximum integer (Method 2) or less than zero (Method 2) the value returned is maximum integer + 1.

5.3.2.2 Exceptions that Apply to DP

The following exceptions apply only to the differential pressure.

Table 5-12 DP Exceptions

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AD</td>
<td>DP signal above Upper Range Limit + 10%</td>
</tr>
<tr>
<td>W</td>
<td>DP signal above Upper Range Limit</td>
</tr>
<tr>
<td>W</td>
<td>DP signal below Lower Range Limit</td>
</tr>
<tr>
<td>AD</td>
<td>DP signal below Lower Range Limit - 10%</td>
</tr>
<tr>
<td>AD</td>
<td>SP signal above Upper Range Limit + 10%</td>
</tr>
<tr>
<td>AD</td>
<td>SP signal below Lower Range Limit - 10%</td>
</tr>
<tr>
<td>AD</td>
<td>SP sensor shorted</td>
</tr>
<tr>
<td>AD</td>
<td>SP signal is unreasonable - open bridge</td>
</tr>
</tbody>
</table>
5.3.2.3 Exceptions that Apply to SP

The following exceptions apply only to the static pressure.

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AD</td>
<td>SP signal above Upper Range Limit + 10%</td>
</tr>
<tr>
<td>W</td>
<td>SP signal above Upper Range Limit</td>
</tr>
<tr>
<td>W</td>
<td>SP signal below Lower Range Limit</td>
</tr>
<tr>
<td>AD</td>
<td>SP signal below Lower Range Limit - 10%</td>
</tr>
<tr>
<td>AD</td>
<td>SP sensor shorted</td>
</tr>
<tr>
<td>AD</td>
<td>SP signal is unreasonable - open bridge</td>
</tr>
</tbody>
</table>

5.3.2.4 Exceptions that Apply to PT

The following exceptions apply only to the process temperature.

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AD</td>
<td>PT signal above Upper Range Limit + 10%</td>
</tr>
<tr>
<td>W</td>
<td>PT signal above Upper Range Limit</td>
</tr>
<tr>
<td>W</td>
<td>PT signal below Lower Range Limit</td>
</tr>
<tr>
<td>AD</td>
<td>PT signal below Lower Range Limit - 10%</td>
</tr>
</tbody>
</table>

5.4 Untrimmed and Corrected Process Variables

A 24 bit integer will be provided that shows an integer representation of the process variables before they have been trimmed and damped.

The formula for interpreting the 24 bit numbers is shown below.

\[
\text{output} = \dfrac{(\text{input} - 8388608) \times \text{URL}}{7601920}
\]

Where:

input = Untrimmed and Corrected Process Variable
output = Scaled Process Variable
5.5 Process Variable Default Values (PT)

The 3095FB allows for the enabling and disabling of the PT input. To disable the PT input turn the RTD present coil OFF. Likewise to enable the PT input turn the RTD present coil ON. If the RTD present coil is OFF the User Entered PT Value is used.

When entering a User Entered PT Value the current PT unit code is used. If the current PT unit code is °F then entering a floating point value of 60 in the register pair 455, 456 would set the User Entered PT Value to 60 °F. If at a later time the PT unit code is changed to °C then the User Entered PT Value will read as 15.556 °C.
### Table 5-16 RTD Present

<table>
<thead>
<tr>
<th>Modbus Access</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address</td>
<td>Attributes</td>
</tr>
<tr>
<td>0004</td>
<td>Coil</td>
</tr>
</tbody>
</table>

*Attributes: R/W = Read/Write, RO = Read Only, WP = Write Protected

**These registers are available at multiple Modbus addresses (see Section 2.3 located in the *Modbus Protocol Guide*).

### Table 5-17 User Entered PT Value

<table>
<thead>
<tr>
<th>Modbus Access</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address</td>
<td>Attributes</td>
</tr>
<tr>
<td>0455, 0456</td>
<td>FP register</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Attributes: R/W = Read/Write, RO = Read Only, WP = Write Protected

**These registers are available at multiple Modbus addresses (see Section 2.3 located in the *Modbus Protocol Guide*).
6.0 Calibration

6.1 Calibration

Each process variable in the 3095FB [differential pressure (DP), static pressure (SP), and process temperature (PT)] can be trimmed. Two types of trims can be performed; offset (zero) trim and slope (span) trim. To perform a trim the user only has to write the applied value to the Modbus register while applying an accurate pressure or temperature to the 3095FB. For accurate trimming the user should wait for the process variable to stabilize before attempting to trim the transmitter. The 3095FB will do all the calculations needed to trim the transmitter. **The host should never write the offset (zero) and slope (span) trims at the same time.**

For example, if the user wants to trim the DP from 0 to 100 inches of H₂O@60 F there are four steps.

1. Apply the offset(zero) DP to the transmitter. In this case apply 0 inches of H₂O@60 F and wait for the transmitter to stabilize.
2. Write the IEEE 754 floating point number to the register pair 437, 438. In this case write a zero to the register pair.
3. Apply the slope(span) DP to the transmitter. In this case apply 100 inches of H₂O@60 F and wait for the transmitter to stabilize.
4. Write the IEEE 754 floating point number to the register pair 439,440. In this case write the number 100 to the register pair.

<table>
<thead>
<tr>
<th>Modbus Access</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functional Area</td>
<td>Data / Control</td>
</tr>
<tr>
<td>Address</td>
<td>Address Type</td>
</tr>
<tr>
<td>0437, 0438</td>
<td>FP register</td>
</tr>
<tr>
<td>0439, 0440</td>
<td>FP register</td>
</tr>
<tr>
<td>0443, 0444</td>
<td>FP register</td>
</tr>
<tr>
<td>0445, 0446</td>
<td>FP register</td>
</tr>
</tbody>
</table>
6.1.1 Calibration Flag

A Modbus coil has been provided as a way of flagging the transmitter as being in a Calibration state. This coil is used only for informational use and does not affect the internal operation of the 3095FB. The host has complete control of the Calibration Flag. When the Calibration Flag is set, the corresponding status bit will turn ON.

It is recommended that this flag be turned on at the start of calibration, and then turned off when the calibration is complete. The Calibration Flag is useful if for some reason the person performing a calibration on the 3095FB gets called away in the middle of the calibration. The 3095FB may be in an unknown state, such as vented to atmosphere. If the Calibration Flag is set, the host that is polling the 3095FB will be able to see the Calibration status bit and mark the incoming data as unreliable.

Table 6-2 Calibration Flag

<table>
<thead>
<tr>
<th>Modbus Access</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address</td>
<td>Address Type</td>
</tr>
<tr>
<td>0003</td>
<td>Coil</td>
</tr>
</tbody>
</table>

*Attributes: R/W = Read/Write, RO = Read Only, WP = Write Protected

**These registers are available at multiple Modbus addresses (see Section 2.3 located in the Modbus Protocol Guide)
6.2 Damping

A damping factor can also be entered for each process variable. The damping will smooth the process variable reading when there are rapid input variations. The following damping values (in seconds) are available. The underlined value is the default.

0.108  0.216  0.432  0.864  1.728  3.456  6.912  13.824  27.648

If the new damping value, sent by the host, is not one of the valid options, the closest damping value will be selected. Only values of 0 to 30 seconds will be accepted by the 3095FB. If the value is outside of this range a Modbus exception Illegal Data Value (03) will be returned.

Table 6-3 Damping

<table>
<thead>
<tr>
<th>Address</th>
<th>Address Type</th>
<th>Attributes</th>
<th>Functional Area</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0441, 0442</td>
<td>FP register</td>
<td>R/W, WP</td>
<td>Damping</td>
<td>DP damping</td>
</tr>
<tr>
<td>0447, 0448</td>
<td>FP register</td>
<td>R/W, WP</td>
<td>SP damping</td>
<td></td>
</tr>
<tr>
<td>0453, 0454</td>
<td>FP register</td>
<td>R/W, WP</td>
<td>PT damping</td>
<td></td>
</tr>
</tbody>
</table>

*Attributes: R/W = Read/Write, RO = Read Only, WP = Write Protected

**These registers are available at multiple Modbus addresses (see Section 2.3 located in the Modbus Protocol Guide)
6.3 Restore Factory Trim Defaults

Triggering the following coils will cause the 3095FB to revert to the Factory Trim Defaults. The 3095FB must then be recalibrated.

**Table 6-4 Reset Factory Trim Defaults**

<table>
<thead>
<tr>
<th>Address</th>
<th>Address Type</th>
<th>Attributes</th>
<th>Functional Area</th>
<th>Data / Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>0031</td>
<td>Coil</td>
<td>R/W, WP</td>
<td>Reset Trim to Factory Defaults</td>
<td>DP</td>
</tr>
<tr>
<td>0032</td>
<td>Coil</td>
<td>R/W, WP</td>
<td></td>
<td>SP</td>
</tr>
<tr>
<td>0033</td>
<td>Coil</td>
<td>R/W, WP</td>
<td></td>
<td>PT</td>
</tr>
</tbody>
</table>

*Attributes: R/W = Read/Write, RO = Read Only, WP = Write Protected

**These registers are available at multiple Modbus addresses (see Section 2.3 located in the Modbus Protocol Guide)**
7.0 LCD Display Configuration

If the 3095FB includes an optional LCD display, the user may select which configuration parameters to display. This is accomplished by the use of the display bit map. The rate at which the LCD display is updated is also configurable between one and ten seconds.

Table 7-1  Transmitter Info

<table>
<thead>
<tr>
<th>Modbus Access</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Address</th>
<th>Address Type</th>
<th>Attributes</th>
<th>Functional Area</th>
<th>Data / Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>0126</td>
<td>Holding register</td>
<td>R/W, WP</td>
<td>LCD</td>
<td>LCD Update Rate (1 - 10 seconds)</td>
</tr>
<tr>
<td>0127, 0128</td>
<td>Holding register</td>
<td>R/W, WP</td>
<td>LCD Display Bit Mask</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0x0000 0001</td>
<td>Differential Pressure</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0x0000 0002</td>
<td>Static Pressure</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0x0000 0004</td>
<td>Process Temperature</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0x0000 0008</td>
<td>Communication Setup</td>
</tr>
</tbody>
</table>

*Attributes: R/W = Read/Write, RO = Read Only, WP = Write Protected

**These registers are available at multiple Modbus addresses (see Section 2.3 located in the *Modbus Protocol Guide*)
8.0 Exception Handling

There are a number of exceptions that may occur. The severity of these may range from a warning to a critical error. The LCD (if present) will display the error condition depending on the attributes of the exception. The following tables define the criteria and list the types of alarms and their attributes.

8.1 Diagnostic Status Bits

There are a number of diagnostic status bits that can give information about the status of the transmitter. The user can read the status bits as discrete inputs, input registers, or as floating point registers. This gives the user a variety of ways to get the status of the transmitter. These registers contain the exact same information. The status registers are placed next to the Floating Point PVs. In a polling environment the host should retrieve the PVs and the Status Registers in a single query. Table 8.1, on page 50 shows the register layout of the diagnostic status bits in each form (discrete input, input register, and floating point register). The floating point status registers are in a bit mapped format.

A value of zero will indicate that the condition is FALSE (OFF), and a value of one will indicate that the condition is TRUE (ON). All reserved bits will be forced to FALSE (OFF).

Meaning of Attributes:
A = Critical Alarm State (Critical Alarm status bit is set)
W = Warning State (Warning status bit is set)
D = LCD will display exception

Table 8-1 Mapping of Status Bits to Coils, Input Registers, and Floating Point Registers

<table>
<thead>
<tr>
<th>Discrete Input Address</th>
<th>Input Register Address</th>
<th>Floating Point Register Address</th>
<th>Bit Position</th>
<th>Attributes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0050</td>
<td>0119</td>
<td>0407</td>
<td>15</td>
<td>D</td>
<td>Calibration Flag</td>
</tr>
<tr>
<td>0051</td>
<td></td>
<td></td>
<td>14</td>
<td></td>
<td>Critical Alarm: The PVs may not be valid</td>
</tr>
<tr>
<td>0052</td>
<td></td>
<td></td>
<td>13</td>
<td></td>
<td>Warning: The PVs are outside specification</td>
</tr>
<tr>
<td>0053</td>
<td></td>
<td></td>
<td>12</td>
<td>AD</td>
<td>DP signal above Upper Range Limit + 10%</td>
</tr>
<tr>
<td>0054</td>
<td></td>
<td></td>
<td>11</td>
<td>W</td>
<td>DP signal above Upper Range Limit</td>
</tr>
<tr>
<td>0055</td>
<td></td>
<td></td>
<td>10</td>
<td></td>
<td>DP signal above Upper Operating Limit</td>
</tr>
<tr>
<td>0056</td>
<td></td>
<td></td>
<td>9</td>
<td></td>
<td>DP signal below Lower Operating Limit</td>
</tr>
<tr>
<td>0057</td>
<td></td>
<td></td>
<td>8</td>
<td>W</td>
<td>DP signal below Lower Range Limit</td>
</tr>
</tbody>
</table>
### Table 8-1  Mapping of Status Bits to Coils, Input Registers, and Floating Point Registers

<table>
<thead>
<tr>
<th>Discrete Input Address</th>
<th>Input Register Address</th>
<th>Floating Point Register Address</th>
<th>Bit Position</th>
<th>Attributes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0058</td>
<td>0119 (cont)</td>
<td>0407 (cont)</td>
<td>7</td>
<td>AD</td>
<td>DP signal below Lower Range Limit - 10%</td>
</tr>
<tr>
<td>0059</td>
<td></td>
<td></td>
<td>6</td>
<td>AD</td>
<td>SP signal above Upper Range Limit + 10%</td>
</tr>
<tr>
<td>0060</td>
<td></td>
<td></td>
<td>5</td>
<td>W</td>
<td>SP signal above Upper Range Limit</td>
</tr>
<tr>
<td>0061</td>
<td></td>
<td></td>
<td>4</td>
<td></td>
<td>SP signal above Upper Operating Limit</td>
</tr>
<tr>
<td>0062</td>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td>SP signal below Lower Operating Limit</td>
</tr>
<tr>
<td>0063</td>
<td></td>
<td></td>
<td>2</td>
<td>W</td>
<td>SP signal below Lower Range Limit</td>
</tr>
<tr>
<td>0064</td>
<td></td>
<td></td>
<td>1</td>
<td>AD</td>
<td>SP signal below Lower Range Limit - 10%</td>
</tr>
<tr>
<td>0065</td>
<td></td>
<td></td>
<td>0</td>
<td>AD</td>
<td>SP sensor shorted</td>
</tr>
<tr>
<td>0066</td>
<td>0120</td>
<td>0408</td>
<td>15</td>
<td>AD</td>
<td>SP signal is unreasonable - open bridge</td>
</tr>
<tr>
<td>0067</td>
<td></td>
<td></td>
<td>14</td>
<td>AD</td>
<td>PT signal above Upper Range Limit + 10%</td>
</tr>
<tr>
<td>0068</td>
<td></td>
<td></td>
<td>13</td>
<td>W</td>
<td>PT signal above Upper Range Limit</td>
</tr>
<tr>
<td>0069</td>
<td></td>
<td></td>
<td>12</td>
<td></td>
<td>PT signal above Upper Operating Limit</td>
</tr>
<tr>
<td>0070</td>
<td></td>
<td></td>
<td>11</td>
<td></td>
<td>PT signal below Lower Operating Limit</td>
</tr>
<tr>
<td>0071</td>
<td></td>
<td></td>
<td>10</td>
<td>W</td>
<td>PT signal below Lower Range Limit</td>
</tr>
<tr>
<td>0072</td>
<td></td>
<td></td>
<td>9</td>
<td>AD</td>
<td>PT signal below Lower Range Limit - 10%</td>
</tr>
<tr>
<td>0073</td>
<td></td>
<td></td>
<td>8</td>
<td>AD</td>
<td>RTD is disconnected</td>
</tr>
<tr>
<td>0074</td>
<td></td>
<td></td>
<td>7</td>
<td>AD</td>
<td>ST signal is above Upper Internal Limit</td>
</tr>
<tr>
<td>0075</td>
<td></td>
<td></td>
<td>6</td>
<td>AD</td>
<td>ST signal is below Lower Internal Limit</td>
</tr>
<tr>
<td>Not Available as Discrete Inputs</td>
<td></td>
<td></td>
<td>5</td>
<td></td>
<td>Reserved</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td></td>
<td>Reserved</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td>Reserved</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td>Reserved</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td>Reserved</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td></td>
<td>Reserved</td>
</tr>
<tr>
<td>0121</td>
<td>0409</td>
<td></td>
<td>15</td>
<td>AD</td>
<td>Sensor module is NOT updating</td>
</tr>
</tbody>
</table>
Note: Not all of the diagnostic status bits are available as a discrete inputs. The rest of the diagnostic status bits can be read as either an input register or as a floating point register.

### 8.1.1 Critical Alarm

The Critical Alarm status bit is linked to the status bits that could cause the PVs to be incorrect. When a status bit with the Attribute A (Alarm) is set the Critical Alarm status bit is also set.

### 8.1.2 Warning

The Warning status bit is linked to the status bits that signify that the transmitter may be outside of specification. When a Status Bit with the Attribute W (Warning) is set the Warning Status Bit is also set.
9.0 Diagnostics

9.1 Self Test

A Self Test will verify the integrity of the some of the crucial areas of nonvolatile memory.

Table 9-1 Self Test

<table>
<thead>
<tr>
<th>Address</th>
<th>Address Type</th>
<th>Attributes</th>
<th>Functional Area</th>
<th>Data / Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>0001</td>
<td>Coil</td>
<td>R/W</td>
<td>Diagnostics</td>
<td>self test</td>
</tr>
</tbody>
</table>

*Attributes: R/W = Read/Write, RO = Read Only, WP = Write Protected

**These registers are available at multiple Modbus addresses (see Section 2.3 located in the Modbus Protocol Guide)

The procedure for performing a Self Test is as follows:

1. Force the Self Test coil ON. The 3095FB will return a normal response. The Self Test takes approximately 500 ms.

2. Any errors that are detected will show up in the following status bits. The following diagnostic status bits will be set or cleared by the Self Test, Master Reset, or cycling power.

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensor CRC error (Static Region)</td>
</tr>
<tr>
<td>Sensor CRC error (Dynamic Region)</td>
</tr>
<tr>
<td>Nonvolatile Database CRC error</td>
</tr>
</tbody>
</table>
9.2 Master Reset

Activating the Master Reset coil performs a software reset of the 3095FB. This is similar to shutting off the power and then reapplying power. The Master Reset takes approximately 500 milliseconds to complete.

<table>
<thead>
<tr>
<th>Modbus Access</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address</td>
<td>Attributes</td>
</tr>
<tr>
<td>0002</td>
<td>Coil</td>
</tr>
</tbody>
</table>

*Attributes: R/W = Read/Write, RO = Read Only, WP = Write Protected
**These registers are available at multiple Modbus addresses (see Section 2.3 located in the Modbus Protocol Guide)

9.3 Restoring Nonvolatile Database to Factory Defaults

Forcing the coils shown below to ON will reset the variables shown in the table below. The transmitter must then be reset to ensure data integrity.

<table>
<thead>
<tr>
<th>Modbus Access</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address</td>
<td>Attributes</td>
</tr>
<tr>
<td>0035</td>
<td>Coil</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>0036</td>
<td>Coil</td>
</tr>
<tr>
<td></td>
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<td></td>
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<td></td>
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</tr>
<tr>
<td>Address</td>
<td>Address Type</td>
</tr>
<tr>
<td>---------</td>
<td>--------------</td>
</tr>
<tr>
<td>0037</td>
<td>Coil</td>
</tr>
<tr>
<td></td>
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<td></td>
</tr>
<tr>
<td>0039</td>
<td>Coil</td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>0041</td>
<td>Coil</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 9-3  Restoring Nonvolatile Database

<table>
<thead>
<tr>
<th>Address</th>
<th>Modbus Access</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0049</td>
<td>Coil</td>
<td>Restore Nonvolatile Database</td>
</tr>
<tr>
<td></td>
<td>R/W, WP</td>
<td>Restore Mapping Section Mapping Addresses</td>
</tr>
</tbody>
</table>

*Attributes: R/W = Read/Write, RO = Read Only, WP = Write Protected

**These registers are available at multiple Modbus addresses (see Section 2.3 located in the Modbus Protocol Guide)
Appendix A: Modbus Mapping Assignments by Data Types

Read/Write Coils

<table>
<thead>
<tr>
<th>Address</th>
<th>Address Type</th>
<th>Attributes</th>
<th>Functional Area</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0001</td>
<td>Coil</td>
<td>R/W</td>
<td>Diagnostics</td>
<td>Self Test</td>
</tr>
<tr>
<td>0002</td>
<td>Coil</td>
<td>R/W</td>
<td></td>
<td>Master Reset</td>
</tr>
<tr>
<td>0003</td>
<td>Coil</td>
<td>R/W, WP</td>
<td></td>
<td>Calibration Mode (set by host)</td>
</tr>
<tr>
<td>0004</td>
<td>Coil</td>
<td>R/W, WP</td>
<td></td>
<td>RTD present (0=not present, 1 = present)</td>
</tr>
<tr>
<td>0031</td>
<td>Coil</td>
<td>R/W, WP</td>
<td>Reset Trim to Factory Defaults</td>
<td>DP</td>
</tr>
<tr>
<td>0032</td>
<td>Coil</td>
<td>R/W, WP</td>
<td></td>
<td>SP</td>
</tr>
<tr>
<td>0033</td>
<td>Coil</td>
<td>R/W, WP</td>
<td></td>
<td>PT</td>
</tr>
<tr>
<td>0035</td>
<td>Coil</td>
<td>R/W, WP</td>
<td>Restore Nonvolatile Database</td>
<td>Restore Modbus Section 1</td>
</tr>
<tr>
<td>0036</td>
<td>Coil</td>
<td>R/W, WP</td>
<td></td>
<td>Restore Modbus Section 2</td>
</tr>
<tr>
<td>0037</td>
<td>Coil</td>
<td>R/W, WP</td>
<td></td>
<td>Restore Sensor Section 1</td>
</tr>
<tr>
<td>0039</td>
<td>Coil</td>
<td>R/W, WP</td>
<td></td>
<td>Restore Trim Section 1</td>
</tr>
<tr>
<td>0041</td>
<td>Coil</td>
<td>R/W, WP</td>
<td></td>
<td>Restore LCD Section 1</td>
</tr>
<tr>
<td>0049</td>
<td>Coil</td>
<td>R/W, WP</td>
<td></td>
<td>Restore Mapping Section</td>
</tr>
</tbody>
</table>

*Attributes: R/W = Read/Write, RO = Read Only, WP = Write Protected

**These registers are available at multiple Modbus addresses (see Section 2.3 located in the Modbus Protocol Guide)
### Read Only Discrete Inputs

<table>
<thead>
<tr>
<th>Address</th>
<th>Type</th>
<th>Attributes</th>
<th>Functional Area</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0050-0075</td>
<td>Coil</td>
<td>RO</td>
<td>Diagnostics</td>
<td>Status bits</td>
</tr>
</tbody>
</table>

*Attributes: R/W = Read/Write, RO = Read Only, WP = Write Protected

**These registers are available at multiple Modbus addresses (see Section 2.3 located in the Modbus Protocol Guide)**

### Floating Point Register Pairs

<table>
<thead>
<tr>
<th>Address</th>
<th>Type</th>
<th>Attributes</th>
<th>Functional Area</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0300-0400</td>
<td>FP register</td>
<td></td>
<td></td>
<td>Reserved for future use</td>
</tr>
<tr>
<td>0401, 0402</td>
<td>FP register</td>
<td>RO</td>
<td>PVs</td>
<td>DP</td>
</tr>
<tr>
<td>0403, 0404</td>
<td>FP register</td>
<td>RO</td>
<td></td>
<td>SP</td>
</tr>
<tr>
<td>0405, 0406</td>
<td>FP register</td>
<td>RO</td>
<td></td>
<td>PT</td>
</tr>
<tr>
<td>0407, 0408</td>
<td>FP register</td>
<td>RO</td>
<td>Diagnostics</td>
<td>Status Bytes</td>
</tr>
<tr>
<td>0409, 0410</td>
<td>FP register</td>
<td>RO</td>
<td></td>
<td>Status Bytes</td>
</tr>
<tr>
<td>0411, 0412</td>
<td>FP register</td>
<td>RO</td>
<td></td>
<td>Status Bytes</td>
</tr>
<tr>
<td>0413, 0414</td>
<td>FP register</td>
<td>RO</td>
<td>Sensor limits</td>
<td>DP upper range limit</td>
</tr>
</tbody>
</table>
## Floating Point Register Pairs

<table>
<thead>
<tr>
<th>Address</th>
<th>Address Type</th>
<th>Attributes</th>
<th>Functional Area</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0415,</td>
<td>FP register</td>
<td>RO</td>
<td>Sensor limits</td>
<td>DP lower range limit</td>
</tr>
<tr>
<td>0416</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0417,</td>
<td>FP register</td>
<td>R/W, WP</td>
<td></td>
<td>DP upper operating limit</td>
</tr>
<tr>
<td>0418</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0419,</td>
<td>FP register</td>
<td>R/W, WP</td>
<td>DP lower operating limit</td>
<td></td>
</tr>
<tr>
<td>0420</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>0421,</td>
<td>FP register</td>
<td>RO</td>
<td>SP upper range limit</td>
<td></td>
</tr>
<tr>
<td>0422</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0423,</td>
<td>FP register</td>
<td>RO</td>
<td>SP lower range limit</td>
<td></td>
</tr>
<tr>
<td>0424</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0425,</td>
<td>FP register</td>
<td>R/W, WP</td>
<td>SP upper range limit</td>
<td></td>
</tr>
<tr>
<td>0426</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0427,</td>
<td>FP register</td>
<td>R/W, WP</td>
<td>SP lower range limit</td>
<td></td>
</tr>
<tr>
<td>0428</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0429,</td>
<td>FP register</td>
<td>RO</td>
<td>PT upper range limit</td>
<td></td>
</tr>
<tr>
<td>0430</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0431,</td>
<td>FP register</td>
<td>RO</td>
<td>PT lower range limit</td>
<td></td>
</tr>
<tr>
<td>0432</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0433,</td>
<td>FP register</td>
<td>R/W, WP</td>
<td>PT upper range limit</td>
<td></td>
</tr>
<tr>
<td>0434</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0435,</td>
<td>FP register</td>
<td>R/W, WP</td>
<td>PT lower operating limit</td>
<td></td>
</tr>
<tr>
<td>0436</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0437,</td>
<td>FP register</td>
<td>R/W, WP</td>
<td>DP calibration</td>
<td>DP offset</td>
</tr>
<tr>
<td>0438</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0439,</td>
<td>FP register</td>
<td>R/W, WP</td>
<td>DP slope</td>
<td></td>
</tr>
<tr>
<td>0440</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0441,</td>
<td>FP register</td>
<td>R/W, WP</td>
<td>DP damping</td>
<td></td>
</tr>
<tr>
<td>0442</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Floating Point Register Pairs

<table>
<thead>
<tr>
<th>Address</th>
<th>Address Type</th>
<th>Attributes</th>
<th>Functional Area</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0443, 0444</td>
<td>FP register</td>
<td>R/W, WP</td>
<td>SP calibration</td>
<td>SP offset</td>
</tr>
<tr>
<td>0445, 0446</td>
<td>FP register</td>
<td>R/W, WP</td>
<td></td>
<td>SP slope</td>
</tr>
<tr>
<td>0447, 0448</td>
<td>FP register</td>
<td>R/W, WP</td>
<td></td>
<td>SP damping</td>
</tr>
<tr>
<td>0449, 0450</td>
<td>FP register</td>
<td>R/W, WP</td>
<td>PT calibration</td>
<td>PT offset</td>
</tr>
<tr>
<td>0451, 0452</td>
<td>FP register</td>
<td>R/W, WP</td>
<td></td>
<td>PT slope</td>
</tr>
<tr>
<td>0453, 0454</td>
<td>FP register</td>
<td>R/W, WP</td>
<td></td>
<td>PT damping</td>
</tr>
<tr>
<td>0455, 0456</td>
<td>FP register</td>
<td>R/W, WP</td>
<td>User Entered PT</td>
<td>User Entered PT Value</td>
</tr>
<tr>
<td>0457, 0458</td>
<td>FP register</td>
<td>RO</td>
<td>PVs</td>
<td>ST</td>
</tr>
<tr>
<td>0469, 0470</td>
<td>FP register</td>
<td>RW</td>
<td>PV Scaled Integers</td>
<td>DP_x1</td>
</tr>
<tr>
<td>0471, 0472</td>
<td>FP register</td>
<td>RW</td>
<td></td>
<td>DP_x2</td>
</tr>
<tr>
<td>0473, 0474</td>
<td>FP register</td>
<td>RW</td>
<td></td>
<td>SP_x1</td>
</tr>
<tr>
<td>0475, 0476</td>
<td>FP register</td>
<td>RW</td>
<td></td>
<td>SP_x2</td>
</tr>
<tr>
<td>0477, 0478</td>
<td>FP register</td>
<td>RW</td>
<td></td>
<td>PT_x1</td>
</tr>
<tr>
<td>0479, 0480</td>
<td>FP register</td>
<td>RW</td>
<td></td>
<td>PT_x2</td>
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</table>

*Attributes: R/W = Read/Write, RO = Read Only, WP = Write Protected

**These registers are available at multiple Modbus addresses (see Section 2.3)
### Input Registers

<table>
<thead>
<tr>
<th>Address</th>
<th>Address Type</th>
<th>Attributes</th>
<th>Functional Area</th>
<th>Data / Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>0001</td>
<td>Input register</td>
<td>RO</td>
<td>Identify transmitter</td>
<td>manufacturer’s code (U8)</td>
</tr>
<tr>
<td>0002</td>
<td>Input register</td>
<td>RO</td>
<td></td>
<td>transmitter type code (U8)</td>
</tr>
<tr>
<td>0003</td>
<td>Input register</td>
<td>RO</td>
<td></td>
<td>output board software rev level (U8)</td>
</tr>
<tr>
<td>0004</td>
<td>Input register</td>
<td>RO</td>
<td></td>
<td>sensor module software rev level (U8+U8)</td>
</tr>
<tr>
<td>0005, 0006</td>
<td>Input register</td>
<td>RO</td>
<td></td>
<td>sensor module serial number (U32)</td>
</tr>
<tr>
<td>0007, 0008</td>
<td>Input register</td>
<td>RO</td>
<td></td>
<td>transmitter serial number (U24)</td>
</tr>
<tr>
<td>0009</td>
<td>Input register</td>
<td>RO</td>
<td></td>
<td>hardware rev level (U8)</td>
</tr>
<tr>
<td>0010</td>
<td>Input register</td>
<td>RO</td>
<td></td>
<td>Modbus specific rev level (U8)</td>
</tr>
<tr>
<td>0011</td>
<td>Input register</td>
<td>RO</td>
<td></td>
<td>Sensor Type (U8)</td>
</tr>
<tr>
<td>0012-0015</td>
<td>Input register</td>
<td>RO</td>
<td></td>
<td>Reserved</td>
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## Input Registers

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<th>Attributes</th>
<th>Functional Area</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0017</td>
<td>Input register</td>
<td>RO</td>
<td>Transmitter Info</td>
<td>DP Sensor Range Code (U8)</td>
</tr>
<tr>
<td>0018</td>
<td>Input register</td>
<td>RO</td>
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<td>SP Sensor Range Code (U8)</td>
</tr>
<tr>
<td>0019</td>
<td>Input register</td>
<td>RO</td>
<td></td>
<td>PT Sensor Range Code (U8)</td>
</tr>
<tr>
<td>0020</td>
<td>Input register</td>
<td>RO</td>
<td></td>
<td>Module Isolator Code (U8)</td>
</tr>
<tr>
<td>0021</td>
<td>Input register</td>
<td>RO</td>
<td></td>
<td>Module Fill Fluid Code (U8)</td>
</tr>
<tr>
<td>0076, 0077</td>
<td>Input register</td>
<td>RO</td>
<td>PVs Untrimmed and Corrected Counts</td>
<td>DP (U24)</td>
</tr>
<tr>
<td>0078, 0079</td>
<td>Input register</td>
<td>RO</td>
<td></td>
<td>SP (U24)</td>
</tr>
<tr>
<td>0080, 0081</td>
<td>Input register</td>
<td>RO</td>
<td></td>
<td>PT (U24)</td>
</tr>
<tr>
<td>0082, 0083</td>
<td>Input register</td>
<td>RO</td>
<td></td>
<td>ST (U24)</td>
</tr>
<tr>
<td>0084, 0115</td>
<td>Input register</td>
<td>RO</td>
<td></td>
<td>Reserved</td>
</tr>
<tr>
<td>0116</td>
<td>Input register</td>
<td>RO</td>
<td></td>
<td>DP</td>
</tr>
<tr>
<td>0117</td>
<td>Input register</td>
<td>RO</td>
<td></td>
<td>SP</td>
</tr>
<tr>
<td>0118</td>
<td>Input register</td>
<td>RO</td>
<td></td>
<td>PT</td>
</tr>
<tr>
<td>0119-0124</td>
<td>Input register</td>
<td>RO</td>
<td>Diagnostics</td>
<td>Status Bytes(U16)</td>
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## Input Registers

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<th>Functional Area</th>
<th>DESCRIPTION</th>
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<tr>
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<td>RO</td>
<td>Communication Statistics</td>
<td>Framing Error Count</td>
</tr>
<tr>
<td>0146</td>
<td>Input register</td>
<td>RO</td>
<td></td>
<td>Noise Error Count</td>
</tr>
<tr>
<td>0147</td>
<td>Input register</td>
<td>RO</td>
<td></td>
<td>Overrun Error Count</td>
</tr>
<tr>
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<td>Input register</td>
<td>RO</td>
<td></td>
<td>CRC Error Count</td>
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<td>Good Message Count</td>
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*Attributes: R/W = Read/Write, RO = Read Only, WP = Write Protected

**These registers are available at multiple Modbus addresses (see Section 2.3 located in the Modbus Protocol Guide)

## Holding Registers

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## Holding Registers

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<td>O-ring gasket material (U8)</td>
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<td>R/W, WP</td>
<td>remote seal type (U8)</td>
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<td>R/W, WP</td>
<td>remote seal fill fluid (U8)</td>
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<td>number of remote seals (U8)</td>
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<tr>
<td>0030, 0031</td>
<td>Holding register</td>
<td>R/W, WP</td>
<td>user-entered date</td>
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<td>Modbus units codes for PVs</td>
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<td>Modbus units codes for PVs</td>
<td>PT</td>
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<td>R/W, WP</td>
<td>Reserved</td>
<td>Reserved</td>
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<tr>
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<td>Holding register</td>
<td>R/W, WP</td>
<td>PV Scaled Integers</td>
<td>Maximum Integer</td>
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<td>R/W, WP</td>
<td>LCD</td>
<td>LCD Update Rate</td>
</tr>
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<td>0127, 0128</td>
<td>Holding register</td>
<td>R/W, WP</td>
<td>LCD</td>
<td>LCD Display Bit Mask</td>
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<td>Holding register</td>
<td>R/W, WP</td>
<td>Communications</td>
<td>Turnaround Delay Time</td>
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<td>0132</td>
<td>Holding register</td>
<td>R/W, WP</td>
<td>Floating Point Format Code</td>
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### Holding Registers

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<td>SP Offset</td>
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<td>PT Scale Factor</td>
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*Attributes: R/W = Read/Write, RO = Read Only, WP = Write Protected

**These registers are available at multiple Modbus addresses (see Section 2.3 located in the Modbus Protocol Guide)
ASCII Character Strings

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<td>0032-0035</td>
<td>ASCII</td>
<td>R/W, WP</td>
<td>Transmitter info</td>
<td>user-entered tag (U8x8)</td>
</tr>
<tr>
<td>0036-0043</td>
<td>ASCII</td>
<td>R/W, WP</td>
<td></td>
<td>user-entered descriptor(U8x16)</td>
</tr>
<tr>
<td>0044-0059</td>
<td>ASCII</td>
<td>R/W, WP</td>
<td></td>
<td>user entered message (U8x32)</td>
</tr>
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*Attributes: R/W = Read/Write, RO = Read Only, WP = Write Protected

**These registers are available at multiple Modbus addresses (see Section 2.3 located in the Modbus Protocol Guide)
## Appendix B: Modbus Mapping Assignments by Register

### Coils and Discrete Inputs

<table>
<thead>
<tr>
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<th>Data / Control</th>
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<td>R/W</td>
<td>Diagnostics</td>
<td>Self Test</td>
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</tr>
<tr>
<td>0002</td>
<td>R/W</td>
<td>Master Reset</td>
<td></td>
<td></td>
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<tr>
<td>0003</td>
<td>R/W, WP</td>
<td>Calibration Mode (set by host)</td>
<td></td>
<td></td>
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<td>R/W, WP</td>
<td>RTD present (0=not present, 1 = present)</td>
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<td></td>
</tr>
<tr>
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<td>R/W, WP</td>
<td>Reset Trim to Factory Defaults</td>
<td>DP</td>
<td></td>
</tr>
<tr>
<td>0032</td>
<td>R/W, WP</td>
<td>SP</td>
<td></td>
<td></td>
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<tr>
<td>0033</td>
<td>R/W, WP</td>
<td>PT</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>R/W, WP</td>
<td>Restore Nonvolatile Database</td>
<td>Restore Modbus Section 1</td>
<td></td>
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<tr>
<td>0036</td>
<td>R/W, WP</td>
<td>Restore Modbus Section 2</td>
<td></td>
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<td>0037</td>
<td>R/W, WP</td>
<td>Restore Sensor Section 1</td>
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<td>0039</td>
<td>R/W, WP</td>
<td>Restore Trim Section 1</td>
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<td>0041</td>
<td>R/W, WP</td>
<td>Restore LCD Section 1</td>
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<td>R/W, WP</td>
<td>Restore Mapping Section</td>
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<td>0050-0075</td>
<td>RO</td>
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<td>Status bits</td>
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*Attributes: R/W = Read/Write, RO = Read Only, WP = Write Protected

**These registers are available at multiple Modbus addresses (see Section 2.3 located in the Modbus Protocol Guide)
### Input and Holding Registers (includes Floating Point and ASCII registers)

<table>
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<th>Attributes</th>
<th>Functional Area</th>
<th>DESCRIPTION</th>
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<td>manufacturer’s code (U8)</td>
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<td>0002</td>
<td>Input register</td>
<td>RO</td>
<td></td>
<td>transmitter type code (U8)</td>
</tr>
<tr>
<td>0003</td>
<td>Input register</td>
<td>RO</td>
<td></td>
<td>output board software rev level (U8)</td>
</tr>
<tr>
<td>0004</td>
<td>Input register</td>
<td>RO</td>
<td></td>
<td>sensor module software rev level (U8+U8)</td>
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<td>0005, 0006</td>
<td>Input register</td>
<td>RO</td>
<td></td>
<td>sensor module serial number (U32)</td>
</tr>
<tr>
<td>0007, 0008</td>
<td>Input register</td>
<td>RO</td>
<td></td>
<td>transmitter serial number (U24)</td>
</tr>
<tr>
<td>0009</td>
<td>Input register</td>
<td>RO</td>
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<td>hardware rev level (U8)</td>
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<td>0010</td>
<td>Input register</td>
<td>RO</td>
<td></td>
<td>Modbus specific rev level (U8)</td>
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<tr>
<td>0011</td>
<td>Input register</td>
<td>RO</td>
<td></td>
<td>Sensor Type (U8)</td>
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<td>Input register</td>
<td>RO</td>
<td></td>
<td>Reserved</td>
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<td>R/W, WP</td>
<td>Transmitter info</td>
<td>Transmitter Polling Address</td>
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### Input and Holding Registers (includes Floating Point and ASCII registers)

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<th>DESCRIPTION</th>
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<td>Transmitter Info</td>
<td>SP Sensor Range Code (U8)</td>
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<td>Input register</td>
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<td>Transmitter Info</td>
<td>PT Sensor Range Code (U8)</td>
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<td>Module Isolator Code (U8)</td>
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<td>Transmitter Info</td>
<td>Module Fill Fluid Code (U8)</td>
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<td>flange material code (U8)</td>
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<td>Holding register</td>
<td>R/W, WP</td>
<td>Transmitter Info</td>
<td>flange type code (U8)</td>
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<td>R/W, WP</td>
<td>Transmitter Info</td>
<td>drain/vent code (U8)</td>
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<td>Transmitter Info</td>
<td>O-ring gasket material (U8)</td>
</tr>
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<td>Holding register</td>
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<td>Transmitter Info</td>
<td>remote seal type (U8)</td>
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<td>Transmitter Info</td>
<td>remote seal fill fluid (U8)</td>
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<td>Holding register</td>
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<td>Transmitter Info</td>
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<td>Transmitter Info</td>
<td>number of remote seals (U8)</td>
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### Input and Holding Registers (includes Floating Point and ASCII registers)

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<td>R/W, WP</td>
<td>Modbus units codes for PVs</td>
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<td>Reserved</td>
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<td>PVs Untrimmed and Corrected Counts</td>
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## Input and Holding Registers (includes Floating Point and ASCII registers)

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<td>LCD Update Rate</td>
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<td>Holding register</td>
<td>R/W, WP</td>
<td>LCD Display Bit Mask</td>
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<td>Reserved</td>
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<td>Communication Options</td>
<td>Turnaround Delay Time</td>
</tr>
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<td>Floating Point Format Code</td>
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<td>RO</td>
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<td>DP_y2</td>
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## Input and Holding Registers (includes Floating Point and ASCII registers)

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<td>PVs</td>
<td>DP</td>
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<td>FP register</td>
<td>RO</td>
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<td>SP</td>
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<td>0405, 0406</td>
<td>FP register</td>
<td>RO</td>
<td></td>
<td>PT</td>
</tr>
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<td>0407, 0408</td>
<td>FP register</td>
<td>RO</td>
<td>Diagnostics</td>
<td>Status Bytes</td>
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<td>RO</td>
<td></td>
<td>Status Bytes</td>
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<td>0411, 0412</td>
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<td>RO</td>
<td></td>
<td>Status Bytes</td>
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<td>RO</td>
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<td>RO</td>
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<td>DP lower range limit</td>
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<td>R/W, WP</td>
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<td>FP register</td>
<td>R/W, WP</td>
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<td>DP lower operating limit</td>
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<td>RO</td>
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<td>SP upper range limit</td>
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<td>0423, 0424</td>
<td>FP register</td>
<td>RO</td>
<td></td>
<td>SP lower range limit</td>
</tr>
<tr>
<td>0425, 0426</td>
<td>FP register</td>
<td>R/W, WP</td>
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<td>SP upper operating limit</td>
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### Input and Holding Registers (includes Floating Point and ASCII registers)

<table>
<thead>
<tr>
<th>Address</th>
<th>Address Type</th>
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<th>DESCRIPTION</th>
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<td>0431, 0432</td>
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<td>PT upper operating limit</td>
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<td>R/W, WP</td>
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<td>DP offset</td>
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<tr>
<td>0439, 0440</td>
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<td>R/W, WP</td>
<td></td>
<td>DP slope</td>
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<td>R/W, WP</td>
<td>SP calibration</td>
<td>SP offset</td>
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<td>User Entered PT Value</td>
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## Input and Holding Registers (includes Floating Point and ASCII registers)

<table>
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<tr>
<th>Address</th>
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<td>SP_x2</td>
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*Attributes: R/W = Read/Write, RO = Read Only, WP = Write Protected

**These registers are available at multiple Modbus addresses (see Section 2.3 located in the Modbus Protocol Guide)
### Appendix C: Modbus Mapping of 32-bit Floating Point Registers

#### 32-bit Floating Point Registers

<table>
<thead>
<tr>
<th>Address</th>
<th>Address Type</th>
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<td>FP register</td>
<td>R/W, WP</td>
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<td>PT lower operating limit</td>
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<td>DP calibration</td>
<td>DP offset</td>
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### 32-bit Floating Point Registers

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<th>DESCRIPTION</th>
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<td>SP slope</td>
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<td>R/W, WP</td>
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<td>SP damping</td>
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<td>R/W, WP</td>
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<td>PT slope</td>
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<td>User Entered PT Value</td>
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<td>Integers</td>
<td>DP_x2</td>
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</tr>
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</table>

*Attributes: R/W = Read/Write, RO = Read Only, WP = Write Protected

**These registers are available at multiple Modbus addresses (see Section 2.3 located in the Modbus Protocol Guide)
Appendix D: Scaled Integer Examples

Example 1: Configure DP for -250 to 250 inches of water at 60 F with a scaled integer range of 0 to 65,534

Method 1:
1. Configure the Scaled Integer Method for Method 1
2. Write a 0 to register DP_y1 (see Table 5-7)
3. Write a 65,534 to register DP_y2 (see Table 5-7)
4. Write a -250 to register DP_x1 (see Table 5-8)
5. Write a 250 to register DP_x2 (see Table 5-8)

Method 2:
1. Configure the Scaled Integer Method for Method 2
2. The Scale Factor = \( \frac{y_2 - y_1}{x_2 - x_1} = \frac{65534 - 0}{250 - (-250)} = 131.068 \) Since the Scale Factor must be an integer, the Scale Factor = 131
3. The Offset = \( (Scale \ Factor \ * \ x_1) - y_1 + 32768 = (131 \ * \ (-250)) - 0 + 32768 = 18 \)
4. Write a 65,534 to register Maximum Integer (see Table 5-9)
5. Write a 131 to register DP Scale Factor (see Table 5-10)
6. Write a 18 to register DP Offset (see Table 5-10)

Due to the conversion of the scale factor to an integer value, the actual limits are:

7. \( x_1 = \frac{y_1 + (Offset - 32768)}{Scale \ Factor} = \frac{0 + (18 - 32768)}{131} = -250.0 \)
8. \( x_2 = \frac{y_2 + (Offset - 32768)}{Scale \ Factor} = \frac{65534 + (18 - 32768)}{131} = 250.26 \)
Example 2: Configure DP for 0 to 100 inches of water at 60 F with a scaled integer range of 0 to 10,000

Method 1:
1. Configure the Scaled Integer Method for Method 1
2. Write a 0 to register DP_y1 (see Table 5-7)
3. Write a 10,000 to register DP_y2 (see Table 5-7)
4. Write a 0 to register DP_x1 (see Table 5-8)
5. Write a 100 to register DP_x2 (see Table 5-8)

Method 2:
1. Configure the Scaled Integer Method for Method 2
2. The Scale Factor = \( \frac{y_2 - y_1}{x_2 - x_1} = \frac{10,000 - 0}{100 - 0} = 100 \)
3. The Offset = \( \text{Scale Factor \times x1} - y1 + 32768 = (100 \times 0) - 0 + 32768 = 32768 \)
4. Write a 10,000 to register Maximum Integer (see Table 5-9)
5. Write a 100 to register DP Scale Factor (see Table 5-10)
6. Write a 32,768 to register DP Offset (see Table 5-10)
Section 4  Operation

The 3095FB User Interface (UI) Software is a PC-based package that performs configuration and maintenance functions for the 3095FB transmitter.

SAFETY MESSAGES

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

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explosions could result in death or serious injury.</td>
</tr>
<tr>
<td>• Do not remove the transmitter cover in explosive atmospheres when the circuit is live.</td>
</tr>
<tr>
<td>• Verify that the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.</td>
</tr>
<tr>
<td>• Both transmitter covers must be fully engaged to meet explosion-proof requirements.</td>
</tr>
<tr>
<td>Failure to follow these installation guidelines could result in death or serious injury.</td>
</tr>
<tr>
<td>• Make sure only qualified personnel perform the installation.</td>
</tr>
<tr>
<td>Electrical shock could cause death or serious injury. If the sensor is installed in a high-voltage environment and a fault or installation error occurs, high voltage may be present on the transmitter leads and terminals:</td>
</tr>
<tr>
<td>• Use extreme caution when making contact with the leads and terminals.</td>
</tr>
</tbody>
</table>

INSTALLATION AND INITIAL SETUP

The following are the minimum system requirements to install the UI Software:

- IBM-compatible PC
- Pentium 800 MHz personal computer or above
- Operating System: Microsoft© Windows™ NT, 2000 or XP
- CD-ROM
- 800 x 600 256 color display

Installing the UI Software

The UI Software package is available with or without the RS232-485 converter and connecting cables. The complete UI package contains the UI software CD-ROM, and one RS232-485 converter with cables for connecting the computer to the 3095.
1. Insert the 3095FB UI CD in the CD-ROM drive.
2. On MS Windows, click Start > Run.
3. Type D:\setup.exe in the prompt window and click OK.

**NOTE**
If your CD-ROM is located at a drive letter other than “D”, type that letter instead of “D” in step 3 above (ex. E:\setup.exe).

4. Follow the onscreen instructions provided by installation wizard.

**Connecting to a Personal Computer**

Figure 4-1 shows how to interface a computer and 3095FB.

**Figure 4-1. Connecting a Personal Computer to a Rosemount 3095FB**

**NOTE**
The converter cables may be connected directly to the RS-485 bus or the transmitter terminals. Be sure to observe proper polarity.
1. Power the device as detailed in Section 2.
2. Connect the 9-pin RS232-485 converter to the 9-pin serial communications port on the PC.
3. Remove the cover of the transmitter above the side marked “Field Terminals.”

**WARNING**
Explosions can cause death or serious injury. Do not remove the instrument cover in explosive atmospheres when the circuit is live.

4. Connect the red mini-grabber connector to the “A” terminal and the black mini-grabber connector to the “B” terminal.
5. Launch the 3095FB User Interface Software.

**NAVIGATION & USE**

Figure 4-2 shows the main screen that appears when a valid connection is established between the PC and the 3095FB transmitter.

Figure 4-2. 3095FB User Interface Software - Main Screen
Menu Categories

**File**
Contains screens for creating and saving 3095FB configuration files.

**Setup**
Contains screens for configuration while in “disconnect mode.”

**Transmitter**
Contains screens for configuring the transmitter that is currently connected to the PC via the RS232-485 connector.

**Maintenance**
Contains screens for calibrating the transmitter.

**Diagnostics**
Contains screens to assist in diagnostics and troubleshooting.

**View**
Enable/disable the toolbars that appear in the UI Software

**Help**
View the current revision of the UI Software.

**Hot Keys**
Hot keys provide convenient one-click access to nine of the more popular commands on the 3095FB UI Software.

- Create a new configuration file
- Open an existing configuration file
- Save the active configuration file
- Connect to the transmitter or change the multidrop address
- Trim the sensors for each process variable
- View or change the sensor limits for each process variable
- Download the current configuration to the transmitter
- Upload the current configuration from the transmitter
- View the current revision of the UI software

**CALIBRATION PROCEDURES**
The following procedures outline the major steps for calibrating and configuring the 3095FB. Refer to the individual screen explanations for more detailed information.

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NOTE
Whenever the UI software is about to change the configuration in the transmitter, a warning message will be displayed. It is impossible for the software to know whether the transmitter is on the bench or in the field, controlling extremely hazardous materials. These warnings are to remind you to put any automatic control loops to manual before changing or modifying the 3095FB configuration, and to return the control loops to automatic when you are finished with the configuration procedure.

Bench Configuration (Standard)

1. (If necessary) Select Transmitter > Disconnect to switch to disconnect mode.
2. (Optional) If a configuration file is already created, select File > Open Config... to retrieve those configuration settings.
3. Select Setup > Units..., to select the units of measure for each process variable.
4. Select Setup > Damping... to configure the damping for each process variable.
5. Select Setup > Device Info... to define basic transmitter information.
6. Select Setup > Sensor Limits... to define the upper and lower sensor limits for each process variable.
7. Click Transmitter > Connect to reestablish communication with the transmitter.
8. Select Setup > Send Config... to download the configuration to the transmitter.

Bench Calibration Procedure

After a transmitter is bench configured, the transmitter can be bench calibrated.

1. Select Maintenance > Sensor Trim... to trim each of the process variables.
2. Select DP and click Offset and Slope Trim.
3. Enter in the desired offset (zero) and slope (span) and click Trim.
4. Repeat for steps 3 and 4 for SP and PT process variables.

Field Calibration Procedure

To correct for mounting position effects, field calibrate the 3095FB after installation:

1. Select Maintenance > Sensor Trim... to trim each of the process variables.
2. Select DP and click Offset.
3. Enter in the desired offset value, and click Trim.
4. (Optional) Trim the SP sensor.
   a. Repeat steps 2 and 3 for the SP process variable if using an Absolute Sensor.
   b. For Gage Sensors, vent the GP sensor to atmosphere.
USER INTERFACE SOFTWARE SCREENS

File Menu

- **New Config**
  Create a completely new configuration file from scratch.

- **Open Config…**
  Load a configuration file that has previously been created and saved on the computer.

- **Save Config**
  Save the current configuration file under the same file name.

- **Save Config As…**
  Save the current configuration but with a new file name.

- **Exit**
  Shut down and exit the 3095FB UI Software.

Setup Menu

- **Setup > Host Communications…**

  **Port Parameters:**
  - **Port:** Specifies the serial port on the PC that the RS232-485 converter connects to. COM1 is the most common port in most laptop PCs.
  - **Bit Rate:** Specifies the baud rate for the PC serial communication port. This baud rate must match the transmitter’s baud rate as selected by the jumper positions on the electronics comm. board (see page 2-12).
  - **CTS Delay:** Specifies the delay before a Clear-To-Send message is sent out. (Valid range is 0 – 9999 ms, recommended value is 25 ms.)
  - **Hardware CTS Enabled:** Enable / Disable hardware Clear-To-Send.

  **Poll Parameters:**
  - **Retries:** Specifies the number of retries a Modbus command is resent before the computer declares failed communication. (Valid range is 0 -99, recommended value is 3.)
  - **Reply Timeout:** Specifies the maximum response duration before the computer declares failed communication. (Valid range is 0 – 9999 ms, recommended value is 1000 ms.)
  - **Interpoll Delay:** (Valid range is 0 – 99 ms, recommended value is 10 ms.)
  - **Poll Interval:** (Valid range is 0 – 999,999 ms, recommended value is 2000 ms.)
  - **Extra Cmd Time:** (Valid range is 0 – 9999 ms, recommended value is 500 ms.)
Figure 4-3. Host Communication Screen

Setup > Transmitter Comm…

This screen sets the turnaround delay time between the transmitter and the Modbus host system. In some instances, the 3095FB responds too fast, and the host misses the response message.

Responses from the transmitter can be delayed from 0 – 200 ms. The default value is 50 ms.

**CAUTION**

If the valid delay time value is less than 50 mS, communication problems may occur with the user interface.

Figure 4-4. Transmitter Comm. Screen
Setup > Units…

This screen defines the units of measure for the differential pressure, static pressure, and temperature measurements.

Units of measure are available per Table 4-1.

Table 4-1. Units of Measure

<table>
<thead>
<tr>
<th>Differential Pressure</th>
<th>Static Pressure</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>InH₂O - 60°F</td>
<td>PSI</td>
<td>°F</td>
</tr>
<tr>
<td>InH₂O - 68°F</td>
<td>kPa</td>
<td>°C</td>
</tr>
<tr>
<td>Pa</td>
<td>MPA</td>
<td></td>
</tr>
<tr>
<td>kPa</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 4-5. Units of Measure Screen

Setup > Damping…

The 3095FB has electronic damping that can change the response time of the transmitter to smooth the process variable reading when there are rapid input variations. Different damping values can be entered for the DP, SP, and PT process variables. Available damping values are shown in Table 4-2.

High damping values filter out process noise, but response time is decreased. Low damping values increase response time, but process noise can also be detected. The factory default damping value is 0.864.

To change the damping value, simply enter new values, and click Set Values. If a new value is selected that is not available, the 3095FB automatically selects the closest damping value.

Table 4-2. Damping

<table>
<thead>
<tr>
<th>Available Damping Values (in seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.108</td>
</tr>
<tr>
<td>0.216</td>
</tr>
<tr>
<td>0.432</td>
</tr>
<tr>
<td>0.864</td>
</tr>
<tr>
<td>1.728</td>
</tr>
<tr>
<td>3.456</td>
</tr>
<tr>
<td>6.912</td>
</tr>
<tr>
<td>13.824</td>
</tr>
<tr>
<td>27.648</td>
</tr>
</tbody>
</table>
Figure 4-6. Damping Screen

Setup Damping

DP: 0.396 seconds
SP: 0.396 seconds
PT: 0.396 seconds

NOTE:
The transmitter will assign the damping values to their nearest acceptable values.

Figure 4-7. Device Info Screen

Setup > Device Info…

This screen contains information that can be used to uniquely identify the transmitter. **Tag**, **Date**, **Descriptor**, and **Message** can all be used for transmitter identification purposes. Additionally, material information for the flange, o-ring, drain/vent, and remote seals can be assigned for reference purposes.
Setup > Sensor Limits...

This screen determines the normal sensor operating limits for each of the process variables. If a process value is outside of these set limits, the appropriate alarm status bit will be set (registers 407, 408, or 409. See section 8.0 in *Modbus Protocol Guide* in chapter 3).

Figure 4-8. Sensor Limits Screen

Setup Sensor Operating Limits

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Lower Operating Limit</th>
<th>Upper Operating Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>DP</td>
<td>-250</td>
<td>250</td>
</tr>
<tr>
<td>SP</td>
<td>0</td>
<td>800</td>
</tr>
<tr>
<td>PT</td>
<td>-40</td>
<td>400</td>
</tr>
</tbody>
</table>

InH2O-60°F psi °F

Setup > Data Formats...

Floating Point Format:

- **Byte Transmission Order**: Specifies the byte order for the transmission of IEEE 754 floating point numbers. Changing the byte transmission order only affects the transmission of data that is in floating point form, not integer form. Changing the byte order may be necessary to make sure that floating point numbers are compatible between the 3095FB transmitter and the Modbus host system.

IEEE floating point numbers are made up of 4 bytes (total of 32 bits). The 3095FB can transmit floating point numbers in 4 different byte formats. The default and additional formats are shown in Table 4-3. For more information, refer to section 3.4 in the *Modbus Protocol Guide* in chapter 3.

Table 4-3. Available Floating Point Formats

<table>
<thead>
<tr>
<th>Floating Point Format Code</th>
<th>Byte Transmission Order</th>
<th>Example Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Format 0 (default)</td>
<td>A B C D</td>
<td>$42 C8 80 00</td>
</tr>
<tr>
<td>Format 1</td>
<td>C D A B</td>
<td>$80 00 42 C8</td>
</tr>
<tr>
<td>Format 2</td>
<td>D C B A</td>
<td>$00 80 C8 42</td>
</tr>
<tr>
<td>Format 3</td>
<td>B A D C</td>
<td>$C8 42 00 80</td>
</tr>
</tbody>
</table>
Figure 4-9. Data Formats Screen

Integer Scaling:

- **Scaling Method**: Integer scaling allows the host system to view process variables as integers rather than floating point values. Integer scaling methods are available per Table 4-4.

Table 4-4. Integer Scaling Methods

<table>
<thead>
<tr>
<th>Integer Scaling Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disabled</td>
<td>This is the default setting. Only floating point values will be available when integer scaling is disabled.</td>
</tr>
<tr>
<td>Entered Endpoints</td>
<td>Allows you to define two endpoints for scaling each process variable.</td>
</tr>
<tr>
<td>Entered Scale (slope) Factor &amp; Offset</td>
<td>Allows you to define the scale (slope) factor and offset for scaling each process variable.</td>
</tr>
<tr>
<td>Calculated Scale (slope) Factor &amp; Offset</td>
<td>Allows you to have the User Interface Software calculate the scale (slope) and offset for each process variable.</td>
</tr>
</tbody>
</table>

**Entered Endpoints**

**Entered Endpoints** assigns a low and high integer that corresponds to a low and high process reading and assumes a linear relation for values in-between. Integer values must be between 0 and 65534. For more information, see section 5.3.1.1 in the *Modbus Protocol Guide* located in chapter 3 of the manual.
Figure 4-10. Integer Scaling - Entered Endpoints Screen

**Entered Scale Factor and Offset**

Entered Scale Factor and Offset converts floating point numbers into integers through the equation:

\[ y = (A)(x) - (B - 32768) \]

where

- \( y \) = scaled integer output
- \( x \) = measured value of PV in current units
- \( A \) = scale factor
- \( B \) = offset of scaled integer

For more information, see section 5.3.1.2 in the Modbus Protocol Guide located in chapter 3 of the manual.

1. Define the maximum integer count.
2. Calculate the scale factor ("A" in above equation) for each process variable.
3. Calculate the offset ("B" in above equation) for each process variable.
4. Click **Set Scaling** to implement changes.
Figure 4-11. Integer Scaling - Entered Scale Factor and Offset Screen

Calculated Scale Factor and Offset

The **Calculated Scale Factor and Offset** option works the same way as the **Entered Scale Factor and Offset** feature, only the User Interface automatically calculates the values for the scale and offset.

1. Define the maximum integer count.
2. Choose the rounding method (all integers must be whole number values).
3. Enter in the minimum and maximum process variable limits that will correspond to 0 and the maximum integer count.
4. Click **View Factors...** to show the calculated scale factor and offset values for the entered information in steps 1 – 3. Click **OK** to exit the screen. Modify any of the inputs in steps 1 – 3 if desired.
5. Click **Set Scaling** to implement the changes.
Figure 4-12. Integer Scaling - Calculated Scale Factor and Offset Screen

**Setup > LCD Display…**

This screen allows for the selection of what process variables are shown on the LCD display. The *Update Interval* determines the rate at which the LCD display updates the readings.

Figure 4-13. LCD Display Screen
Setup > Send Config…
Downloads the currently used configuration file to the transmitter.

Setup > Receive Config…
Uploads the configuration file from the transmitter to the User Interface Software.

Transmitter Menu

Connect…

- **Address**: If you know the address for the transmitter that you want the User Interface Software to talk to, type it in and click OK to connect.

- **Transmitters Online**: To view all of the transmitters that are currently on the bus, select Transmitters Online and click search. A list of available transmitters will appear. Select the desired transmitter from the list and click OK to connect.

- **Change Address**: To change the address for a particular transmitter on the RS485 bus, select Change Address. Type in the transmitter’s old address, and assign it a new one. Click OK to implement changes.

**NOTE**
In a multidrop installation, each transmitter must have a different address. These addresses should be set before a transmitter is connected to the bus.

Figure 4-14. Connect Screen

Disconnect
If the **Setup** menu selections are grayed out, this indicates that the User Interface Software is currently connected with a 3095FB transmitter. Click **Transmitter > Disconnect** to disconnect the software from the transmitter, which will then enable the **Setup** menu selections.
These seven links have the same functions and configurations as those found under the Setup menu. The only difference is the changes made happen immediately to the transmitter, as apposed to working in disconnect mode with the Setup menu. For complete information and on configuring these screens, reference the instructions found under the Setup menu section in this same chapter.

**Maintenance Menu**

**Sensor Trim...**

The sensor trim screens are used during bench and field calibration of the 3095FB transmitter.

In addition to the User Interface Software, the following equipment is required for a sensor trim:

- 3095FB transmitter
- Dead-weight tester
- Power supply and load resistor
- Vacuum pump or a barometer that is at least 3 times as accurate as the 3095FB AP sensor. The barometer is preferred. (Only required for transmitters equipped with an AP sensor).
- Ice bath and hot oil bath for trimming the RTD probe.

Table 4-5 identifies the sensor range limits for the 3095FB transmitter.

### Table 4-5. Sensor Range Limits

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Lower Reading Limit (LRL)</th>
<th>Upper Reading Limit (URL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DP Range 2</td>
<td>250 in.H20 (-622.7 mbar)</td>
<td>250 in.H20 (622.7 mbar)</td>
</tr>
<tr>
<td>DP Range 3</td>
<td>1000 in.H20 (-2.49 bar)</td>
<td>1000 in.H20 (2.49 bar)</td>
</tr>
<tr>
<td>AP Range 3</td>
<td>0.5 psia (1.245 mbar)</td>
<td>800 psia (55.2 bar)</td>
</tr>
<tr>
<td>AP Range 4</td>
<td>0.5 psia (1.245 mbar)</td>
<td>3626 psia (250 bar)</td>
</tr>
<tr>
<td>GP Range C</td>
<td>0 psig (0 bar)</td>
<td>800 psig (55.2 bar)</td>
</tr>
<tr>
<td>GP Range D</td>
<td>0 psig (0 bar)</td>
<td>3626 psig (250 bar)</td>
</tr>
<tr>
<td>PT</td>
<td>-40 °F (-40 °C)</td>
<td>1200 °F (649 °C)</td>
</tr>
</tbody>
</table>

**Sensor Trim Procedure (Full Calibration)**

1. Isolate the transmitter from the process by closing the block valves and opening the equalize valve on the manifold.
Figure 4-15. Sensor Selection and Trim Screen

2. SP Offset (zero) and Slope (span) Trim
   a. Select SP from the **Sensor Selection** heading, and click **Offset and Slope Trim**.
   b. Enter the **Offset Trim Point** and **Slope Trim Point** values that will be applied by a reference device, and click **Trim**.
   c. Apply the offset trim value.
      • If using a vacuum pump, pull a vacuum to both the high and low sides of the transmitter. Wait for the measured value to stabilize, and click **OK**.
      • If vented to atmosphere and using a barometer, wait for the measured value to stabilize, and click **OK**.
   d. Using a deadweight tester, apply the desired slope trim value (high pressure value) to both the low and high sides of the transmitter. Wait for the measured value to stabilize, and click **OK**.
3. **DP Offset (zero) and Slope (span) Trim**
   a. Select DP from the Sensor Selection heading, and click Offset and Slope Trim.
   b. Enter the Offset Trim Point and Slope Trim Point values that will be applied by a reference device, and click Trim.
   c. Using a deadweight tester, apply the desired offset trim value (low pressure value) to only the high side of the transmitter. Wait for the measured value to stabilize, and click OK.
   d. Using a deadweight tester, apply the desired slope trim value (high pressure value) to only the high side of the transmitter. Wait for the measured value to stabilize, and click OK.

4. **PT Offset (zero) and Slope (span) Trim**
   a. Select PT from the Sensor Selection heading, and click Offset and Slope Trim.
   b. Enter the Offset Trim Point and Slope Trim Point values that will be applied, and click Trim.
   c. Insert the RTD probe into an ice bath. Wait for the measured value to stabilize, and click OK.
   d. Insert the RTD probe into a hot oil bath. Wait for the measured value to stabilize, and click OK.

**NOTE**
A calibrated decade box can be used instead of the ice bath and the hot oil bath. However, trim results may not be as accurate since the RTD probe is not used in the trim procedure.

5. Return the transmitter to service by closing the equalize valves and opening the block valves.

**NOTE**
To protect the sensor module, do NOT close the bypass valve on the manifold until after process pressure has been reapplied. This keeps one side of the DP sensor from being subjected to high pressure while the other side has no pressure applied.
Sensor Trim Procedure (Field Calibration)

To correct mounting position effects, field calibrate the 3095FB after installation.

1. Perform a DP Offset (zero)
   a. Select DP from the Sensor Selection heading, and click Offset Trim.
   b. Enter the Offset Trim Point, and click Trim.
   c. Wait for the measured value to stabilize, and click OK.

2. (Optional) If a barometer that is at least 3 times as accurate as the 3095FB AP sensor is available, perform an SP Offset (zero).
   a. Select SP from the Sensor Selection heading, and click Offset Trim.
   b. Enter the Offset Trim Point, and click Trim.
   c. Wait for the measured value to stabilize, and click OK.

Maintenance > Fixed Process Temp…

This selection allows enabling or disabling the process temperature input from the RTD. To disable the process temperature input:

1. Select Fixed Process Temperature – Absent RTD so that an “x” appears in the box.

2. Enter the desired fixed temperature (between -40 and 1200 °F), then click OK.

To enable the process temperature input from the RTD, simply deselect the Fixed Process Temperature – Absent RTD box.

The 3095FB can be configured so that a user-selected temperature will be used as the process temperature measurement if an RTD failure occurs.

1. Select Fixed Process Temperature – Absent RTD so that an “x” appears in the box.

2. Enter the desired fixed temperature, and click OK.

3. Reopen the fixed process temperature screen by selecting Maintenance > Fixed Process Temp…

4. Deselect the Fixed Process Temperature box so that the box is empty, and click OK.
At the end of this procedure, the process temperature input is enabled, and the process temperature register will contain the current measured temperature. If an RTD failure occurs, the temperature entered in step 3 will be stored in the process temperature register. In addition, “RTD isDisconnected” exception handling status bits will be set (Section 8.0 in the Modbus Protocol Guide located in chapter 3 of the manual).

**Diagnostics Menu**

**Read Outputs…**

This screen displays continuously updated readings for the process variables.

**Figure 4-18. Read Outputs Screen**

![Read Outputs Screen](image)

**Diagnostics > Device Info > Module Info…**

The module information screen displays read-only information about the sensor module.
Figure 4-19. Module Information Screen

![Module Information Screen]

**Diagnosics > Device Info > Identification Info…**

This screen displays information about hardware and software revisions, as well as device serial numbers.

Figure 4-20. Identification Information Screen

![Identification Information Screen]
Diagnostics > Transmitter Master Reset...

The transmitter master reset command reinitializes the transmitter microprocessor. This is the equivalent of removing and then reapplying power to the transmitter.

Diagnostics > Transmitter Self Test...

The transmitter self test performs a series of test to validate the transmitter non-volatile memory. When finished, the Diagnostics > Error Info... screen is automatically displayed to show the test results.

Diagnostics > Error Info...

This screen identifies the current error status for the 3095FB transmitter. The screen is NOT actively updated. Section 8.0 of the Modbus Protocol Guide in Chapter 3 of the manual identifies the possible errors that could be displayed.

Figure 4-21. Error Info Screen

View Menu

ToolBar

This selection toggles the toolbar on and off.

Status Bar

This selection toggles the status bar on and off.

Help Menu

About 3095 Configurator...

This screen displays the version of the 3095 User Interface Software that is in use.
Section 5  Troubleshooting

OVERVIEW
This chapter provides summarized troubleshooting suggestions for the most common operating problems.

If you suspect a malfunction despite the absence of any diagnostic messages on the communicator display, follow the procedures described here to verify that transmitter hardware and process connections are in good working order. Always deal with the most likely and easiest-to-check conditions first.

SAFETY MESSAGES
Procedures and instructions in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that raises potential safety issues is indicated by a warning symbol. Refer to the following safety messages before performing an operation preceded by this symbol.

Warnings

⚠️ WARNING
Explosions could result in death or serious injury.
- Do not remove the transmitter cover in explosive atmospheres when the circuit is live.
- Both transmitter covers must be fully engaged to meet explosion-proof requirements.

⚠️ CAUTION
Static electricity can damage sensitive components.
- Observe safe handling precautions for static-sensitive components.
**COMMUNICATION PROBLEMS**

Table 5-1 identifies the most likely causes for communication problems with the 3095FB transmitter.

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Corrective Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>No communication between the User Interface Software and the transmitter</td>
<td>Check for proper voltage across the power terminals of the transmitter (7.5 – 30 V dc). Check for intermittent shorts, open circuits, and multiple grounds. Verify the RS-485 bus is terminated with 120 Ohm resistors at each end of the bus. Verify the RS-485 bus is NOT terminated at points other than at each end of the bus. Verify that the RS-485 converter is connected to the A and B terminals, not the power terminals. Test the opposite polarity connection to the RS-485 bus. Verify identical baud rates for computer and transmitter. Verify the correct COMM port is selected. Verify the laptop computer is not in low energy mode (some models disable all comm ports in low energy mode).</td>
</tr>
<tr>
<td>No communication between the transmitter and the Modbus host</td>
<td>Check for proper voltage across the power terminals of the transmitter (7.5 – 30 V dc). Check for intermittent shorts, open circuits, and multiple grounds. Verify the RS-485 bus is terminated with 120 Ohm resistors at each end of the bus. Verify the RS-485 bus is NOT terminated at points other than at each end of the bus. Verify the power wiring and RS-485 bus wiring are not switched. Verify identical baud rates for the RTU and transmitter. Verify you are talking to the correct transmitter address. Possible noise on the bus - switch both &quot;A&quot; and &quot;B&quot; pull-up switches on the comm board of only one transmitter to the &quot;on&quot; position (see Figure 2-5). The turnaround time for the transmitter may be too fast for RTU. Try using a longer time (see page 4-7). The RTU may be polling too fast and cutting off the transmitter response messages. Try adjusting the polling time on the RTU. Verify the software for the RTU is functioning properly.</td>
</tr>
<tr>
<td>Transmitter is not sending meaningful data</td>
<td>Verify that the 3095FB is transmitting floating point data in the correct format for the RTU (see page 4-10). The RTU may have register addresses referenced to 0 rather than 1. Try subtracting or adding 1 from register addresses when polling.</td>
</tr>
</tbody>
</table>

**ALARMS AND CONDITIONS**

If an alarm or error condition exists in the 3095FB, it will be displayed in the Modbus registers (Section 3: 8.1.1 in the *Modbus Protocol Guide* located in this manual). Specific alarm conditions can be viewed via the Configurator User Interface software (see the **Diagnostics > Error Info...** selection).

**NOTE**

Alarms are not logged or archived. The alarms and error conditions displayed on the **Diagnostics > Error Info...** Info screen indicate the alarms present at the time of command invocation.
Table 5-2 identifies corrective actions for 3095FB alarms and events.

<table>
<thead>
<tr>
<th>Floating Point Reg./Bit Posit.</th>
<th>Sets Alarm/Warning Flag?</th>
<th>Alarm Description</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>20407</td>
<td>15</td>
<td>Calibration flag</td>
<td>Indicates that the host has set the calibration flag. No action required. For more information, see page 31 in the Modbus Master Document.</td>
</tr>
<tr>
<td>20407</td>
<td>14</td>
<td>Critical alarm: PVs may not be valid</td>
<td>Summation alarm flag. This register is set if any Alarm (A) register is set.</td>
</tr>
<tr>
<td>20407</td>
<td>13</td>
<td>Warning: PVs outside specifications</td>
<td>Summation warning flag. This register is set if any Warning (W) register is set.</td>
</tr>
<tr>
<td>20407</td>
<td>12</td>
<td>DP signal exceeded Upper Range Limit + 10%</td>
<td>This display means that the transmitter differential pressure reading exceeds its sensor limits by more than 10%. There are two possible causes. Either the transmitter is overpressured, or it has a sensor malfunction. Check the pressure input to the transmitter. If an overpressure condition exists, correct it. If not, replace the sensor module as described on page 5-7.</td>
</tr>
<tr>
<td>20407</td>
<td>11</td>
<td>DP signal exceeded Upper Range Limit</td>
<td>No action required.</td>
</tr>
<tr>
<td>20407</td>
<td>10</td>
<td>DP signal exceeded Upper Operating Limit</td>
<td>No action required.</td>
</tr>
<tr>
<td>20407</td>
<td>9</td>
<td>DP signal is less than Lower Operating Limit</td>
<td>No action required.</td>
</tr>
<tr>
<td>20407</td>
<td>8</td>
<td>DP signal is less than Lower Range Limit</td>
<td>No action required.</td>
</tr>
<tr>
<td>20407</td>
<td>7</td>
<td>DP signal is less than Lower Range Limit - 10%</td>
<td>This display means that the transmitter differential pressure reading exceeds its sensor limits by more than 10%. There are two possible causes. Either the transmitter is underpressured, or it has a sensor malfunction. Check the pressure input to the transmitter. If an overpressure condition exists, correct it. If not, replace the sensor module as described on page 5-7.</td>
</tr>
<tr>
<td>20407</td>
<td>6</td>
<td>SP signal exceeded Upper Range Limit + 10%</td>
<td>This display means that the transmitter absolute (or gage) pressure reading exceeds its sensor limits by more than 10%. There are two possible causes. Either the transmitter is overpressured, or it has a sensor malfunction. Check the pressure input to the transmitter. If an overpressure condition exists, correct it. If not, replace the sensor module as described on page 5-7.</td>
</tr>
<tr>
<td>20407</td>
<td>5</td>
<td>SP signal exceeded Upper Range Limit</td>
<td>No action required.</td>
</tr>
<tr>
<td>20407</td>
<td>4</td>
<td>SP signal exceeded Upper Operating Limit</td>
<td>No action required.</td>
</tr>
<tr>
<td>20407</td>
<td>3</td>
<td>SP signal is less than Lower Operating Limit</td>
<td>No action required.</td>
</tr>
<tr>
<td>20407</td>
<td>2</td>
<td>SP signal is less than Lower Range Limit</td>
<td>No action required.</td>
</tr>
<tr>
<td>20407</td>
<td>1</td>
<td>SP signal is less than Lower Range Limit - 10%</td>
<td>This display means that the transmitter absolute (or gage) pressure reading exceeds its sensor limits by more than 10%. There are two possible causes. Either the transmitter is underpressured, or it has a sensor malfunction. Check the pressure input to the transmitter. If an overpressure condition exists, correct it. If not, replace the sensor module as described on page 5-7.</td>
</tr>
</tbody>
</table>
# TABLE 5-2. Rosemount 3095FB Alarm and Event Summary

<table>
<thead>
<tr>
<th>Floating Point Reg./Bit Pos.</th>
<th>Sets Alarm/Warning Flag?</th>
<th>Alarm Description</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>20407 0</td>
<td>A</td>
<td>SP sensor shorted</td>
<td>The sensor module has undergone a component or software failure. Replace the sensor module as described on page 5-7. Contact your Field Service Center.</td>
</tr>
<tr>
<td>20408 15</td>
<td>A</td>
<td>SP signal is unreasonable - open bridge</td>
<td>This display means that the transmitter absolute (or gage) pressure reading exceeds its sensor limits. There are two possible causes. Either the transmitter is overpressured, or it has a sensor malfunction. Check the pressure input to the transmitter. If an overpressure condition exists, correct it. If not, replace the sensor module as described on page 5-7.</td>
</tr>
<tr>
<td>20408 14</td>
<td>A</td>
<td>PT signal exceeded Upper Range Limit + 10%</td>
<td>Check the transmitter RTD connector and RTD screw terminals to ensure the RTD cable is properly connected. Verify that the process temperature is between -40°F and 400°F. If process temperature exceeds these limits, correct the temperature. If process temperature is within these limits, replace the sensor module as described on page 5-7.</td>
</tr>
<tr>
<td>20408 13</td>
<td>W</td>
<td>PT signal exceeded Upper Range Limit</td>
<td>No action required.</td>
</tr>
<tr>
<td>20408 12</td>
<td>W</td>
<td>PT signal exceeded Upper Operating Limit</td>
<td>No action required.</td>
</tr>
<tr>
<td>20408 11</td>
<td></td>
<td>PT signal is less than Lower Operating Limit</td>
<td>No action required.</td>
</tr>
<tr>
<td>20408 10</td>
<td>W</td>
<td>PT signal is less than Lower Range Limit</td>
<td>No action required.</td>
</tr>
<tr>
<td>20408 9</td>
<td>A</td>
<td>PT signal is less than Lower Range Limit - 10%</td>
<td>Check the transmitter RTD connector and RTD screw terminals to ensure the RTD cable is properly connected. Verify that the process temperature is between -40°F and 400°F. If process temperature exceeds these limits, correct the temperature. If transmitter temperature is within these limits, replace the sensor module as described on page 5-7.</td>
</tr>
<tr>
<td>20408 8</td>
<td>A</td>
<td>RTD is disconnected</td>
<td>Check the transmitter RTD connector and RTD screw terminals to ensure the RTD cable is properly connected.</td>
</tr>
<tr>
<td>20408 7</td>
<td>A</td>
<td>ST signal is greater than high limit</td>
<td>This message indicates that the ambient temperature limit of the transmitter is being exceeded. Verify that the transmitter ambient temperature is between -40 °F and 185 °F. If transmitter temperature exceeds these limits, correct the temperature. If transmitter temperature is within these limits, replace the sensor module as described on page 5-7.</td>
</tr>
<tr>
<td>20408 6</td>
<td>A</td>
<td>ST signal is less than lower limit</td>
<td>This message indicates that the ambient temperature limit of the transmitter is being exceeded. Verify that the transmitter ambient temperature is between -40°F and 185°F. If transmitter temperature exceeds these limits, correct the temperature. If transmitter temperature is within these limits, replace the sensor module as described on page 5-7.</td>
</tr>
<tr>
<td>20408 5</td>
<td></td>
<td>Reserved</td>
<td>NA.</td>
</tr>
<tr>
<td>20408 4</td>
<td></td>
<td>Reserved</td>
<td>NA.</td>
</tr>
<tr>
<td>20408 3</td>
<td></td>
<td>Reserved</td>
<td>NA.</td>
</tr>
<tr>
<td>20408 2</td>
<td></td>
<td>Reserved</td>
<td>NA.</td>
</tr>
<tr>
<td>20408 1</td>
<td></td>
<td>Reserved</td>
<td>NA.</td>
</tr>
<tr>
<td>20408 0</td>
<td></td>
<td>Reserved</td>
<td>NA.</td>
</tr>
</tbody>
</table>
TABLE 5-2. Rosemount 3095FB Alarm and Event Summary

<table>
<thead>
<tr>
<th>Floating Point Reg./ Bit Pos.</th>
<th>Sets/Alarm/ Warning Flag</th>
<th>Alarm Description</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>20409 15</td>
<td>A</td>
<td>Sensor module is NOT updating</td>
<td>The sensor module has undergone a component or software failure. Replace the sensor module as described on page 5-7. Contact your Field Service Center.</td>
</tr>
<tr>
<td>20409 14</td>
<td>A</td>
<td>Sensor board eeprom not initialized, default values used</td>
<td>The sensor electronics has not initialized properly. Replace the sensor module as described on page 5-7. Contact your Field Service Center.</td>
</tr>
<tr>
<td>20409 13</td>
<td>A</td>
<td>Sensor microprocessor does not respond</td>
<td>The sensor module has undergone a component or software failure. Replace the sensor module as described on page 5-7. Contact your Field Service Center.</td>
</tr>
<tr>
<td>20409 12</td>
<td>A</td>
<td>Sensor board eeprom burn failure</td>
<td>The sensor module has undergone a component or software failure. Replace the sensor module as described on page 5-7. Contact your Field Service Center.</td>
</tr>
<tr>
<td>20409 11</td>
<td>A</td>
<td>Sensor hardware incompatible with software</td>
<td>The sensor hardware is incompatible with the software. Replace the sensor module as described on page 5-7. Contact your Field Service Center.</td>
</tr>
<tr>
<td>20409 10</td>
<td>A</td>
<td>Sensor CRC error (static region)</td>
<td>Sensor CRC checksum failed indicating corrupted sensor module memory. Replace the sensor module as described on page 5-7.</td>
</tr>
<tr>
<td>20409 9</td>
<td>A</td>
<td>Sensor CRC error (dynamic region)</td>
<td>Sensor CRC checksum failed indicating corrupted sensor module memory. Replace the sensor module as described on page 5-7.</td>
</tr>
<tr>
<td>20409 8</td>
<td>Reserved</td>
<td>NA.</td>
<td></td>
</tr>
<tr>
<td>20409 7</td>
<td>Reserved</td>
<td>NA.</td>
<td></td>
</tr>
<tr>
<td>20409 6</td>
<td>A</td>
<td>Flash output board eeprom soft (recoverable) error</td>
<td>If this is a common error, replace the output electronics board as described on page 5-7.</td>
</tr>
<tr>
<td>20409 5</td>
<td>A</td>
<td>Flash output board eeprom hard (non-recoverable) error</td>
<td>The transmitter electronics has undergone a component or software failure. Replace the output electronics board as described on page 5-7.</td>
</tr>
<tr>
<td>20409 4</td>
<td>A</td>
<td>Flash output board eeprom time out</td>
<td>If this is a common error, replace the output electronics board as described on page 5-7.</td>
</tr>
<tr>
<td>20409 3</td>
<td>Reserved</td>
<td>NA.</td>
<td></td>
</tr>
<tr>
<td>20409 2</td>
<td>A</td>
<td>Non-volatile database CRC error</td>
<td>Non-volatile database checksum failed. Attempt to restore non-volatile database to factory defaults (see page 41 in Modbus Master Document). If unable to restore these factory defaults, replace the output electronics board as described on page 5-7.</td>
</tr>
<tr>
<td>20409 1</td>
<td>Write protect status flag</td>
<td>Reflects write protect jumper position. No action required.</td>
<td></td>
</tr>
<tr>
<td>20409 0</td>
<td>Bit not used</td>
<td>Bit not used</td>
<td></td>
</tr>
</tbody>
</table>

Disassembly Procedures

Read the following information carefully before disassembling a transmitter. General information concerning the process sensor body and electrical housing is included in the following sections.

**WARNING**

Explosions can result in death or serious injury. Do not remove the instrument cover in explosive environments.
Remove the transmitter from Service

Once a transmitter is determined to be inoperable, remove it from service. Be aware of the following:

- Isolate and vent the process from the transmitter before removing the transmitter from service.
- Remove all electrical leads and conduit.
- Detach the process flange by removing the four flange bolts and the two alignment screws that secure it.
- Do not scratch, puncture, or depress the isolating diaphragms.
- Clean isolating diaphragms with a soft rag and a mild cleaning solution, and rinse with clear water.
- Whenever you remove the process flange or flange adapters, visually inspect the Teflon O-rings. Replace the O-rings if they show any signs of damage, such as nicks or cuts. If they are undamaged, you may reuse them.

Remove the Terminal Block

Electrical connections are located on the terminal block in the compartment labeled “FIELD TERMINALS.” Remove the housing cover (see Figure 5-1). Loosen the two small screws located at the 9 o'clock and 4 o'clock positions, and pull the entire terminal block out to remove it.

Figure 5-1. Removing the Terminal Block Housing Cover

Remove the Electronics Board

The transmitter electronics board is located in the compartment opposite the terminal side. To remove the electronics board, perform the following procedure:

1. Remove the housing cover opposite the field terminal side.
2. Loosen the two captive screws that anchor the board to the housing.
3. The electronics board is electrostatically sensitive; observe handling precautions for static-sensitive components.
NOTE
If you are disassembling a transmitter with a LCD display, loosen the two captive screws that are visible on the right and left side of the meter display. The two screws anchor the LCD display to the electronics board and the electronics board to the housing.

4. Slowly pull the electronics board out of the housing. With the two captive screws free of the transmitter housing, only the sensor module ribbon cable holds the board to the housing (see Figure 5-2).

5. Disconnect the sensor module ribbon cable to release the electronics board from the transmitter (See Figure 5-2).

Figure 5-2. Removing the Electronics Board

Removing the Sensor Module from the Electronics Housing

1. Carefully tuck the cable connector completely inside of the internal shroud (see Figure 5-3).

CAUTION
The circuit board is electrostatically sensitive. To prevent damage to the circuit board, be sure to observe handling precautions for static-sensitive components.

CAUTION
Before removing the sensor module from the electrical housing, disconnect the electronics board power cable from the sensor module. This will prevent damage to the sensor module ribbon cable.
Figure 5-3. Tucking the Cable Connector

2. Loosen the housing rotation set screw with a hex wrench, and back off one full turn (see Figure 5-3).

**CAUTION**

Before removing the sensor module from the electrical housing, disconnect the electronics board power cable from the sensor module. This will prevent damage to the sensor module ribbon cable.

Figure 5-4. Loosening the Housing Rotation Screws

3. Unscrew the housing from the module, making sure the shroud and sensor cable do not catch on the housing. Damage can occur to the cable if the internal shroud and sensor cable rotate with the housing. Carefully pull the shroud and sensor ribbon cable assembly through the housing opening.

**REAASSEMBLY PROCEDURE**

Follow these procedures carefully to ensure proper reassembly:
1. Inspect all cover and housing (non-process-wetted) O-rings and replace if necessary. Lightly grease with silicone lubricant to ensure a good seal.

2. Carefully tuck the cable connector completely inside the internal shroud. To do this, turn the shroud and cable counterclockwise one rotation to tighten the cable.

3. Lower the electronics housing onto the module. Guide the internal shroud and cable through the housing and into the external shroud.

4. Turn the housing clockwise to fasten it to the module.

**CAUTION**

To prevent damage to the cable connector, watch the cable and shroud as you attach the housing to the module. Make sure the cable connector does not slip out of the internal shroud and begin to rotate with the housing. Reinsert the cable connector into the shroud if it escapes before the housing is fully fastened.

5. Thread the housing completely onto the sensor module. The housing must be no more than one full turn from flush with the sensor module to comply with explosion proof requirements.

6. Tighten the housing rotation set screw using a hex wrench.
Attach the Electronics Board

1. Remove the cable connector from its position inside of the internal shroud and attach it to the electronics board.

2. Insert the electronics board into the housing, making sure that the posts from the electronics housing properly engage the receptacles on the electronics board.

3. Tighten the captive mounting screws.

4. Replace the electronics housing cover. The transmitter covers must be engaged metal-to-metal to ensure a proper seal and to meet Explosion-Proof requirements.

Install the Terminal Block

Gently slide the terminal block into place, making sure the posts from the electronics housing properly engage the receptacles on the terminal block. Tighten the captive screws and replace the electronics housing cover. The transmitter covers must be fully engaged to meet Explosion-Proof requirements.

Reassembling the Process Sensor Body

1. Visually inspect the Teflon sensor module O-rings. If the O-rings are undamaged, you may reuse them. If the O-rings show signs of damage, such as nicks or cuts, or if there is any doubt about their ability to seal properly, replace them with new O-rings.

NOTE
If you are replacing the O-rings, be careful not to scratch the O-ring grooves or the surface of the isolating diaphragm when removing the damaged O-rings.

2. Install the process flange on the sensor module. To hold the process flange in place, install the two hex head alignment screws. While these screws are not pressure retaining, tighten the hex head alignment screws to 33 in-lbs to ensure proper alignment. Do not over-tighten; this will affect the module/flange alignment.

3. Install the appropriate flange bolts:
   - For installations requiring a 1/4–18 NPT mounting, install the four 1.75-inch process flange bolts. First, finger-tighten the bolts. Then tighten the bolts incrementally in a cross pattern until they are securely tightened to 650 in-lb (300 in-lb for stainless steel bolts). After tightening, the bolts should protrude through the top of the module housing.
   - For installations requiring a 1/2–14 NPT mounting, hold the optional flange adapters and flange adapter O-rings in place while finger-tightening the four 2.88-inch process flange/adapter bolts. Tighten the bolts in a cross pattern following the procedure outlined above. (Use two 2.88-inch bolts and two 1.75-inch bolts for gage pressure configurations.) After tightening, the bolts should protrude through the top of the module housing. If the bolts do not extend all the way through the module housing, you have used a bolt of incorrect length. Replace the bolt with one of the correct length, and repeat the procedure.
   - For installations with a three-valve manifold, align the process flange with the three-valve manifold. Install the four 2.25-inch manifold flange bolts following the procedure outlined above. After tightening, the bolts should protrude through the top of the module housing. If the bolts do
not extend all the way through the module housing, you have used a bolt of incorrect length. Replace the bolt with one of the correct length, and repeat the procedure. Optional flange adapters can be installed on the process end of the three-valve manifold using the 1.75-inch flange bolts supplied with the transmitter.

4. **IF** you replaced the Teflon sensor module O-rings, **THEN** re-torque the flange bolts after installation to compensate for cold flow.

5. Install the drain/vent valve.
   a. Apply sealing tape to the threads on the seat. Starting at the base of the valve with the threaded end pointing toward the installer, apply two clockwise turns of the sealing tape.
   b. Take care to place the opening on the valve so that process fluid will drain toward the ground and away from personnel when the valve is opened.
   c. Tighten the drain/vent valve to 250 in-lb.

---

**NOTE**

After replacing O-rings on Range 1 (DP) transmitters and re-installing the process flange, expose the transmitter to a temperature of 185 °F (85 °C) for two hours. Then re-tighten the flange bolts in a cross pattern, and again expose the transmitter to a temperature of 185 °F (85 °C) for two hours before calibration.
Appendix A

Specifications and Reference Data

FUNCTIONAL SPECIFICATIONS

Service
Gas, Liquid, or Steam

Differential Sensor
Limits
- Code 2: –250 to 250 inH₂O (-0,622 to 0,622 bar)
- Code 3: –1000 to 1000 inH₂O (-2,49 to 2,49 bar)

Absolute Sensor
Limits
- Code 3: 0.5 to 800 psia (3,447 to 5516 kPa)
- Code 4: 0.5 to 3,626 psia (3,447 to 25000 kPa)

Gage Sensor
Limits
- Code C: 0 to 800 psig (0 to 5516 kPa)
- Code D: 0 to 3,626 psig (0 to 25000 kPa)

Over Pressure Limit
0.5 psia to two times the absolute pressure sensor range with a maximum of 3,626 psia.

Static Pressure Limit
Operates within specifications between static line pressures of 0.5 psia and the URL of the absolute pressure sensor.

Power
- Quiescent supply current 10 mA typical. Transmitting supply current not to exceed 100 mA.
- External power supply required
- Transmitter: operates on terminal voltage of 7.5 - 42 Vdc

RS-485 Signal Wiring
2-wire half-duplex RS-485 MODBUS with 8 data bits, 1 stop bit, and no parity

Bus Terminations
Standard RS-485 bus terminations required per EIA-485.

Failure Mode Alarm
If self-diagnostics detect a gross transmitter failure, non-latched status bits are set in the transmitter alarm registers.

Humidity Limits
- 0 – 100% relative humidity

Communications
User Interface: EIA-232 (RS-232C) format
Baud Rate: 600 to 19.2 K User selectable
Host: RS-485 / RS-232
User Interface Software and Hardware Requirements:
- IBM-compatible PC
- 10 MB of available hard drive space
- Microsoft® Windows® 98 or higher operating system
- CD-ROM drive
- 32 MB of RAM

Temperature Limits
Process (at transmitter isolator flange for atmospheric pressures and above):
- –40 to 250 °F (–40 to 121 °C)
- Inert fill sensor: 0 to 185 °F (-18 to 85 °C).
- Process temperatures above 185 °F (85 °C) requires derating the ambient limits by a 1.5:1 ratio.

Ambient:
- –40 to 185 °F (–40 to 85 °C)
- with integral meter: -4 to 175 °F (-20 to 75 °C)

Storage:
- –50 to 212 °F (–46 to 100 °C)
- with integral meter: -40 to 185 °F (-40 to 85 °C)

Turn-on Time
Process variables will be within specifications less than 4 seconds after power is applied to transmitter.

Damping (3095FB only)
Response to step input change can be user-selectable from 0.1 to 30 seconds for one time constant. This is in addition to sensor response time of 0.2 seconds.

PERFORMANCE SPECIFICATIONS
(Zero-based spans, reference conditions, silicone oil fill, 316 SST isolating diaphragms, and digital trim values to the span end points)

Specification Conformance
The Rosemount 3095FB maintains a specification conformance of measured variables to at least 3σ.

Differential Pressure
Range 2
- 0–2.5 to 0–250 inH₂O (0–6.2 to 0–622.7 mbar)
  (100:1 rangeability is allowed)

Range 3
- 0–10 to 0–1000 inH₂O(0–0.0249 to 0–2.49 bar)
  (100:1 rangeability is allowed)

Accuracy (including Linearity, Hysteresis, Repeatability)
Range 2-3: 3095FB Ultra for Flow (Option U3)(1)
- ±0.05% DP reading for rangedown from 1:1 to 3:1 of URL
- For rangedown greater than 3:1 of URL
- Accuracy = \[0.05 + 0.0145 (URL\ Reading)\]% Reading
  
Range 2-3:
- ±0.075% of span for spans from 1:1 to 10:1 URL
- For spans less than 10:1 rangedown
  
Accuracy = \[0.025 + 0.005 (URL\ Span)\]% of span

---

(1) Ultra for Flow (Option U3) applicable for DP ranges 2 and 3 with SST isolator material and silicone fill fluid only.
Ambient Temperature Effect per 50 °F (28 °C)
Range 2-3: 3095FB Ultra for Flow (Option U3)\(^1\)
- ±0.130% reading for rangedown from 1:1 to 3:1 of URL
- ±[0.05 + 0.0345 (URL/Reading)]% Reading > 3:1 to 100:1 of URL

Range 2-3:
- ±(0.025% URL + 0.125% span) spans from 1:1 to 30:1
- ±(0.035% URL + 0.175% span) spans from 30:1 to 100:1

Static Pressure Effects
- Zero error = ±0.05% of URL per 1000 psi (68.9 bar)
- Span error = ±0.20% of reading per 1000 psi (68.9 bar)

Stability
Range 2-3: 3095FB Ultra for Flow (Option U3)\(^1\)
- ±0.25% of URL for 10 years for ±50 °F (28 °C) temperature changes, up to 1000 psi (68.9 bar) line pressure

Range 2-3:
- ±0.125% URL for five years for ±50 °F (28 °C) ambient temperature changes, and up to 1000 psi (68.9 bar) line pressure.

Absolute / Gage Pressure

Absolute (100:1 rangeability allowed)
Range 3
0.5–8 to 0.5–800 psia (3,447–55,16 to 3,447–5516 kPa)
Range 4
0.5–36.26 to 0.5–3,626 psia (3,447–250 to 3,447–25000 kPa)

Gage (100:1 rangeability allowed)
Range C
0–8 to 0–800 psig (0–55,16 to 0–5516 kPa)
Range D
0–36.26 to 0–3,626 psig (0–250 to 0–25000 kPa)

Ambient Temperature Effect per 50 °F (28 °C)
- ±(0.05% URL + 0.125% of span) spans from 1:1 to 30:1
- ±(0.06% URL – 0.175% of span) spans from 30:1 to 100:1

Stability
±0.125% URL for five years for ±50 °F (28 °C) ambient temperature changes.

Accuracy (including Linearity, Hysteresis, Repeatability)
- ±0.075% of span for spans from 1:1 to 10:1 of URL
- For spans less than 10:1 rangedown,
  \[
  \text{Accuracy} = \left[ 0.03 + 0.0075 \frac{\text{URL}}{\text{Span}} \right] \% \text{ of span}
  \]

Process Temperature (RTD)

Specification for process temperature is for the transmitter portion only. Sensor errors caused by the RTD are not included. The transmitter is compatible with any PT100 RTD conforming to IEC 751 Class B, which has a nominal resistance of 100 ohms at 0 °C and \(\alpha = 0.00385\). Examples of compatible RTDs include the Rosemount Series 68 and 78 RTD Temperature Sensors.

Sensing Range
- –40 to 1200 °F (–40 to 649 °C)

Accuracy (including Linearity, Hysteresis, Repeatability)
±1.0 °F (0.56 °C)
Ambient Temperature Effects per 50 °F (28 °C)

- ±0.72 °F (0.40 °C) for process temperatures from –40 to 185 °F (–40 to 85°C)
- ±1.28 °F (0.72 °C) + 0.16% of reading) for process temperatures from 185 to 1200 °F (85 to 649 °C)

Stability

±1.0 °F (0.56 °C) for one year

**Electrical Connections**

- ½–14 NPT, M20 x 1.5 (CM20), PG-13.5

**RTD Process Temperature Input:**

100-ohm platinum RTD per IEC-751 Class B

**Process Connections**

- Transmitter: ¼–18 NPT on 2½/8-in. centers
- RTD: RTD dependent (see ordering information)

**Radiated/Conducted Transmissions**

Meets requirements of IEC 61326

**Process Wetted Parts**

Isolating Diaphragms
- 316L SST or Hastelloy C-276®

Drain/Vent Valves
- 316 SST or Hastelloy C®

Flanges
- Plated carbon steel, 316 SST, or Hastelloy C

Wetted O-rings
- Glass-Filled TFE

**Non-Wetted Parts**

Electronics Housing
- Low copper aluminum

Bolts
- Plated carbon steel per ASTM A449, Grade 5; or austenitic 316 SST

Fill Fluid
- Silicone oil
- Inert oil (available for gage pressure ranges only)

Paint
- Polyurethane

O-rings
- Buna-N

**Weight**

<table>
<thead>
<tr>
<th>Components</th>
<th>Weight in lb. (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3095 Transmitter</td>
<td>6.0 (2.7)</td>
</tr>
<tr>
<td>LCD Meter</td>
<td>0.5 (0.2)</td>
</tr>
<tr>
<td>SST Mounting Bracket</td>
<td>1.0 (0.5)</td>
</tr>
<tr>
<td>12 ft. (3.66 m) RTD Shielded Cable</td>
<td>0.5 (0.2)</td>
</tr>
<tr>
<td>12 ft. (3.66 m) RTD Armored Cable</td>
<td>1.1 (0.5)</td>
</tr>
<tr>
<td>24 ft. (7.32 m) RTD Shielded Cable</td>
<td>1.0 (0.5)</td>
</tr>
<tr>
<td>24 ft. (7.32 m) RTD Armored Cable</td>
<td>2.2 (1.0)</td>
</tr>
<tr>
<td>Battery / Solar panel</td>
<td>–</td>
</tr>
<tr>
<td>Battery Backup</td>
<td>–</td>
</tr>
</tbody>
</table>
3095FB

**Side View**
- Meter Cover (Optional)
- 0.75 (19) Clearance
- Transmitter Circuitry
- Nameplate
- Drain/Vent Value

- 1/2-14 NPT Conduit Connection (2 Places)
- 0.75 (19) Clearance Required to remove cover
- Transmitter connections this side

**Front View**
- Certification Label
- Housing Rotation Set Screw

- 1/4-18 NPT on Coplanar Flange for Pressure Connection without the use of Mounting Adapters

Dimensions are in inches (millimeters)

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**Mounting Configurations for 3095FB Transmitter**

**Panel Mount**
- 2.82 (72)
- 4.93 (125)
- 7.07 (180)
- 6.15
- 4.73 (120)

**Pipe Mount**
- 6.25 (159)
- 3.54 (90)

Dimensions are in inches (millimeters)
# ORDERING INFORMATION

<table>
<thead>
<tr>
<th>Code</th>
<th>Product Description</th>
<th>3095FB</th>
<th>3095FC</th>
</tr>
</thead>
<tbody>
<tr>
<td>3095F</td>
<td>MultiVariable Transmitter</td>
<td>•</td>
<td>•</td>
</tr>
</tbody>
</table>

## Output

- B: Process Variable Measurement: Modbus RS-485

## Differential Pressure Range

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Available</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>0 – 2.5 to 0 – 250 inH&lt;sub&gt;2&lt;/sub&gt;O (0 – 6.22 to 0 – 622.7 mbar)</td>
<td>•</td>
</tr>
<tr>
<td>3</td>
<td>0 – 10 to 0 – 1000 inH&lt;sub&gt;2&lt;/sub&gt;O (0 – 0.0249 to 0 – 2.49 bar)</td>
<td>•</td>
</tr>
</tbody>
</table>

## Absolute/Gage Pressure Ranges

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Available</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>0.5–8 to 0.5–800 psia (3.447–55.16 to 3.447–5516 kPa)</td>
<td>•</td>
</tr>
<tr>
<td>4</td>
<td>0.5–36.26 to 0.5–3,626 psia (3.447–250 to 3.447–25000 kPa)</td>
<td>•</td>
</tr>
<tr>
<td>C</td>
<td>0–8 to 0–800 psig (0–55.16 to 0–5516 kPa)</td>
<td>•</td>
</tr>
<tr>
<td>D</td>
<td>0–36.26 to 0–3,626 psig (0–250 to 0–25000 kPa)</td>
<td>•</td>
</tr>
</tbody>
</table>

## Isolator Material

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Fill Fluid</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>316L Stainless Steel (SST)</td>
<td>Silicone</td>
</tr>
<tr>
<td>B&lt;sup&gt;(1)&lt;/sup&gt;</td>
<td>Hastelloy C-276</td>
<td>Silicone</td>
</tr>
<tr>
<td>J&lt;sup&gt;(2)&lt;/sup&gt;</td>
<td>316L SST</td>
<td>Inert</td>
</tr>
<tr>
<td>K&lt;sup&gt;(1)(2)&lt;/sup&gt;</td>
<td>Hastelloy C-276</td>
<td>Inert</td>
</tr>
</tbody>
</table>

## Flange Style

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Coplanar</td>
<td>CS</td>
</tr>
<tr>
<td>B</td>
<td>Coplanar</td>
<td>SST</td>
</tr>
<tr>
<td>C</td>
<td>Coplanar</td>
<td>Hastelloy C&lt;sup&gt;(2)&lt;/sup&gt;</td>
</tr>
<tr>
<td>J</td>
<td>DIN Compliant Traditional Flange</td>
<td>SST, 7/16 - 20 Bolting</td>
</tr>
<tr>
<td>0</td>
<td>None (Required for Option Codes S3 or S5)</td>
<td></td>
</tr>
</tbody>
</table>

## Drain/Vent Material

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>SST</td>
<td></td>
</tr>
<tr>
<td>C&lt;sup&gt;(1)&lt;/sup&gt;</td>
<td>Hastelloy C</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>None (Required for Option Codes S3 or S5)</td>
<td></td>
</tr>
</tbody>
</table>

## O-ring

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Glass-filled TFE</td>
</tr>
</tbody>
</table>

## Process Temperature Input (RTD ordered separately)

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Available</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No RTD Cable (required for 3095FC)</td>
<td>•</td>
</tr>
<tr>
<td>1</td>
<td>RTD Input with 12 ft. (3.66 m) of Shielded Cable (intended for use with conduit)</td>
<td>•</td>
</tr>
<tr>
<td>2</td>
<td>RTD Input with 24 ft. (7.32 m) of Shielded Cable (intended for use with conduit)</td>
<td>•</td>
</tr>
<tr>
<td>3</td>
<td>RTD Input with 12 ft. (3.66 m) of Armored, Shielded Cable (intended for use with conduit)</td>
<td>•</td>
</tr>
<tr>
<td>4</td>
<td>RTD Input with 24 ft. (7.32 m) of Armored, Shielded Cable</td>
<td>•</td>
</tr>
<tr>
<td>7</td>
<td>RTD Input with 75 ft. (22.86 m) of Shielded Cable (intended for use with conduit)</td>
<td>•</td>
</tr>
<tr>
<td>8</td>
<td>RTD Input with 75 ft. (22.86 m) of Armored, Shielded Cable</td>
<td>•</td>
</tr>
<tr>
<td>A</td>
<td>RTD Input with 12 ft. (3.66 m) of ATEX Flameproof Cable (typically ordered with Product Certificate code H)</td>
<td>•</td>
</tr>
<tr>
<td>B</td>
<td>RTD Input with 24 ft. (7.32 m) of ATEX Flameproof Cable (typically ordered with Product Certificate code H)</td>
<td>•</td>
</tr>
<tr>
<td>C</td>
<td>RTD Input with 75 ft. (22.86 m) of ATEX Flameproof Cable (typically ordered with Product Certificate code H)</td>
<td>•</td>
</tr>
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</table>

## Transmitter Housing Material

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Conduit</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Polyurethane-covered Aluminum</td>
<td>1/2–14 NPT</td>
</tr>
<tr>
<td>B</td>
<td>Polyurethane-covered Aluminum</td>
<td>3/4–14 NPT</td>
</tr>
<tr>
<td>C</td>
<td>Polyurethane-covered Aluminum</td>
<td>M20 x 1.5 (CM20)</td>
</tr>
<tr>
<td>J</td>
<td>SST</td>
<td>1/2–14 NPT</td>
</tr>
<tr>
<td>K</td>
<td>SST</td>
<td>M20 x 1.5 (CM20)</td>
</tr>
<tr>
<td>L</td>
<td>SST</td>
<td>PG 13.5</td>
</tr>
<tr>
<td>Code</td>
<td>Terminal Block</td>
<td>3095FB</td>
</tr>
<tr>
<td>------</td>
<td>----------------</td>
<td>--------</td>
</tr>
<tr>
<td>A</td>
<td>Standard</td>
<td>•</td>
</tr>
<tr>
<td>B</td>
<td>With Integral Transient Protection</td>
<td>•</td>
</tr>
<tr>
<td>C</td>
<td>CE MARK/ Compliant with EMC - Transient Protection Included</td>
<td>•</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Display</th>
<th>3095FB</th>
<th>3095FC</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>None</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>1</td>
<td>LCD Display</td>
<td>•</td>
<td>•</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Bracket</th>
<th>3095FB</th>
<th>3095FC</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>None (required for option code S3 or S5)</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>1</td>
<td><strong>Coplanar SST Flange Bracket for 2-in. Pipe or Panel Mount, SST Bolts</strong></td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>2</td>
<td>Traditional Flange Bracket for 2-in. Pipe Mounting, CS Bolts</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>3</td>
<td>Traditional Flange Bracket for Panel Mounting, CS Bolts</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>4</td>
<td>Traditional Flange Flat Bracket for 2-in. Pipe Mounting, CS Bolts</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>5</td>
<td>Traditional Flange Bracket for 2-in. Pipe Mounting, 300 Series, SST Bolts</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>6</td>
<td>Traditional Flange Bracket for Panel Mounting, 300 Series, SST Bolts</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>7</td>
<td>Traditional Flange Flat Bracket for 2-in. Pipe Mounting, 300 Series, SST Bolts</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>8</td>
<td>SST Traditional Flange Bracket for 2-in. Pipe Mounting, 300 Series, SST Bolts</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>9</td>
<td>SST Traditional Flange Flat Bracket for 2-in. Pipe Mounting, 300 Series, SST Bolts</td>
<td>•</td>
<td>•</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Bolts</th>
<th>3095FB</th>
<th>3095FC</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>CS bolts</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>1</td>
<td>Austenitic 316 SST bolts</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>N</td>
<td>None (required for Options code S5)</td>
<td>•</td>
<td>•</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Product Certifications</th>
<th>3095FB</th>
<th>3095FC</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>None</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>A</td>
<td>FM Approvals Explosion-Proof</td>
<td>•</td>
<td>—</td>
</tr>
<tr>
<td>C</td>
<td>Canadian Standards Associate (CSA) Explosion Proof</td>
<td>•</td>
<td>—</td>
</tr>
<tr>
<td>H</td>
<td>ATEX Flame-proof</td>
<td>•</td>
<td>—</td>
</tr>
<tr>
<td>M</td>
<td>Canadian Standards Association (CSA) US and Canada Explosion-Proof</td>
<td>—</td>
<td>•</td>
</tr>
<tr>
<td>P</td>
<td>ATEX Dust</td>
<td>•</td>
<td>—</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Engineered Measurement Solution (EMS)</th>
<th>3095FB</th>
<th>3095FC</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>Process Variable Measurement: MODBUS</td>
<td>•</td>
<td>—</td>
</tr>
<tr>
<td>C</td>
<td>Mass Flow with Process Variable Measurement and Data Logging: MODBUS (required for 3095FC)</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Options</th>
<th>3095FB</th>
<th>3095FC</th>
</tr>
</thead>
<tbody>
<tr>
<td>U3</td>
<td><strong>Ultra for Flow:</strong> ±0.05% DP reading accuracy, up to 100:1 rangedown, 10 year stability, limited 12 year warranty</td>
<td>•</td>
<td>—</td>
</tr>
<tr>
<td>S3</td>
<td>Assembly with 405 Compact Orifice (requires compact orifice model number, see 00813-0100-4810)</td>
<td>•</td>
<td>—</td>
</tr>
<tr>
<td>S4</td>
<td>Assembly with <strong>Annubar</strong> Averaging Pitot Tubes or 1195 Integral Orifice Plates (requires corresponding model number, see 00813-0100-4809, 00813-0100-4760, or 00813-0100-4686)</td>
<td>•</td>
<td>—</td>
</tr>
<tr>
<td>S5</td>
<td>Assemble to 305 Integral Manifold (requires integral manifold model number)</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>C1</td>
<td>Custom Flow Configuration (requires completed Configuration Data Sheet)</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>A3</td>
<td>Mast with Solar Panel Assembly and 12 Vdc Batteries</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>P1</td>
<td>Hydrostatic testing with certificate</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>P2</td>
<td>Cleaning for Special Services</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Q4</td>
<td>Calibration Certificate</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Q8</td>
<td>Material Traceability Certification per EN 10204 3.1B</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>DF</td>
<td><strong>1/2–14 NPT Flange Adapter, Carbon Steel, Stainless Steel, Hastelloy C</strong></td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>A1</td>
<td>Additional RS-232 Communication Board</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>A2</td>
<td>12 Vdc System with Batteries</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

**Typical Model Number:** 3095F B 2 3 A B A 1 1 A B 0 1 0 A N

---

(1) Materials of Construction comply with metallurgical requirements highlighted within NACE MR0175/ISO 15156 for sour oil field production environments. Environmental limits apply to certain materials. Consult latest standard for details. Selected materials also conform to NACE MR0103 for sour refining environments.

(2) Ultra for Flow (Option U3) applicable for DP ranges 2 and 3 with SST isolator material and silicone fill fluid only.

(3) With a primary element installed, the maximum operating pressure will be the lesser of either the transmitter or the primary element.

(4) Material determined by Flange Style material selection (Not available with S4 option).
# SPARE PARTS

<table>
<thead>
<tr>
<th>Spares Category(1)</th>
<th>Item No.</th>
<th>Sensor Modules Parts Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>9</td>
<td>Silicone Fill Sensor Module</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Differential: 0–2.5/250 in H₂O, Range 2 / Absolute: 0.5–8/800 psia, Range 3</td>
<td>316L SST 03095-0345-2312</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Differential: 0–2.5/250 in H₂O, Range 2 / Absolute: 0.5–36.26/3,626 psia, Range 4</td>
<td>316L SST 03095-0345-2312</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Differential: 0–10/830 in H₂O, Range 3 / Absolute: 0.5–8/800 psia, Range 3</td>
<td>316L SST 03095-0345-3312</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Differential: 0–10/830 in H₂O, Range 3 / Absolute: 0.5–36.26/3,626 psia, Range 4</td>
<td>316L SST 03095-0345-3312</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Differential: 0–2.5/250 in H₂O, Range 2 / Gage: 0–8/800 psig, Range C</td>
<td>316L SST 03095-0345-2812</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Differential: 0–2.5/250 in H₂O, Range 2 / Gage: 0–36.26/3,626 psig, Range D</td>
<td>316L SST 03095-0345-2912</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Differential: 0–10/830 in H₂O, Range 3 / Gage: 0–8/800 psig, Range C</td>
<td>316L SST 03095-0345-3812</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Halocarbon Inert Fill Sensor Module</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Differential: 0–2.5/250 in H₂O, Range 2 / Gage: 0–8/800 psig, Range C</td>
<td>316L SST 03095-0345-2822</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Differential: 0–2.5/250 in H₂O, Range 2 / Gage: 0–36.26/3,626 psig, Range D</td>
<td>316L SST 03095-0345-2922</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Differential: 0–10/830 in H₂O, Range 3 / Gage: 0–8/800 psig, Range C</td>
<td>316L SST 03095-0345-3822</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spares Category(1)</th>
<th>Item No.</th>
<th>Electronics Board Assembly Hardware Parts Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>5</td>
<td>Output Electronics Board: Modbus</td>
<td>03095-4005-0009</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Output Electronics Board: HART</td>
<td>03095-0303-1010</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Real-Time Clock Battery</td>
<td>03095-0378-0001</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spares Category(1)</th>
<th>Item No.</th>
<th>Housing, Covers, Terminal Blocks Parts Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td></td>
<td>Electronics Housing without Terminal Block (½–14 NPT conduit, RFI filters)</td>
<td>03031-0635-0301</td>
</tr>
<tr>
<td>B</td>
<td>1</td>
<td>Electronics Cover</td>
<td>03031-0292-0001</td>
</tr>
<tr>
<td>A</td>
<td>3</td>
<td>Standard Terminal Block Assembly: Modbus</td>
<td>03095-0302-0021</td>
</tr>
<tr>
<td>A</td>
<td>3</td>
<td>Standard Terminal Block Assembly: HART</td>
<td>03095-0946-0001</td>
</tr>
<tr>
<td>B</td>
<td>3</td>
<td>Transient Protection Terminal Block Assembly: Modbus</td>
<td>03095-0302-0022</td>
</tr>
<tr>
<td>B</td>
<td>3</td>
<td>Transient Protection Terminal Block Assembly: HART</td>
<td>03095-0946-0002</td>
</tr>
<tr>
<td>A</td>
<td></td>
<td>External Ground Assembly</td>
<td>03031-0398-0001</td>
</tr>
</tbody>
</table>

(1) Spares Category: “A” - One spare part for every 25 transmitters recommended. “B” - One spare part for every 50 transmitters recommended.
### Flanges Parts Description

<table>
<thead>
<tr>
<th>Spares Category</th>
<th>Item No.</th>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>11</td>
<td>03031-1350-0022</td>
<td>SST, 7/16 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>03031-0388-0025</td>
<td>Nickel-Plated Carbon Steel</td>
</tr>
<tr>
<td></td>
<td></td>
<td>03031-0388-0022</td>
<td>316L SST</td>
</tr>
<tr>
<td></td>
<td></td>
<td>03031-0388-0023</td>
<td>Hastelloy C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>03031-0309-0001</td>
<td>Coplanar™ Flange Alignment Screw (package of 12 screws)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>03031-1350-0012</td>
<td>DIN compliant Traditional Flange, SST, 7/16 in Adaptor/Manifold Bolting</td>
</tr>
</tbody>
</table>

### Flange Adapter Union Parts Description

<table>
<thead>
<tr>
<th>Spares Category</th>
<th>Item No.</th>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>13</td>
<td>02024-0069-0005</td>
<td>Nickel-plated Carbon Steel</td>
</tr>
<tr>
<td></td>
<td></td>
<td>02024-0069-0002</td>
<td>316L SST</td>
</tr>
<tr>
<td></td>
<td></td>
<td>02024-0069-0003</td>
<td>Hastelloy C</td>
</tr>
</tbody>
</table>

### Drain/Vent Valve Kits Parts Description

<table>
<thead>
<tr>
<th>Spares Category</th>
<th>Item No.</th>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>10</td>
<td>01151-0028-0022</td>
<td>Vent Valve Kits</td>
</tr>
<tr>
<td></td>
<td></td>
<td>01151-0028-0023</td>
<td>Hastelloy C Valve Stem and Seat Kit</td>
</tr>
</tbody>
</table>

(Each kit contains parts for one transmitter.)

### O-Ring Packages Parts Description

<table>
<thead>
<tr>
<th>Spares Category</th>
<th>Item No.</th>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>2</td>
<td>03031-0232-0001</td>
<td>Electronic Housing, Cover (Standard and Meter)</td>
</tr>
<tr>
<td>B</td>
<td>8</td>
<td>03031-0233-0001</td>
<td>Electronics Housing, Module</td>
</tr>
<tr>
<td>B</td>
<td>15</td>
<td>03031-0234-0001</td>
<td>Process Flange, Glass-filled Teflon</td>
</tr>
<tr>
<td>B</td>
<td>14</td>
<td>03031-0242-0001</td>
<td>Flange Adapter, Glass-filled Teflon (Each package contains 12 O-rings.)</td>
</tr>
</tbody>
</table>

### Mounting Brackets Parts Description

<table>
<thead>
<tr>
<th>Spares Category</th>
<th>Item No.</th>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td></td>
<td>03031-0189-0003</td>
<td>Coplanar Flange Bracket Kit for 2 in. Pipe or Panel Mounting, all SST</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td>03031-0313-0001</td>
<td>Traditional flange Bracket Kit for 2 in. Pipe Mounting, CS Bolts</td>
</tr>
</tbody>
</table>

### Bolt Kits Parts Description

<table>
<thead>
<tr>
<th>Spares Category</th>
<th>Item No.</th>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td></td>
<td>03031-0312-0001</td>
<td>Flange Bolt Kit</td>
</tr>
<tr>
<td></td>
<td></td>
<td>03031-0312-0002</td>
<td>316 SST (set of 4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>03031-0306-0001</td>
<td>Flange/Adapter Bolt Kit</td>
</tr>
<tr>
<td></td>
<td></td>
<td>03031-0306-0002</td>
<td>316 SST (set of 4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>03031-0311-0001</td>
<td>Manifold/Flange Kit</td>
</tr>
<tr>
<td></td>
<td></td>
<td>03031-0311-0002</td>
<td>316 SST (set of 4) (Each kit contains bolts for one transmitter)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>03031-0101-0001</td>
<td>Manifold</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Carbon Steel</td>
<td>316 SST</td>
</tr>
<tr>
<td>Spares Category(1)</td>
<td>Item No.</td>
<td>LCD Display Option Part Description</td>
<td>Part Number</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------</td>
<td>-------------------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>A</td>
<td></td>
<td><strong>Aluminum Housing</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Meter Kit (Meter Display, 6-pin Interconnection Header, Cover Assembly): Modbus</td>
<td>03031-0193-0101</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Meter Kit (Meter Display, 6-pin Interconnection Header, Cover Assembly): HART</td>
<td>03095-0392-0001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Meter (Meter Display, 6-pin Interconnection Header): Modbus</td>
<td>03031-0193-0103</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Meter (Meter Display, 6-pin Interconnection Header): HART</td>
<td>03095-0392-0002</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cover Assembly Kit: Modbus</td>
<td>03031-0193-0002</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cover Assembly Kit: HART</td>
<td>03095-0392-0003</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td><strong>RTD Cables, Adapters and Plugs Part Description</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>RTD Input with 12 ft (3.66 m) of Shielded Cable (Intended for use with conduit.)</td>
<td>03095-0320-0011</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RTD Input with 24 ft (7.32 m) of Shielded Cable (Intended for use with conduit.)</td>
<td>03095-0320-0012</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RTD Input with 12 ft (3.66 m) of Armored, Shielded Cable</td>
<td>03095-0320-0001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RTD Input with 24 ft (7.32 m) of Armored, Shielded Cable</td>
<td>03095-0320-0002</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RTD Input with 21 in. (53 cm) of Armored, Shielded Cable</td>
<td>03095-0320-0003</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RTD input with 4 ft (1.22 m) of Armored, Shielded cable</td>
<td>03095-0320-0004</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RTD Input with 75 ft (22.86 m) of Shielded Cable (Intended for use with conduit)</td>
<td>03095-0320-0013</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RTD Input with 75 ft (22.86 m) of Armored, Shielded Cable</td>
<td>03095-0320-0007</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RTD Input with 12 ft (3.66 m) of CENELEC Flameproof Cable</td>
<td>03095-0320-0021</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RTD Input with 24 ft (7.32 m) of CENELEC Flameproof Cable</td>
<td>03095-0320-0022</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RTD Input with 75 ft (22.86 m) of CENELEC Flameproof Cable</td>
<td>03095-0320-0023</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RTD Input with 21 in. (53 cm) of CENELEC Flameproof Cable</td>
<td>03095-0320-0024</td>
</tr>
<tr>
<td></td>
<td></td>
<td>¾–14 to ½–14 NPT Adapter (conduit adapter for Rosemount RTD Connection Head)</td>
<td>03095-0308-0001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Armored Cable Compression Seal</td>
<td>03095-0325-0001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>½ in. male to CM20 female Brass Cable Adapter</td>
<td>00444-0282-0001</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>NOTE: The following connect to the Rosemount 3095 RTD Connector:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>RTD Connector Plug (for transmitters without an RTD)</td>
<td>03095-0323-0001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>½–14 NPT RTD Cable Adapter</td>
<td>03095-0322-0001</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Accessories Part Description</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>3095FB User Interface Software</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Windows User Interface Software–Single PC License, Converter, Cables</td>
<td>03095-5130-0003</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Windows User Interface Software–Single PC License</td>
<td>03095-5125-0004</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Windows User Interface Software–Site License</td>
<td>03095-5125-0005</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Converter and Cables</td>
<td>03095-5106-0002</td>
</tr>
</tbody>
</table>
OPTIONS

Standard Configuration

Unless otherwise specified, transmitters are shipped as follows:

<table>
<thead>
<tr>
<th>Engineering Units</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Differential</td>
<td>in. H2O</td>
<td></td>
</tr>
<tr>
<td>Absolute/ Gage</td>
<td>psi</td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td>°F</td>
<td></td>
</tr>
</tbody>
</table>

Output: Modbus RTU
Baud Rate: 9600
Transmitter Address: 1
Flange Type: Specified Model Code Option
O-ring Material: Specified Model Code Option
Drain/ Vent: Specified Model Code Option
Software Tag: Specified Model Code Option

Custom Configuration (Option Code C1)

If option code C1 is ordered, the transmitters are factory configured per user-specified information. Unspecified parameters remain at the factory default settings.

Tagging

Three customer tagging options are available:

- Standard SST tag is wired to the transmitter. Tag character height is 0.125 in. (3.18 mm), 85 characters maximum.
- Tag may be permanently marked on transmitter nameplate upon request. Tag character height is 0.0625 in. (1.59 mm), 65 characters maximum.
- Tag may be stored in transmitter memory. Software tag is left blank unless specified.

Optional Rosemount 305 Integral Manifolds

The Rosemount 3095 Transmitter and 305AC (305BC) Integral Manifold are fully assembled, calibrated, and seal tested by the factory. Refer to the Rosemount product data sheet 00813-0100-4733 for additional information.

Temperature Sensors and Assemblies

Rosemount offers many types of temperature sensors and assemblies.

ACCESSORIES

User Interface Software Package

The User Interface Software package is available with or without the RS232-485 converter and connecting cables. All configurations are packaged separately.

Part Number:
- 03095-5130-0003: Single PC License, Converter, and Cable
- 03095-5125-0004: Single PC License
- 03095-5125-0005: Site License
- 03095-5106-0002: RS232-485 Converter and Cable
Appendix B  Product Certifications

APPROVED MANUFACTURING LOCATIONS

European Directive Information

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

ATEX Directive (94/9/EC)
Emerson Process Management complies with the ATEX Directive.

European Pressure Equipment Directive (PED) (97/23/EC)
3095F_2/3/4/D Flow Transmitters — QS Certificate of Module H Conformity Assessment
All other 3095_ Transmitters/Level Controller — Sound Engineering Practice
Transmitter Attachments: Process Flange - Manifold — Sound Engineering Practice

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

Ordinary Location Certification for Factory Mutual
As standard, the Rosemount 3095FB transmitter has been examined and tested to determine that the design meets basic electrical, mechanical, and fire protection requirements by FM, a nationally recognized testing laboratory (NRTL) as accredited by the Federal Occupational Safety and Health Administration (OSHA).

HAZARDOUS LOCATIONS CERTIFICATIONS

North American Certifications

FM Approvals
A 3095FB
Explosion Proof for Class I, Division 1, Groups B, C, and D. Dust-Ignition Proof for Class II/III, Division 1, Groups E, F, and G, hazardous locations. Factory Sealed. Provides non-incendive RTD connections for Class I, Division 2, Groups A, B, C, and D. Install per Rosemount drawing 03095-1025. Enclosure Type 4X.

Canadian Standards Association (CSA) - Canada only
C 3095FB
Canadian Standards Association (CSA) - U.S. and Canada

M 3095FC
Explosion-Proof for Class I, Division 1, Groups C and D including optional solar panel: mast option: Suitable for use in Class I, Division 2, Groups A, B, C, D, and T3. CSA Enclosure Type 4.

European Certifications

H ATEX Flameproof
3095FB
Certificate Number: KEMA02ATEX2320X  II 1/2 G
EEEx d IIC T5 (-50°C ≤ T_{amb} ≤ 80°C)
    T6 (-50°C ≤ T_{amb} ≤ 65°C)
V_{max} = 55V dc
\(\varepsilon\) 1180

Special Conditions for Safe Use (x):
The device contains a thin wall diaphragm. Installation, maintenance, and use shall take into account the environmental conditions to which the diaphragm will be subjected. The manufacturer’s instructions for installation and maintenance shall be followed in detail to assure safety during its expected lifetime.

3095FC
Certificate Number: LCIE05ATEX6057X  II 2 G
EEEx d IIB T5
V_{max} = 28V dc
IP66
\(\varepsilon\) 1180

Special Conditions for Safe Use (x):
Operating ambient temperature: -40°C to 75°C
The users have to make sure that the thermal fluid transfer doesn’t overheat the equipment to a temperature corresponding to the spontaneous combustion temperature of surrounding gas.

P ATEX Dust
3095FB
Certificate Number: KEMA02ATEX2321  II 1 D T90°C Ambient Temp (-50°C ≤ T_{amb} ≤ 80°C)
V = 55 Vdc MAX
I = 23 mA MAX
IP66
\(\varepsilon\) 1180
**INSTALLATION TO BE IN ACCORDANCE WITH NATIONAL ELECTRICAL CODE.**

**NON-INCENDIVE FIELD WIRING METHODS MAY BE USED FOR CONNECTING THE TEMPERATURE SENSING ASSEMBLY. WHEN USING NON-INCENDIVE FIELD WIRING, THE CONNECTION HEAD AND TEMPERATURE SENSOR ASSEMBLY NEED NOT BE EXPLOSION PROOF, BUT ALL COMPONENTS CONNECTED TO THE TEMP SENSOR CONNECTOR MUST BE CLASSIFIED 'SIMPLE APPARATUS'. SIMPLE APPARATUS ARE DEVICES WHICH ARE INCAPABLE OF GENERATING OR STORING MORE THAN 1.2V, 0.1A, 25mW, OR 2E5W (RTD's QUALIFY AS SIMPLE APPARATUS).**

**DIVISION 2 WIRING METHOD.**

6. CLASS II INSTALLATIONS MUST USE A CSA APPROVED DUST-IGNITIONPROOF SENSOR.

5. IN AMBIENT greater THAN 40°C, SPRING LOADED TEMPERATURE SENSORS USED WITHOUT AN EXPLOSIONPROOF THERMOWELL MUST BE RATED FOR AT LEAST 85°C.

4. COMPONENTS REQUIRED TO BE APPROVED MUST BE APPROVED FOR GAS GROUP APPROPRIATE TO AREA CLASSIFICATION.

3. ALL CONDUIT THREADS TO BE ASSEMBLED WITH FIVE FULL THREADS MINIMUM.

2. TRANSMITTER MUST NOT BE CONNECTED TO EQUIPMENT GENERATING MORE THAN 250VAC.

1. WIRING METHOD SUITABLE FOR CLASS I, DIV 1, ANY LENGTH.

**NOTES:**

---

**CONTRACT NO.**

**DR. Mykal Lee Miller**

**CHKD**

**APPROB. BEN LOUWAGIE**

**APPROD. C/O VT.**

**TITLE**

**MODEL 3095/2055**

**EXPLOSIONPROOF INSTALLATION DRAWING, FACTORY MUTUAL**

**SIZE**

**FSCM NO.**

**EWRG NO.**

**03095-1025**

**SCALE**

**WT.**

**SHEET 1 OF 3**

---

Electronic Master - PRINTED COPIES ARE UNCONTROLLED - Rosemount Proprietary
12. INSTALLATION TO BE IN ACCORDANCE WITH CANADIAN ELECTRICAL CODE.

NON-INCENDIVE FIELD WIRING METHODS MAY BE USED FOR CONNECTING THE TEMPERATURE SENSING ASSEMBLY. WHEN USING NON-INCENDIVE FIELD WIRING, THE CONNECTION HEAD AND TEMPERATURE SENSOR ASSEMBLY NEED NOT BE EXPLOSION PROOF, BUT ALL COMPONENTS CONNECTED TO THE TEMP SENSOR CONNECTOR MUST BE CLASSIFIED ‘SIMPLE APPARATUS’. SIMPLE APPARATUS ARE DEVICES WHICH ARE INCAPABLE OF GENERATING OR STORING MORE THAN 1.2V, 0.1A, 25mW, OR 20 µW (RTD’s QUALIFY AS SIMPLE APPARATUS).

DIVISION 2 WIRING METHOD.

6. CLASS II INSTALLATIONS MUST USE A CSA APPROVED DUST-IGNITIONPROOF SENSOR.

5. IN AMBIENTS GREATER THAN 40°C, SPRING LOADED TEMPERATURE SENSORS USED WITHOUT AN EXPLOSIONPROOF THERMOWELL MUST BE RATED FOR AT LEAST 85°C.

4. COMPONENTS REQUIRED TO BE APPROVED MUST BE APPROVED FOR GAS GROUP APPROPRIATE TO AREA CLASSIFICATION.

3. ALL CONDUIT THREADS TO BE ASSEMBLED WITH FIVE FULL THREADS MINIMUM.

2. TRANSMITTER MUST NOT BE CONNECTED TO EQUIPMENT GENERATING MORE THAN 250VAC.

1. WIRING METHOD SUITABLE FOR CLASS I, DIV 1, ANY LENGTH.

NOTES: CAD Maintained, (MICROSTATION)
Appendix C  3095FB Modbus Integration Guide

Use this appendix for quick reference to common parameters needed to integrate the 3095FB with various RTUs and other Modbus hosts. For more detailed information, please refer to the Modbus Protocol Guide located in chapter 3 of this manual.

GENERAL PROTOCOL INFORMATION

Supported Protocols

The 3095FB supports the following types of Modbus:

- Standard Modbus – RTU

Physical Layer Requirements

- RS485
- 2-Wire (A & B)
- Half-Duplex

Data Format

- Data Bits: 8
- Stop Bits: 1
- Parity: None
- Bit Order: Least Significant Byte (LSB)

Baud Rate

The baud rate is selectable by using the jumper located on the comm. electronics board of the transmitter (see section 2-12 of this manual).

- Default Baud Rate: 9600
- Available Baud Rates: 1200, 2400, 4800, 9600

Supported Modbus Function Codes

Table C-1 lists all of the Modbus functions supported by the 3095FB. For more information, please refer to page 13 of the Modbus Protocol Guide in chapter 3 of this manual.

<table>
<thead>
<tr>
<th>Function Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Read coil status</td>
</tr>
<tr>
<td>02</td>
<td>Read input status</td>
</tr>
<tr>
<td>03</td>
<td>Read holding registers</td>
</tr>
<tr>
<td>04</td>
<td>Read input registers</td>
</tr>
<tr>
<td>05</td>
<td>Force coil</td>
</tr>
<tr>
<td>06</td>
<td>Write register</td>
</tr>
<tr>
<td>08</td>
<td>Loopback diagnostic</td>
</tr>
<tr>
<td>16</td>
<td>Write multiple registers</td>
</tr>
<tr>
<td>69</td>
<td>Read multiple floating point registers</td>
</tr>
<tr>
<td>70</td>
<td>Write multiple floating point registers</td>
</tr>
</tbody>
</table>
NOTE
Function code 04 (read input registers) is the most common command to read the DP, SP, and T process variables measured by the 3095FB.

**PROCESS VARIABLE REGISTERS**

**Floating Point Numbers**

The 3 process variables (DP, SP, and T) are saved as 32-bit floating point numbers in three different address locations. In two of the locations, the 32-bit floating point number is saved in two 16-bit registers. In the third location, the number is saved in one 32-bit register.

**NOTE**
Depending on whether the Modbus host is referenced to a 1 or 0, you may need to add or subtract a 1 from the registers listed below (ex. 0400 instead of 0401) for successful data acquisition between the host and transmitter.

<table>
<thead>
<tr>
<th>Process Variable</th>
<th>16-bit Register Locations</th>
<th>32-bit Register Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Differential Pressure</td>
<td>0401, 0402</td>
<td>20401, 20402</td>
</tr>
<tr>
<td>Static Pressure</td>
<td>0403, 0404</td>
<td>20403, 20404</td>
</tr>
<tr>
<td>Temperature</td>
<td>0404, 0405</td>
<td>20404, 20405</td>
</tr>
</tbody>
</table>

**Scaled Variables**

The 3 process variables can also be read as scaled 16-bit registers in 5 different locations. For example, 0 – 100 in.H20 could correspond to 0 – 65534 (65534 is the maximum value for a 16-bit number).

<table>
<thead>
<tr>
<th>Process Variable</th>
<th>16-bit Register Locations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Differential Pressure</td>
<td>0116, 3116, 30116, 40116, 50116</td>
</tr>
<tr>
<td>Static Pressure</td>
<td>0117, 3117, 30117, 40117, 50117</td>
</tr>
<tr>
<td>Temperature</td>
<td>0118, 3118, 30118, 40118, 50118</td>
</tr>
</tbody>
</table>

**OTHER CONSIDERATIONS**

For the successful integration of 3095FB transmitters with various installations, it may also be necessary to consider some of the following:

- Make sure the RS-485 network is terminated only twice on the entire bus (once on each end). Termination at multiple points on the bus will hamper communication.
- It may be necessary to alter the way the 3095FB transmits floating point numbers so that Modbus host interprets the data correctly (see page 23 of the *Modbus Protocol Guide* in chapter 3 of this manual).
- If there is noise on the RS-485 bus, try turning on the pull-up and pull-down jumpers (see page 2-12) on only one transmitter.
NOTE
A good practice to assist in troubleshooting is to turn all of the jumpers to the “on” position on the furthest transmitter on the bus while leaving the jumpers on all the other transmitters in the “off” position. This guarantees that the bus is not terminated at more than one point, and that only one transmitter has the pull-up/pull-down jumpers on.

- The transmitter turnaround time may require adjustment (see page 4-7) to make sure the Modbus host receives all transmitted data.
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