Rosemount 3095FC MultiVariable™ Mass Flow Transmitter

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Rosemount 3095FC MultiVariable Mass Flow Transmitter

⚠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 an Emerson Process Management Sales Representative.

This device is intended for use in temperature monitoring applications and should not be used in control and safety applications.

NOTICE

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

The United States has two toll-free assistance numbers and one International number.

Customer Central
1-800-999-9307 (7:00 a.m. to 7:00 P.M. CST)

International
1-(952) 906-8888

National Response Center
1-800-654-7768 (24 hours a day)
Equipment service needs

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Section 1 Introduction

3095FC OVERVIEW

The 3095FC is a 32-bit microprocessor-based transmitter. The device electronically measures, monitors, and manages gas flow for a single meter run using an orifice plate (DP). It reliably and accurately performs gas flow calculations, temperature measurements, and data archival.

The 3095FC performs minute, 10-minute, hourly (periodic), daily, and minimum / maximum historical data archival. It records the corrected gas flow across an orifice plate, stores the data, and has the ability to send the data to a remote host.

The 3095FC computes gas flow for both volume and energy. It provides on-site functionality and supports remote monitoring, measurement, data archival, communications, and control.

The 3095FC provides the following components and features:

- Weather-tight enclosure
- Termination Board
- 32-bit Processor Board
- Battery Charger Board
- Backplane Board
- 2 MB of flash ROM (Read Only Memory), which is field upgradeable
- 512 KB of battery backed-up RAM (Random Access Memory) storage
- Support for a three-wire 100-ohm Resistance Thermal Detector (RTD) input
- Internal lead-acid batteries (optional)
- Local Operator Interface (LOI) port - EIA-232 (RS-232)
- EIA-485 (RS-485) Comm 1 port
- Communications card using EIA-232 (RS-232) on Comm 2 port (optional)
- Extensive applications firmware

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Hardware

The *backplane board* provides the power regulation, the routing of the signals to the termination board, the processor board, the backup battery board, the optional communications board, the sensor module, and the battery charger board.

The *termination board* provides connections to the field wiring and is located on the terminal side of the housing. Connections include the power supply, Local Operator Interface (LOI) communications, Comm 1 communications, optional Comm 2 communications, RTD wiring, and the I/O field wiring. The termination board provides surge and static discharge protection for the field wiring. Electronics include the RTD circuits and the final I/O drivers/receivers. The termination board also serves as an interface to the backplane board in the electronics portion of the enclosure.

The *32-bit processor board* contains the processor, memory, Local Operator Interface (LOI) communications driver, Comm 1 communications driver, the reset controller, and the real-time clock. The functions for the I/O of analog conversion originate on the processor board. The processor board, also called the central processor unit, provides the Serial Peripheral Interface (SPI) buss, Liquid Crystal Display drivers, and Sensor module.

The microprocessor has low-power operating modes, including inactivity and low battery condition. The 3095FC comes standard with 512 KB of built-in, static random access memory (SRAM) for storing data and history. The 3095FC also has 2 MB of flash ROM for storing operating system firmware, applications firmware, and configuration parameters.

The *charger board* controls the charging of the internal batteries, if installed. Three D-size lead-acid batteries provide 2.5 Amp-hours of current at 6.2 volts nominal. The charger board also serves as the interface to the optional LCD assembly, as well as supporting the On/Off and Norm/Reset jumpers.

A *backup battery* provides backup power for the static RAM and the Real-Time Clock. This battery is field replaceable. Under normal conditions, the battery has a functional life that exceeds five years.

An *RTD temperature* probe typically mounts in a thermowell on the meter run. The RTD measures the flowing temperatures under a constant current drive. The RTD wires connect directly to the RTD connector on the termination board located inside the enclosure.

The *built-in inputs and outputs (I/O)* on the 3095FC consist of a port for a 3-wire 100-ohm RTD input interface. Three diagnostic analog inputs (AI) monitor the battery voltage, logical voltage, and enclosure/battery temperature.

The *Local Operator Interface (LOI)* port provides a direct link between the 3095FC and a personal computer (PC) through a Local Operator Interface Cable using EIA-232 (RS-232) communications. Configure the functionality of the 3095FC and monitor its operation using Rosemount User Interface Software (see Section 3: Configuration).

The *Comm 1* allows for EIA-485 (RS-485) serial communication protocols. The EIA-232 (RS-232) activates Comm 2. "Establishing Communication" on page 2-13

The I/O parameters, Sensor inputs, flow calculations, power control, and security are configured and accessed using the configuration options available in Section 3: Configuration.

Firmware

The firmware contained in flash ROM on the termination board, determines the functionality of the 3095FC and includes:

- 1992 AGA-3 flow calculations (with user-selectable AGA8 compressibility Detail, Gross I, or Gross II) for a single meter run
- Memory logging of 240 alarms and 240 events
- Archival of minute data from the last 60 minutes for 15 points
- Archival of 60 days of 10-minute data for 4 points
- Archival of 35 days of hourly data for 15 points
- Archival of 35 days of daily data for 15 points
- Archival of Min / Max historical data for today and yesterday
- Communications based on Modbus slave, (ASCII or RTU) protocol for use with EFM applications
- User level security

Accessories

The 3095FC supports the following options and accessories:

- Local Operator Interface (LOI) cable
- Liquid Crystal Display (LCD) with two-line alphanumeric viewing. The LCD automatically displays information at 3-second intervals.
- Solar panel mast assembly (installed to recharge the backup battery)

Automatic Tests

The 3095FC performs the following self-tests on a periodic basis:

- Battery low and high
- Software and hardware watchdog
- RTD automatic temperature compensation
- Sensor operation
- Memory validity

The 3095FC will operate with its internal batteries down to 5.4 VDC. The LCD becomes active when input power with the proper polarity and startup voltage (typically set greater than 8.0 Volts) is applied to the CHG+ connector (provided the power input fusing/protection is operational). The battery and logical voltage tests ensure that the 3095FC is operating in the optimum mode.

The software watchdog is controlled by the central processor unit (CPU). The software will arm the watchdog timer every second. If the watchdog timer is not armed for a period of 6 seconds, then the watchdog timer forces the 3095FC unit to reset. If necessary, the software automatically resets. The hardware watchdog is controlled by the CPU and monitors the power to the hardware. If the battery voltage drops below 5.4 volts, the 3095FC automatically shuts down.

The Rosemount 3095FC monitors its orifice-metering measurement for accurate and continuous operation.

Low Power Mode

Sleep mode is used to place the CPU in a low power mode. The battery voltage is monitored by low voltage detection circuitry and the low voltage limit value is set at 5.4 volts. During Sleep mode, sub-modules are powered down. The 3095FC enters Sleep mode after one minute of inactivity on the communication ports.

Wake-up from Sleep occurs when the 3095FC receives a:

- Timed interrupt from the Real-Time Clock
- Signal from one of the communication ports

3095FC Functions

Most of the 3095FC functions are determined by the firmware. The features and applications provided by the firmware, which must be configured by using Rosemount User Interface Software, include:

- Flow calculations for an orifice meter
- Extensive historical data archival
- Memory logging of 240 alarms and 240 events
- Security with local and remote password protection

Flow Measurement

The primary function of the 3095FC is to measure the flow of natural gas through an orifice in accordance with the 1992 American Petroleum Institute (API) and American Gas Association (AGA) standards.

The primary inputs used for the orifice metering flow measurement function are DP, SP, and temperature. The DP and SP inputs are sampled once per second. The temperature input is sampled and linearized once per second from an RTD probe.

1992 Flow Calculations for Orifice Metering

The 1992 flow calculation is in accordance with ANSI/API 2530-92 (AGA Report No. 3 1992), API Chapter 14.2 (AGA Report No. 8 1992 2nd printing 1994), and API Chapter 21.1. The 1992 flow calculation may be configured for either Metric or U.S. units.

Flow Time
The DP stored for each second is compared to the configured low flow cutoff. If the DP is less than or equal to the low flow cutoff or the converted SP is less than or equal to zero, flow is considered to be zero for that second. Flow time for a recalculation period is defined to be the number of seconds the DP exceeded the low flow cutoff.

Input and Extension Calculation
Every second the Rosemount 3095FC stores the measured input for DP, SP, and temperature and calculates the Integrated Value (IV) (the square root of the absolute upstream SP times the DP).

Flow time averages of the inputs and the IV over the configured calculation period are calculated, unless there is no flow for an entire calculation period. Averages of the inputs are recorded to allow monitoring during no flow periods.

Instantaneous Rate Calculations

The instantaneous value of the IV is used with the previous calculation period of the Integral Multiplier Value (IMV) to compute the instantaneous flow rate. The IMV is defined as the value resulting from the calculation of all other factors of the flow rate equation not included in the IV. The instantaneous flow rate is used with the volumetric heating value to compute the instantaneous energy rate.

Flow and Energy Accumulation

The averages of the DP and SP, temperature, and sum of the IV are used with the flow time to compute the flow and energy over the calculation period. The flow and energy are then accumulated and stored at the top of every hour. At the configured contract hour, the flow and energy are stored to the Daily Historical Log and zeroed for the start of a new day.

CONSIDERATIONS

Environmental Requirements

The 3095FC is designed to operate between -40 to 75°C (-40 to 167°F). When mounting, ambient temperatures may effect the operating temperature. Operation beyond the recommended temperature range may cause measurement error and erratic performance.

The 3095FC should not be exposed to levels of vibration that exceed 2g for 15 to 150 Hz and 1g for 150 to 2000 Hz.

Enclosures

The 3095FC is packaged in a NEMA 4 windowed enclosure The enclosure is fabricated from die-cast aluminum alloy with iridite plating and paint. There are two ¾-in. pipe threaded holes for field conduit wiring, and communications.

Mounting

Provide adequate clearance for wiring, service, and solar panel. Mount on a pipestand or to an orifice plate using a 3- or 5-valve manifold. The LCD display can be rotated 90 degrees in either direction.

For solar-powered 3095FC units orient solar panels as follows:
- Northern Hemisphere: due south (not magnetic south)
- Southern Hemisphere: and due north (not magnetic north)
- Sunlight is not blocked from 9:00 AM to 4:00 PM.

Power Installation Requirements

The primary power source is provided through DC voltage sources or solar power. Route power away from hazardous areas, sensitive monitoring devices, and radio equipment. Adhere to all local, company, and National Electrical Code (NEC) requirements for power installations.

The 3095FC accepts input voltages from 8.0 volts to 28 volts at the charge (CHG+ / CHG-) terminals on the termination board. The maximum power for DC voltage sources is 130 mW, not including battery charging.

An external solar panel connects to the CHG+ / CHG- inputs on the termination board. Circuitry on the battery charger board monitors and regulates the charge based on battery voltage, charging voltage, and temperature. The 3095FC requires a minimum 8-volt 200 mA solar panel.

NOTE:
Do not allow the batteries to fully discharge. If the batteries fully discharge, the battery charger board may enter thermal limiting.

Rosemount User Interface Software PC Requirements

The Rosemount User Interface Software operates on any PC that meets the following requirements:

- IBM compatible
- Pentium-Class Processor (233 MHz or greater is recommended)
- CD-ROM drive
- Windows 95 (service release B), 98, ME, NT 4.0 (Service Pack 6), 2000 (Service Pack 2), or XP.
- 32 MB RAM
- 10 MB of available hard disk space
- RS-232 serial communication
- SVGA color monitor, 800 x 600 pixels

Site Requirements

Local, state, and federal codes may restrict monitoring locations and dictate site requirements. Position the 3095FC to minimize the length of signal and power wiring.

Wiring Requirements

I/O wiring requirements are site and application dependent. Local, state, or NEC requirements determine the I/O wiring installation methods. Direct burial cable, conduit and cable, or overhead cables are options for I/O wiring installations.

Section 2   Installation

MOUNTING

Mounting the Rosemount 3095FC can be accomplished using one of the following methods:

- Pipestand mounted – The Rosemount 3095FC can mount to a 2-in. pipestand. Ensure that the pipestand meets all weight requirements and installation conforms to local building codes.

- Orifice Plate – Mount directly to an orifice plate using a 3- or 5-valve manifold.

With either mounting method, the pressure inputs must be piped to the process connections.

For solar panel mounting see "Mounting" on page 1-5. Dimensional drawings are located on page page A-7. Solar power installation is located on page page 2-3.

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INSTALLATION

Rosemount 3095FC

Piping from the static and DP meter runs connect to female ¼-18 NPT connections. The 3095FC is an upstream device, meaning that the SP line normally connects to the high pressure side (labeled "H" on the sensor body).

Installing the Rosemount 3095FC on a Pipestand

The following steps must be taken to install the 3095FC on a 2-in. pipestand:

1. Install the pipestand using the pipestand documentation.
2. Remove the orifice/meter run from service.
3. Install the 3095FC on a pipestand using clamps or mounting brackets.
4. Connect the impulse lines.
5. Attach the appropriate wiring (see "Wiring" on page 2-4).
6. Using the prefabricated operator interface cable, physically connect the 3095FC to the PC running the Rosemount User Interface Software. One end of the cable (a 9-pin, D-shell, female connector) plugs into a serial communications port on the PC. The other end of the cable plugs into the 3095FC.
7. Apply power to the 3095FC (see "Apply Power" on page 2-10)
8. Log into the Rosemount User Interface Software (see page "Log into the Software" on page 2-12)
9. Establish communication between the 3095FC and PC (see "Establishing Communication" on page 2-13).
10. Configure the 3095FC (see "Configuration" on page 3-4)
11. Calibrate the 3095FC (see "Calibrate" on page 4-1).
12. Connect the 3095FC unit to any other external communication devices or networks.
13. Place the meter run in service and monitor with Rosemount User Interface Software for proper operation.

Installing the 3095FC on an Orifice Plate (Direct Mount)

The following steps must be taken to install the 3095FC on an orifice plate:

1. Remove the orifice/meter run from service.
2. Install the 3095FC on the meter run using a manifold and hardware to secure the 3095FC to the orifice flanges.
3. Attach the appropriate wiring (see "Wiring" on page 2-4).
4. Using the prefabricated operator interface cable, physically connect the 3095FC to the PC running the Rosemount User Interface Software. One end of the cable (a 9-pin, D-shell, female connector) plugs into a serial communications port on the PC. The other end of the cable plugs into the 3095FC.
5. Apply power to the 3095FC (see "Apply Power" on page 2-10)
6. Log into the Rosemount User Interface Software (see page "Log into the Software" on page 2-12)
7. Establish communication between the 3095FC and PC (see "Establishing Communication" on page 2-13).
8. Configure the 3095FC (see "Configuration" on page 3-4)

9. Calibrate the 3095FC (see "Calibrate" on page 4-1).
10. Connect the 3095FC unit to any other external communication devices or networks.
11. Place the meter run in service and monitor with Rosemount User Interface Software for proper operation.

Solar Panels

Solar panels generate electrical power for the 3095FC from solar radiation. They are the optimal choice for locations where a DC voltage source is not available. The size of solar panels required for a particular installation depends on several factors, including the power consumption of all devices connected to the solar array and the geographic location of the installation. An 8-volt solar panel can provide charging power for the backup batteries (see "Solar Panel Sizing" for information on how to determine the appropriate panel size required for an application).

An external solar panel typically mounts to the same 2-in. pipe that supports the 3095FC (see "Mounting" on page 2-1). The panel wiring terminates at the charge (CHG+ / CHG-) power terminals on the termination board.

NOTE:
Solar panel size may violate certain CSA Class I, Division 1 ratings. Use approved 3095FC enclosure connectors for routing the power wiring.

The optional solar panel is adequate for support of API Chapter 21.1 compliant measurement and the retrieval of the historical logs once a day using the internal communication methods.

Solar Panel Sizing

To determine solar panel output requirements, first determine the solar insolation for the geographic area. The map in Figure 2-1 shows solar insolation (in hours) for the United States during winter months. Contact an Emerson Process Management representative for a map detailing a specific geographic area.

Insolation (from map) = _____ hours

Next, calculate the amount of current required from the solar array per day using the following equation. I_{SF} is the system current requirement.

I_{array} = [I_{SF} (amps) ´ 24 (hrs)]/Insolation (hrs) = _____ amps

Finally, the number of solar panels can be determined using the following equation:

Number of Panels = I_{array} amps/(I_{panel} amps/panel) = _____ panels

NOTE:
The "I_{panel}" value varies depending on the type of solar panel installed. Refer to the vendor's specifications for the solar panel being used.

The current accepted by the Rosemount 3095FC is limited by its charging circuit to around 1 Amp. Therefore, it is not practical to install a solar array that

supplies significantly more than 1 Amp to the 3095FC. The maximum input is 28 volts.

Do not allow the batteries to fully discharge. If the batteries are fully discharged, the battery charger board may enter thermal limiting.

Figure 2-1. Solar Insolation in Hours for the United States
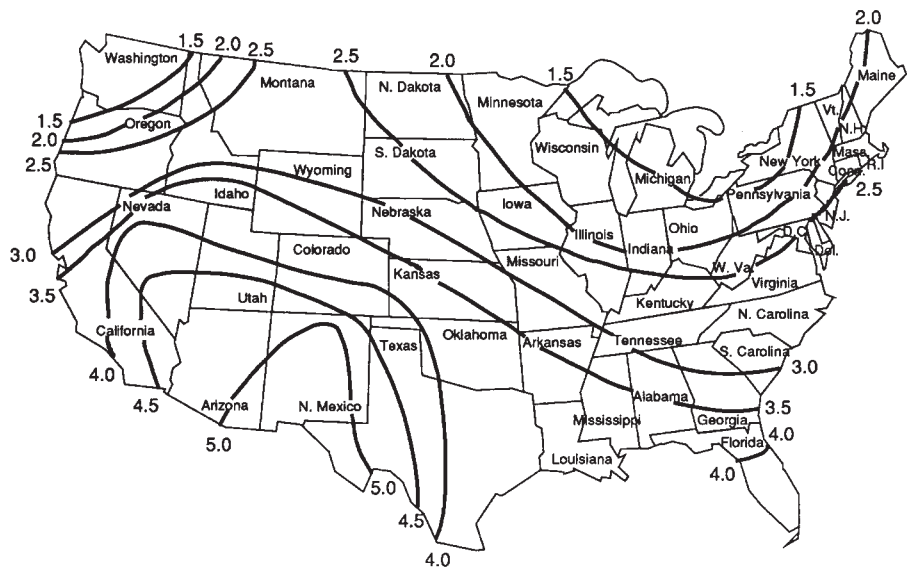
WIRING

The field terminals are all located on a Termination Board. The input power termination (CHG+ / CHG-) uses a removable connector and accommodates wiring up to 16 AWG in size.

Use the following steps to connect wiring. See Figure 2-2 on page 2-5.

1. Remove power from transmitter (if applicable)
2. Strip the rubber coating from the end ($1/4$-in. maximum) of the wire.
3. Insert the bared end into the clamp beneath the termination screw. To prevent short circuits, the inserted wires should have as little bare wire exposed as possible.To prevent strain, allow some slack when making connections.
4. Tightening the screw to 0.25 N-m (2.2 lb-in.). Do not over torque the connector screws.
5. Check the polarity before applying power.

NOTE
To avoid circuit damage, use appropriate electrostatic discharge precautions, such as wearing a grounded wrist strap.

Figure 2-2. Wiring Terminals
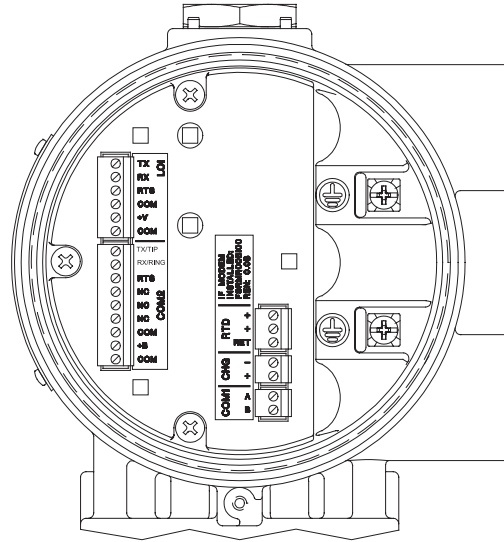
Power Supply Wiring

The terminals are labeled CHG+ for positive power connection and CHG- for negative power connection on a label on the termination board. These connections provide the input voltage and power for the battery charging circuitry. The maximum voltage that can be applied to the CHG+ / CHG- terminals is 28 Volts dc.

Pin	Signal	Description
1	CHG+	Battery 8.0 to 28 V Power
2	CHG–	Battery Common

RTD Wiring

Temperature is input through the Resistance Temperature Detector (RTD) probe and circuitry. The 3095FC provides terminations for a 2- or 3-wire 100-ohm platinum RTD with a IEC 751 curve. The RTD has an alpha (α) equal to 0.00385.

The RTD mounts directly to the piping using a thermowell. RTD wires should be protected by a metal sheath or by a conduit connected to a conduit wiring fitting on the enclosure. The RTD wires connect to the three screw terminals designated "RTD" on the Termination Board (see Figure 2-2).

Wiring between the RTD and 3095FC should be shielded wire, with the shield grounded only at one end to prevent ground loops. Ground loops cause RTD input signal errors.

Table 2-1 displays the RTD terminal connections for the various RTD probes.

Table 2-1. RTD Signal Routing

Terminal	Designation	3-Wire RTD	2-Wire RTD
RTD +	Signal positive input	RTD +	RTD +
RTD +	Signal positive input	RTD +	Jumper to RTD +
RTD RET	Return reference	RTD RET	RTD RET

Communications Wiring

The communication ports located on the 3095FC provide a data link to the Rosemount User Interface Software, other 3095FC units, and host systems.

NOTE
All communication ports for the 3095FC are located on an optional communications card or built into the termination board.

Table 2-2. Communication Ports for the 3095FC

Port	3095FC Comm Port Location	Default Tag	Function/Type
1	CPU RJ-45 (top)	Local Port	LOI / RS-232D
2	CPU RJ-45 (top)	COMM1	Ethernet
3	CPU 5-pin (bottom)	COMM2	Serial / EIA-232 (RS-232)
4	Module Slot 1	COMM3	EIA-232 (RS-232), EIA-485 (RS-485), Modem, or MVS
5	Module Slot 2	COMM4	EIA-232 (RS-232), EIA-485 (RS-485), Modem, or MVS
6	Module Slot 3	COMM5	EIA-232 (RS-232), EIA-485 (RS-485), Modem, or MVS

Local Operator Interface Port (LOI)

The Local Operator Interface (LOI) port provides direct communications between the 3095FC and the serial port of an operator interface device, such as an IBM compatible PC using an EIA-232 (RS-232) link. The interface allows access to the 3095FC (using Rosemount User Interface Software) for configuration and transfer of stored data.

The LOI terminal on the Termination Board provides wiring access to a built-in EIA-232 (RS-232) serial interface, which is capable of up to 19,200 bps operation. The operator interface port supports Modbus protocol communications. The LOI also supports the log-on security feature of the 3095FC if the Security on LOI is Enabled in Rosemount User Interface Software ("Security Configuration" on page 3-13).

NOTE
By default, the LOI Port is Comm Tag Local Port in the 3095FC > Comm Port settings screen. Use the 3095FC > Direct Connect command to connect using the LOI. See "Connection Methods" on page 2-13.

To ease wiring, operator interface cable is available as an accessory (see "Installation" on page 2-2). Refer to Figure 2-3.

Figure 2-3. Operator Interface Wiring

White TX

Red TX

Black TX

To screw Terminals

Connection at PC COM Port
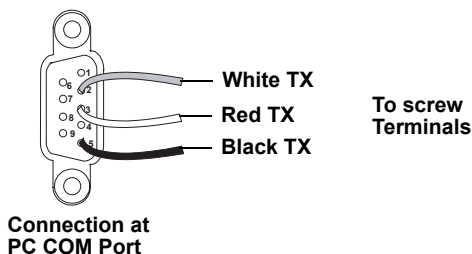
Table 2-3. Local Operator
Interface Port Wiring

Signal	Label
Common	COM
LOI Power[1]	TX + V
Common	COM
Ready to Send	RTS
Receive (RX)	RX
Transmit (TX)	TX

(1) Do not use the LOI to power external devices.

Table 2-4. PC Comm Port
Wiring

Signal	Pin	Label
Transmit (TX)	2	TX
Receive (RX)	3	RX
Ground (GND)	5	COM

EIA-485 (RS-485) Serial Communications - Comm 1

Use Comm 1 to monitor or alter the 3095FC from a remote site using a host or Rosemount User Interface Software. Comm 1 supports baud rates up to 19200 bps. Comm 1 also supports the log-on security feature of the 3095FC if the Security on Comm 1 is Enabled in Rosemount User Interface Software.

Comm 1 sends and receives messages using Modbus protocol. Comm 1 permits EIA-485 (RS-485) serial communication protocols that meet EIA-485 (RS-485) specifications for differential, asynchronous transmission of data over distances of up to 1220 m (4000 ft). The EIA-485 (RS-485) drivers are designed for true multi-point applications with multiple devices on a single bus.

The default values for the EIA-485 (RS-485) communications are: 9600 Baud Rate, 8 Data Bits, 1 Stop Bit, No Parity, 10 millisecond Key On Delay, and 10 millisecond Key Off Delay. The maximum baud rate is 19200 bps. To enable or disable the Comm 1 port, select Configure > Radio Power Control and select the Enable (default)/Disable under Radio Power Control (see "Radio Power Control Configuration" on page 3-23).

Wiring should be twisted-pair cable. The terminals and their functions are as follows:

Table 2-5. EIA-485 (RS-485)
Communications Wiring

Pin	Function	Label
1	RS-485	B
2	RS-485	A

EIA-232 (RS-232) Communications - Comm 2

A EIA-232 (RS-232) communications card in the Comm 2 port can switch power to an external communication devices, such as a radio, to conserve power. A label on the termination board denotes the usage of each pin on the connector.

The EIA-232 communications card meets all EIA-232 specifications for single-ended RS-232 asynchronous data transmission over distances of up to 15 m (50 ft). The EIA-232 (RS-232) communications card defaults are: 9600 baud rate, 8 data bits, 1 stop bit, no parity, 10 millisecond Key On Delay, and 10 millisecond Key Off Delay. The maximum baud rate is 19200 bps. Refer to Table 2-6 for communication card signals.

Table 2-6. Communications
Card Signals

Signals	Action
RTS	The request to send signals that the modem is ready to transmit.
RX	The RXD receive data signals that data is being received at the communications card.
TX	The TXD transmit data signals that data is being transmitted from the communications card.

Table 2-7. EIA-232 (RS-232)
Communications Card Wiring

Signal	Label
Signal Common Negative	COM[1]
Switched Power	TX[2] + B
Ground	COM[1]
Request to Send	RTS
Tip / Receive Data	RX
Ring / Transmit Data	TX[3]

(1) GND at Pin 1 and Pin 3 are identical. They are separated for ease of wiring.
(2) Switched Power is used with an internal radio or cell phone. It does not power external devices.
(3) Transmit (TX) connects to the 3095FC unit's receive.

Ground the Transmitter

Grounding reduces the effects of electrical noise on the unit's operation and protects against lightening. The 3095FC provides lightening protection for built-in field wiring inputs and outputs. Install a surge protection device on the DC voltage source system to protect the device against lightning and power surges.

The 3095FC has two grounding screws inside the enclosure. It is recommended that a minimum of 14 AWG wire be used for the ground wiring. To minimize signal errors caused by EMI (electromagnetic interference), RFI (radio frequency interference), and transients, The I/O signal wiring cable should be an insulated, shielded, twisted-pair. All grounds should terminate at a single point.

NOTE
Grounding wiring requirements for DC voltage sources equipment are governed by the National Electrical Code (NEC). When the equipment uses DC voltage sources, the grounding system must terminate at the service disconnect. All equipment grounding conductors must provide an uninterrupted electrical path to the service disconnect.

Earth Grounds

All earth grounds must have an earth to ground rod or grid impedance of 25 ohms or less as measured with a ground system tester. The grounding conductor should have a resistance of 1 ohm or less between the 3095FC enclosure ground and the earth ground rod or grid.

Pipelines With Cathodic Protection

The 3095FC must be electrically isolated from the pipeline. Electrical isolation can be accomplished by using insulating flanges upstream and downstream on the meter run. In this case, the Rosemount 3095FC could be flange mounted or saddle-clamp mounted directly on the meter run and grounded with a ground rod or grid system (see "Earth Grounds" on page 2-8).

Pipelines Without Cathodic Protection

The pipeline may provide an adequate earth ground and the 3095FC could mount directly on the meter run using an orifice plate. Use a ground system tester to make sure the pipeline to earth impedance is less than 2 ohms. If the pipeline to earth impedance is greater than 2 ohms, the 3095FC installation should be electrically isolated and a ground rod or grid grounding system installed. If the pipeline provides an adequate ground, a separate ground rod or grid system may not need to be installed.

POWER SUPPLY

The 3095FC accepts input voltages from 8.0 volts to 28 volts at the power terminals (CHG+ / CHG-) with no external current limiting (internal current limit is 200 mA). The CHG+ / CHG- terminal can accommodate up to 16 AWG wire.

To adequately meet the needs of the 3095FC system, it is important to determine the total power consumption and size of solar panel requirements accordingly. To determine the total 3095FC power consumption, be sure to add the power consumption (in mW) of any other devices used with the 3095FC in the same power system. The maximum power for DC voltage sources is 130 mW not including the battery charging.

Convert the total value (in mW) to Watts by dividing it by 1000.

mW / 1000 = Watts

For selecting an adequate power supply, use a safety factor (SF) of 1.25 to account for losses and other variables not factored into the power consumption calculations. To incorporate the safety factor, multiply the total power consumption (P) by 1.25.

PSF = P x 1.25 = _____ Watts

To convert PSF to current consumption in amps (ISF), divide PSF by the system voltage (V) of 12 volts.

ISF = PSF / 12V = _____ Amps

Batteries

Batteries provide power for the 3095FC when the solar panels are not generating sufficient output. The batteries are three D-size lead-acid batteries providing 2.5 Amp-hours of current at 6.2 volts.

The batteries are connected in series by the Battery Charger Board to achieve the required capacity. The battery capacity determines the number of days of reserve (autonomy) desired.

When the 3095FC is configured as an API compliant Electric Flow Management (EFM) and requires an internal communications card, a solar panel, and the internal batteries, the 3095FC should be able to communicate the API audit trail information once a day to a remote host using no additional battery source, no additional solar panel, and maintain a 13 day autonomy in the event that the solar panel is lost.

To determine the system capacity requirements, multiply the system current load (ISF) on the batteries by the amount of reserve time required. Compute "ISF" as described above. The equation is as follows:

System Requirement = ISF amps x Reserve hrs = _____ amp-hrs

APPLY POWER

To prevent unnecessary battery drainage, the 3095FC is delivered with the reset jumper in the OFF position. To apply power to the 3095FC:

1. Complete the necessary wiring ("Wiring" on page 2-4).

1. Unscrew the front end cap cover (LCD end).

2. Place the power jumper in the ON position. The jumper is located on the LCD (if installed) or at J1 on the Battery Charger Board.

3. Screw the front-end cap cover (LCD end).

After the 3095FC completes start-up diagnostics (RAM and other internal checks), the optional LCD displays the date and time to indicate that the 3095FC completed a valid reset sequence. If the LCD does not come on, refer to Section 5: Troubleshooting and Maintenance.

INSTALL THE ROSEMOUNT USER INTERFACE SOFTWARE

If a previous version of the Rosemount User Interface Software is installed, refer to "Uninstalling the Rosemount User Interface Software" on page 2-12.

Software Overview

The Rosemount User Interface Software is used to configure the 3095FC. For PC requirements see "I/O wiring requirements are site and application dependent. Local, state, or NEC requirements determine the I/O wiring installation methods. Direct burial cable, conduit and cable, or overhead cables are options for I/O wiring installations." on page 1-6.

The major components of the Rosemount User Interface Software user interface are:

- Menu bar and menus
- Function screens
- Dialog boxes
- Help system, including the Status bar and message boxes

The menu bar appears on the screen after successfully logging on. From the menu bar, the user may activate a menu and select a function in that menu. Functions may be selected using Toolbar Buttons or the Configuration Tree Menu

Several buttons are commonly used on many Rosemount User Interface Software screens.These buttons are:

- Update: updates content of the window.
- OK: approves and closes the window. A Confirm Save dialog box appears if there are unsaved changes.
- Cancel: cancels all changes and closes the window.
- Apply: applies changes to the window.

Install With Autorun

1. Insert the Rosemount User Interface Software installation CD-ROM into the drive
2. Click Next.
3. Click Yes to agree with the Terms and Conditions
4. Enter the users Name and the Company name. Click Next.
5. The software is saved to the default directory C:\Program Files\Rosemount\Rosemount 3095FC User Interface\User Interface. If another location is desired, use to Browse button to select that location. Click Next. A warning box appears if there are incompatible files.
6. Review the items in the list and click Next.
7. When the installation is complete click Finish.
8. Remove the Rosemount User Interface Software installation CD-ROM.

Install Without Autorun

1. Insert the Rosemount User Interface Software installation CD-ROM.
2. Click the Windows Start button.
3. Select Run.
4. Click the Browse button
5. Navigate to and select the Select.exe located on the CD-ROM.
6. Click OK in the Navigation Window.
7. Click OK in the Run window.
8. Continue with in "Install With Autorun" steps 2-8, located above.

Uninstalling the Rosemount User Interface Software

1. Click the Windows Start button.
2. Select Settings > Control Panel.
3. Double-click the Add/Remove Programs icon.
4. Select Rosemount 3095FC User Interface.
5. Click Change/Remove.
6. Follow the instructions that appear on the screen.

GETTING STARTED WITH THE SOFTWARE

Run the Software

To run the software, perform one of the following steps

- Double-click on 3095FC User Interface located on the desktop.
- Select Start > Programs > Rosemount 3095FC User Interface > 3095FC User Interface.
- Double-click on the file 3095.exe located in C:\Program Files\Rosemount\Rosemount 3095FC User Interface (default directory). If the program file was saved to another location in "Install With Autorun" on page 2-11, select this location instead.

NOTE
Only one version of Rosemount User Interface Software can run at a time.

Log into the Software

To log on to Rosemount User Interface for Windows software:

1. Connect the 3095FC to the Local Operator Interface (LOI) port and launch Rosemount User Interface Software.
2. Enter the factory-assigned 3-character login (username): LOI.
   Enter the 4-digit password: 1000. The login is assigned using the security feature of the Rosemount User Interface Software (see "Security Configuration" on page 3-13).

NOTE
Login is case sensitive.

If the login is not valid, a dialog box appears. Click OK and reenter the login and password. Repeat this procedure until a successful login and password is entered. To exit the login screen press >Esc> or click Cancel.

When login is successful, the Configuration Tree appears on the screen. See "Configuration Tree" on page 2-14 for more information.

ESTABLISHING COMMUNICATION

Connection Methods

When the user is logged into the Rosemount User Interface Software, the PC must connect to the 3095FC unit so communication can be accomplished. Use one of the following connection methods:

- Direct Connect - Connect to the 3095FC using the Local Port (LOI) if the default communication parameters apply.
- 3095FC (Communications) Directory View - Double-click the Station Name to connect to the 3095FC using the parameters currently set for that 3095FC.

NOTE
Once connected, the Configuration Tree view becomes the active screen.

Direct Connect

The Direct Connect command allows the Rosemount User Interface Software to initiate communications with the 3095FC by performing a search of the PC communication ports at various baud rates. Direct Connect "locks on" to the first Comm Port and Baud Rate (1200, 2400, 4800, 9600, 19200, 38400, and 57600 bps) that successfully communicate with a 3095FC.

If unsuccessful, the program attempts to establish communications through the remaining COM Ports of the PC, successively, until it receives a valid reply.

For the Direct Connect option to operate correctly the PC must be connected to the Local Operator (LOI) port of the 3095FC with communication settings of:

- 8 Data Bits
- 1 Stop Bit
- No Parity

To use Direct Connect:

1. Physically connect the 3095FC (see "Installation" on page 2-2).

2. Launch and log into Rosemount User Interface Software (see "Getting Started with the Software" on page 2-12).

3. Perform one of the following:

   - Click on the Direct Connect icon in 3095FC Directory (Configuration Tree.)
   - Click the Direct Connect button on the toolbar.

4. If this is the first time connecting to the 3095FC, continue with "Setting the Clock" on page 3-4.

Connect

When off-line, the 3095FC menu displays Connect. To use Connect:

1. Physically connect the 3095FC (see "Installation" on page 2-2).

2. Launch and log into Rosemount User Interface Software (see "Getting Started with the Software" on page 2-12).

3. Perform one of the following:

    • Select a communications port from the Device Directory and press the <Enter> key.

    • Double-click on a communications port from the Device Directory.

    • Click the Connect button on the toolbar.

    • Select Device > Connect to connect to the 3095FC currently selected in the Device Directory. If a 3095FC is not currently selected, the error "No 3095FC is Currently Selected" appears.

Remote Hardware Connection

To connect the PC to a remote 3095FC, a serial, dial-up modem, radio, satellite, or other communications line should be installed. This connection is typically made through the host port on the 3095FC. Use the Connect command to connect to a serial or dial-up modem

Disconnect from the 3095FC

Close the screen to disconnect an on-line connection. This automatically closes the connection.

CONFIGURATION TREE

When communication is established with a 3095FC or opening a configuration file, the Configuration Tree appears on the screen. The Configuration Tree is used to perform the following:

• Add, delete, or modify communication configurations for the 3095FC units. The communication configurations allow the Rosemount User Interface Software to communicate to an individual 3095FC unit.

• Establish Groups of 3095FC units. A 3095FC Group is typically several units in the same geographical area or a number of units with something else in common. Each group contains a list of all the 3095FC devices contained within that group.

• Assign an address for every 3095FC within a group. Each 3095FC has a Station Name (Tag) and unique address with which to differentiate each device. The Address must be different from any other host system that may access the communications link.

• Setup the 3095FC Comm Ports

Use the "+" and "–" symbols to display or hide various options.

Toggle between the Online configuration screen and the Configuration tree/device directory using Window > >select file>.

NOTE
Double-click the desired communications link (3095FC name) to connect to that 3095FC. Double-clicking an icon is the same as selecting the menu bar or toolbar button Direct Connect or Connect commands.

Configuration of the PC Communication Ports to the 3095FC unit cannot be performed within the 3095FC unit configuration screen. Return to the 3095FC Directory (Configuration Tree) screen. If the user is in a configuration, select Window > Device Directory or View > Device Directory to view the 3095FC directory.

Figure 2-4. Configuration Tree Screen
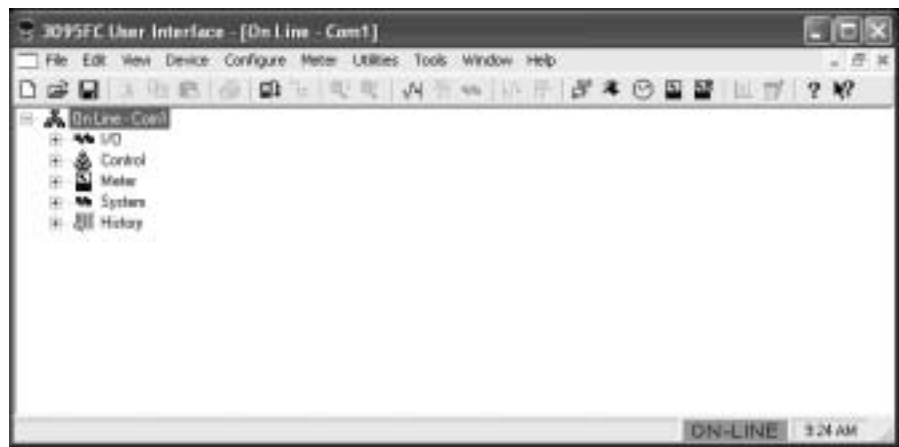
Adding a Group

Multiple 3095FC units can be organized to form Groups. Unit Groups are typically units in the same geographical area or units with something else in common. When a Group file is selected, a list of all 3095FC communication setups in the Group appears below the Group.

1. Right-mouse click on the Device Root directory icon.
2. Select Add a Group.
3. Right-mouse click on the New Group and select Rename. Type in the new Group name.
4. Press <Enter>.
5. The 3095FC can now be added to the Group.

Deleting a Group

1. Right-mouse click on the group to be deleted.
2. Select Delete Group.
3. Click Yes.

Adding a 3095FC transmitter

1. Right-mouse click on the Device Root directory icon.
2. Select Add a Device   .
3. Right-mouse click on the New Device and select Rename. Type in the new device name.
4. Press <Enter>.
5. Configure the 3095FC communication parameters.

NOTE
Place a 3095FC connection under a Group by selecting the Group before adding the 3095FC Connection.

Deleting a 3095FC transmitter

1. Right-mouse click on the device to be deleted.
2. Select Delete Device.
3. Click Yes.

Deleting all 3095FC transmitters

1. Right-mouse click on the Device Root directory icon.
2. Select Delete All Devices.
3. Click Yes in the Confirm Delete Message dialog box.

Renaming a Group or 3095FC

1. Right click on the Device or Group to be renamed.
2. Select Rename.
3. Type the new name.
4. Press <Enter>.

Section 3   Configuration

OVERVIEW

The Rosemount 3095FC has parameters that must be configured before it is calibrated and placed into operation. Configuration must be performed using Rosemount User Interface Software. Configuration can be performed either onsite using the LOI port or off-line and later loaded into the unit.

Default values for all parameters exist in the firmware of the 3095FC. The following parameters should be verified and configured:

- "Setting the Clock" on page 3-4
- "Configuring the System Flags" on page 3-5
- "3095FC Communications Ports Configuration" on page 3-8
- "Security Configuration" on page 3-13
- "LCD User List Configuration" on page 3-15
- "Analog Input (AI) Configuration" on page 3-16
- "Meter Run Configuration" on page 3-25 and "Gas Quality Tab" on page 3-28.
- "History Points Configuration" on page 3-32

BASIC FUNCTIONS

Begin the configuration process with "Setting the Clock" on page 3-4.

The following functions are used throughout the configuration process. They are provided at the beginning of the section so they can be easily referenced.

Select TLP Options [...]

Throughout Rosemount User Interface Software, the Select TLP dialog can be accessed by clicking the browse button with three dots. The Select TLP dialog allows the user to assign specific inputs and outputs to parameters. Rosemount User Interface Software uses Point Type (T), Logical Number (L), and Parameter (P) to define point locations.

The display field at the bottom of the Select TLP dialog displays the numeric point location of the TLP point or a text abbreviation, depending on the Display setting (see "Display TLP Options").

Display TLP Options

Select Tools > Options to set whether the TLP displays as text or numbers in TLP display fields throughout the Rosemount User Interface Software.

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Process Management

Duplicating a Configuration

Duplicate the configuration of a 3095FC using these instruction.
1. File > Save Configuration to save the configuration to a specified file.
2. Establish Communications with the second unit (see page 2-13).
3. File > Download loads the configuration into the unit.
4. After loading the configuration data into the second 3095FC (Step 3), save the configuration to a unique disk file by repeating Step 1.

Using Copy and Paste

Use Copy and Paste to copy data from one configuration screen to another of the same type.
1. Configure the point that is to be duplicated.
2. Click Apply.
3. Click Copy.
4. Select the next Point Number or go to the appropriate screen.
5. Click Paste.
6. Click Update.

New Configuration File

Create a configuration file off-line using the following instructions.
1. Select File > New.
2. The Type parameter indicates the type of 3095FC unit.
3. The number of orifice meters will be 1.
4. Save the configuration file.
5. Establish an on-line connection to the 3095FC unit.
6. Configure as necessary.

Open File

The Open option opens an existing configuration file. Configuration files are created using the Save Configuration function. To open a configuration file:
1. Establish an on-line connection to the 3095FC (see "Establishing Communication" on page 2-13).
2. Select File > Open.
3. Select the configuration file name. The extension must be .800.
4. Configure as necessary.

Once the configuration file is opened it automatically becomes active and may be edited offline. The configuration file may also be loaded into a 3095FC using the "Download File" function (see page 3-3).

Save File

The Save option saves the current configuration of a connected 3095FC to a disk file. Once a backup configuration file is created it can be loaded into a 3095FC using the "Download File" function (see page 3-3).
1. Select File > Save Configuration. The Save As dialog box appears.
2. Type the desired File name of the backup file or use the default.
3. Click Save. The file is saved in the default directory C:\Program Files\Rosemount\Rosemount 3095FC User Interface\User Interface unless another directory was selected.

Download File

Use this function to download a previously saved configuration to a 3095FC. Configuration files are created using the Save Configuration function. To download a previously saved configuration:

1. Select File > Download.
2. Select the configuration file name with the extension .FCF
3. Click Open.
4. Select the Point Types to download. Use Select All or Deselect All to change multiple Point Types. Select or Deselect individual Point Types by selecting the configuration Point Type in the left column and selecting specific Point Types in the right column.

NOTE
The Configuration Points screen changes depending on the type of device that is connected.

5. Select only the Configuration Points to download.
6. Click Download. Downloading automatically begins.
7. Click OK when the download is complete.

Print Configuration

The Print Configuration option enable specifying Point Types to Print.

1. Select File > Print Configuration.
2. Select the Point Types to be printed. Select the All or Deselect All buttons for multiple Point Types or select/deselect individual Point Types by using the mouse to double click on the Point Type in the left column and selecting specific Parameters in the right column.
3. Click OK.
4. When the Print Preview screen appears, choose one of the following buttons:
   • Print to send to a local printer.
   • PDF to create a .pdf (Portable Document File).
   • Excel to create an .xls spreadsheet file.
   • RTF to create an .rtf (Rich Text Format) file.
   • HTML to create an .htm Internet browser file.
   • TXT to create a .txt text file.
5. The 3095FC Group, Address, Field, and Value information displays in the Print Configuration results window.

CONFIGURATION

Setting the Clock

Immediately after connecting to a 3095FC for the first time, set the Rosemount User Interface Software Clock to ensure proper logging of history. The internal real-time clock provides time-stamping and control of the historical databases, Event Log, Alarm Log, Audit Log, and Contract Hour.

NOTE

The time stamp reflects the time at the end of the period. Data collected from 0800 to 0900 is thus time-stamped 0900. This is used for the logging of history.

See Figure 3-1

1. Select Device > Clock or click the Clock icon in the toolbar.
2. The display at the bottom of the calendar is the date and time from the PC clock. Continue with Step 5 if correct.
3. If it is not correct:

   a. use the arrow buttons to select the correct Month and Year

   b. click on the desired day of the month

   c. click on the time field and type in the desired value (type A or P for the AM/PM field) or use the arrows.

4. The clock can automatically compensate for daylight savings time by enabling this feature.
5. Click Apply and click OK.

Figure 3-1. Clock Screen
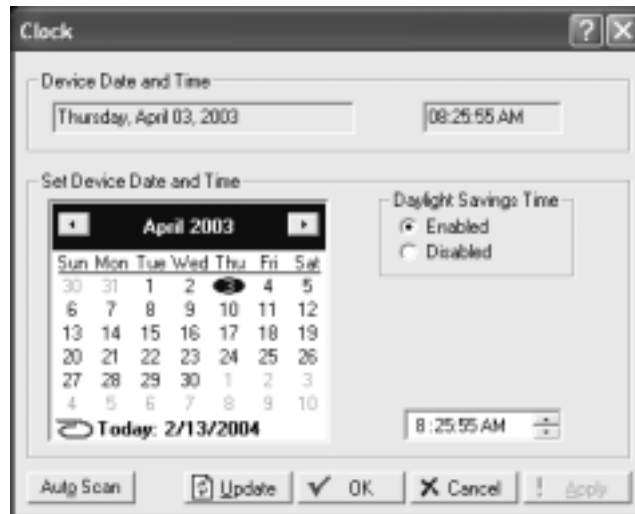
Configuring the System Flags

Use System Flags to perform actions that affect the overall operation of the 3095FC. From the Flags screen, a configuration can be saved to Flash memory and the 3095FC can be re-initialized.

NOTE
Certain Flags cause data to be lost, parameter values to be changed, and configuration memory to be cleared. Confirm Flag function before changing.

General Tab

Figure 3-2 on page 3-6

After a Warm Start, the 3095FC is initialized from SRAM memory if the configuration is valid. If valid, the databases remain intact. If the memory does not have a valid configuration, the configuration that was last saved to Flash memory is used. To save a valid configuration, use the Save Configuration button.

In a Cold Start, the 3095FC is initialized from the restart configuration saved in the Flash memory. If the configuration memory does not have a valid configuration written in it, the factory defaults are used.

NOTE
Perform a Cold Start after setting the clock and BEFORE setting any other parameters to ensure the 3095FC memory is cleared before configuration begins.

Cold Start reloads all restart configuration data and may also clear logs and displays. In addition, it may cause output changes, load new accumulator values, and disable user program tasks and User Data Types. Generally, a Cold Start should not be used on a 3095FC that is actively gathering data or performing control. Save or document all required data and parameter values that could be affected before performing the Cold Start.

The following may occur when performing a Cold Start:
- Cold Start restores a configuration from default values stored in Flash memory.
- Cold Start & Clear ALL restores a configuration from default values stored in Flash memory and clears all History, Alarm Log/Event Log, and displays.
- Cold Start & Clear Alarms/Events restores a configuration from default values stored in Flash memory and clears the Alarm Log/Event Log.
- Cold Start & Clear Displays restores a configuration from default values stored in Flash memory and clears the 3095FC Displays.
- Cold Start & Clear History Data restores a configuration from default values stored in Flash memory and clears all History database files.

The Clear Flash Memory procedure clears all saved restart configuration data contained in Flash memory. Only factory defaults are retained. To return the 3095FC to the original factory default settings:

1. Select Device > Flags > General Tab
2. Select the Clear button and click Yes.
3. Perform a Cold Start using the Cold Start & Clear ALL button.
4. Click Yes, Apply, and OK.

NOTE
The Status field displays the current status of the save or clear flash memory function.

To save configuration settings to Flash memory, use the Flash Memory Save Configuration function in the 3095FC Flags screen. It is possible to backup the working configuration from SRAM to Flash memory. In the event of operating problems, the working configuration can be restored by performing a Cold Start. To save the current configuration to Flash memory:

1. Select Device > Flags.
2. Select Save Configuration. Click Yes, Apply, and OK.

NOTE
Depending on the communications type and speed, the user may have to reconnect to the 3095FC after this procedure.

Figure 3-2. 3095FC System Flags General Tab

Advanced Tab

Use the following instructions to configure the Advanced System Flags tab.

See Figure 3-3.

1. Select Device > Flags > Advanced Tab.
2. Enable CRC Check to perform CRC (Cyclical Redundancy Check) check on 3095FC protocol communications.
3. Enable I/O Scanning so the I/O is in normal scan mode. When Disabled, all I/O scanning stops and the last values are used until scanning is resumed.
4. Select a Pass Through Mode communications option to send Pass Through messages. Using any of the communications ports, Pass Through Mode allows data to be received by one unit and then passed through to other devices connected on any other communications port. For example, the host communicates using a radio on its LOI port. Other 3095FC units can then be connected to the EIA-485 (RS-485) port of the first unit.   All units can use the one radio to communicate to the host.

NOTE
COM2 may only use a Dial-up modem if it is receiving Pass Through messages. It cannot transmit to other field devices via Dial-up modem.

5. Select the respective port (LOI, COM 1, or COM 2) for the Set RTS to High for 30 Sec option and click Apply to activate the RTS (Request-to-Send) signal. The RTS signal turns on for 30 seconds.

Figure 3-3. 3095FC System Flags Advanced Tab
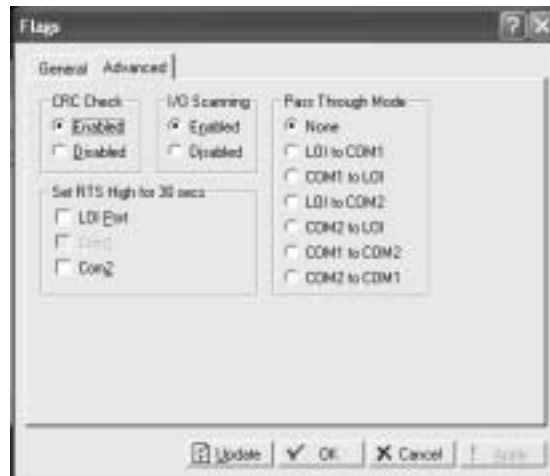
3095FC Communications Ports Configuration

The communication ports of the 3095FC provide a link to a PC, such as one running Rosemount User Interface Software or a host PC. The 3095FC can have up to three communication ports.

General Tab

See Figure 3-4.

1. Select Device > Comm Ports > General Tab
1. Select the Port that the 3095FC is using to communicate. Enter the 10-character Comm Tag name for identification of the communications port.
2. Select the transmit and receive data Baud Rate in bits per second.
3. Select the Parity radio button if checks are to be performed by the communications controller.
4. Select the number of Data Bits contained in an asynchronous byte, or character. This number is typically 8.
5. Select the number of Stop Bits contained in an asynchronous byte, or character. This number is typically 1.
6. Select if the RTS/CTS Handshaking is enabled.
7. Enter the Key On Delay to define the number of seconds to delay after turning the RTS signal on before beginning transmission. For older radios, the Key On Delay may need to be set as high as 0.2 seconds. For radios designed for data transmission, no more than 0.02 second should be required.
8. Enter the Key Off Delay intervals defining the period to delay before turning the RTS signal off once a valid message has been sent. The default of 0.01 seconds should be sufficient for most radios.
9. Enter the Valid Receive Ctc (Counter) to log the number of valid OpCodes received by the device on the communication port. The value in the counter can be preset or cleared.

Figure 3-4. Device Comm Port General Tab Screen

RBX Tab

To configure the RBX, a modem must be present and appropriately configured. Use the following steps to configure the RBX tab.

See Figure 3-5 on page 3-10.

1. Configure the Device > Comm Ports > General Tab (see "General Tab" on page 3-8).

2. Select Device > Comm Ports > RBX Tab.

3. Enable RBX Mode. The RBX (Report-by-Exception) feature allows the 3095FC to call in to a host PC when a configured alarm occurs.

4. Enter the RBX Host Address and Group number. The defaults of "1" and "0" are used by most host driver software.

5. Set the Delay to define the time, in seconds, between attempts to transmit an RBX message. There is a Delay parameter associated with each Retry Count parameter, allowing the user to identify different length delays for each entry.

6. The RBX Attempts #1 - 3 (Retry Count) is the number of attempts a message is repeated if a valid response is not obtained on the first attempt. Attempts include the initial message plus the retries. The three Retry Count parameters each have an associated Delay parameter. Selecting Fixed Number allows the user to enter a value for how many times a message is retried after the first unsuccessful attempt. Note that a "0" entry causes no retries. Selecting Continuous causes continuous retries that can only be stopped when the host clears the RBX alarm.

    For example: If setting the Retry Count #1 to "2", Delay #1 to "10", Retry Count #2 to "1" and Delay #2 to "20", then after the first unsuccessful attempt to communicate with the host, the 3095FC tries two more times after waiting 10 seconds each time, and once more after waiting 20 seconds.

7. Enabling the Extra Key On Delay to add an additional amount of time to delay transmitting an RBX message after turning the RTS signal on. The amount of time is fixed. This parameter is used for radio communications.

8. RBX ACK Timeout - This is a message from the Device. If the ACK fails to be received within the timeout period the 3095FC retries the RBX.

NOTE
The RBX Alarm Index indicates alarms currently being reported through the RBX. The RBX Status parameter indicates the status of RBX messaging, either Active or Inactive. Active indicates that an SRBX alarm is being processed.

9. After configuring the RBX function, use Device > Flags > Flash Memory Save Configuration to save the configuration to the Flash Memory in case a Cold Start must be performed.

Figure 3-5. Device Comm Port
RBX Tab Screen

**3095FC Device
Configuration /
Information**

This step establishes the Station Name, Address, Group, and other global variables that differentiate a 3095FC. Other system variables set in the information screen must be established for a particular application.

General Tab

See Figure 3-6 on page 3-11.

Use the following instructions to configure the Device Information General tab.

1. Select Device > Information > General Tab.

2. Enter the Station Name to be logged with the historical database for site identification.

3. Enter a unique Address to differentiate each device in a communications group. The Address can be assigned a value from 1 to 255. The System Default Address of 240 should not be used.

4. Enter a Group to identify a set of 3095FC units for communication purposes, typically to a host that polls the 3095FC. The station Group can be assigned a value from 1 to 255. All of the 3095FCs addressed as an area in the host have the same station Group.

5. Set the Contract Hour to indicate when the values are totaled for a single day of production, accumulators are cleared, and data is logged to the Daily History database. The Contract Hour is based on a 24-hour clock with midnight as the "0" hour.

6. Select Force End of Day to reset the daily and hourly accumulators. Click Apply to cause the daily and hourly values to be logged into memory for all historical data totals.

7. Select either U.S. or Metric Units for calculations. All calculations will be performed to reflect the selected preference.

8. Use Device > Flags > Flash Memory Save Configuration to save the configuration to the Flash Memory in case a Cold Start must be performed.

NOTE
The Device Type field displays the type of 3095FC being configured.

Figure 3-6. 3095FC
Differentiation / Information
General Screen
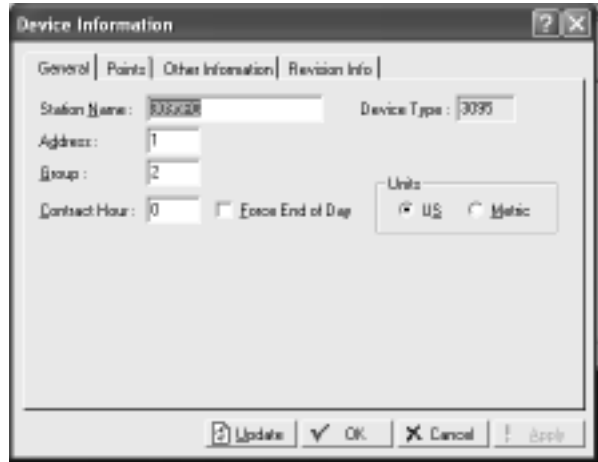
Points Tab

The Points screen allows the user to change the number of certain points that will be active.

1.   Select Device > Information > Points Tab

Figure 3-7. 3095FC
Differentiation / Information point
Tab Screen
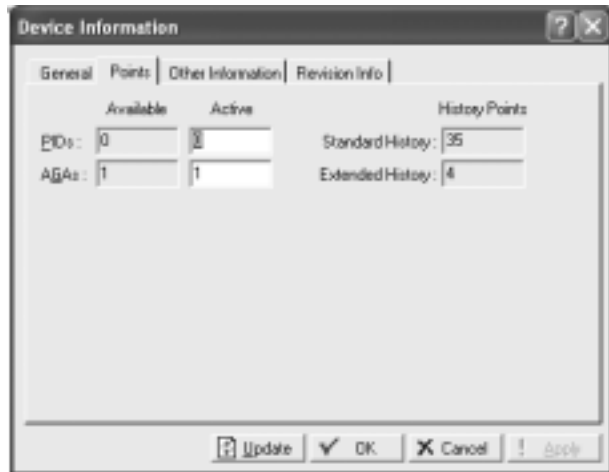
Other Information Tab

This tab displays information about the firmware (Version Name, Part Number, ID, and Time Created), the boot firmware (Version Name, Part Number, and Time Created), the processor (loading), amount of RAM installed, and the ROM (customer name and serial number).

Figure 3-8. 3095FC Differentiation / Information Other Information Screen
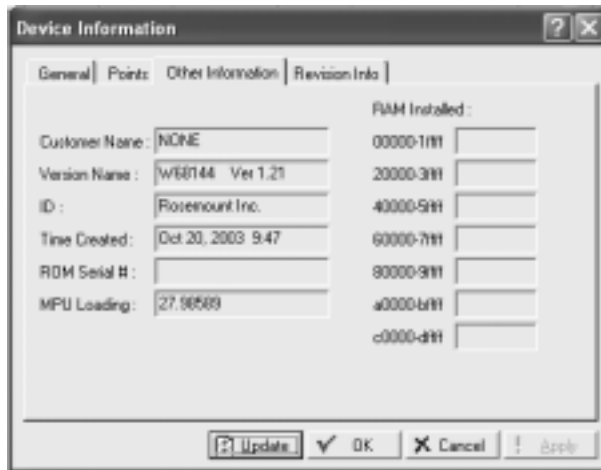
Revision Info Tab

This screen displays information about the firmware or accessory software installed in the 3095FC. The first field displays the name of an accessory if one is installed. For example, this field may say I/O Expansion Board or Turbine Interface. When the field displays Not Used, there are no additional accessories installed. The part number and version control number may also be displayed.

Figure 3-9. 3095FC Differentiation / Information Revision Info Screen
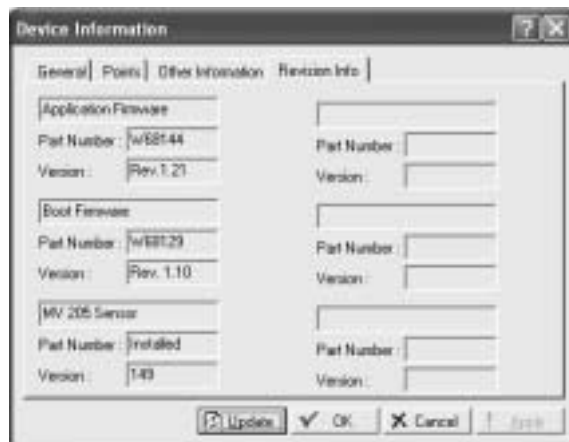
Security Configuration

The 3095FC has two types of security.

- Rosemount User Interface Security - Enables access to the Rosemount User Interface Software and what menu items the user can access.
- 3095FC Security - Enables communication to the transmitter.

Rosemount User Interface Security - Menu and Log On

See Figure 3-10 on page 3-14.

Use Operator ID and Password controls who can log on to Rosemount User Interface Software and the Access Level controls access to menus and screens. Up to 21 different users are permitted.

1. Select Utilities > 3095FC User Interface Security.
2. Enter the 3 alphanumeric characters for each operator I.D. (login). Each operator I.D. must be unique. The I.D.is case sensitive. The default is LOI.
3. Assign the four numeric characters between 0000 and 9999 to define the password for each operator I.D (login). Users can have the same password. The default is 1000.
4. Assign an access level for each user
   - Level 0: only allows access to several options in the File and Display menus, plus all options in the Help menu.
   - Level 1: allows access to the menu options of Level 0 and several options in the View menu.
   - Level 2: allows access the menu options of all lower level options, Collect Data, EFM reports, and Meter menu.
   - Level 3: allows access the menu options of all lower level options, several options in the Device and File menu, and the Configuration menu.
   - Level 4: allows access the menu options of all lower level options and several options in the Utilities menu.
   - Level 5 (system administrator level: allows access to all menus and options.

NOTE

To prevent unauthorized users from accessing the software, delete the default factory-assigned login (username) LOI and the password 1000 after the security parameters are established.

Ensure that someone has Level 5 Access prior to deleting LOI 1000.

Rosemount 3095FC

Figure 3-10. Security Access
Level Screen

3095FC Security

See Figure 3-11.

The 3095FC Security controls access to the device Comm Ports. When
enabled, login is required to use the communication ports. Each
communication port can be enabled or disabled separately.

The Access Level provides security for the 3095FC communication ports
depending on the value of the Comm Port Security parameter as defined by
the Comm Ports screen.

- Disabled - All login requested accepted. Access Level is ignored.
- Enabled - Login required (setup Operator ID and Password in
  "Rosemount User Interface Security - Menu and Log On" on
  page 3-13). Upon successful login, full read and write access is
  allowed. Access Level is ignored.
- User Access Level Enabled - Login required (setup Operator ID and
  Password in "Rosemount User Interface Security - Menu and Log On"
  on page 3-13). Rejects a login request when the Access Level is
  greater than the Access Level stored in the Utilities > 3095FC Security
  Interface Security screen. This ensures the user is limited to the
  Access Level configured in Rosemount User Interface.

Figure 3-11. Security Enable
Screen
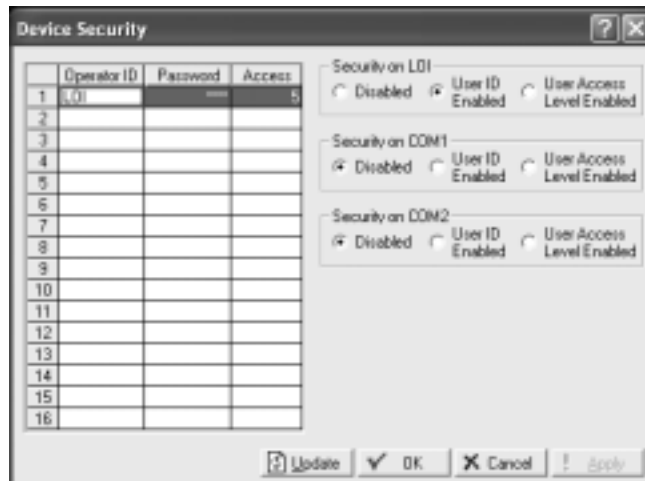
LCD User List Configuration

LCD User List Setup allows the user to assign up to 16 parameters to be displayed on the LCD. Each parameter is displayed for three seconds before continuing to the next.

1. Select Configure > LCD User List Setup.
2. Use the drop-down list box to select the desired LCD User List Number (List No.) to configure.
3. Click the Point Definition TLP button to define the desired point parameters to view on the LCD display. "Undefined" indicates that no parameter has been specified.
4. Define up to 16 Data Point definitions to be displayed in the User List. Enter the 10-character Description (Text) of the parameter.

I/O Configuration

Configuring the 3095FC is a matter of establishing points and then configuring various parameters. Each input and output has a unique Point Number to identify the input or output. Each I/O point parameter must be individually configured. The point number indicates the location of the point on the termination board. It is automatically assigned and cannot be edited.

Each Point Number is given a Tag, which includes up to 10 characters to identify the Point Number being defined in the I/O screen. Any alphanumeric characters, including spaces, may be used.

NOTE
Units is a user-defined 10-character description for the engineering units assigned to the I/O. For example: PSIG, MCF, degrees F, mA, or volts.

The I/O can be configured through either the Configure > I/O menu or the I/O list on the Configuration Tree.

A1 - DP
A2 - SP
A3 - RTD
B1 - Aux AI
E1 - Logic Voltage
E2 - Bat Voltage
E3 - Spare
E4 - Spare
E5 - Brd Temp

Scanning Disabled versus Scanning Enabled

If scanning is set to disabled, the transmitter stops updating values for each point number and values may be manually entered. Scanning Enabled allows the transmitter to continuously update the parameters.

I/O Monitor

I/O Monitor displays all installed and active I/O points and flow calculation information. The I/O Monitor screen shows the requested point information, such as field I/O values or calculated flow values. These on-screen values are automatically updated by Rosemount User Interface Software.

Analog Input (AI) Configuration

Analog Inputs are analog signals generated by measurement devices, such as pressure and temperature transmitters, including RTD probes.

The following tabs are available as part of the AI configuration:

- AI General tab
- AI Advanced tab
- AI Calibration tab (see "Analog Input (AI) Calibration" on page 4-3)
- AI Alarms tab

AI General Tab

The AI General Table sets the basic parameters for the Analog Input point. Use the following steps to configure the AI General Tab.

See Figure 3-12

1. Select Device > I/O > AI Points > General Tab
2. Select the Analog Input.
3. Enter a 10-character Tag for identification of this Point Number.
4. Enter the Value and Units.
5. Select the Scanning option.
   - When Scanning is set to Enabled, Value automatically displays the last Analog Input scan in engineering units.
   - When Scanning is set to Disabled (manual mode), the value is no longer updated by the 3095FC. If Scanning is set to Disabled, enter a value to override the input. If Alarming is Enabled, an alarm generates when Scanning is set to Disabled.
6. Set the Alarming option. The Active Alarms field indicates any alarms that are active for this point. For example, when Alarming is Enabled, the limit alarms (such as Low Alarm and Rate Alarm) that are active appear. Even if Alarming is Disabled, the Point Fail (hardware reports a malfunction) alarm and Manual (Scanning Disabled) indicators can still appear.
7. Enter the Scan Period as the amount of time between updates of the filter value. All Analog Inputs are updated based on their individual Scan Periods. The default value is 1 second. The minimum Scan Period allowed is 50 msec.
8. Enter the Low Reading EU (engineering unit) corresponding to 0% input. Enter the High Reading EU corresponding to 100% input. For example: If a temperature transmitter is connected to the Analog Input with a range of -40 °F to 212 °F, the Low Reading EU would be set to -40 and the High Reading EU would be set to 212.
9. To complete point configuration click Apply.
10. Use Device > Flags > Flash Memory Save Configuration to save the configuration to the Flash Memory in case a Cold Start must be performed.

Figure 3-12. AI General Tab
Screen

AI Advanced Tab

The AI Advanced tab enables the user to configure features, such as filtering, A/D conversions, and clipping for the selected Analog Input. Use the following steps to configure the AI Advanced Tab.

See Figure 3-13 on page 3-18.

1. Select Device > I/O > AI Points > Advanced

2. Enter a Filter value, which is a weighted sample using a percentage of the last value plus a percentage of the new value. The entered data is the percentage of the last value used. The Filter is calculated every Scan Period by the formula:
    (Last Value × Entered %) + (New Value × (100 - Entered %)) = Filtered Value

3. Enter the Adjusted A/D 0%, which is the calibrated Analog-to-Digital (A/D) reading that corresponds to 0%input. In the Calibrate function, this value is altered to set the 0% input exactly at the Low Reading EU value to eliminate transmitter and system errors.

4. Enter the Adjusted A/D 100%, which is the calibrated A/D reading corresponding to 100% input. This value is used to convert the input to engineering units. In the Calibrate function, this value is altered to set the 100% input exactly at the High Reading EU value.

NOTE
Raw A/D Input displays the current reading directly from the analog-to-digital converter. Actual Scan displays the actual amount of time in seconds that passes between scans. This number should be the same as shown for the Scan Period parameter if the system is not overloaded.

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5. The Enable Average Raw Values calculates and averages the raw readings during the Scan Period. Use the outcome as the Raw A/D Input during calculations. For example: When Enabled, an Analog Input point configured with a Scan Period of 1.0 seconds obtains a new value from the A/D every 50 milliseconds. During the Scan Period, 20 values are obtained from the A/D and summed together. At EU Value calculation, the values summed are divided by the number of samples taken during the scan period and are used as the Raw A/D Input. Disable this function to acquire instantaneous values.

6. When Temp Compensation is Enabled, a temperature compensation curve is applied to the Analog Input using the board temperature of the 3095FC as a reference. Use this feature to improve the A/D conversion accuracy at temperature extremes for modular Analog Inputs only; built-in Analog Inputs already have temperature compensation. When using this feature, be sure to perform a calibration after it is Enabled.

7. When Clipping is Enabled, the 3095FC forces the Filtered EUs to stay within the range defined by the cut off limits. Set the cut off limits by using the LoLo Alarm and HiHi Alarm parameters (see "AI Alarms Tab" on page 3-19).

8. To complete point configuration click Apply.

9. Use Device > Flags > Flash Memory Save Configuration to save the configuration to the Flash Memory in case a Cold Start must be performed.

Figure 3-13. AI Advanced Tab Screen
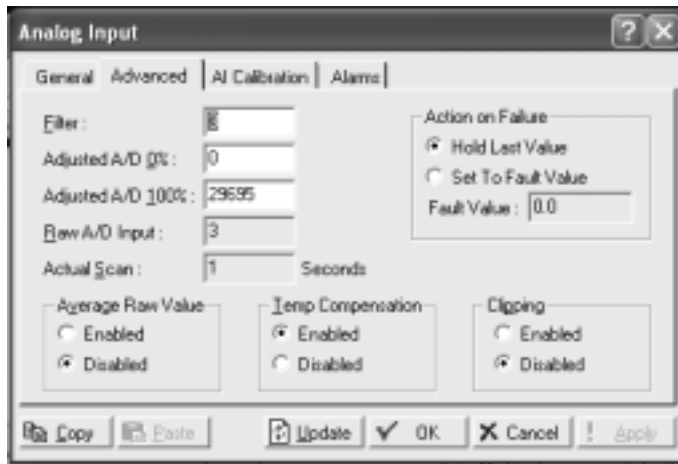
AI Alarms Tab

See Figure 3-14 on page 3-20.

The AI Alarms tab sets the alarm parameters for the AI point.

1. Select Device > I/O > AI Points > Alarms

2. Set the values for the different alarms. There are six different alarms:

    • Low Alarm: The limit value, in engineering units, to which the I/O must fall to generate a Low Alarm.

    • High Alarm: The limit value, in engineering units, to which the I/O must rise to generate a High Alarm.

    • LoLo Alarm: The limit value, in engineering units, to which the I/O must fall to generate a LoLo Alarm. The value is set lower than the Low Alarm.

    • HiHi Alarm: The limit value, in engineering units, to which the I/O must rise to generate a HiHi Alarm. The value is set higher than the High Alarm.

    • Rate Alarm: The value, in engineering units, that represents the maximum amount of change permitted between updates. If the change is equal to, or greater than this value, an alarm is generated. To disable the Rate Alarm without disabling the other alarms, the Rate Alarm value must be set greater than the Span of the Analog Input or TDI.

    • Alarm Deadband - The value, in engineering units, is an inactive zone above the Low Alarm limits and below the High Alarm limits. The purpose of the Alarm Deadband is to prevent the alarm from being continuously set and cleared when the input value is oscillating around the alarm limit. This prevents the Alarm Log from being over-filled with data.

3. Select RBX Alarming

    • Disabled if limit alarms are not necessary for this point. Even if Alarming is Disabled, the Point Fail (hardware reports a malfunction) alarm and Manual (Scanning Disabled) indicators can still occur. To conserve Alarm Log space, only Enable Alarming when necessary.

    • If the host PC is configured to receive field-initiated calls, a Report-by-Exception (RBX) option is available.

        • On Alarm Set - When the point enters an alarm condition, the 3095FC generates a RBX message.

        • On Alarm Clear - When the point leaves an alarm condition, the 3095FC generates a RBX message.

        • On Alarm Set and Clear - When point enters and leaves an alarm condition, the 3095FC generates a RBX message.

4. To complete point configuration click Apply.

5. Use Device > Flags > Flash Memory Save Configuration to save the configuration to the Flash Memory in case a Cold Start must be performed.

Figure 3-14. AI Alarms Tab
Screen
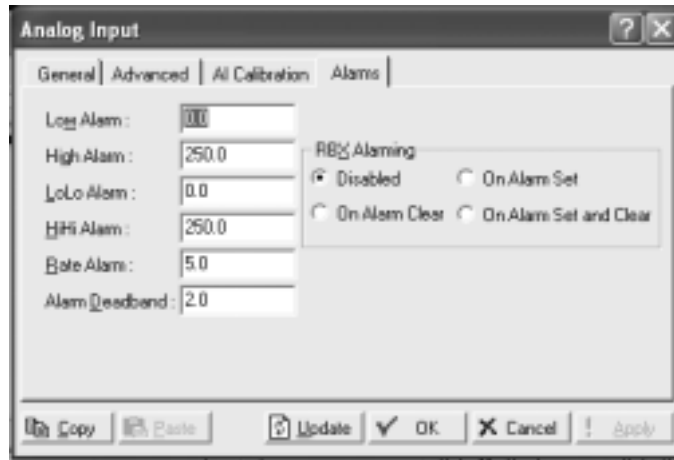
Soft Points Configuration

Softpoints are data storage areas that can be used by any 3095FC application. Softpoints consist of a Tag identifier, one integer value, and twenty floating values. Softpoints consist of:

- tag identifier (10 character string)
- 20 floats (floating point values)
- 1 integer value (16 bit)
- 2 longs (32-bit)
- 10 shorts (16-bit)
- 10 bytes (8-bit). Select:

Use the following steps to configure the soft points

See Figure 3-15.

1. Select Configure > I/O > Soft Points.
2. Select the Softpoint to be configured or viewed.
3. Enter the Tag identification name (10-character).
4. The Integer Flag is a 16-bit unsigned integer value used as a flag to denote the validity of the floating point data or as a counter.
5. Enter the Float number (1 - 20 parameters). These parameters provide storage for IEEE floating point values.
6. To complete point configuration click Apply.
7. Use Device > Flags > Flash Memory Save Configuration to save the configuration to the Flash Memory in case a Cold Start must be performed.

Figure 3-15. Soft Point Screen

Opcode

Opcode (operation code) is an instruction from a host system that informs a slave device what actions to take. Table 3-1 contains a summary and brief description of each Opcode. In some cases the number of data bytes returned for an Opcode varies. For example, Opcode 0, a full update, always returns certain input/output (I/O) information along with optionally specified data.

Table 3-1. Summary of Opcodes

Opcode	Description
0	Send general update such as I/O update, gas flows, and control loop status.
6	Send device configuration with 20 data bytes defining device configuration.
7	Send current time and date
8	Set new time and date
10	Send data from configurable Opcode tables.
11	Set data in configuration Opcode tables
17	Set operator identification
18	Log event.
24	Store and forward
80	Reserved
103	Send system information such as on/off times, manual/alarm status, firmware version, and current time and date.
105	Send history point definition, min/max data, and current values for specified history point.
107	Send tag and current history period for specified history points.
120	Send pointer for alarm, even, and history logs
121	Send specified number of alarms starting at specified alarm pointer
122	Send specified number of events starting at specified event pointer
123	Read user template data
124	Read user Program Memory Allocation Information
126	Send last 60 minutes of data for specified history point.
128	Send archived daily and hourly data for the currently selected day and month
130	Send archived hourly and daily data for specified history point starting at specified history pointer
131	Send specified number of event sequence numbers starting at specified pointer[1]
132	Clear specified number of event sequence number starting at specified pointer[1]
133	Send number of writable events[1]
148	Reads 240 bytes of data from a specified judgment: offset address
149	Reserved
160	Sends the entire structure for a specified Function Sequence Table (FST)

Opcode	Description
162	Sets a single parameter
165	Set or send current configurable historical data
166	Set specified contiguous block of parameters
167	Send specified contiguous block of parameters
180	Send specified parameters
181	Set specified parameters
190/195	Reserved
224	Send Spontaneous Report-by-Exception (SRBX or RBX) message to host
225	Acknowledge Spontaneous Report-by-Exception message from device
255	Error messages transmitted by device in response to a request with invalid parameters or format.

(1) Industry Canada

Certain Opcodes only send data and do not receive data from the device. For example, Opcode 8 requests the device to set the time and date. The device resets the time and date and sends back an acknowledgement in which the Opcode is repeated, but no data bytes are transmitted back. All acknowledgements are 8-byte messages that repeat the Opcode received, but do not transmit any data bytes.

Opcode 255 is an error message indicator. This is also an 8-byte message with no data bytes included. The Opcode is set to 255 to indicate the message received by the device had Cyclical Redundancy Error, but contained invalid parameters. For example, if a request was made for the information on Analog input #9, but the device only has 8 Analog inputs (0–7), the device would respond back with the 8-byte message with the opcode equal to 255 (error).

Opcode Table Configuration

Use the Opcode Table to group data for more efficient communication. Parameters from different point types can be assigned to the Opcode table data points, substantially reducing the number of polls from a host PC.

See Figure 3-16 on page 3-23

1. Select Configure > Opcode Table.
2. Select the Table Number for the Opcode Screen.
3. If the configuration has changed, update the version number. The version number field attaches a version number to an Opcode table configuration. It is a floating point number.

NOTE
Each Opcode Data point has a TLP box for mapping TLP values into the Opcode Table Data point. If a host PC asks for a specific Opcode Data point, the 3095FC returns the value that is referred by the mapped TLP.

Once the parameters have been configured in the Opcode Table:

1. Opcodes 10 and 11 can be used to read and write data directly without specifying the Point Type, Logical Number, or Parameter Number (TLP).
2. Opcodes 180 and 181 can be used to read and write the parameter data and do not include the parameter definition.

Figure 3-16. Opcode Table
Screen

Radio Power Control Configuration

Radio Power Control conserves battery power to a radio or any other communicating device. Radio power is controlled either by the DTR signal or by a Discrete Output (DO). Because there are separate Radio Control points for COM1 and COM2, radio power cycling for COM1 can be configured differently from that for COM2, including independent timer values and separate output controls using the Output Definitions options.

For each Radio Power Control point, the power cycling can be configured to automatically change three times a day. During each of these three periods (Zone 1, Zone 2, and Zone 3), the ON and OFF times can be setup to operate at various intervals. Figure 3-17 is a graphical depiction of how the power control operates within each time "zone."

Figure 3-17. Radio Power
Control Timing
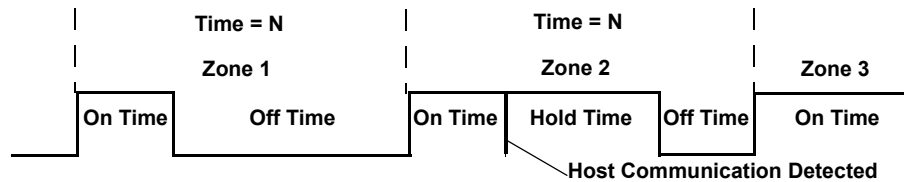
During the ON time:

- The DO is switched to ON.
- Communication may occur.

During the OFF time:

- The DO is set to OFF.
- Communication does not occur.

If communications occur during the ON time, the time is extended by the Hold Time. The DO remains ON and receives interrupts remain enabled for the duration of the Hold Time. When the Radio Power Control parameter is Enabled, radio power cycling is activated. The Low Battery Shutoff parameter allows power cycling to be automatically disabled whenever the input voltage to the 3095FC falls below the specified threshold.

See Figure 3-18 on page 3-25.

1. Select Configure > Control > Radio Power Control.
2. Select the Radio Power Control point to be configured. Enter the Tag (10-character) to identify this point.

3. Enter the The Radio Power Status, which indicates the current status of the Power Control function of ON, OFF, or RBX. The Active Zone indicates which zone is currently activated for determining the Start Time, On Time, and Off Time. Some of the On Time is also used by the radio during power-up initialization of the receiver, causing part of the On Time to be unavailable for receiving requests.

4. Select Radio Power Control Enabled to activate the Radio Power Control function.

5. Use the radio buttons to select Seconds and Minutes. In Seconds mode, the time base for the timers is in 0.1 second increments, primarily used with radios. In Minutes mode, the time base for the timers is in one-minute increments, primarily used with cellular telephones.

6. Enter the Zone parameters to indicate when Radio Power Control is active/inactive.

   • Start Time that the respective Zone begins, in hours and minutes (HHMM). Time is expressed in local time, 24-hour clock. For example: "1500" under Zone 2 means that the associated On Time and Off Time are used beginning at 3:00 p.m.

   • On Time during a power cycle when the output is in the ON state.

   • Off Time during a power cycle that the output is in the OFF state.

7. Enter the Hold Time that the output remains ON after detection of communications activity (in seconds, unless the Minutes mode has been enabled). This value applies to all Zones. When communications occur during the On Time, the On Time is extended by the Hold Time.

8. Enter the Low Battery Deadband. The Low Battery Deadband value is added to the Low Battery Shutoff to determine when the Radio Power Control function is enabled and allows the DO to turn ON as needed.

9. Enter a Low Battery Shutoff value that specifies the voltage at which Power Control is automatically disabled. The voltage being sensed is the System AI Battery Input voltage (0-1). The Low Battery Shutoff parameter allows power cycling to be automatically disabled whenever the input voltage to the 3095FC falls below the specified threshold. The default value is 11 Volts.

10. Select the Power Timer, which counts down the amount of time (On Time, Off Time, or Hold Time) that the Radio Control is currently using. The value is the number of seconds remaining.

11. Select which DO point the signal will send along.

12. Enter the On Counter, which indicates the cumulative time that the Power Control has been in the ON state. The Off Counter value indicates the cumulative time that the Power Control has been in the OFF state.

NOTE
If a Report By Exception (RBX) message needs to be sent to the host PC, the radio power on DO will come on and allow the message to be sent. The hold time should be long enough to allow the 3095FC to receive a response back from the host.

13. Click Apply when configuration is complete. Save the configuration using Device > Flags > Flash Configuration Memory Save.

Figure 3-18. Radio Power Control Screen
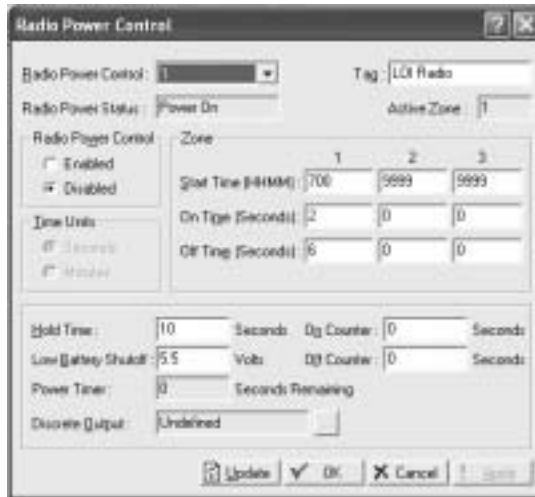
Meter Run Configuration

The Meter Setup screens allows configuring the AGA calculation point for the connected 3095FC. The Meter Setup screens are used to configure the computation of gas flow through a meter (Orifice AGA3)

Each meter run must be uniquely identified to ensure proper configuration and allows the host to acquire the required data.

Each meter run Point Number is given a unique Meter ID of up to 10 characters to label the meter run for which this flow calculation is performed. Use the Meter Description field to enter up to 30 characters to further identify this meter run or provide information about the run.

The 3095FC uses AGA3 (1992) for flow calculation in orifice metering. Additionally, the AGA8 compressibility method is used as well. The AGA8 method calculates the compressibility factor based on the physical chemistry of the gasses at specified temperatures and pressures. The AGA8 method provides extended capabilities for accurate computation of compressibility factors beyond the temperature, pressure, and composition ranges of NX19.

General Tab

The General tab sets the basic parameters for the meter.

See Figure 3-19 on page 3-26

1. Select Meter > Setup.

2. Select the Point number to be configured. Enter the meter tag. Enter a unique Meter Description for the meter.

3. Select the Meter Type. Orifice is the default.

4. Select the Calculation Standard and Edition.

5. Select if Alarming is enabled or disabled.

6. Enter the inside Pipe Diameter (orifice) of the pipe, The U.S. units are inches and the Metric units are millimeters.

7. Enter the Orifice Diameter (orifice) of the orifice. The U.S. units are inches and the Metric units are millimeters.

8. Enter the Low Flow Cutoff (orifice) when the DP value of the metering device is less than the Low Flow Cutoff value, the calculated flow is set equal to zero. No Flow is recorded in the Alarm Log if Alarming is Enabled. For the Orifice AGA3 calculation method, this value is in inH_2O (U.S.) or kPa (Metric).

9. Enter the Integral Multiplier Period (IMP) to indicate the frequency of calculation in minutes of the Integral Multiplier Value (IMV) to be used in the flow equation. The Integral Value (IV) portion of the flow equation is calculated once per second. The value must be an integer divider of 60, such as 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, or 60.

Figure 3-19. Meter Setup General Tab Screen

AGA Meter Inputs Tab

See Figure 3-20 on page 3-27.

The Inputs tab screen defines the field inputs, including DP and SP to be used in the flow calculation.

To setup the meter inputs used in the flow calculation:

1. Select Meter > Setup >Input tab.
2. Click the Differential Pressure TLP button to assign the input that senses the DP (high DP, if Stacked Dp is Enabled). The input units are inH$_2$O (U.S.) or kPa (Metric).

NOTE
If Manual appears, the Values field can be used to enter a value for the meter input. Otherwise, the Values field indicates the current input value.

3. Click the Static Pressure TLP button to assign the input that senses the SP. The input units are psig (U.S.) or kPa (Metric).
4. Click the Temperature TLP button to assign the input that senses the temperature of the flowing gas. The input units are degrees Fahrenheit (U.S.) or degrees Celsius (Metric).

Figure 3-20. Meter Setup Inputs Tab Screen

Gas Quality Tab

See Figure 3-21 on page 3-28

Gas Quality defines the mole percentage of twenty gas components, the Heating Value Basis, the Heating Value, and the Specific Gravity.

NOTE

Entering Hexane+ (C_6+) and the mole percent of hexane+ will automatically distribute among hexane, heptane, octane, nonane, and decane as specified by the heavy gas distribution parameters under the Advanced tab ("Advanced Meter Setup Tab" on page 3-29.

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1. Select Meter > Setup > Gas Quality tab.
2. Enter the mole percent of each Gas Component, or use the default values of 96% methane, 3% ethane, and 1% nitrogen. The Total Mole % should equal 100%. If changes are applied to the device when the Total Mole % does not equal 100%, the composition will be adjusted based on the Normalization Type selected.
3. Select Log Methane Adjust Enabled if the percentages are automatically adjusted to total 100.
4. Select the Heating Value Basis. If Dry or Wet is selected, select Calculate for the Heating Value parameter (the heating value is always calculated on a dry basis). If As Delivered is selected, select Enter for the Heating Value parameter and provide the value.
5. Select either Calculate or Enter for the capacity Heating Value of a specified quantity of gas. If Calculate is chosen, the Heating Value is calculated from the gas composition data. If Enter is chosen, the value entered will be used in the heating value calculation. Use the units button to toggle between volume or mass measurement U.S units are BTU/Cf or BTU/Lb and the metric unit are MJ/m3 or MJ/Kg.
6. Select either Calculate or Enter for the Specific Gravity to specify the ratio of the molar mass of the gas to the molar mass of air. If Calculate is selected, the specific gravity is calculated from the gas composition data at standard conditions of 14.73 PSIA and 60 °F. If Enter is selected, the value entered for standard conditions is used.

Figure 3-21. Meter Setup Gas Quality Tab Screen

Advanced Meter Setup Tab

See Figure 3-22 on page 3-30

The Meter Setup advanced tab contains a number of additional parameters that affect the flow calculation.

1. Select Meter > Setup > Advanced tab.

2. Select the FPV Method of calculating the compressibility factor under the 1992 AGA scheme. The three methods are:

    •   Detailed - Requires the natural gas composition in mole percent to be entered.

    •   Gross I - Uses the density of the natural gas, its heating value, and the quantity of non-hydrocarbon components as follows:
        •   Specific Gravity
        •   Real gas gross heating value per unit volume
        •   The mole % of CO_2

    •   Gross II - Uses the density of the natural gas as well as the quantity of non-hydrocarbon components as follows:
        •   Specific Gravity
        •   The mole % of CO_2
        •   The mole % of N_2

NOTE

If either Gross Method is chosen, manually enter the Specific Gravity and Heating Value in the Gas Quality screen. For Gross Method II, the heating value is required only for calculating the gas energy flow.

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3. Select the units (U.S. or metric)

4. Select either Calculate or Enter Atmospheric Pressure for the value of the atmospheric pressure (absolute) at the metering location. If Calculate is selected, the value is calculated from other parameters. If Enter is selected, type a value greater than zero for the pressure. The units of measurement are in psia (U.S.) or kPa (metric).

5. Enter the flow measurement Base Pressure specified in the gas contract. The pressure units are in psia (U.S.) or kPa (metric).

6. Enter the flow measurement Base Temperature specified in the gas contract. The temperature units are in degrees Fahrenheit (U.S.), or degrees Celsius (metric).

7. Enter the Elevation or altitude of the metering location. The units are in feet (U.S.) or meters (metric) is selected.

8. Enter the geographic Latitude of the metering location. The units are in degrees (U.S.) and minutes separated by a decimal point (metric). For example: 46.15.

9. Select the Pressure Tap used in the meter run.

    •   Select Gauge or Absolute as the way of measuring pressure at the SP tap. The selection must be consistent with the type of pressure measured by the sensor (absolute or gauge).

10. Select the Force Recalculation Set and click Apply to cause a full recalculation of the flow without waiting for the next normal recalculation.

NOTE
Normal recalculation periods are established in Meter Set-up screen using Integral Multiplier period or the Base Multiplier Period. Upon forcing a recalculation, the accumulations are zeroed and the flow value is logged as a new entry. The Force Recalculation parameter is automatically set to Clear after the recalculation.

Figure 3-22. Meter Setup Advanced Tab Screen

Instrument Calibration Tab

See Figure 3-23 on page 3-30.

The 3095FC Instrument Calibration options allow setting the calibration parameters for the Analog Inputs of the flow calculation.

1. Select Meter > Setup > Instrument Calib tab.
2. Dead Weight Calibration - If a deadweight tester is used to calibrate the DP or the SP, select the respective Yes option. Enter the Calibrated Grav. Accel. value.
3. Enter the User Correction Factor value that is multiplied by the base volume flow equation, allowing the user to make any desired adjustment to the flow. When using the default value 1, no correction is applied.

Figure 3-23. Meter Setup Instrument Calibration Tab Screen

Meter Setup Alarms Tab

See Figure 3-24 on page 3-32.

Meter Setup Alarms allows setting the alarm limits, configure RBX Alarming, and view active alarms for the selected meter run. Alarms can be configured for the individual meter runs and/or the stations, generating meter-specific and /or station-wide alarm conditions.

For enable alarms, the alarms can be configured using the Alarms tab in the Meter Set-up screen and are logged to the Alarm Log. To conserve log space, alarms should be enabled only when necessary. For alarm disable, no alarm is generated for a point, regardless of the Alarm configuration. Alarm conditions display in the Active Alarm fields located in the Meter Configuration screen.

NOTE
Even if alarms are not used, check and adjust the alarm value to prevent false alarms.

Use the following steps to set the alarm values.

1. Go to Select Meter > Setup > General tab. Set the Alarming to Enable (see "General Tab" on page 3-26).

2. Go to Select Meter > Setup > Alarms tab.

3. Enter the Low Alarm limit value, in engineering units, within the calculated flow value resides to generate a Low Alarm. The default value is 1000 MCF/day (U.S.) or km^3/day (metric).

4. Enter the High Alarm limit value, in engineering units, within the calculated flow value resides to generate a High Alarm. The input units are 10000 MCF/day (U.S.) or km^3/day (metric). The Active Alarms field on the General tab indicates any alarm currently activated. For example, Low indicates that the calculated flow is below the Low Alarm limit.

5. Select the RBX Alarming option.

   • On Alarm Set - When the point enters an alarm condition, the 3095FC generates a RBX message.

   • On Alarm Clear - When the point leaves an alarm condition, the 3095FC generates a RBX message.

   • On Alarm Set and Clear - When point enters and leaves an alarm condition, the 3095FC generates a RBX message.

NOTE
RBX Alarming requires the communications port to be properly configured.

Figure 3-24. Meter Setup Alarms
Tab Screen
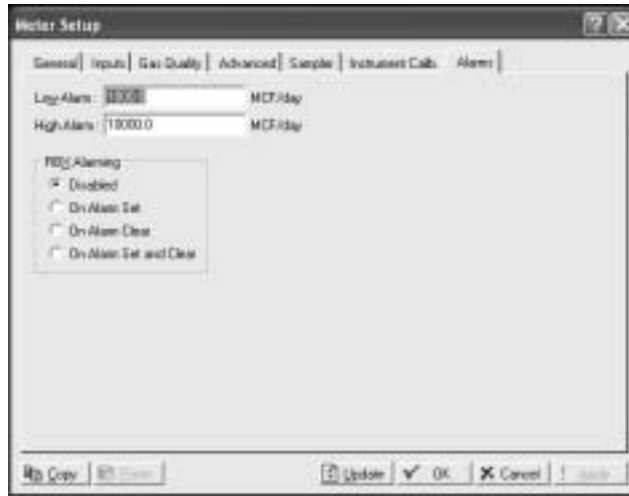
History Points Configuration

The History option allows data stored in the current value database to be copied and stored for up to a month in the historical database. The historical database can be configured to log only the values that need to be logged. The values are logged in the standard (minute-hourly-daily) time base.

NOTE
The time stamp used for standard logging reflects the time at the end of the period, not at the beginning. For example: Data collected from 8:00 to 9:00 is stamped 9:00.

The 3095FC also maintains a 10-minute historical database.

Four types of historical databases are maintained:

- Min/Max Database (see "Meter History")
- Minute Database (see "General History")
- Hourly Database (see "General History")
- Daily Database (see "General History")

Meter History

The Min/Max Database is for viewing only and cannot be saved to a disk file. A total of fifteen history points may be accessed. For an AGA3 meter run, the first eight (out of fifteen) history points are pre-configured for flow metering history and cannot be changed. They are configured as follows:

1. Flowing Minutes Today (Accumulate archive type)
2. DP (Average)
3. Static or Line Pressure (Average)
4. Flowing Temperature (Average)
5. C´ or Integral Multiplier Value (IMV)
6. Pressure Extension or Integral Value (IV) (Average)
7. Instantaneous Flow (Accumulate)
8. Instantaneous Energy (Accumulate)

History Point 2, History Point 3, History Point 4, and History Point 6 are all setup as an Average Archive Type that employs one of the following techniques:

- Flow dependent time-weighted linear averaging (default)
- Flow dependent time-weighted formulaic averaging
- Flow-weighted linear averaging
- Flow-weighted formulaic averaging

Averaging Technique

The averaging technique is selected using Rosemount User Interface Software. The user-configurable history points, 9-15, may be configured using Rosemount User Interface Software. In the Meter > Setup > Inputs tab, select the desired Averaging Technique. The selected Averaging Technique is applied to the meter inputs.

History point archival includes:

- Archival of minute data from the last 60 minutes for 15 points.
- Archival of 60 days of 10-minute data for 4 points.
- Archival of 35 days of hourly data for 15 points.
- Archival of 35 days of daily data for 15 points.
- Archival of minimum / maximum historical data for today and yesterday.

Log Types

The following are logs that are available through the History Points data.

- Minute Historical Log: The 3095FC has a 60-minute historical log for each history point. The Minute Historical Log stores the last 60 minutes of data from the current minute. Each history point has Minute Historical Log entries.

- 10-Minute Historical Log: The 3095FC has a 10-minute historical log for up to four (4) history points that stores 60 days of 10-minute data. The four (4) 10-Minute history points include DP, SP, flowing temperature, and an auxiliary Analog Input.

- Hourly Historical Log: The 3095FC has a total of 35 days of hourly historical logs available for every history point. The Hourly Historical Log is also called the Periodic database. Normally, the Hourly Log is recorded at the beginning of every hour. The time stamp for periodic logging consists of the month, day, hour, and minute.

- Daily Historical Log: The 3095FC has a total of 35 daily historical logs for every history point. The Daily Log is recorded at the configured contract hour every day with a time stamp that is the same as the Hourly Log. Each history point has daily historical log entries.

- Min / Max Historical Log: The Min / Max database displays the minimum and the maximum values for the database points over a 24-hour period for today and yesterday. The Min / Max historical log can be viewed, but not saved to disk.

- Alarm Log: The Alarm Log contains the change in the state of any alarm signal that has been enabled for alarms. The system Alarm Log has the capacity to maintain and store up to 240 alarms in a "circular" log. The Alarm Log has information fields that include time and date stamp, alarm clear or set indicator, and either the Tag name or a 14-byte detail string in ASCII format.

  In addition to providing functionality for appending new alarms to the log, the Alarm Log allows host packages to request the index of the most recently logged alarm entry. Alarm Logs are not stored to the flash ROM during the Save Configuration function in Rosemount User Interface Software.

  The Alarm Log operates in a circular fashion with new entries overwriting the oldest entry when the buffer is full. The Alarm Log provides an audit history trail of past alarms. The Alarm Log is stored separately to prevent recurring alarms from overwriting configuration audit data.

- Event Log: The Event Log contains changes to any parameter within the 3095FC made through the protocol. This Event Log also contains other 3095FC events, such as power cycles, cold starts, and disk configuration downloads. The Event Log provides an audit history trail of past operation and changes.

  The system Event Log has the capacity to maintain and store up to 240 events in a circular log. The Event Log has information fields that includes point type, parameter number, time and date stamp, point number if applicable, the operator identification, and either the previous, current parameter values, and either the Tag name or a 14-byte detail string in ASCII format.

  In addition to providing functionality for appending new events to the log, the Event Log allows host packages to request the index of the most recently logged event entry.

  Event Logs are not stored to Flash memory when Save Configuration is issued in Rosemount User Interface Software. The Event Log operates in a circular fashion with new entries overwriting the oldest entry when the buffer is full. The Event Log provides an audit trail history of past operation and changes. The Event Log is stored separately to prevent recurring alarms from overwriting configuration audit data.

General History

The Configure > History option allows data to be stored in the historical database. Hourly and daily values are stored for up to 35 days. The historical database can be configured to log only the values that need to be logged.

NOTE
History points setup in the Meter > History screen override history points setup in the Configure > History screen. When configuring history points ensure that the point is not already defined in Meter History.

1. Select Configure > History Points.
2. Select the desired history point to be configured in Select History Point. The parameter currently configured (if any) for this history point appears in the Value to Archive field.

NOTE
The first eight history points are reserved for use as Meter History; begin selecting history points with History Pt. #9.

3. Click the TLP Value to Archive label to specify a point type and parameter to be archived.
4. Select the Point Type to archive. To prevent this history point from logging values, select Undefined as the Point Type.
5. Select the Logical Number. For example, select Analog Input AIN A 2.
6. Select the specific Parameter to log.
7. Click OK.
8. Choose the Select Archive Type to specify the exact archive type of the history point. The archive type affects how the logged value is calculated.
   - Undefined – Point not configured
   - Disabled - Point not configured
   - Average - Minute values are averaged to compute the hourly value. The flow inputs (such as DP) allow the user to select among four types of averaging for calculating flow quantities or for providing values. Refer to the Select Average Type parameter.
   - Accumulate - The flow, energy, or uncorrected flow values are summed over a specified time period to compute the value based on what is selected in the Select Accumulation Time Basis. The accumulation technique is used to acquire accurate accumulated counts from an input for a specified time period.
   - Current Value - Current sampled value is used for the hourly value.

- Totalize - The difference between the current value and last hour's current value is used for point values polled or received as accumulated values. The Totalization technique assumes that the value being archived is zeroed out by something else at Contract Hour and that no rollover of the value occurs. Totalization occurs at the Minute Historical Log and is summed up for the Hourly and Daily Historical Logs. A minute after Contract Hour, the current value is archived. All other minutes are the difference between the current value and the previous minute's archived value.

- Select Average Type -The Select Average Type parameter is set to Average, this list appears at the bottom of the screen. Choose one of the following options to determine how the average value is calculated.

    - Flow Dependant Linear - This is the default method for calculating the average for the flow input. It is the simplest and most commonly used method. This method discards samples for periods when there is no measurable flow and performs a straightforward (linear) average of the remaining samples to compute the minute and hour values. The value specified in the Low Flow Cutoff of the Meter setup determines the values. When no flow occurs, all values are sampled.

    - Flow Dependant Formulaic - Like the Flow-Dependent Linear method, this method discards samples for periods when there is no flow. However, in calculating the average, this method typically takes the square root of each sample before averaging the samples together and then squares the result. This formulaic method produces a slightly lower value than the linear method.

    - Flow Weighted Linear - This method does not discard any samples. Instead, it "weights" each sample by multiplying it by a flow value (square root of the DP measured during the sample period), and then performs a linear average by dividing the sum of the flow-weighted sample by the sum of the flow values. This results in minute and hourly values that are more reflective of short periods of high flow.

    - Flow Weighted Formulaic - This method combines the flow-weighting action with the formulaic averaging technique, both of which were described previously.

9. Select Accumulation Time Basis - When the Selected Archive Type is Accumulate, this list appears at the bottom of the screen. Choose one of the following options to determine how the accumulated values are computed:

- Per Sec - Values summed to compute the second value.

- Per Min - Values summed to compute the minute value.

- Per Hour - Values summed to compute the hourly value.

- Per Day - Values summed to compute the daily value.

History, Alarm, Event, and Audit Log Reports

History, Alarm, Event, and Audit Log can be viewed from the View menu. History can viewed from an on-line Rosemount User Interface Software, 3095FC, or from a disk file. History and log files work in a circular fashion; the newest data overrides the oldest data when the log is full.

Once a selected history log has been displayed, the following options are available:

- Select New - Return to the Select History points screen and make a new selection.
- Save - Save the history archives to a file.
- Print Preview - Show a preview of what will be sent to the printer and allow printing of the history log.
- Close - Close the screen. View the History Logs from the View menu.

Once the alarms are displayed the following options are available:

- Save - Save the alarm log to a file.
- Print Preview - Show a preview of what will be sent to the printer and allow printing of the alarm log.
- Close - Close the screen. View the Alarm Logs from the View menu.

Once the events are displayed the following options are available:

- Save - Save the event log to a file.
- Print Preview - Show a preview of what will be sent to the printer and allow printing of the event log.
- Close - Close the screen. View the Event Logs from the View menu.

A report is generated based on the Search Criteria from the 3095FC.

1. Select View menu > History, Alarm, or Event > From 3095FC.
2. Select the History Points in the Search Criteria field (History only). Select, Deselect All, and Select All allow the user to mass select or deselect History Points. The Search Criteria selections change depending on the Frequency.
3. Select the Frequency to be viewed (History only). The Minute, Hourly (Hour), Daily (Day), or Minimum and Maximum (Min/Max) values can be view.
4. Click Upload.

A report is generated based on the Search Criteria from a disk file.

1. Select View menu > History, Alarm, or Event Log > From File.
2. Select the file and click Open.
3. Perform one of the following:
    - Select New - Return to the Select History points to be shown screen and perform a new search.
    - Invert - View the log in reverse order (default is newest to oldest). This changes the time order of the Alarm, or Event Log.
    - Save - Save the report to a file.
    - Print Preview - Print the report.
    - Close - Close the screen.

Collect Data

Select 3095FC > Collect Data to save various 3095FC data to disk files. Select the values to be saved for later generating into a report(s). This screen may only be accessed when the user is on-line with the already configured 3095FC from which data will be gathered.

Use Save As and the Browse button to either accept the default File name or enter a new File name. The files are saved in the default directory C:/Program Files/Rosemount User Interface for Windows/Data unless another directory was selected. When selecting EFM Report Data, the Collect Data function saves all the values for EFM parameters. The files has the .efm extension.

The EFM Reports utility uses the flow data that was gathered using either the "EFM Report Data" or the "All" option. The "All" function retrieves Rosemount User Interface Software data including the EFM Report Data and stores it in disk files identified with various extensions. The "EFM Report" function retrieves just the detailed flow data needed for an EFM report and stores it in disk files with an .AGA extension.

NOTE
EFM Reports can be created, using this data, by selecting View >EFM Report.

Configure History for EFM Reporting

Electronic Flow Measurement (EFM) Reports

The Rosemount User Interface Software has the ability to create an EFM report file that contains all the configuration, alarms, events, and history logs associated with the stations and meter runs. This file becomes the custody transfer audit trail. To collect the periodic and daily history logs required for the EFM report file, a specific list of station and meter run parameters must be configured for historical archiving.

For Orifice meters, the following history points must be configured for EMF reports.

Table 3-2. Orifice Meter Run History Points

Description	Archive Type	Point Type	Parameter
Flowing Minutes	Totalize	Orifice Meter Run Values	Minutes Accumulated
DP	Avg (Flow Dependent Linear) Avg (Flow Dependent Formulaic) Avg (Flow Weighted Linear) Avg (Flow Weighted Formulaic)	Orifice Meter Run Configuration	DP
SP	Avg (Flow Dependent Linear) Avg (Flow Dependent Formulaic) Avg (Flow Weighted Linear) Avg (Flow Weighted Formulaic)	Orifice Meter Run Configuration	SP
Temperature	Avg (Flow Dependent Linear) Avg (Flow Dependent Formulaic) Avg (Flow Weighted Linear) Avg (Flow Weighted Formulaic)	Orifice Meter Run Configuration	TMP
Pressure Extension	Avg (Flow Dependent Linear) Avg (Flow Dependent Formulaic) Avg (Flow Weighted Linear) Avg (Flow Weighted Formulaic)	Orifice Meter Run Configuration	Pressure Extension
Multiplier Value	Avg (Flow Dependent Linear) Avg (Flow Dependent Formulaic) Avg (Flow Weighted Linear) Avg (Flow Weighted Formulaic)	Orifice Meter Run Configuration	Multiplier Value
Volume	Totalize	Orifice Meter Run Configuration	Flow Accumulated
Energy	Totalize	Orifice Meter Run Configuration	Energy Accumulated

Selecting View > EFM Reports opens the initial screen. The utility program is used in conjunction with the AGA flow calculation capabilities of the 3095FC to display or print previously collected flow data. EFM Reports generate printed and on-screen reports of the historical flow data for a meter point. Selecting EFM Reports causes the Rosemount User Interface Software to suspend operation and load the EFM Reports Utility.

The flow data is contained in an EFM Report file, which includes the operational characteristics of all the meter runs configured in the 3095FC. The operational characteristics consist of Configuration Parameters, Hourly and Daily History, Events, and Alarms associated with each measured meter run. The Audit Log events are also included for Industry Canada custody transfer.

To create the EFM Report disk file, use Device > Collect Data and select either the "EFM Report" or "All" option ("Configure History for EFM Reporting" on page 3-38). Once the disk file is created, a report can be generated anytime thereafter and connection/communication with the Rosemount User Interface Software is no longer necessary. The EFM Reports utility formats this report for a single meter run covering a specified period of time. The user can choose to view the report or print the report.

NOTE
In order for the EFM Reports utility to work, the historical database in the Rosemount User Interface Software or 3095FC must be configured so that certain flow calculation values can be retrieved from memory.

1. Select View > EFM Reports.
2. Click the EFM Report File button to display a lists the names of all the files that have the .AGA extension previously created by using the Collect Data function (see "Configure History for EFM Reporting" on page 3-38).
3. Select the desired file and click Open.
4. Use the Enter meter run drop-down list box to select the meter run for which to create a report.
5. Enter the Start date and End date. Any alarms, events, hourly history, and daily history records that occur between these dates will be included in the report. Click Next.
6. Under the Available sections list select the Data files to be included in the report. Use the arrows to scroll through the selections.
7. Click Next.
8. Select the Available Subsections to include in the report. Use the arrows to scroll through the selections.
9. Click Next.
10. Select the Point Types and Fields to include in the report.
11. Click Finish. The EFM Report displays.

Modbus Configuration

The 3095FC has the ability to communicate using Modbus protocol. This makes it possible to integrate with Modbus devices into the same Host/Slave system. The 3095FC can act as a Slave device.

The LOI, Comm 1, and Comm 2 ports all support Modbus communications. The Modbus mapping on the Modbus Registers screen and Modbus History Access Registers screen will affect Modbus communication on all of the 3095FC comm ports.

The 3095FC point types and parameters for Function Codes 1, 2, 3, 4, 5, 6, 15, and 16 are configured using the Rosemount User Interface Software. Table 3-3 provides details of the Function Codes supported by the 3095FC.

Table 3-3. Modbus Function Codes

Code	Meaning	Action
01	Read Logic Coil Status	Obtain current status (ON/OFF) of a group of logic coils (outputs)
02	Read Discrete Input Status	Obtain current status (ON/OFF) of a groups of Discrete Inputs
03	Read Output Registers (Holding)	Obtain current binary value in one or more holding requests
04	Read Input Registers	Obtain current binary value in one or more binary registers
05	Force Single Logic Coil	Force logic coil to a state of ON or OFF. Acknowledge Alarm or Event request
06	Preset Single Holding Register	Place a specific binary value into a holding register
15	Force Multiple Logic Coils	Force a series of consecutive logic output coils to defined ON or OFF states.
16	Preset Multiple Holding Registers	Place specific binary values into a series of consecutive holding registers.

General Tab

The General tab sets the basic communication parameters.

See Figure 3-25 on page 3-42

1. Select Configure > Modbus > Configuration > General tab

2. Select the Modbus Type. The Modbus protocol supports two modes of transmission ASCII and RTU. All devices in the same communications must be configured with the same mode of transmission.

   • American Standard Code for Information Interchange (ASCII) – allows additional time intervals of up to one second to occur between characters without causing an error. This allows the messages to be read with the use of a dumb terminal. Each character is divided into two 4-bit parts that are represented by their hexadecimal equivalent. The ASCII mode uses twice as many characters as the RTU mode. Each character sent is composed of a Start bit, 8 or 7 Data bits, and one or two Stop bits with Even, Odd, or No parity. ASCII mode uses Longitudinal Redundancy Checking (LRC) error checking

- Remote Terminal Unit (RTU)– Allows for greater character density and better data throughput than ASCII for the same baud rate. Each message is transmitted in a continuous stream. Data is sent in 8-bit binary characters. In the ASCII mode, each RTU character is divided into two 4-bit parts that are represented by their hexadecimal equivalent. RTU mode uses Cyclic Redundancy Check (CRC) error checking. By default, RTU is enabled.

In either mode, ASCII or RTU, a Modbus message is placed by the transmitting device into a frame that has a known beginning and ending point.

Table 3-4. Message Framing

ASCII Message Framing

Begin of Frame	Address	Function	Data	LRC Error Check	End
:	2 characters	2 characters	N characters	2 Characters	CRLF

RTU Message Framing

Begin of Frame	Address	Function	Data	CRC Error Check	End
T1-T2-T3-T4	1 Byte	1 Byte	N * 1 Byte	2 Bytes	T1-T2-T3-T4

3. Select Log Modbus Events Enabled to log all Modbus parameter changes to the Event Log or select Disabled to allow Modbus parameter changes to occur without being logged. By default, Log Modbus Events is Enabled.

4. Select the Byte Order of data bytes in a transmission or request can be reversed by the selection made in these check boxes. This only affects the Data field of a Modbus message, has no effect on the data for Function Codes 01, 02, and 05, and only applies to floating points.

   - Least Significant Byte First - Selecting this check box places the least significant byte first. This is the default value.

   - Most Significant Byte First - Selecting this check box places the most significant byte first.

5. Select EFM Modbus Enable to use an implementation of Modbus protocol with EFM extensions. This causes the Hourly (Periodic) and Daily indices to be returned as floating point values instead of the standard integer and character values. In addition, the history index is adjusted to accommodate a one-based index (1 to 840), and the date stamp (MMDDYY) is returned before the time stamp (HHMM), which does not include seconds.

6. The "status" field displays the status codes returned from the modem.

Figure 3-25. Configure Modbus
General Tab Screen

Scale Values Tab

The Scale Value tab allows the user to enter low and high floating point and integer values for converting between integer and floating point numbers.

See Figure 3-26 on page 3-43

1. Select Configure > Modbus > Configuration > Scale Values tab.
2. Enter the Integer Scale values. In the 3095FC, the endpoints of the Analog Inputs and the Analog Outputs are used to scale or calibrate the range of the input or output signal. Because each I/O point can have different scaling, the raw values from the Analog I/O points are normalized to the values defined by the Integer Scale Low Value and Integer Scale High Value fields.
3. Enter the Low Value that contains the 0% value for all analog data (Type 3, Parameter 17 and Type 4, Parameter 9) registers. Enter the High Value that contains the 100% value for all analog data (Type 3, Parameter 17 and Type 4, Parameter 9) registers.

NOTE

The High and Low Value fields are signed integers, so they can range from zero to 32767. These data fields can also be used to scale the Analog I/O to integer values with an implied decimal point. For example: All Analog I/O Raw values can be transmitted with 0 to 1000 values (0 to 100.0, decimal point implied) by setting the values in this field to 0 for the Integer Scale Low Value and 1000 for the Integer Scale High Value.

4. Enter the Float Scale # in the Low Value Float Scale and High Value Float Scale fields used when the Host is not able to process floating point numbers.

In Host systems that do not accept floating point numbers, eight sets of floating point ranges for values can be specified. This allows floating point values, such as PID Setpoints, to be read and set by the Host as integer values. The 3095FC floating point values are converted to integers by configuring a register or range of registers with the Conversion field set in the Modbus Registers Definition configuration.

The equations used to convert floating point values to integer values to enable the reading of floating point values are:

- *Float Range = High Value Float Scale - Low Value Float Scale*
- *Integer Range = High Value Integer Scale - Low Value Integer Scale*
- *Adjusted Reading = Float Reading - Low Value Float Scale*
- *Integer = (Integer Range × Adjusted Reading)/(Float Range) + Low Value Integer Scale*

The equations used to convert integers to floating point values are:

- *Float Range = High Value Float Scale - Low Value Float Scale*
- *Integer Range = High Value Integer Scale - Low Value Integer Scale*
- *Adjusted Integer = Integer Sent - Low Value Integer Scale*
- *Float Value = (Adjusted Integer × Float Range)/(Integer Range) + Low Value Float Scale*

Figure 3-26. Configure Modbus Scaled Values Tab Screen
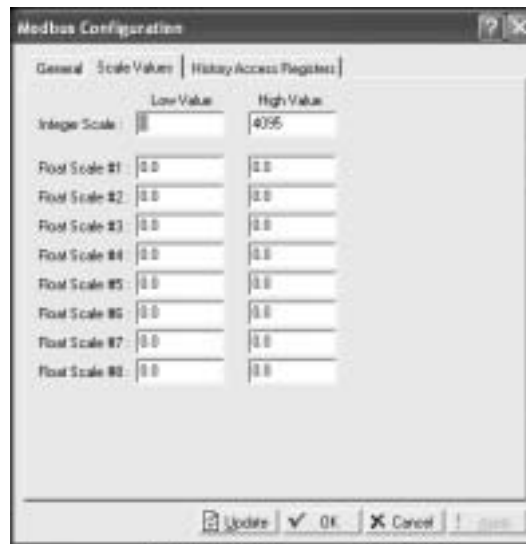
Modbus - History Collection

The Modbus protocol sends the Hourly (periodic) and Daily History. Refer to "History Access Registers Tab" on page 3-44. Each record contains a time and date stamp and all of the history archives for which the Register Number is configured. The Modbus Function Code 03 and the History Archive Register are used to collect the archived data. Two Modbus registers indicate the current Hourly and Daily history index as selected in the Archive Type field. These can be configured in the Hourly History Index Register and the Daily History Index Register. These indexes identify the current history archive at which data was last logged.

To collect the Hourly and Daily history a standard Modbus Function Code 03 is used. The Register Number field is used to address the individual History Archive Register. The Daily Index, Hourly Index, and Event/Alarm data fields are used to address a history index number. The response message contains two floating point values for the time and date stamp of the history archive (time stamp = HHMMSS and date stamp = MMDDYY) and floating point values for each of the defined history points for that History Archive Register. The date stamp for history uses the current year and does not figure the number of years since 1980.

NOTE
When in Modbus with EFM extensions mode, the time stamp is in the HHMM format. In addition, the date time stamp is returned before the time stamp.

History Access Registers Tab

See Figure 3-27 on page 3-45

The History Archive Register is a single register that can contain one or more history points for retrieval of the Event Log, Alarm Log, and Historical Archives. Historical data is contained in Point Type 55 up to 35 days of hourly data for each of its history points can be stored. The points mapped on the history tab are configured on the Configure > History Points screen.

1. Enter Configure > Modbus > Configuration > History Access Registers tab.
2. Enter the modbus Register Number used to acquire the Daily Index values.
3. Enter the Modbus Register Number used to acquire the Hourly Index values.
4. Enter the Modbus Register Number used to acquire the Events/Alarm logs.
5. Enter the Modbus Register Number used to acquire the group of history points defined in the Starting History Point and Ending History Point fields without having to define each history point separately.
6. Enter the Starting History Point to acquire a group of history points without having to define each history point separately, enter values in the Starting History Point and Ending History Point fields. The Starting History Point value is the first history point to be retrieved.
7. Enter the Ending History Point to acquire a group of history points without having to define each history point separately, enter values in the Starting History Point and Ending History Point fields. Then Ending History Point is the last history point to be retrieved.

NOTE
The Starting History Point and Ending History Point values must be different with the Starting History Point value being the smaller of the two. The group of history points is specified by the Modbus register value set in the Register Number field.

8. Enter the Archive Type to archive either Hourly or Daily values.

9. Enter the Conversion field to specify the type of conversion required, if any, on the data before it is sent to the Host or before it is written to the 3095FC. The conversions are used to allow integer values instead of floating point values to be transmitted and received. Table 3-5 summarizes the applicable function calls and their associated register and data fields.

Figure 3-27. Modbus History Access Registers Screen

Modbus - Events / Alarms Functionality

The record formats for the Event log and Alarm log are the same size and have similar contents. The first word in a record is a bit map in which bit 9 indicates if the log record is an Event (1) or an Alarm (0). The meanings of the other bits are specific to either the event or the alarm log records. The Event and Alarm log record consists of the bytes shown in Table 3-6. A breakdown of the bit map in the first byte is given in the table immediately after the record table.

Table 3-5. History, Event, and
Alarm Functionality

Function Code	Register Field	Data Field	Description
3	7160 – Daily Index	Ignored	Response contains current daily index
3	7161 – Hourly Index	Ignored	Response contains current hourly index
3	32 – Event/Alarm Register	Ignored	Response contains Events and Alarm records. Maximum number of bytes returned is 240 (12 records of 20 bytes each). Events are returned before Alarms are returned. The format is displayed in Table 3-6.
5	32 – Event/Alarm Register	Ignored	After Events and Alarms have been returned, there must e an acknowledgement made so that the same Events and Alarms are not returned on the next request.
3	703 – 7160 – Daily History	History Archive Register (0 to 34)	Response contains two floating point values for the time and date stamp of the history archive (time stamp = HHMMSS and date stamp = MMDDYY) and floating point values for each of the defined history point for that History Archive Register.
3	704 – Hourly Index	History Archive Register (0 to 8.39)	Response contains two floating point values for the time and date stamp of the history archive (time stamp = HHMMSS and date stamp = MMDDYY) and floating point values for each of the defined history point for that History Archive Register.

The 3095FC supports the Modbus with EFM extensions method for retrieving alarms, events, and history. When a Function code 3 request referencing defined Events/Alarms Register (usually 32) is received, it begins to collect records from first the Event Log and then the Alarm Log, starting where the last poll left off. The 3095FC will collect records until either there are not any more new events/alarms or the maximum of twelve records have been collected. The 3095FC sends the information back to the host, which in return replies with Function Code 5, referencing the same Events/Alarms Register, indicating that the points have been received and that the host is ready for the next twelve records.

When the 3095FC receives a Function Code 3 request referencing one of the user-defined Periodic History Registers or Daily History Registers, the number of registers field is interrupted as an index into the specific history log. The reply message contains the date and time stamp and historical values configured for the specified for that index.

Reading Events / Alarms Register
The Modbus request to read the Event/Alarm log (see Table 3-6) uses the standard read Function Code 03 and the Event/Alarm Register (parameter #0) in the Modbus Special Function Table (point type 39). In this request, the number of registers is included to maintain format compatibility but is ignored by the receiving 3095FC unit. For the date stamp in the events and alarms returned, the year (YY) is really the number of years since 1980 (for example, the current year is 1997, so the year (YY) for the date stamp would be 17).

Acknowledging Events / Alarms
The Modbus request to acknowledge the event/alarm log uses Function Code 05 and the Event/Alarm Register (parameter #0) in the Modbus Special Function Table (point type 39). In this request, the number of registers is always one (1).

Table 3-6. Modbus Events and
Alarms Log Content

Byte	Content of Event Log Record	Contents of Alarm Log Record
1 – 2	Operator change bit map (16-bit)	Alarm change bit map (16-bit integer)
3 – 4	Modbus register number of variable (16-bit integer)	Modbus register number of variable (16-bit integer)
5 –8	Time Stamp (HHMMSS; 32-bit floating point)	Time Stamp (HHMMSS; 32-bit floating point)
9 – 12	Date Stamp (HHMMSS; 32-bit floating point)	Date Stamp (HHMMSS; 32-bit floating point)
13 – 16	Previous value of variable (32-bit floating point)	Current (alarmed) value of variable (32-bit floating point)
17 – 20	Current (new) value of variable ((32-bit floating point	Unused at the current time (zero filled when transmitted to the master)

Bit	Operator Change Bit Map	Alarm Changed Bit Map
0	Fixed value - change to an EU value on an I/O point in Manual mode	Not used
1	Zero scale - change to the 0% Adjusted on an AI	Not used
2	Full scale - change to the 100% Adjusted on an AI	Not used
3	Operator entry work value - change to any parameter other than those described	Not used
5	Fixed / variable flag - change to manual mode for an I/O point	Manual alarm
6	Table entry change - change to Modbus Function Tables	Status change alarm
7	System command change - events logged by system (power up)	No flow alarm
8	Not used	Point fail alarm
9	Operator change event identifier bit	Operator change even identifier bit
10	LoLo Limit - change to LoLo alarm parameter	LoLo Alarm
11	Low Limit - change to Low alarm parameter	Low Alarm
12	HiHi Limit - change to HiHi alarm parameter	HiHi Alarm
13	High Limit - change to High alarm parameter	High Alarm
14	Rate of change limit - change to Rate Alarm parameter	Rate Alarm
15	Not used	Set/clear alarm (1=set, 0=clear)

Modbus - Detailed Point / Parameter Information

The Modbus Special Function Table (point type 39) returns the Event Log, Alarm Log, and the Historical Archives. The Event/Alarm Register (parameter #0), Hourly (periodic) History Index Register (parameter #1), and the Daily History Index Register (parameter #2) can be configured to the desired Register Number. The History Archive Register is a single register, which can contain one or more history points for retrieval. The Starting History Point field contains the Starting History Point for the History Archive Register, while the Ending History Point is the last history point to be included in the History Archive Register. All history points in between the Starting History Point and the Ending History Point are included in the History Archive Register. The Type of History Archive can only be one of two choices: Hourly or Daily. The Conversion Code can be used to convert the history values. However, the Conversion Code does not affect the time and date stamp.

Configure Modbus Registers

The Modbus register configuration tables are used to associate Modbus register numbers with 3095FC point data. When a Modbus request is received, the Modbus user program searches the function table for the Modbus function requested, starting with the first table entry down to the last. If a register number match is found, it builds a response based on the point type and parameter configured in the table. If no register number match is located, an error message is returned. The user program locates a register as long as it matches the Starting Register number, the Ending Register number, or any number in between for that particular entry in the table.

Register numbers should be unique for a given communication port. Registers may be duplicated as long as they are assigned to separate port or located in a separate Modbus configuration table. If a register number is duplicated within the same Modbus function table, the first occurrence is used. In addition, it is best to number the table from the smallest register number to the largest register number, especially when using two table entries to configure a continuous group of registers. Up to fifteen different lines can be configured for Modbus Functions 4 and 16. Up to thirty different lines can be configured for Modbus Function 3, split into tables 3A and 3B. By making the registers continuous, meaning the Starting Register address of a new line is one greater than the Ending Register address of the previous line, a continuous data table can be created up for Modbus Function 3, 4, or 16 up to the limit of 240 bytes. This type of data table allows access to all its data with one request.

Up to fifteen different lines can also be configured for Modbus Function Codes 1, 2, 5, 6, and 15. For Function Codes 1, 2, 5, and 15, the parameter specified should be a single-byte parameter type, preferably a status parameter (only bit 0 is used), because this function packs the data into a binary format for transmission. Each address span must be unique within the function for proper operation. If not, the first valid address is used.

Modbus Register tables allow the user to map Modbus Registers to 3095FC Point Type, Logical, and Parameter (TLP) numbers. One line in the Modbus Register table can be used to map more than one register-TLP pair by using either Point Indexing or Parameter Indexing.

Point Indexing means that the Start Register is mapped to the selected TLP. Subsequent registers, through the End Register, are mapped to the same point type and parameter and increment as the point logical number.

Parameter Indexing means that the Start Register is mapped to the selected TLP. Subsequent registered, through the End Register, are mapped to the same point type and point logical number, and increment the parameter number.

Once a register is mapped, it can be referenced by any Modbus request, providing the data type of the TLP is appropriate for the Function Code. If the native 3095FC data type does not me the requirements of the Modbus host device, conversion codes are available to convert data to the required data type. The user can select to have the mapping apply to all 3095FC communication ports or on a selected port only.

Use the following steps to Configure the Modbus Registers.

See Figure 3-28 on page 3-51.

1.   Select Configure > Modbus > Modbus Registers. (See Table 3-7 on page 3-49).

2.   Select the Function Index to which the maps are to be registered. There are 9 function indexes available, each corresponding to a Function Code displayed in the Function name field. Refer to Table 3-2 on page 3-38 for a detailed description of supported Modbus Function Codes.

3.   Enter a Function Name up to 20 characters to distinguish between the different Modbus Register tables.

Table 3-7. Modbus Registers

Function Code	Row	Starting Register	Ending Register	Device Parameter (s)	Indexing	Conversion
1	1	1070	1070	N/A	Point	0
2	1	0	0	N/A	Point	0
3	1	7052	7059	Filtered EUs (Analog Inputs 1-8)	Point	0
	2	7100	7102	DP, P, Temp	Param	0
	3	7103	7107	Meter Flow Values - Starting with "Flow Rate/Day," Ending with "hwPf"	Param	0
	4	7108	7127	Meter Flow Values - Starting with "Flow Today," Ending with "Uncorrected Accumulated"	Param	0
	5	7262	7288	Meter Config Parameters - Starting with "Atmospheric Pressure," Ending with "Carbon Monoxide"	Param	0
4	1	0	0	N/A	Point	0
5	1	1070	1070	N/A	Point	0
6	1	7052	7059	Filtered EUs (Analog Inputs 1-8)	Point	0
	2	7100	7102	DP, P, Temp	Param	0
	3	7103	7107	Meter Flow Values - Starting with "Flow Rate/Day," Ending with "hwPf"	Param	0
	4	7108	7127	Meter Flow Values - Starting with "Flow Today," Ending with "Uncorrected Accumulated"	Param	0
	5	7262	7288	Meter Config Parameters - Starting with "Atmospheric Pressure," Ending with "Carbon Monoxide"	Param	0
15	0	0	0	N/A	Point	0
16	1	8000	8053	Meter Config Parameters - Starting with "Point Tag ID," Ending with "Low Flow Cutoff"	Param	0
	2	8054	8063	All Meter Calibration Parameters - Starting with "Calibration Options)	Param	0

4. Enter a Starting Register to represent the first data register in the address span. Any number from 0 to 65535 is valid. Register numbers can be duplicated as long as they are in separate Modbus Function configuration tables. The tables should be numbered from smallest to largest. For example, the Host device requests the Starting Register 500 through Ending Register 700. The Starting Register is 400 and the Ending Register is 700. All register numbers requested by the Host (500 through 700) are valid and would be responded because the requested register numbers fall between the Start and Ending Register numbers (400 through 700).

5. Specify that the Ending Register address is a number representing the last location of a point's data. The value for this number is computed by: Ending Register address = (Starting Register address + Number of Functions) - 1

6. The Device Parameter field denotes the type of data associated with an address (Starting through Ending Register). When the Host requests a valid range of register numbers, the Function Code tells the Slave what to do and between which registers (Starting Register through Ending Register). The Rosemount User Interface Software Parameter defines what data is collected or which parameter is set.

For example: When using **Point Indexing** the configuration of:

Starting Register	Ending Register	Device Parameter(s)	Indexing	Conversion
100	103	AIN, 4-1, EU	Point	0

Specifies four Registers (100, 101, 102, and 104) that are mapped to a group of Analog Input (AIN) values in engineering units (EU) starting at the Analog Input in the forth module location, first position (4-1).

- Register 100 - EU of AIN point in location 4-1

- Register 101 - EU of AIN point in location 4-2

- Register 102 - EU of AIN point in location 4-3

- Register 103 - EU of AIN point in location 4-4

For example: When using Parameter Indexing the configuration of:

Starting Register	Ending Register	Device Parameter(s)	Indexing	Conversion
7100	7102	AGANEW1, CUR DP	Parameter	0

Specifies three Registers (7100, 7101, and 7102) that are mapped to a group of AGA parameters starting at CUR DP.

- Register 7100 - CUR DP (hw - differential pressure)

- Register 7101 - CUR SP (Pf - static pressure)

- Register 7102 - CUR TP (Tf - temperature)

7. Select the type of Indexing to define the block of Register values for the Point Types or the Parameters without having to define each separately.

- Select Point to define the Register values as Point Types. If multiple Registers are used (Starting and Ending Register values are different), each successive Register increments to the next logical point number of the same Point Type.

- Select Param to define the Register values as Parameters. If multiple Registers are used (Starting and Ending Register values are different), each successive Register increments to the next logical Parameter of the Point Types to be set or acquire data. Be aware of the different data types (Character, Integer, Long, Float) and the size of the data types. Use the TLP button to select parameters.

8. Specify the type of Conversion required, if any, on the data before it is sent to the host or written to the 3095FC. The conversions are used to allow integer values to be transmitted and received instead of floating point values. Table 3-8 lists the Convert Codes used with the Modbus Protocol Emulation program. Conversion codes affect Function Codes 3, 4, 6, 8, and 16.

Figure 3-28. Modbus Registers
Configuration Screen

Modbus Conversion

Conversion codes convert the data into a format that is compatible to a Modbus device.

Select the Conversion field, on the Modbus Registers or Modbus History screen, (Configure > Modbus > Modbus Register) to specify the type of conversion required, if any, on the data before it is sent to the host or before it is written to the 3095FC. The conversions are used to account for differences in data types between the master and slave devices. Table 3-8 lists the Convert Codes used.

Conversion Codes 65 to 72 allows a four-byte IEEE formatted floating point number to be sent or received in two Modbus registers with the byte orders configurable. A check is made to ensure that an even number of registers is requested, that the Start Register number does not begin in the middle of a register pair, and that the number of registers does not exceed the number of registers configured.

Table 3-8. Modbus Conversion Codes

Convert Code	Description	Slave Function	Definition
0	No Conversion	–	–
1	Float to Integer, Float Scale 1	3, 4	The Float to Integer conversion changes floating point data to an integer for transmission to the host. The number of the Convert Code specifies which floating point scaling value is to be used for the conversion
2	Float to Integer, Float Scale 2	3, 4	
3	Float to Integer, Float Scale 3	3, 4	
4	Float to Integer, Float Scale 4	3, 4	
5	Float to Integer, Float Scale 5	3, 4	
6	Float to Integer, Float Scale 6	3, 4	
7	Float to Integer, Float Scale 7	3, 4	
8	Float to Integer, Float Scale 8	3, 4	
9 to 16	No Conversion	6, 16	–
17	Integer to Float, Float Scale 1	6, 16	The Integer to Float conversion changes a transmitted integer value to a floating point value. The number of the Convert Code specifies which floating point scaling value is to be used for the conversion. If no fractional part is coming through on conversion from integer to float, use a float conversion that more closely fits the range of integer to be converted, such as float range 0 to 10 instead of 0 to 1000.
18	Integer to Float, Float Scale 2	6, 16	
19	Integer to Float, Float Scale 3	6, 16	
20	Integer to Float, Float Scale 4	6, 16	
21	Integer to Float, Float Scale 5	6, 16	
22	Integer to Float, Float Scale 6	6, 16	
23	Integer to Float, Float Scale 7	6, 16	
24	Integer to Float, Float Scale 8	6, 16	
30 to 32	No Conversion	–	–
33	Character to Integer	3, 4	The Character to Integer conversion changes a character data type to an integer for transmitter to the host.
34	Integer to Character	6, 16	The Integer to Character conversion changes a transmitted integer value to a character data type.
35	Long to Integer	3, 4	The Long to Integer conversion changes a long data type to an integer for transmission to the host.
36	Integer to Long	6, 16	The Integer to Long conversion changes a transmitter integer value to a long data type.
39	Float to Integer, No Scaling	3, 4	The Float to Integer conversion changes a floating point data type to an integer for transmitter to the host.
40	Integer to Float, No Scaling	3, 4, 6, 16	The Integer to Float conversion changes a transmitted integer value to a floating point data type.
41	Float to Byte, No Scaling	3, 4	The Float to Byte conversion changes a floating point data type to a byte for transmission to the host.
42	Byte to Float, No Scaling	3, 4, 6, 16	The Byte to Float conversion changes a transmitted byte value to a floating point data type
43	Float to Long, No Scaling	3, 4	The Float to Long conversion changes a floating point data type to a Long Integer for transmission to the host.
44	Long to Float, No Scaling	3, 4, 6, 16	The Long to Float conversion changes a transmitted Long Integer value to a floating point data type.
45	Float to Byte	6, 16	he Float to Byte Unsigned Character conversion changes a transmitted floating point value to an unsigned character data type.
46	Float to Unsigned Integer	6, 16	The Float to Unsigned Integer conversion changes a transmitted floating point value to an unsigned integer data type.
47	Float to Unsigned Long	6, 16	The Float to Unsigned Long conversion changes a transmitted floating point value to an unsigned long data type.
48	No Conversion	–	–

Convert Code	Description	Slave Function	Definition
49	Deadband, Float Scale 1	3, 4, 6, 16	The Deadband to Float Scale conversion changes the Deadband pint data to an integer for transmission to the host. The number of the Convert Code specifies which floating point scaling value is to be used for the conversion.
50	Deadband, Float Scale 2	3, 4, 6, 16	
51	Deadband, Float Scale 3	3, 4, 6, 16	
52	Deadband, Float Scale 4	3, 4, 6, 16	
53	Deadband, Float Scale 5	3, 4, 6, 16	
54	Deadband, Float Scale 6	3, 4, 6, 16	
55	Deadband, Float Scale 7	3, 4, 6, 16	
56	Deadband, Float Scale 8	3, 4, 6, 16	
57 to 64	No Conversion	–	–
65	IEEE Floating Point Number	3, 4, 16	Places byte 0 an byte 1 in register xxxxx; bye 2 and bye 3 are placed in register xxxxx + 1. this places a 4-byte floating point value into two, 2-byte registers to allow integer values to be transmitted. Code 66 does the same as Coded 65 regardless of the Byte Order field in the Modbus Configuration screen. Register xxxxx byte 0, byte 1 register xxxxx + 1 byte 2, byte 3.
66	IEEE Floating Point Number	3, 4, 16	
67	IEEE Floating Point Number	3, 4, 16	Code 67 reverses byte 0 and byte 1 order in register xxxxx; reverses byte 2 and byte 3 order in register xxxxx + 1. This places a 4-byte floating point value into two, 2-byte registers to allow integer values to be transmitter. Code 68 does the same as Code 67 regardless of the Byte Order field in the Modbus Configuration screen. Register xxxxx byte 1, byte 0 Register xxxxx + 1 byte 3, byte 2.
68	IEEE Floating Point Number	3, 4, 16	
69	IEEE Floating Point Number	3, 4, 16	Code 69 places byte 2 and byte 3 in register xxxxx; byte 0 and byte 1 are placed in register xxxxx + 1. This places a 4-byte floating point value into two, 2-byte registers to allow integer values to be transmitted. Code 70 does the same as Code 69 regardless of the Byte Order field in the Modbus Configuration screen. Register xxxxx byte 2, byte 3 Register xxxxx + 1 byte 0, byte 1.
70	IEEE Floating Point Number	3, 4, 16	
71	IEEE Floating Point Number	3, 4, 16	Code 67 reverses byte 2 and byte 3 order in register xxxxx; reverses byte 0 and byte 1 order in register xxxxx + 1. This places a 4-byte floating point value into two, 2-byte registers to allow integer values to be transmitter. Code 72 does the same as Code 71 regardless of the Byte Order field in the Modbus Configuration screen. Register xxxxx + 1byte 1, byte 0.
72	IEEE Floating Point Number	3, 4, 16	
73	IEEE Floating Point Number	3, 4, 6, 16	Convert Codes 73 and 74 send the IEEE formatted floating point number as four bytes with a single register request. Only the byte order is changed: Function Code 73 loads register xxxxx in byte 2, byte 3, byte 0, byte 1 order. Function code 74 does the same as Function Code 73 regardless of the Byte Order field in the Modbus Configuration screen.
74	IEEE Floating Point Number	3, 4, 6, 16	
75 to 255	No Conversion	–	–

CUSTOM DISPLAYS

This section describes the Custom Display option. The Custom Display option allows the creation of customized "live" displays, loading a display from a disk file, and monitoring flow and I/O points. Display options are located under the View menu. The 3095FC stores displays to disk.

New Display

A new display must be created while connected to the 3095FC and then saved either to a disk file or to display memory in the 3095FC. The display can incorporate "live" data, as well as other information to be conveyed. One example is a graphical representation of the application that a 3095FC is monitoring and controlling.

Use the following instructions to create a new display.

1. Select View > Display > New.
2. If the Properties box does not appear, select the Properties button from the toolbar.
3. Enter the name of the display in the Properties: Form Display Name field.
4. Select to Enable or Disable the Logical Point Number Selection List.
   - When Enabled, enter a Point Type. When selecting a TLP, the Logical Number (L) comes from the logical listing selection box for those parameters that have the Point Type (T) match the Point Type entered in this screen.
   - When Disabled, the display is in What You See Is What You Get (WYSIWYG) mode and the user selects the TLP to view.
5. Place the cursor where the display element is to appear. Right-click on the mouse and select an element.
   - Add Frame - Place like elements in a Frame to group user selections. Once Frame is in place, drag and drop elements onto the Frame.
   - Add Label - Use labels to mark other elements.
   - Add Text Box - Data entry fields.
   - Add Check Box - Multiple selection box.
   - Add Option Button - Radio button to limit input to a single selection.

NOTE
Create elements in the main Form before dragging and dropping them into a Frame.

6. Enter or select the desired data in the Properties Form. The items in the Properties box depend on the added object.
7. Many elements can be created and placed anywhere on the edit screen. Option buttons should be placed within a frame. Element properties can be edited at any time.
8. After creating elements to display, click Save to save the display to a disk file located on the PC or floppy drive. Enter the desired File name of the disk file, or use the default. The .DSP extension will automatically be added.

9. Press the Test button to display the screen as it will appear in use. Use the Update, Autoscan, Stop Scan, Edit, Save, and Close buttons at the bottom of the screen to perform the following functions:

   • Update - Use this button to update all TLP (live data) information with the current reading from the 3095FC. The message "Reading Data" appears in the Status Line.

   • Apply - Applies changes made to fields in display which display is not in Autoscan.

   • Autoscan - Provides an automatic update on intervals lasting one to three seconds.

   • Stop Scan - Stops Autoscan.

   • Edit Display - Change currently selected display.

   • Character Set - Show the Character Set currently selected for building the display. This button toggles between viewing and not viewing Character Sets. Eight different character sets are supported: two for upper and lower case alphabetical characters, and six for various types of graphical characters.

   • TLP Box - Enter live data from the Rosemount User Interface Software or 3095FC. To use the TLP Box, first determine the Point Type to use as a flow input by highlighting it. Next, select the exact Logical Number. For example, an Analog Input Point Type that the user might select is AIN A 2. Finally, select the specific Parameter to use. For example, an Analog Input is typically Filtered EUs. Save - If the display is new, this push button saves the current display to a disk file located on the PC. If the display already exists, this saves the display back to where it had been saved before. The extension .DSP (display) is added to the specified file name. Refer to "Save Displays" on page 3-55.

   • Save As - Saves the current display to a disk file under a different name to a file or to internal Display1 or Display2. The extension.DSP (display) is applied to the name of the file.

   • Close - Close the selected display screen with option to save.

NOTE
Use the mouse or >Alt+F6> keys to move between the buttons. Cut, Copy, and Paste can also be used when creating custom Displays.

Save Displays

After creating a display, store the current display to:

   • Disk file located on the PC or floppy drive.

   • Display1.

   • Display2 (if available in the device).

To save a Display:

1. Click Save and proceed to Step 4. Click Save As to save either to a file or to display memory.

2. Click To Rosemount User Interface Software or To File.

3. If To Rosemount User Interface Software is selected, select Display1 or Display2.

4. If To File is selected, enter the desired File name of the disk file, or use the default. The .DSP extension will automatically be added.

Section 4   Calibration

OVERVIEW

Once startup is successful and configuration is complete, it is necessary to calibrate the 3095FC to meet the requirements of the application. The following section details the procedure for calibrating the 3095FC and the I/O. Once calibration is complete the 3095FC can be placed into operation.

NOTE
When the enclosure end caps are unscrewed, local calibration or monitoring of the 3095FC through its LOI port must be performed in a non-hazardous area. Performance of these procedures in a hazardous area could result in personal injury or property damage.

CALIBRATE

3095FC

Use the Rosemount User Interface Software to calibrate as follows:

1.   Launch the Rosemount User Interface Software and connect to the 3095FC.

2.   Select the Meter > Calibration. The current reading displays under each meter input as the Freeze Value. The 3095FC uses these values in the flow calculations while calibrating the points.

3.   Click Freeze. If necessary, create a calibration file.

4.   Isolate the device from the process by opening the by-pass valve on the valve manifold prior to isolating the device from the process (to protect the sensor module). This keeps one side of the differential sensor from being subjected to high pressure while the other side has no pressure applied. This is required when calibrating either DP or SP. See Figure 4-1.

5.   To calibrate the pressure input, setup the pressure calibrator and make the necessary connections to the device.

6.   To calibrate the temperature input, disconnect the RTD sensor and connect a decade box (or comparable equipment) to the RTD terminals of the 3095FC.

7.   Click Calibrate under the desired input to calibrate DP, SP, or Temperature. This displays the Set Zero calibration window.

Figure 4-1. Removing the
Device from Service
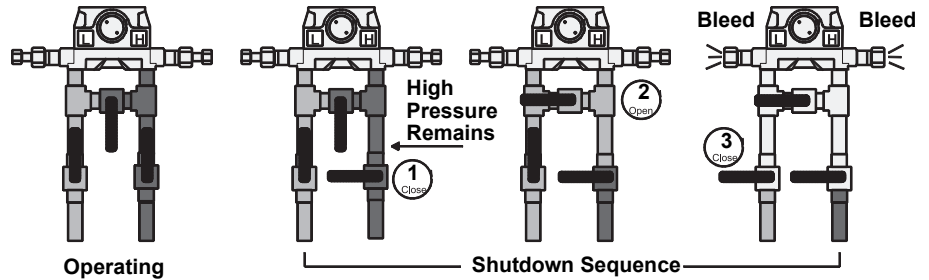
8. Apply the low (zero) value. For a pressure input, this would typically be open to atmosphere.

9. Enter the applied value in the Dead Weight / Tester Value field of the Set Zero dialog. For SP on an absolute-pressure device, enter the actual current atmospheric pressure.

NOTE
Apply pressure to both the high and low sides of the transmitter when calibrating SP.

10. When the displayed Live Reading is stable, click Set Zero to calibrate the zero reading. The Set Span window then appears

11. Apply the desired high value to the input (the top end of the expected operating range).

12. Enter the applied value in the Dead Weight / Tester Value field of the Set Span dialog.

    •   For SP on an absolute-pressure device, add the actual atmospheric pressure, such as 300 + 14.73.

13. When the Live Reading is stable, click Set Span to calibrate the high reading. The window advances to the Set Midpoint 1 window.

14. To perform a two-point calibration, click Done to complete calibration.

15. To calibrate midpoints, apply the desired pressure or temperature and enter the applied value in the Dead Weight / Tester Value field. Midpoint can be calibrated in any order.

16. When the Live Reading is stable, click Set Mid 1 to calibrate the reading. The display advances to the Set Midpoint 2 window.

17. To perform a three-point calibration, click Done to complete calibration.

18. To calibrate additional midpoints, apply the desired pressure or temperature and enter the applied value in the Dead Weight / Tester Value field.

19. When the Live Reading is stable, click Set Mid 2 to calibrate this reading. The display advances to the Set Midpoint 3 window.

20. To perform a four-point calibration, click Done to complete calibration.

21. To calibrate a third midpoint, apply the desired pressure or temperature and enter the applied value in the Dead Weight / Tester Value field.

22. When the Live Reading is stable, click Set Mid 3 to calibrate the reading. The display returns to the Meter Calibration window.

23. When the calibration for a selected point is complete, another input can be calibrated or complete the calibration. If calibration is complete return the device to service.

NOTE
Do NOT close the by-pass valve on the valve manifold until after process pressure has been reapplied, to protect the sensor module. This keeps one side of the differential sensor from being subjected to high pressure while the other side has no pressure applied. See Figure 4-2.

Figure 4-2. Returning the Sensor Module to Service
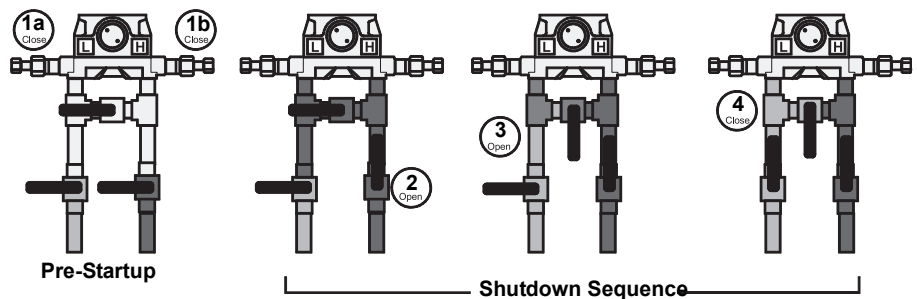
NOTE:
If calibrating the DP input, refer to "Zero Shift" on page 4-5 before completing the last step.

24. Finally, click Done to cause the calibration window to close, cancel freeze values (unfrozen), and enable live readings for use in the flow calculations. The Event Log records all calibration settings that were changed.

Analog Input (AI) Calibration

Select Utilities > AI Calibration Value to view the calibration values for a specific Analog Input point.

NOTE
Deadweight calibration may be performed from the Calibration tab in the AI Configuration screen. The Calibration Freeze Value field displays the value received from the AI when the Update button was last pressed.

Use the drop-down list box to select the AI Point to be viewed. The Tag for that point displays. Not all of the following parameters apply to each point.

- Raw Value #1 to 5 - Raw Value 1 is the lowest calibrated Raw A/D input, Raw Value 5 is the highest calibrated Raw A/D input.

- EU Value #1 to 5 - The five calibration settings in Engineering Units Values, converted from the Raw Values, based on the Low Reading EU and High Reading EU defined for the point. EU Value 1 is the Zero value, EU Value 5 is the Span value, and the rest are Midpoint values.

- Press Effect is the Zero Shift adjustment value; it is used as an offset to the calibrated EU Values to compensate for the working SP effect on a DP transmitter that was calibrated at atmospheric pressure.

- Set EU Value is the Tester Value specified for the last calibration value that was set. Manual EU is the Live Reading for the last calibration value that was set.

- The Timer field shows the last inactivity count-down in seconds (starting from 3600 seconds) that occurred during the last calibration session. Had the countdown reached 0, time-out would have taken place, causing the calibration mode to end.

- Mode indicates:
  - 0 = Use Current Calibration
  - 1 = Start Calibration
  - 2 = Calibrate
  - 3 = Restore Previous Calibration
  - 4 = Stop Calibration.

NOTE
No event is logged for the Mode Read-Only parameter.

- Type indicates which calibration value is currently being set:
  - 0 = Inactive (no value)
  - 1 = Zero
  - 2 = Span
  - 3 = Midpoint 1
  - 4 = Midpoint 2
  - 5 = Midpoint 3
  - 6 = Zero Shift

Figure 4-3. AI Calibration Values Screen
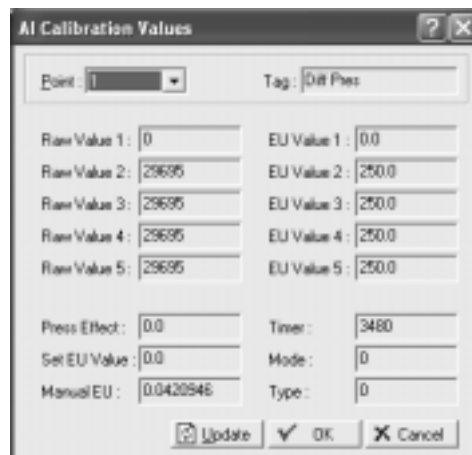
Calibration Report

The Calibration Report details which parameters were set during calibration.

1. Select View > Calibration Report.
2. Select the Calibration Report to be viewed. The file has the extension *.800 and is located in the default directory C:/Program Files/Rosemount User Interface for Windows/Data directory unless the directory location was changed when the Calibration Report was created.
3. Click Open.

Calibration Value

Select Utilities > Calibration Value to view the calibration values for a specific analog input point.

NOTE
Remove/restore the device from/to working pressure during calibration. Failure to follow recommendations may cause sensor damage.

Zero Shift

To check or adjust for Zero Shift, leave the sensor by-pass valve open (to simulate a no-flow condition), with either line pressure or a normal operating SP from the calibrator applied to the sensor. This applies the same pressure to both sides of the DP diaphragm to give a zero DP reading.

Perform the following steps:

1. Connect the Rosemount User Interface Software to the 3095FC and run the calibration procedure.
2. Select Meter > Calibration > Freeze.
3. Under the Diff Press input, click Zero Shift to open the Set Zero Shift window.
4. Verify Reading to determine if a Zero Shift correction is required.
5. If the reading is not zero, click Set Zero Shift to adjust the Zero and click Done. If the reading is zero, click Done.
6. Click Done to close the calibration window and cancel the freeze values to begin using live readings for the flow calculations.

VERIFY CALIBRATION

Rosemount User Interface Software can verify the calibration to check if the device requires re-calibration. To verify, perform the following steps:

1. Launch the Rosemount User Interface Software. Connect the 3095FC.

2. Select the Meter > Calibration.

3. Click Freeze. This opens the Meter Calibration window. The current reading displays under each meter input as the Freeze Value. The 3095FC uses these values in the flow calculations while verifying the points.

NOTE
Open the by-pass valve on the valve manifold prior to isolating the device from the process, to protect the sensor module. This keeps one side of the sensor from being subjected to high pressure while the other side has no pressure applied. This is required when calibrating either DP or SP.

4. While observing the previous Note, apply the desired pressure setting to the input.

NOTE
Apply pressure to both the high and low sides of the transmitter when verifying SP.

5. Click Verify listed under the input to be calibrated.

6. To log the Tester Value and the Live Reading to the Event Log as a record of the verification, click Log Verify.

7. Click Done.

8. Continue to verify all required pressures/values.

9. When complete, connect the 3095FC back to the process.

NOTE
Do NOT close the by-pass valve on the valve manifold until after process pressure has been reapplied, to protect the device. This keeps one side of the differential sensor from being subjected to high pressure while the other side has no pressure applied.

10. Click **Done** to close the calibration window, to cancel the freeze values, and to begin using live readings for the flow calculations.

Figure 4-4. Meter Calibration Screen

Section 5   Troubleshooting and Maintenance

The following tools are required for troubleshooting:

- IBM-compatible PC
- Rosemount User Interface Software

BACKUP CONFIGURATION INFORMATION

Perform backup procedure before removing power to the 3095FC for repairs, troubleshooting, removing or adding components, or upgrades. This procedure preserves the current flow PC configuration and log data held in RAM.

NOTE
When installing equipment in a hazardous area, ensure that all components are approved for use in such areas. Check the product labels. Change components only in an area known to be non-hazardous. Performing these procedures in a hazardous area could result in personal injury or property damage.

To avoid circuit damage when working inside the unit, use appropriate electrostatic discharge precautions, such as wearing a grounded wrist strap.

1. Log into the Rosemount User Interface Software.
2. Save the configuration in flash memory Click Device > Flags > Save Flash Memory Configuration. This saves all configuration settings, including the current states of the flags and calibration values.
3. Select Device > Collect Data. Click OK to save event logs (.evt), alarm logs (.alm), report data (.det), hourly logs (.pdb), and daily (.day) logs. Specify the desired file name and path.
4. Backup the 10-minute history file.
5. Select File > Save.
6. Type the desired File name for the backup file.
7. Click Save. The file is saved in the default directory C:/Program Files/Rosemount/Rosemount User Interface Data, unless the directory has been changed.

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COMMUNICATION ERRORS

Several events can cause a connection failure:

- If the Direct Connect communication link fails, use the Connect feature to establish a connection to the 3095FC. The Configuration Tree option allows the user to change the communications port, time-out settings, and other variables used when establishing a communications link to the PC.

- A communications failure can also occur if Rosemount User Interface Software stands idle for too long and exceeds the timeout value for a device. In this case, simply log back into Rosemount User Interface Software using Direct Connect or the Configuration Tree connect feature.

- Enter an Operator and Password for each user who connects to a 3095FC in the 3095FC security options located under the 3095FC menu.

Communication Problems

The PC communications options may need to be altered if communicating problems occur.

1. If not currently active, select 3095FC Directory from the View or Window menu.
2. Select the desired Station Name of the 3095FC device.
3. Right-mouse click and select Properties.
4. Specified the correct 3095FC Address and 3095FC Group of the 3095FC with which communicate is being established. If communicating through the LOI port of the device, set the 3095FC Address to 240 and Group Address to 240, which is the universal address.
5. Click the Advanced tab.
6. Try increasing the Time Out and/or Tx Delay.
7. Click Apply, and then OK.
8. Click the General tab, and click Connect.
9. If communication problems still occur, try increasing the Number of Retries field in the Advanced tab screen. Contact an Emerson Process Management representative for additional assistance.

Debug Communications

Select Utilities > Debug Communications to open a Diagnostics window, which displays the data bytes (in hex format) sent and received from the 3095FC during any operation. Bytes sent are shown in black; bytes received are shown in red. Right-click on the display to Copy highlighted data, Clear All data, or Unselect. Copied data can be pasted in a file for analyzing.

RESETTING THE 3095FC

If problems occur that appear to be software related, try resetting with a Warm Start, Cold Start, or Jumper Reset.

Warm Start

The re-initialization is performed by setting a parameter in the Rosemount User Interface Software Flags. The re-initialization includes the Tasks, Database, Communication Ports, sensor module, and I/O. It does not change the current configuration of any parameters.

1. Log into the Rosemount User Interface Software.
2. Connect the PC to the 3095FC.
3. Perform "Backup Configuration Information" on page 5-1.
4. Select 3095FC > Flags
5. Click on Warm Start
6. Apply to save the change.

Cold Start

The re-initialization is performed by setting a parameter in the Rosemount User Interface Software Flags, called Cold Start. The re-initialization includes the Tasks, Database, Communication Ports, Sensor, I/O, and restoring the saved configuration, if there is one. It also includes resetting or clearing other items, based upon the selection made in the Options screen.

1. Log into the Rosemount User Interface Software.
2. Connect the PC to the 3095FC.
3. Perform "Backup Configuration Information" on page 5-1.
4. Select 3095FC > Flags.
5. Click on Cold Start.
6. Apply to save the change.

Jumper Reset

The Reset jumper located on the LCD (if installed) or on the Battery Charger Board can be used to perform a special type of cold start. The jumper permits a power-up reset to re-establish a known operating point. It includes re-initializing the Communication Ports to the factory default configuration.

The cold start does not include any of the clearing options available in a Cold Start performed using Rosemount User Interface Software.

NOTE:
This type of reset restores the communications ports to the factory configuration defaults. Some user-entered configuration parameters may be lost. Therefore, back up any required data before performing the reset.

1. Perform "Backup Configuration Information" on page 5-1.
2. Unscrew the front end cap cover (LCD end).
3. Place the reset jumper (located on the LCD if installed or on the Battery Charger Board at J2) in the Reset position.
4. Cycle the power.
5. Remove the reset jumper and install it in the normal (NORM) position.
6. Replace the front end cap cover (LCD end).
7. Perform the "After Installing Components" on page 5-4.

The reset procedure loads the factory default values into the communication ports.

AFTER INSTALLING COMPONENTS

After removing power to the 3095FC and installing components as needed, perform the following steps to start the 3095FC and reconfigure the data.

NOTE
Ensure all input devices, output devices, and processes remain in a safe state upon restoring power. An unsafe state could result in property damage.

When installing equipment in a hazardous area, ensure that all components are approved for use in such areas. Check the product labels. Change components only in an area known to be non-hazardous. Performing these procedures in a hazardous area could result in personal injury or property damage.

1. Reconnect power to the 3095FC by inserting the CHG+ / CHG- power terminal.
2. Launch Rosemount User Interface Software, log in, and connect to the 3095FC.
3. Verify that the configuration is correct. If it is not, continue by configuring the required items. If major portions or the entire configuration needs to be reloaded, perform the remaining steps.
4. Select File > Download.
5. From the Open dialog box, select the backup configuration file (has extension *.800).
6. Select the portions of the configuration to download (restore).
7. Click Download to restore the configuration.

REPLACING THE BATTERIES

The battery pack contains three D-size lead-acid batteries providing 2.5 Amp-hours of current at 6.2 volts nominal.

NOTE
When installing equipment in a hazardous area, ensure that all components are approved for use in such areas. Check the product labels. Change components only in an area known to be non-hazardous. Performing these procedures in a hazardous area could result in personal injury or property damage. To avoid circuit damage when working inside the unit, use appropriate electrostatic discharge precautions, such as wearing a grounded wrist strap.

To replace the battery pack.

1. Unscrew the front end cap cover.
2. Remove the LCD display (if applicable).
3. Place the power jumper (located at J1 on the Battery Charger Board) in the OFF position.
4. Remove the four screws from the Battery Charger Board.
5. Remove the ribbon cable from the Battery Charger Board to the Backplane Board.
6. Remove the Battery Charger Board.
7. Replace the Battery Charger Board.
8. Replace the ribbon cable from the Backplane Board to the Battery Charger Board.
9. Replace the four screws from the Battery Charger Board.
10. Reinstall the LCD display (if applicable).
11. Place the power jumper in the ON position.
12. Replace the front end cap cover.

CHANGING THE PLATE

The Plate Change option allows the user to change the size of an orifice plate.

1. Select Plate Change from the Meter menu to record an orifice plate change.
2. Select Yes if the plate change occurs during flowing conditions. Click No for non-flowing conditions.
3. After selecting the appropriate Meter ID, click Freeze. If performing the Plate Change under flowing conditions, the dialog box shows the Freeze Value of each meter input (for purposes of data logging) while the change is being made. All I/O values are held in Manual mode at the current value. The values are returned to an active state after clicking OK in the Plate Change dialog box.
4. Enter the new exact size for the Orifice Diameter (Inches or Millimeters) in the new plate.
5. Click Apply to record the change creating a record in the Event Log and restarts the flow calculation using the new orifice size data.
6. Click OK.

Appendix A Specifications and Reference Data

SPECIFICATIONS

**Functional
Specifications**

Service
Gas or liquid

Input
Single input for a 2- or 3-wire RTD

Differential Sensor
Limits
- Code 2: –250 to 250 inH$_2$O (-622,70 to 622,7mbar)
- Code 3: –1000 to 1000 inH$_2$O (-2,49 to 2,49 bar)

Absolute Sensor
Limits
- Code 3: 0 to 800 psia (0 to 55158,1 mbar)
- Code 4: 0 to 3,626 psia (0 to 250,0 bar)

Gage Sensor
Limits
- Code C: 0 to 800 psig (0 to 55158,1 bar)
- Code D: 0 to 3,626 psig (0 to 250,0 bar)

Over Pressure Limit
0 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.

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Power
- Transmitter: operates on terminal voltage of 8 - 28 Vdc
- Input current: 5mA nominal, 9.5 mA at 100% duty cycle (battery charging not included)
- Internal battery: rechargeable, Nominal 6.2 Vdc (2.5 Amp/hr)
- Maximum power consumption: 19 watts
- Solar panel input: nominal 8 V to 200 mA
- Solar panel output: 2 watts, 9 V nominal
- External charging input: 12 Vdc max (8 - 10 Vdc nominal)

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
0–95%, non condensing

Communications
User Interface: EIA-232 (RS-232C) format
Baud Rate: 600 to 19200 bps User selectable
Host: RS-485 / RS-232

Rosemount User Interface Software and Hardware Requirements:
- IBM-compatible PC
- 1 MB of RAM
- Pentium-grade processor: 233 MHz or faster
- Microsoft Windows 98 or higher operating system
- CD-ROM drive

Temperature Limits
Process (at transmitter isolator flange for atmospheric pressures and above):
- –40 to 212 °F (–40 to 100 °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 167 °F (–40 to 75 °C)
- with integral meter: -4 to 167 °F (-20 to 75 °C)

Storage:
- –50 to 185 °F (–46 to 85 °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.

Real Time Clock

- Year /month / day / hour / minute / second
- Battery Packed

Serial Card – EIA-232D Card

Standards

- Meets EIA-232 standard for single-ended data transmission over distances of up to 50 ft (15 m).

Data Rate

- Selectable from 1200 to 19200 bps

Format

- Asynchronous, 7 or 8-bit (software selectable with full handshaking)

Parity

- None, odd, or even (software selectable)

Performance Specifications

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

Differential Pressure

Range 2

- 0–2.5 to 0–250 inH$_2$O (0–6,2 to 0–622,7 mbar)
  (100:1 rangeability is allowed)

Range 3

- 0–10 to 0–1000 inH$_2$O(0–0,025 to 0–2,49 bar)
  (100:1 rangeability is allowed)

Accuracy (including Linearity, Hysteresis, Repeatability)

- ±0.075% of span for spans from 1:1 to 10:1 URL for spans less than 10:1 rangedown

$$\text{Accuracy} = \left[0.03 + 0.0075\left(\frac{\text{URL}}{\text{Span}}\right)\right]\% \text{ of span}$$

Ambient Temperature Effect per 50 °F (28 °C)

- ±(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 1,000 psi (68.9 bar)
- Span error = ±0.20% of reading per 1,000 psi (68.9 bar)

Stability

- ±0.125% URL for five years for ±50 °F (28 °C) ambient temperature changes, and up to 1000 psi (6,9MPa) line pressure.

Absolute/Gage Pressure (AP)(GP)

Range 3 (absolute), Range C (gage)

- 0–8 to 0–800 psi (0–0,55 to 0–55,2 bar)
  (100:1 rangeability is allowed)

Range 4 (absolute)/ Range D (gage)
- 0–36.26 to 0–3,626 psi (0–2,5 to 0–250,0 bar)
  (100:1 rangeability is allowed)

Accuracy (including Linearity, Hysteresis, Repeatability)
- ±0.075% of span for spans from 1:1 to 6:1 of URL
- For spans less than 6:1 rangedown,

$$\text{Accuracy} = \left[0.03 + 0.0075\left(\frac{URL}{Span}\right)\right]\% \text{ of span}$$

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, and up to 1000 psi (6,9MPa) line pressure.

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 $\propto$ = 0.00385. Examples of compatible RTDs include the Rosemount Series 68 and 78 RTD Temperature Sensors.

Sensing Range
- –40 to 212 °F (–40 to 100 °C)

Accuracy (including Linearity, Hysteresis, Repeatability)
- ±1.0 °F (0.56 °C)

Ambient Temperature Effects per 50 °F (28 °C)
- ±0.90 °F (0.50 °C) for process temperatures from –40 to 212 °F (–40 to 100°C)

Stability
- ±1.0 °F (0.56 °C) for one year

Physical Specifications

Electrical Connections
½–14 NPT ¾-14 NPT, CM 20, PG-13.5

RTD Process Temperature Input:
100-ohm platinum RTD per IEC-751 Class B

Process Connections
- Transmitter: ¼–18 NPT on 2¹/₈-in. centers
- RTD: RTD dependent (see ordering information)

Battery
Lead-acid

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

Components	Weight in lb. (kg) 3095FC
3095 Transmitter	12.4 (5.6)
LCD Meter	0.5 (0.2)
SST Mounting Bracket	1.0 (0.5)
Battery / Solar Panel	2.0 (0.9)
Battery Backup	1.3 (0.6)

Memory Specifications

Programmable Memory
2 MB x 8 flash EPROM

Data Memory
512 kB 5 RAM

Boot Memory
128 kB flash EPROM

Data Logging
Archival
- 60 days of 10 minutes data
- 35 days of hourly data
- 35 days of daily data
- minimum/maximum values for a single data

Memory Logging
- 240 alarms before rollover
- 240 events before rollover

Flow Specifications

Flow Calculation:
- Computed in accordance with ANSI/API 2530-92 (AGA 3, 1992), API 14.2 (AGA 8, 1992), and API 21.1. Detail Gross I, Gross II.

DIMENSIONAL DRAWINGS

3095FC

Side View **Front View**

7.50 (191)

Meter Cover
Optional

10.71 (272)

1.2 (30.5)
Clearance
Required to
remove cover

Terminal
Block

^{3}/4-in.–14 NPT
Conduit Plug

6.4 (163)

Dimensions are in inches (millimeters)

3095FC with Solar Panel Assembly

Side View **Front View**

6.24 (159)

Solar Panel
Assembly
(optional)

4.48 (114)

17 (732)

10.71 (272)

Dimensions are in inches (millimeters)

Mounting Configurations for 3095FC Transmitter

Panel Mount | Pipe Mount

2.0 (51)

10.25 (260)

6.40 (163)

2.81 (71)

1.10 (28)

5.26 (134)

6.40 (163)

7.50 (191)

^{3}/4–14 NPT Conduit Plug

Terminal Block

3.70 (93)

3095/3095J04E, 3095J04F, 3095J04G

Dimensions are in inches (millimeters)

ORDERING INFORMATION

• Available
— Not available

Code	Product Description		3095FB	3095FC
3095F	MultiVariable Transmitter		•	•

Code	Output		3095FB	3095FC
B	Process Variable Measurement: Modbus RS-485		•	—
C	Process Variable Measurement: Mass Flow and Data Logging: Modbus RS-485		—	•

Code	Differential Pressure Range		3095FB	3095FC
2	0 – 2.5 to 0 – 250 inH$_2$O (0 – 6,23 to 0 – 623 mbar)		•	•
3	0 – 10 to 0 – 1000 inH$_2$O (0 – 0,025 to 0 – 2,49 bar)		•	•

Code	Absolute/Gage Pressure Ranges		3095FB	3095FC
3	0–8 to 0–800 psia (0–0,55 to 0–55,1 bar)		•	•
4	0–36.26 to 0–3,626 psia (0–2,5 to 0–250 bar)		•	•
C	0–8 to 0–800 psig (0–0,55 to 0–55,1 bar)		•	•
D	0–36.26 to 0–3,626 psig (0–2,5 to 0–250 bar)		•	•

Code	Isolator Material	Fill Fluid	3095FB	3095FC
A	316L Stainless Steel (SST)	Silicone	•	•
B[1]	Hastelloy C-276	Silicone	•	•
J[2]	316L SST	Inert	•	•
K[1][2]	Hastelloy C-276	Inert	•	•

Code	Flange Style	Material	3095FB	3095FC
A	Coplanar	CS	•	•
B	Coplanar	SST	•	•
C	Coplanar	Hastelloy C[2]	•	•
0	None (Required for Option Codes S3 or S5)	SST	•	•

Code	Drain/Vent Material		3095FB	3095FC
A	SST		•	•
C[1]	Hastelloy C		•	•
0	None (Required for Option Codes S3 or S5)		•	•

Code	O-ring		3095FB	3095FC
1	Glass-filled TFE		•	•

Code	Process Temperature Input (RTD ordered separately)		3095FB	3095FC
0	No RTD Cable[3]		•	•
1	RTD Input with 12 ft. (3.66 m) of Shielded Cable		•	—
2	RTD Input with 24 ft. (7.32 m) of Shielded Cable		•	—
3	RTD Input with 12 ft. (3.66 m) of Armored, Shielded Cable		•	—
4	RTD Input with 24 ft. (7.32 m) of Armored, Shielded Cable		•	—
7	RTD Input with 75 ft. (22.86 m) of Shielded Cable		•	—
8	RTD Input with 75 ft. (22.86 m) of Armored, Shielded Cable		•	—
A	RTD Input with 12 ft. (3.66 m) of CENELEC Flameproof Cable		•	—
B	RTD Input with 24 ft. (7.32 m) of CENELEC Flameproof Cable		•	—
C	RTD Input with 75 ft. (22.86 m) of CENELEC Flameproof Cable		•	—

Code	Transmitter Housing Material	Conduit Entry Size	3095FB	3095FC
A	Polyurethane-covered Aluminum	$^1/_2$–14 NPT	•	Adapter
E	Polyurethane-covered Aluminum	$^3/_4$–14 NPT	—	•
B	Polyurethane-covered Aluminum	M20 x 1.5 (CM20)	•	Adapter
C	Polyurethane-covered Aluminum	PG 13.5	•	Adapter
J	SST	$^1/_2$–14 NPT	•	—
K	SST	M20 x 1.5 (CM20)	•	—
L	SST	PG 13.5	•	—

		3095FB	3095FC
		• Available	
		— Not available	

Code	Terminal Block	3095FB	3095FC
A	Standard	•	—
B	With Integral Transient Protection	•	•
C	CE MARK / Compliant with EMC – Transient Protection Included	•	—

Code	Meter	3095FB	3095FC
0	None	•	•
1	LCD Meter	•	•

Code	Bracket	3095FB	3095FC
0	None	•	•
1	Coplanar SST Flange Bracket for 2-in. Pipe or Panel Mount, SST Bolts	•	•
2	Traditional Flange Bracket for 2-in. Pipe Mounting, CS Bolts	•	•
3	Traditional Flange Bracket for panel Mounting, CS Bolts	•	•
4	Traditional Flange Flat Bracket for 2-in. Pipe Mounting, CS Bolts	•	•
5	Traditional Flange Bracket for 2-in. Pipe Mounting, SST Bolts	•	•
6	Traditional Flange Bracket for panel Mounting, SST Bolts	•	•
7	Traditional Flange Flat Bracket for 2-in. Pipe Mounting, SST Bolts	•	•
8	SST Traditional Flange Bracket for 2-in. Pipe Mounting, SST Bolts	•	•
9	SST Traditional Flange Flat Bracket for 2-in. Pipe Mounting, SST Bolts	•	•

Code	Bolts	3095FB	3095FC
0	Carbon Steel bolts	•	•
1	Austenitic 316 SST bolts	•	•
N	None (required for Options code S5)	•	•

Code	Product Certifications	3095FB	3095FC
0	None	•	•
A	Factory Mutual (FM) Explosion-Proof	•	—
C	Canadian Standards Associate (CSA) Explosion Proof	•	—
H	ATEX Flame-proof	•	—
M	Canadian Standards Association (CSA) U.S. and Canada Explosion-Proof	—	•

Code	Engineered Measurement Solution (EMS)	3095FB	3095FC
N	Process Variable Measurement: MODBUS	•	—
C[3]	Mass Flow with Process Variable Measurement and Data Logging: MODBUS	—	•

Code	Options	3095FB	3095FC
S5	Assemble to 305 Integral Manifold (requires integral manifold model number)	•	•
C1	Custom Flow Configuration (requires completed Configuration Data Sheet (see document number 00813-0100-4716))	•	•
A3	Mast with Solar Panel Assembly: includes 12 Vdc Batteries	—	•
P1	Hydrostatic Testing	•	•
P2	Cleaning for Special Services	•	•
Q4	Calibration Certificate	•	•
Q8	Material Traceability Certification per EN 10204 3.1B	•	•
DF[4]	$1/2$–14 NPT Flange Adapter, Carbon Steel, Stainless Steel, Hastelloy C	•	•
A1	Additional RS-232 Communication Board	—	•
A2	12 Vdc System with Batteries	—	•

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

(1) *Materials of Construction meet NACE material recommendation per MR 01-75. Environmental limits apply to certain materials. Consult standard for details.*

(2) *Only available with C or D Gage Sensor Modules.*

(3) *Required for 3095FC.*

(4) *Material determined by Flange Style material selection.*

OPTIONS

Standard Configuration

Unless otherwise specified, the transmitter is shipped as follows:

Engineering units:	
Differential	inH$_2$O
Absolute/gage	psi (all ranges)
Output:	Modbus RTU protocol signal
Flange type:	Specified model code option
Flange material:	Specified model code option
O-ring material:	Specified model code option
Drain/vent:	Specified model code option
Flow Configuration Parameters:	Factory default
Software tag:	(Blank)

Custom Configuration (Option Code C1)

If Option Code C1 is ordered, the user-specified information for the 3095F Modbus Transmitter in addition to the standard configuration parameters are factory configured.

Message, descriptor, slave address, baud rate, upper and lower trim points for each process variable, damping for each process variable, units for each process variable, upper and lower operation limits. Unspecified parameters will 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 stamped 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.
- Software tag is left blank unless specified.

Optional 305 Integral Manifolds

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

ACCESSORIES

Rosemount User Interface Software Packages

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

Windows 98 or higher

3095FC

- Part Number 03095-5136-0001: Windows User Interface Software–Single PC License, and Cable.
- Part Number 03095-5135-0001: Windows User Interface Software–Single PC License.
- Part Number 03095-5135-0002: Windows User Interface Software– Site License.
- Part Number 03095-5106-0003: 10 foot (3.05 m) 9-pin Serial Cable

Appendix B   Product Certifications

APPROVED MANUFACTURING LOCATIONS

Rosemount Inc. — Chanhassen, Minnesota   USA

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 Assessment - EC No. PED-H-20 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)

3095F Flow Transmitters — EN 50081-1: 1992; EN 50082-2:1995; EN 61326-1:1997 – Industrial

HAZARDOUS LOCATIONS CERTIFICATIONS

North American Certifications

2, Groups A, B, C, and D. Install per Rosemount drawing 03095-1025.

Canadian Standards Association (CSA) Approvals

M   Explosion-Proof for Class I, Division 1, Groups C and D. Optional solar panel: mast option: Explosion-Proof for Class I, Division 2, Groups A, B, C, D, and T3. CSA Enclosure Type 4.
ISSeP

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Appendix C   Rosemount User Interface Software

OVERVIEW

To configure the 3095FC, you must be familiar with the structure of the database. The database is broken into individual parameters and each database parameter is uniquely associated by Parameter Number and Point Type.

POINT TYPE PARAMETER DEFINITIONS

A list of all Point Types is provided in Table 3 1 on page 3-1. For each of the configurable point types (0 through 59), a parameter table is given in Table 3 5 through Table 3 48. Note that the parameter tables each have a point type name and five columns:

Parameter # - Identifies the specific parameter associated with the Point Type.

Read-Write - Indicates if the parameter can be read and written to (R/W) or if the parameter is read-only (R/O).

Data Type - Table C-1 defines the Data Types found in the parameters table.

Table C-1. Data Types

Data Type	Definition	Byte Length
AC	ASCII character (groups of 10, 20, or 30 characters)	1 per character
BIN	Binary	1
FLP	Floating Point - IEEE Format	4
INT 8, 16, 32	Signed Integer - number of bits follows	1, 2, or 4
N/A	Not applicable	–
TLP	Point **T**ype, **L**ogical or Point Number, and **P**arameter Number	3
UINT 8, 16, 32	Unsigned Integer - number of bits follows	1, 2, or 4

Length - The byte length of the parameter is indicated in this column.

Description - A brief description of each parameter is provided in this column.

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Point Type 0 Information

Table 3 5 lists the parameters for the Configurable Opcode Point Type found in the 3095FC. The parameters for this Point Type consist of a sequence number and 44 device parameter identifications (Point Type, Logical Number, and Parameter Number - TLP). After the TLPs have been configured in Point Type 0:

- Opcodes 10 and 11 can be used to read and write data directly without specifying the Point Type, Logical Number, or Parameter Number.
- Opcodes 180 and 181 can be used to read and write the parameter data and do not include the parameter definition.

Table C-2. Point Type 0 - Configurable Opcode

Parameter Number	Read-Write	Data Type	Length	Description
0	R/W	FLP	4	Sequence / Revision Number
1	R/W	TLP	3	Data 1
2	R/W	TLP	3	Data 2
3	R/W	TLP	3	Data 3
4	R/W	TLP	3	Data 4
5	R/W	TLP	3	Data 5
6	R/W	TLP	3	Data 6
7	R/W	TLP	3	Data 7
8	R/W	TLP	3	Data 8
9	R/W	TLP	3	Data 9
10	R/W	TLP	3	Data 10
11	R/W	TLP	3	Data 11
12	R/W	TLP	3	Data 12
13	R/W	TLP	3	Data 13
14	R/W	TLP	3	Data 14
15	R/W	TLP	3	Data 15
16	R/W	TLP	3	Data 16
17	R/W	TLP	3	Data 17
18	R/W	TLP	3	Data 18
19	R/W	TLP	3	Data 19
20	R/W	TLP	3	Data 20
21	R/W	TLP	3	Data 21
22	R/W	TLP	3	Data 22
23	R/W	TLP	3	Data 23
24	R/W	TLP	3	Data 24
25	R/W	TLP	3	Data 25
26	R/W	TLP	3	Data 26
27	R/W	TLP	3	Data 27
28	R/W	TLP	3	Data 28
29	R/W	TLP	3	Data 29
30	R/W	TLP	3	Data 30
31	R/W	TLP	3	Data 31
32	R/W	TLP	3	Data 32
33	R/W	TLP	3	Data 33
34	R/W	TLP	3	Data 34
35	R/W	TLP	3	Data 35
36	R/W	TLP	3	Data 36
37	R/W	TLP	3	Data 37
38	R/W	TLP	3	Data 38

Parameter Number	Read-Write	Data Type	Length	Description
39	R/W	TLP	3	Data 39
40	R/W	TLP	3	Data 40
41	R/W	TLP	3	Data 41
42	R/W	TLP	3	Data 42
43	R/W	TLP	3	Data 43
44	R/W	TLP	3	Data 44

Device Point Types

The tables in the rest of this section list the parameters for each of the Point Types.

Table C-3. Point Type 3 - Analog Input

Parameter Number	Read-Write	Data Type	Length	Description	Abbr.
0	R/W	AC	10	Point Tag Identification	TAG
1	R/W	AC	10	Units	UNITS
2	R/W	UINT 16	2	Scan Period (50 millisecond intervals)	SCANPR
3	R/W	UINT 16	2	Filter (50 millisecond intervals)	FILTER
4	R/W	INT 16	2	Adjusted A/D 0%	MINRAW
5	R/W	INT 16	2	Adjusted A/D 100%	MAXRAW
6	R/W	FLP	4	Low Reading EU	MINEU
7	R/W	FLP	4	High Reading EU	MAXEU
8	R/W	FLP	4	Low Alarm EU	LOAL
9	R/W	FLP	4	High Alarm EU	HIAL
10	R/W	FLP	4	Low Low Alarm EU	LOLOAL
11	R/W	FLP	4	Hi Hi Alarm EU	HIHIAL
12	R/W	FLP	4	Rate Alarm EU	RATEAL
13	R/W	FLP	4	Alarm Deadband	ALDBND
14	R/W	FLP	4	Filtered EUs	EU

15	R/W	BIN	1	Mode:
				  Bit 7 – Manual Mode
				    0 = Normal Scan
				    1 = Manual Scan
				  Bit 6 – RBX on Set
				    0 = Disabled
				    1 = Active
				  Bit 5 – RBX on Clear
				    0 = Disabled
				    1 = Active
				  Bit 4 – Alarm Enable
				    0 = Disabled
				    1 = Log Alarm
				  Bit 3 – Not Used
				  Bit 2 – Not Used
				  Bit 1 – Clipping
				    0 = Disable
				    1 = Clipping Enable
				  Bit 0 – Fault Handling
				    0 = Retain Last EU Value
				    1 = Set EU Value to Fault EU Value (Parameter 19)
					BIN

Parameter Number	Read-Write	Data Type	Length	Description	Abbr.
16	R/O	BIN	1	Alarm Code: Bit 7 – Manual Mode Bit 6 – Point Fail Bit 5 – Not Used Bit 4 – Rate Alarm Bit 3 – High High Alarm Bit 2 – High Alarm Bit 1 – Low Low Alarm Bit 0 – Low Alarm	ALARM
17	R/O	INT 16	2	Raw A/D Input	CURRAW
18	R/O	UINT 16	2	Actual Scan Time	SCAN
19	R/W	FLP	4	Fault EU Value	FAULTVAL

Table C-4. Point Type – AGA Flow Parameters

Parameter Number	Read-Write	Data Type	Length	Description	Abbr.
0	R/W	AC	10	Point Tag Identification	TAG
1	R/W	FLP	4	Latitude	LAT
2	R/W	FLP	4	Elevation	ELAVTN

3	R/W	BIN	1	Calculation Method:
				Bit 7 – Manual Mode
				  0 = Normal
				  1 = Manual
				Bit 6 – RBX Set
				  0 = Disabled
				  1 = Active
				Bit 5 – RBX on Clear
				  0 = Disabled
				  1 = Active
				Bit 4 – ALM Enable
				  0 = Disabled
				  1 = Log Alarms
				Bit 3 – US or Metric
				  0 = US Units
				  1 = Metric Units
				Bit 2 – AGA3 Algorithm
				  1 = 1992 Algorithm
				Bit 1 – Flow Calculation Method
				  0 = AGA3
				Bit 0 – Compressibility Method
				  1 = AGA8
					METHOD

Parameter Number	Read-Write	Data Type	Length	Description	Abbr.

4	R/W	BIN	1	AGA Configuration – Options:
				  Bit 7 – Log Methane Adjustment
				    0 = Yes
				    1 = No
				  Bit 6 – Heating Value
				    0 = Mass
				    1 = Volume Basis
				  Bit 5 – Gravitational Acceleration
				    0 = Calculate
				    1 = Enter Acceleration
				  Bit 4 – Heating Capacity
				    0 = Calculate
				    1 = Enter Heating Value
				  Bit 3 – Static Pressure Value
				    0 = Gauge
				    1 = Absolute Static Press
				  Bit 2 – Static Pressure Value
				    0 = Downstream
				    1 = Upstream Static Press
				  Bit 1 – Specific Gravity
				    0 = Calculate
				    1 = Enter Specific Gravity
				  Bit 0 – Tap
				    0 = Flange Tap
					OPTION

5	R/W	FLP	4	Specific Gravity	SPGR
6	R/W	FLP	4	Heating Value	GASHV
7	R/W	FLP	4	Gravity Acceleration Correction	GRAVIT
8	R/O	UINT 16	2	Scan Period	SCANPR
9	R/W	FLP	4	Pipe Diameter	PIPDIA
10	R/W	FLP	4	Orifice Diameter	ORFDIA
11	R/W	FLP	4	Orifice Measured (Reference) Temperature	TMEAS
12	R/W	UINT 8	1	Orifice Material	OR_MAT
13	R/W	AC	30	Meter Run (Point) Identification	DESC

14	R/O	BIN	1	Alarm Code:
				  Bit 7 – Manual Mode
				  Bit 6 – No Flow
				  Bit 2 – High Alarm
				  Bit 0 – Low Alarm
				  Bits 5, 4, 3, and 1 – Not Used
					ALARM

15	R/W	FLP	4	Low Alarm EU – Flow	LOAL
16	R/W	FLP	4	High Alarm EU – Flow	HIAL
17	R/W	FLP	4	Viscosity	VISCOS
18	R/W	FLP	4	Specific Heat Ratio	SPHTRA
19	R/W	FLP	4	BBase Pressure	BASEPR
20	R/W	FLP	4	Base Temperature	BASETP
21	R/W	FLP	4	Low Differential Pressure (hw) Cutoff	MINDP
22	R/W	FLP	4	Fpwl – Gravitational User Correction Factor	FPWL
23	R/W	FLP	4	N_2 – Nitrogen	NITROG
24	R/W	FLP	4	CO_2 – Carbon Dioxide	CARBDI
25	R/W	FLP	4	H_2S – Hydrogen Sulfide	HYDSUL
26	R/W	FLP	4	H_2O – Water	WATER
27	R/W	FLP	4	He – Helium	HELIUM
28	R/W	FLP	4	CH_4 – Methane	METHAN
29	R/W	FLP	4	C_2H_6 – Ethane	ETHANE
30	R/W	FLP	4	C_3H_8 – Propane	PROPAN
31	R/W	FLP	4	C_4H_{10} – n-Butane	NBUTAN

Parameter Number	Read-Write	Data Type	Length	Description	Abbr.
32	R/W	FLP	4	C_4H_{10} – i-Butane	IBUTAN
33	R/W	FLP	4	C_5H_{12} – n-Pentane	NPENTA
34	R/W	FLP	4	C_5H_{12} – i-Pentane	IPENTA
35	R/W	FLP	4	C_6H_{14} – n-Hexane	NHEXAN
36	R/W	FLP	4	C_7H_{16} – n-Heptane	NHEPTA
37	R/W	FLP	4	C_8H_{18} – n-Octane	NOCTAN
38	R/W	FLP	4	C_9H_{20} – n-Nonane	NNONAN
39	R/W	FLP	4	$C_{10}H_{22}$ – n-Decane	NDECAN
40	R/W	FLP	4	O_2 – Oxygen	OXYGEN
41	R/W	FLP	4	CO – Carbon Monoxide	CARBMO
42	R/W	FLP	4	H_2 – Hydrogen	HYDROG
43	R/W	UINT 8	1	Calculation Units (0 = MCF (km^3) / MMBTU (GJoules) 1 = CCF (100 m3) / MBTU (MJoules) 2 = 10 MCF (10 km^3) / MMMBTU (TJoules)	FLOUNITS
44	R/W	UINT 8	1	Enable Stacked Differential Pressure (hw)	DPSTEN
45	R/W	TLP	3	Low Differential Pressure (hw) Input	LO_TYP
46	R/W	TLP	3	Differential Pressure (hw) Input	DP_TYP
47	R/W	TLP	3	Static Pressure Input – Pf	FP_TYP
48	R/W	TLP	3	Temperature Input – Tf	TP-TYP
49	R/W	FLP	4	Low Differential Pressure (hw) Setpoint	LODPSP
50	R/W	FLP	4	High Differential Pressure (hw) Setpoint	HIDPSP
51	R/W	FLP	4	Meter Value Differential Pressure (hw)	CURDP
52	R/W	FLP	4	Static Flowing Pressure Value – Pf	CURFP
53	R/W	FLP	4	Flowing Temperature Value – Tf	CURMP

Table C-5. Point Type 8 – History Parameters

Parameter Number	Read-Write	Data Type	Length	Description	Abbr.
0	R/O	TLP	3	Point Tag Identification TLP	TAG
1	R/O	TLP	3	History Log Point Number 1	HST#1
2	R/O	UINT 8	1	Archive Type	ARCH1
3	R/O	UINT 8	1	Averaging or Rate Type	AVG#1
4	R/O	TLP	3	Point Tag Identification TLP	TAG#2
5	R/O	TLP	3	History Log Point Number 2	HIST#2
6	R/O	UINT 8	1	Archive Type	ARCH2
7	R/O	UINT 8	1	Averaging or Rate Type	AVG#2
8	R/O	TLP	3	Point Tag Identification TLP	TAG#3
9	R/O	TLP	3	History Log Point Number 3	HIST#3
10	R/O	UINT 8	1	Archive Type	ARCH3
11	R/O	UINT 8	1	Averaging or Rate Type	AVG#3
12	R/O	TLP	3	Point Tag Identification TLP	TAG#4
13	R/O	TLP	3	History Log Point Number 4	HIST#4
14	R/O	UINT 8	1	Archive Type	ARCH4
15	R/O	UINT 8	1	Averaging or Rate Type	AVG#4
16	R/O	TLP	3	Point Tag Identification TLP	TAG#5
17	R/O	TLP	3	History Log Point Number 5	HIST#5
18	R/O	UINT 8	1	Archive Type	ARCH5
19	R/O	UINT 8	1	Averaging or Rate Type	AVG#5
20	R/O	TLP	3	Point Tag Identification TLP	TAG#6
21	R/O	TLP	3	History Log Point Number 6	HIST#6

Parameter Number	Read-Write	Data Type	Length	Description	Abbr.
22	R/O	UINT 8	1	Archive Type	ARCH6
23	R/O	UINT 8	1	Averaging or Rate Type	AVG#6
24	R/O	TLP	3	Point Tag Identification TLP	TAG#7
25	R/O	TLP	3	History Log Point Number 7	HIST#7
26	R/O	UINT 8	1	Archive Type	ARCH7
27	R/O	UINT 8	1	Averaging or Rate Type	AVG#7
28	R/O	TLP	3	Point Tag Identification TLP	TAG8
29	R/O	TLP	3	History Log Point Number 8	HIST#8
30	R/O	UINT 8	1	Archive Type	ARCH
31	R/O	UINT 8	1	Averaging or Rate Type	AVG#8
32	R/O	TLP	3	Point Tag Identification TLP	TAG#9
33	R/W	TLP	3	History Log Point Number 9	HIST#9
34	R/W	UINT 8	1	Archive Type	ARCH9
35	R/W	UINT 8	1	Averaging or Rate Type	AVG#9
36	R/O	TLP	3	Point Tag Identification TLP	TAG#10
37	R/W	TLP	3	History Log Point Number 10	HIST#10
38	R/W	UINT 8	1	Archive Type	ARCH10
39	R/W	UINT 8	1	Averaging or Rate Type	AVG#10
40	R/O	TLP	3	Point Tag Identification TLP	TAG#11
41	R/W	TLP	3	History Log Point Number 11	HIST#11
42	R/W	UINT 8	1	Archive Type	ARCH11
43	R/W	UINT 8	1	Averaging or Rate Type	AVG#11
44	R/O	TLP	3	Point Tag Identification TLP	TAG#12
45	R/W	TLP	3	History Log Point Number 12	HIST#12
46	R/W	UINT 8	1	Archive Type	ARCH12
47	R/W	UINT 8	1	Averaging or Rate Type	AVG#12
48	R/O	TLP	3	Point Tag Identification TLP	TAG#13
49	R/W	TLP	3	History Log Point Number 13	HIST#13
50	R/W	UINT 8	1	Archive Type	ARCH13
51	R/W	UINT 8	1	Averaging or Rate Type	AVG#13
52	R/O	TLP	3	Point Tag Identification TLP	TAG#14
53	R/W	TLP	3	History Log Point Number 14	HIST#14
54	R/W	UINT 8	1	Archive Type	ARCH14
55	R/W	UINT 8	1	Averaging or Rate Type	AVG#14
56	R/O	TLP	3	Point Tag Identification TLP	TAG#15
57	R/W	TLP	3	History Log Point Number 15	HIST#15
58	R/W	UINT 8	1	Archive Type	ARCH15
59	R/W	UINT 8	1	Averaging or Rate Type	AVG#15

Table C-6. Point Type 10 – AGA Flow Calculation Values

Parameter Number	Read-Write	Data Type	Length	Description	Abbr.
0	R/O	FLP	4	hw – Meter Differential Pressure Value (Inches H_2O or kPa)	CURDP
1	R/O	FLP	4	Pf – Static Flowing Pressure Value (psi or kPa)	CURFP
2	R/O	FLP	4	Tf – Flowing Temperature Value (°F or °C)	CURTMP
3	R/O	FLP	4	Instantaneous Flow (Flow rate per Day) – MCF/Day or km^3/Day	CURFLO
4	R/O	FLP	4	Instantaneous Energy (Energy rate per Day) – MMBTU/Day or GJ/Day	ENERGY
5	R/O	FLP	4	Flow Today – MCF or km^3	TDYFLO
6	R/O	FLP	4	Energy Today – MMBTU or GJ	TDYENG

Parameter Number	Read-Write	Data Type	Length	Description	Abbr.
7	R/O	FLP	4	Flow Yesterday – MCF or km^3	YDYFLO
8	R/O	FLP	4	Energy Yesterday – MMBTU or GJ	YDYENG
9	R/O	FLP	4	Pressure Extension – hwPf	HWPF
10	R/O	FLP	4	IMV (Integral Multiplier Value) – called C prime (C') in AGA3 1985	IMV
11	R/O	FLP	4	Sample Time	SAMPLE
12	R/O	FLP	4	Orifice: Expansion Factor (Y)	EXPFTR
13	R/O	FLP	4	Fr – AGA 1992	FR
14	R/O	FLP	4	Ftf	FTF
15	R/O	FLP	4	Fpv – Compressibility	FPV
16	R/O	FLP	4	Fgr	FGR
17	R/O	FLP	4	Cd – Orifice AGA 1992 (Coefficient of discharge)	FB
18	R/O	FLP	4	Fpb	FPB
19	R/O	FLP	4	Ftb	FTB
20	R/O	FLP	4	Fa – AGA 1985 Ev – AGA 1992	FA

Table C-7. Point Type 12 – Clock

Parameter Number	Read-Write	Data Type	Length	Description	Abbr.
0	R/W	UINT 8	1	Seconds	SECOND
1	R/W	UINT 8	1	Minutes	MINUTE
2	R/W	UINT 8	1	Hours	HOUR
3	R/W	UINT 8	1	Day	DAY
4	R/W	UINT 8	1	Month	MONTH
5	R/W	UINT 8	1	Year	YEAR
6	R/O	UINT 8	1	Leap Year	LEAPYR
7	R/O	UINT 8	1	Day of Week	DAYOWK
8	R/O	UNIT 8	6	Time: Seconds, Minutes, Hour, Day, Month, and Year	TIME
9	R/W	UINT 8	1	Century	CENT
10	R/W	UINT 8	1	Daylight Savings Enable	DLSTEN

Table C-8. Point Type 13 – System Flags

Parameter Number	Read-Write	Data Type	Length	Description	Abbr.
0	R/W	UINT 8	1	CRC Check	CRCCHK

1	R/W	UINT 8	1	System Mode Flag :
				    Bit 0 to 6 = Not Used
				    Bit 7:
				        0 = Lowest Power Mode
				        1 = No sleep – Communications Always On
					FLAG1

2	R/W	UINT 8	1	User Calc Program 1 Enable (FloBoss 100-Series)	FLAG2
3	R/W	UINT 8	1	User Operator Port Enable	FLAG3
4	R/W	UINT 8	1	FST / Display Clear	FLAG4
5	R/W	UINT 8	1	User COM1 Enable Flag 5 (RegFlo)	COM1EN
6	R/W	UINT 8	1	User COM2 Enable	COM2EN
7	R/W	UINT 8	1	User Calc Program 1 Enable	USRCEN
8	R/W	UINT 8	1	RTS Operator Interface (LOI) Port	RTSROI
9	R/W	UINT 8	1	RTS Communications Port 1	RTSCM1

Parameter Number	Read-Write	Data Type	Length	Description	Abbr.
10	R/W	UINT 8	1	RTS Communications Port 2	RTSCM2
11	R/W	UINT 8	1	Clear Config Memory	CLREEP
12	R/W	UINT 8	1	I/O Scan Enable	IOSCAN
13	R/W	UINT 8	1	Auxiliary Output 2 On	AUX2
14	R/W	UINT 8	1	Auxiliary Output 1 On	AUX1
15	R/W	UINT 8	1	Cold (Hard) Start options: 0 = None 1 = Restore config from flash / defaults 2 = Restore config and clear alarm / event logs 3 = Restore config and clear ROC displays 4 = Restore config and clear FSTs 5 = Restore config and clear history 6 = Restore config and clear all of above	COLD
16	R/W	UINT 8	1	Warm Start	WARM
17	R/W	UINT 8	1	Read I/O	IOREAD
18	R/W	UINT 8	1	Write to Config Memory	WRITE
19	R/W	UINT 8	1	Config Memory Write Complete	COMPLT
20	R/W	UINT 8	1	Event Log Flag (FloBoss 100-series and FloBoss 500-series) Init History (FloBoss 407 and ROC300-series with a FlashPAC)	EVTFLAG
21	R/W	UINT 8	1	LOI Security On	LOISEC
22	R/W	UINT 8	1	Comm Port 1 Security On	COM1SEC
23	R/W	UINT 8	1	Comm Port 2 Security On	COM2SEC

24	R/W	UINT 8	1	Termination Type Installed:
				  1 = 4 point I/O – DI, DO, AI, AO Installed
				  2 = 4 point I/O – No I/O Installed
				  3 = 6 point I/O – I/O Installed
				  4 = 6 point I/O – No I/O Installed
					FLAG24

25	R/W	UINT 8	1	Comm Port Pass Through Mode:
				  0 = No Pass Through.
				  1 = LOI to COM1
				  2 = COM1 to LOI
				  3 = LOI to COM2
				  4 = COM2 to LOI
				  5 = COM1 to COM2
				  6 = COM2 to COM1
					FLAG25

26	R/W	UINT 8	1	6 Point I/O Setup Flag:
				  Bit 0:
				    0 = AI1
				    1 = DI1
				  Bit 1:
				    0 = AI2
				    1 = DI2
				  Bit 2:
				    0 = AO
				    1 = DO1
				  Bit 4:
				    0 = PI1
				    1 = DI3
				  Bit 5:
				    0 = PI2
				    1 = DI4
				  Bits 3, 6 and 7 – Not Used
					FLAGE26

27	R/W	UINT 8	1	Flag 27	FLAG27
28	R/W	UINT 8	1	Flag 28	FLAGE28
29	R/W	UINT 8	1	Flag 29	FLAG29

Table C-9. Point Type 14 – Communication Ports

Parameter Number	Read-Write	Data Type	Length	Description	Abbr.
0	R/W	AC	10	Tag Identification	TAG
1	R/W	UINT 16	2	Baud Rate	BAUD
2	R/W	UINT 8	1	Stop Bits	SBITS
3	R/W	UINT 8	1	Data Bits	DBITS

4	R/W	UINT 8	1	Parity:
				  0 = None
				  1 = Odd
				  2 = Even
					PARITY

5	R/O	BIN	1	Status:
				  Bit 7 – User Status Bits 6 through 2 – Not Used
				  Bit 1 – RBX Status
				    0 = RBX Inactive
				    1 = RBX Active for this port
				  Bit 0 – No Port Installed
				    0 = Comm Board Present
				    1 = No Comm Cards Installed
					STATUS

6	R/W	BIN	1	Mode:
				  Bit 7 – User Flag
				    0 = Reset
				    1 = Set
				  Bit 6 – User Flag
				    0 = Reset
				    1 = Set
				  Bit 5 – Store and Forward Port
				    0 = Same
				    1 = Opposite
				  Bit 4 – Not Used
				  Bit 3 – Enable RTS / CTS
				    0 = Disabled
				    1 = Enabled
				  Bit 2 – Enable Extra Key-On
				    0 = Disabled
				    1 = Enabled
				  Bit 1 = Enable RBX
				    0 = RBX Disabled
				    1 = RBX Enabled
				  Bit 0 – Not Used
					MODE

7	R/W	UINT 8	1	Key On Delay	KEY
8	R/W	UINT 8	1	Key Off Delay – Turnaround	TURN

9	R/W	UINT 8	1	Optional Interface Board Type:
				  Bit 5 through 7 – Not Used
				  Bit 4 – Radio Logic
				  Bit 3 – Reserved
				  Bit 2 – Dial-up Modem
				  Bit 1 – EIA-232 (RS-232)
				  Bit 0 – None
					RCOUNT

10	R/W	UINT 16	2	Host Retry Time	XKEYON
11	R/O	UINT 16	2	Alarm Pointer	ALMPTR
12	R/O	UINT 16	2	Receive Counter Copy	COPY
13	R/O	UINT 16	2	Retry Counter	RCNTR
14	R/W	UINT 16	2	Valid Receive Counter	VALRCV
15	R/O	UINT 8	1	Modem Status	MDMSTS
16	R/W	UINT 8	1	Modem Type	MDMTYP
17	R/W	FLP	4	Connect Time	CONNTM
18	R/W	AC	40	Configuration Command	CFGCMD
19	R/W	AC	40	Connect Command	CONNCMD

Parameter Number	Read-Write	Data Type	Length	Description	Abbr.
20	R/W	FLP	4	Disconnect Time	DISCTM
21	R/W	FLP	4	Inactivity Time	INACTM
22	R/W	FLP	4	RBX Time Base #1	RBXTB#1
23	R/W	UINT 8	1	RBX Retry Count #1	RBXRC#1
24	R/W	FLP	4	RBX Time Base #2	RBXTB#2
25	R/W	UINT 8	1	RBX Retry Count #2	RBXRC#2
26	R/W	FLP	4	RBX Time Base #3	RBXTB#3
27	R/W	UINT 8	1	RBX Retry Count #3	RBXRC#4
28	R/W	UINT 8	1	RBX Address	RBXADR
29	R/W	UINT 8	1	RBX Group	RBXGRP
30	R/W	UINT 8	1	Store and Forward Address #1 (Not Used for RegFlo)	SFADR#1
31	R/W	UINT 8	1	Store and Forward Group #1 (Not Used for RegFlo)	SFG#1
32	R/W	UINT 8	1	Store and Forward Address #2 (Not Used for RegFlo)	SFADR#2
33	R/W	UINT 8	1	Store and Forward Group #2 (Not Used for RegFlo)	SFG#2
34	R/W	UINT 8	1	Store and Forward Address #3 (Not Used for RegFlo)	SFADR#3
35	R/W	UINT 8	1	Store and Forward Group #3 (Not Used for RegFlo)	SFG#4

Table C-10. Point Type 15 – System Variables (Device Information)

Parameter Number	Read-Write	Data Type	Length	Description	Abbr.
0	R/W	UINT 8	1	Device Address	ROCADR
1	R/W	UINT 8	1	Device Group	ROCGRP
2	R/W	AC	20	Station Name	STNNAME
3	R/W	UINT 8	1	Active PIDs	#PIDS
4	R/W	UINT 8	1	Active AGA Meter Runs	#AGAS
5	R/W	UINT 8	1	Not used	FSTINST
6	R/W	UINT 8	1	Number of Standard History Points	#RAM0
7	R/W	UINT 8	1	Number of Extended History Points	#RAM1
8	R/W	UINT 8	1	Number of RAM2 Database Points	#RAM2
9	R/W	UINT 8	1	Force End of Day	FORCE
10	R/W	UINT 8	1	Contract Hour	CONTRC
11	R/O	AC	20	Version Name – Part Number	VERSION
12	R/O	AC	20	Hardware Identification Number	VENDORID
13	R/O	AC	20	Time Created	CREATETM
14	R/O	AC	12	ROM Serial Number	ROMSN
15	R/O	AC	20	Customer Name	CUSTNAME
16	R/O	UINT 8	1	Maximum PIDs	MAXPIDS
17	R/O	UINT 8	1	Maximum AGA Meter Runs	MAXAGAS
18	R/O	UINT 8	1	Maximum Tanks	MAXTANKS
19	R/O	UINT 8	1	FSTs Possible	MAXFSTS
20	R/O	BIN	1	RAM Installed – Memory Assignments: Bit 7 – E0000-FFFFF Bit 6 – C0000-DFFFF Bit 5 – A0000-BFFFF Bit 4 – 80000-9FFFF Bit 3 – 60000-7FFFF Bit 2 – 40000-5FFFF Bit 1 – 20000-3FFFF Bit 0 – 00000-1FFFF	RAM

Parameter Number	Read-Write	Data Type	Length	Description	Abbr.

21	R/O	BIN	1	ROM Installed – Memory Assignments:
				  Bit 7 – E0000-FFFFF
				  Bit 6 – C0000-DFFFF
				  Bit 5 – A0000-BFFFF
				  Bit 4 – 80000-9FFFF
				  Bit 3 – 60000-7FFFF
				  Bit 2 – 40000-5FFFF
				  Bit 1 – 20000-3FFFF
				  Bit 0 – 00000-1FFFF
					ROM

22	R/O	FLP	4	MPU Loading	MPU

23	R/O	BIN	1	Utilities:
				  Bit 7 – Industry Canada Unit
				  Bit 6 – Not Used
				  Bit 5 – Not Used
				  Bit 4 – User Calculation Program Allowed
				  Bit 3 – COM2 User Program Allowed
				  Bit 2 – COM1 User Program Allowed
				  Bit 1 – LCD Installed
				  Bit 0 – AGA Data archived
					UTIL

24	R/O	UINT 16	2	Type of device: 3095 = Rosemount 3095	ROCTYPE

25	R/W	UINT 8	1	Units Flag
				  0 = English
				  1 = Metric (kPa)
				  2 = Metric (bar)
					UNITS

Table C-11. Point Type 17 – Soft Point Parameters

Parameter Number	Read-Write	Data Type	Length	Description	Abbr.
0	R/W	AC	10	Point Tag Identification	TAG
1	R/W	UINT 16	2	Integer Flag	INT1
2	R/W	FLP	4	Data #1	DATA1
3	R/W	FLP	4	Data #2	DATA2
4	R/W	FLP	4	Data #3	DATA3
5	R/W	FLP	4	Data #4	DATA4
6	R/W	FLP	4	Data #5	DATA5
7	R/W	FLP	4	Data #6	DATA6
8	R/W	FLP	4	Data #7	DATA7
9	R/W	FLP	4	Data #8	DATA8
10	R/W	FLP	4	Data #9	DATA9
11	R/W	FLP	4	Data #10	DATA10
12	R/W	FLP	4	Data #11	DATA11
13	R/W	FLP	4	Data #12	DATA12
14	R/W	FLP	4	Data #13	DATA13
15	R/W	FLP	4	Data #14	DATA14
16	R/W	FLP	4	Data #15	DATA15
17	R/W	FLP	4	Data #16	DATA16
18	R/W	FLP	4	Data #17	DATA17
19	R/W	FLP	4	Data #18	DATA18
20	R/W	FLP	4	Data #19	DATA19
21	R/W	FLP	4	Data #20	DATA20

Table C-12. Point Type 19 – Database Parameters

NOTE
Point Type 19 is used by Opcode 165 to configure history points and create events.

Parameter Number	Read-Write	Data Type	Length	Description	Abbr.
0	R/O	FLP	4	Pointer to Tag	TAGPNTR
1	R/O	UINT 8	1	Archive Type	ARCHTYPE
2	R/O	UINT 8	1	Point Type	TYPE
3	R/O	UINT 8	1	Point / Logical Number	LOGICAL
4	R/O	UINT 8	1	Parameter Number	PARAM
5	R/O	FLP	4	Yesterday's Total	YDYTOTAL

Table C-13. Point Type 41 – Run Parameters

Parameter Number	Read-Write	Data Type	Length	Description	Abbr.
0	R/W	AC	10	Point Tag Identification	TAG
1	R/W	FLP	4	Atmospheric Pressure	ATMPRS

2	R/W	BIN	1	Calculation Method II:
				    Bits 7 through 5 – Not Used
				    Bit 4 – BTU Dry or Wet Override
				      0 = See Bit 3
				      1 = BTU as Delivered
				    Bit 3 – BTU Dry or Wet
				      0 = BTU Dry
				      1 = BTU Wet
				    Bit 2 – Calculated or Manual Value
				      0 = Calculated
				      1 = Enter Atmospheric Pressure – AGA 1992
				    Bit 1 – Gross Method
				      0 = Gross Method II
				      1 = Gross Method I
				    Bit 0 – Detail Level
				      0 = Detailed Method
				      1 = Gross Method
					METHOD

3	R/O	TLP	3	Not Used	PIPEREFT
4	R/W	FLP	4	Pipe Reference Temperature – AGA1992	PIPEMAT

5	R/W	UINT 8	1	Pipe Material – AGA1992:
				    0 = SS (Stainless Steal)
				    1 = Monel
				    2 = Carbon steel
					FB

6	R/O	UINT 8	1	Not Used	FR
7	R/O	FLP	4	Cd – AGA 1992	FY
8	R/O	FLP	4	Fr – AGA 1985 Reynolds Number – AGA 1992	FPB
9	R/O	FLP	4	Y – Expansion Factor – Orifice Fpm – Turbine	FTB
10	R/O	FLP	4	Fpb Factor	FPB
11	R/O	FLP	4	Ftb Factor	FTB
12	R/O	FLP	4	Ftf Factor	FTF
13	R/O	FLP	4	Fgr Factor	FGR
14	R/O	FLP	4	Fpv – Super-compressibility Factor	FPV

Parameter Number	Read-Write	Data Type	Length	Description	Abbr.
15	R/W	UINT 8	1	History Point 1	HISTPT1
16	R/W	UINT 8	1	RollUp	ROLLUP1
17	R/W	TLP	3	TLP	TLP1
18	R/W	FLP	4	Conversion	CONV1
19	R/W	UINT 8	1	History Point 2	HISTPT2
20	R/W	UINT 8	1	RollUp	ROLLUP2
21	R/W	TLP	3	TLP	TLP2
22	R/W	FLP	4	Conversion	CONV2
23	R/W	UINT 8	1	History Point 3	HISTPT3
24	R/W	UINT 8	1	RollUp	ROLLUP3
25	R/W	TLP	3	TLP	TLP3
26	R/W	FLP	4	Conversion	CONV3
27	R/W	UINT 8	1	History Point 4	HISTPT4
28	R/W	UINT 8	1	RollUp	ROLLUP4
29	R/W	TLP	3	TLP	TLP4
30	R/W	FLP	4	Conversion	CONV4
31	R/W	UINT 8	1	History Point 5	HISTPT5
32	R/W	UINT 8	1	RollUp	ROLLUP5
33	R/W	TLP	3	TLP	TLP5
34	R/W	FLP	4	Conversion	CONV5
35	R/W	UINT 8	1	History Point 6	HISTPT6
36	R/W	UINT 8	1	RollUp	ROLLUP6
37	R/W	TLP	3	TLP	TLP6
38	R/W	FLP	4	Conversion	CONV6
39	R/W	UINT 8	1	History Point 7	HISTPT7
40	R/W	UINT 8	1	RollUp	ROLLUP7
41	R/W	TLP	3	TLP	TLP7
42	R/W	FLP	4	Conversion	CONV7
43	R/W	UINT 8	1	History Point 8	HISTPT8
44	R/W	UINT 8	1	RollUp	ROLLUP8
45	R/W	TLP	3	TLP	TLP8
46	R/W	FLP	4	Conversion	CONV8
47	R/W	UINT 8	1	History Point 9	HISTPT9
48	R/W	UINT 8	1	RollUp	ROLLUP9
49	R/W	TLP	3	TLP	TLP9
50	R/W	FLP	4	Conversion	CONV9
51	R/W	UINT 8	1	History Point 10	HISTPT10
52	R/W	UINT 8	1	RollUp	ROLLUP10
53	R/W	TLP	3	TLP	TLP10
54	R/W	FLP	4	Conversion	CONV10

Table C-14. Point Type 42 – Extra Run Parameters

Parameter Number	Read-Write	Data Type	Length	Description	Abbr.
0	R/W	AC	10	Point Tag Identification	TAG
1	R/W	FLP	4	Flow Today – MCF (km^3)	FLOTDY
2	R/W	FLP	4	Flow Yesterday – MCF (km^3)	FLODY
3	R/W	FLP	4	Flow Month – MCF (km^3)	FLOMTH
4	R/W	FLP	4	Flow Previous Month – MCF (km^3)	FLOPRV
5	R/W	FLP	4	Flow Accumulated – MCF (km^3)	FLOACC
6	R/W	FLP	4	Minutes Today	MINTDY
7	R/W	FLP	4	Minutes Yesterday	MINYDY
8	R/W	FLP	4	Minutes Month	MINMTH
9	R/W	FLP	4	Minutes Previous Month	MINPRV
10	R/W	FLP	4	Minutes Accumulated	MINACC
11	R/W	FLP	4	Energy Today – MMBTU (GJ)	ENGTDY
12	R/W	FLP	4	Energy Yesterday – MMBTU (GJ)	ENGYDY
13	R/W	FLP	4	Energy Month – MMBTU (GJ)	ENGMTH
14	R/W	FLP	4	Energy Previous Month – MMBTU (GJ)	ENGPRV
15	R/W	FLP	4	Energy Accumulated – MMBTU (GJ)	ENGACC
16	R/W	FLP	4	Uncorrected Today – MCF (km^3)	UCCTDY
17	R/W	FLP	4	Uncorrected Yesterday – MCF (km^3)	UCCYDY
18	R/W	FLP	4	Uncorrected Month – MCF (km^3)	UCCMTH
19	R/W	FLP	4	Uncorrected Previous Month – MCF (km^3)	UCCPRV
20	R/W	FLP	4	Uncorrected Accumulated – MCF (km^3)	UCCACC
21	R/O	FLP	4	Orifice Plate Bore Diameter – d	ORIF_D
22	R/O	FLP	4	Meter Tube (Pipe) Internal Diameter – D	PIPE_D
23	R/O	FLP	4	Beta – Diameter Ratio	BETA
24	R/O	FLP	4	Ev (Velocity of approach) – AGA 1992	EV
25	R/O	FLP	4	Cd (Coefficient of discharge) – AGA 1992	CDISCH
26	R/O	FLP	4	Reynolds Number	REYNLD
27	R/O	FLP	4	Upstream Static Pressure	U_PRSR
28	R/O	FLP	4	Molecular Weight	MLWGHT

Table C-15. Point Type 43 – User List Parameters

Parameter Number	Read-Write	Data Type	Length	Description
0	R/W	AC	10	Text 1
1	R/W	AC	10	Text 2
2	R/W	AC	10	Text 3
3	R/W	AC	10	Text 4
4	R/W	AC	10	Text 5
5	R/W	AC	10	Text 6
6	R/W	AC	10	Text 7
7	R/W	AC	10	Text 8
8	R/W	AC	10	Text 9
9	R/W	AC	10	Text 10
10	R/W	AC	10	Text 11
11	R/W	AC	10	Text 12
12	R/W	AC	10	Text 13
13	R/W	AC	10	Text 14
14	R/W	AC	10	Text 15
15	R/W	AC	10	Text 16

Parameter Number	Read-Write	Data Type	Length	Description
16	R/W	TLP	3	Data 1
17	R/W	TLP	3	Data 2
18	R/W	TLP	3	Data 3
19	R/W	TLP	3	Data 4
20	R/W	TLP	3	Data 5
21	R/W	TLP	3	Data 6
22	R/W	TLP	3	Data 7
23	R/W	TLP	3	Data 8
24	R/W	TLP	3	Data 9
25	R/W	TLP	3	Data 10
26	R/W	TLP	3	Data 11
27	R/W	TLP	3	Data 12
28	R/W	TLP	3	Data 13
29	R/W	TLP	3	Data 14
30	R/W	TLP	3	Data 15
31	R/W	TLP	3	Data 16

Table C-16. Point Type 44 – Power Control Parameters

Parameter Number	Read-Write	Data Type	Length	Description	Abbr.
0	R/W	AC	10	Point Tag Identification	TAG

1	R/O	INT 16	2	Status:
				  0 = Power off
				  1 = Power on
					STATUS

2	R/W	INT 16	2	Enable:
				  0 = Disabled
				  1 = Second mode
				  2 = Minute mode
					ENABLE

3	R/W	INT 16	2	Valid RX (Receive)	VALRX
4	R/W	INT 16	2	Start Time #1	STTM1
5	R/W	INT 16	2	Start Time #2	STTM2
6	R/W	INT 16	2	Start Time #3	STTM3
7	R/W	INT 16	2	On Time #1	ONTM1
8	R/W	INT 16	2	On Time #2	ONTM2
9	R/W	INT 16	2	On Time #3	ONTM3
10	R/W	INT 16	2	Off Time #1	OFFTM1
11	R/W	INT 16	2	Off Time #2	OFFTM2
12	R/W	INT 16	2	Off Time #3	OFFTM3
13	R/W	INT 16	2	Active Time Zone	AZONE
14	R/W	INT 16	2	Hold Time (100 millisecond intervals)	HLDTM
15	R/O	INT 16	2	Power Timer (100 millisecond intervals)	PWRTMR
16	R/W	INT 16	2	Discrete Output Number	LOGDO
17	R/W	FLP	4	Low Battery	LOBAT
18	R/W	UINT 32	4	On Counter	ONCNT
19	R/W	UINT 32	4	Off Counter	OFFCNT

Table C-17. Point Type 45 – Meter Calibration and Sampler

Parameter Number	Read-Write	Data Type	Length	Description	Abbr.

0	R/W	BIN	1	Calibration Options:
				  Bit 5 through 7 – Not Used
				  Bit 4 – Orifice Thermal Expansion Factor – 1985
				    Requires Parameters 11 and 12 of Point Type 46 be set.
				  Bit 3 – Differential Pressure Water Manometer Calibrator, Requires Parameters 4 and 5 of Point Type 45 and Parameters 20, 21, and 22 of Point Type 46 be set.
				  Bit 2 – Differential Pressure Deadweight Calibrator Requires Parameter 3 of Point Type 45 and Parameters 20, 21, and 22 of Point Type 46 be set.
				  Bit 1 – Static Pressure Deadweight Calibrator Requires Parameter 3 of Point Type 45 and Parameters 20, 21, and 22 of Point Type 46 be set.
				  Bit 0 – Mercury Manometer Requires Parameters 1 and 2 of Point Type 45 be set.
				
				Note: Either Bit 2 or Bit 3 can be set, but not both. If both bits are set, Bit 3 is cleared and Bit 2 is used.
					OPTION

1	R/W	FLP	4	Ambient Temperature of Mercury	AMBTMP
2	R/W	FLP	4	Temperature of Mercury when Calibrated	MTPCAL
3	R/W	FLP	4	Calculated Weights Gravitational Acceleration	CALWGT
4	R/W	FLP	4	Water Temperature when Calibrated	WTPCAL
5	R/W	FLP	4	Air Temperature when Calibrating	ATPCAL
6	R/W	FLP	4	User Correction Factor	CORFAC
7	R/W	UINT 8	1	Sampler Enable	SPLENA
8	R/W	FLP	4	Sampler Volume Accumulation	VOLACC
9	R/W	FLP	4	Sampler Duration	SPLDUR

Table C-18. Point Type 46 – Meter Configuration Parameters

Parameter Number	Read-Write	Data Type	Length	Description	Abbr.
0	R/W	AC	10	Point Tag Identification	TAG
1	R/W	AC	30	Point Description	DESC
2	R/W	BIN	1	Calculation Method: 　Bit 7 – Manual Mode 　　0 = Normal 　　1 = Manual Calculation Standard 　　0 = AGA 　　1 = ISO 　Bit 6 – RBX on Set 　　0 = Disable RBX on Set 　　　1 = Enable RBX on Set 　Bit 5 – RBX on Clear 　　0 = Disable RBX on Clear 　　1 = Enable RBX on Clear 　Bit 4 – Alarming 　　0 = Disabled 　　1 = Enabled 　Bit 3 – Units of Measurement 　　0 = English Units 　　1 = Metric Units 　Bit 2 – Calculation Version 　　0 = 1985 　　1 = 1992 　Bit 2 – AGA Limits Events 　　0 = Disable 　　1 = Enable 　Bit 1 – Calculation Type 　　0 = Orifice 　Bit 0 – Fpv Method 　　1 = AGA8	CMTHI
3	R/W	BIN	1	Calculation Method II: 　Bit 7 – Not Used 　Bit 6 – Reserved 　Bit 5 – Gas Quality 　　0 = Constant 　　1 = Live Data (Not Logged) 　Bit 4 – Heating Value Basis 　　0 = Ignore 　　1 = Heating Value as Delivered 　Bit 3 – Heating Value Basis 　　0 = Heating Value Dry 　　1 = Heating Value Wet 　Bit 2 – Atmospheric Press 　　0 = Calculate Atmospheric Pressure 　　1 = Enter Atmospheric Pressure 　Bit 1 – Fpv Method 　　0 = AGA8 Gross Method II 　　1 = AGA Gross Method I 　Bit 0 – Fpv Method 　　0 = AGA8 Detail / ISO 12213-2 　　1 = AGA8 Gross (1992)	CMTHII

Parameter Number	Read-Write	Data Type	Length	Description	Abbr.

4	R/W	BIN	1	Options:
				  Bit 7 – Log Methane Adjust
				    0 = Log Normalization
				    1 = Do Not Log Normalization
				  Bit 6 – Heating Value Basis
				    0 = Mass Basis Heating Value
				    1 = Volume Basis Heating Value
				  Bit 5 – Gravitational Acceleration
				    0 = Calculate Gravity
				    1 = Enter Gravity
				  Bit 4 – Heating Value
				    0 = Calculate Heating Value
				    1 = Enter Heating Value
				  Bit 3 – Press Tap
				    0 = Gauge Static Pressure
				    1 = Absolute Static Pressure
				  Bit 2 – Press Tap
				    0 = Downstream Static Pressure
				    1 = Upstream Static Pressure
				  Bit 1 – Gravitational Acceleration
				    0 = Calculate Specific Gravity
				    1 = Enter Specific Gravity
				  Bit 0 – Press Tap
				    0 = Flange Tap
					AGACFG

5	R/W	UINT 8	1	Contract Hour	CTHOUR
6	R/W	FLP	4	Integral Multiplier Period	IMP
7	R/W	FLP	4	Pipe Diameter (In. or mm)	PIPDIA
8	R/W	FLP	4	Pipe Reference Temperature – AGA 1992	PIPERT

9	R/W	UINT 8	1	Pipe Material – AGA 1992:
				  0 = SS (Stainless Steel)
				  1 = Monel
				  2 = Carbon steel
					ALPH

10	R/W	FLP	4	Orifice Diameter (inches or millimeters)	ORFDIA
11	R/W	FLP	4	Orifice Reference Temperature	TMEAS

12	R/W	UINT 8	1	Orifice Material:
				  0 = SS (Stainless Steel)
				  1 = Monel
				  2 = Carbon steel
					ORMAT

13	R/W	FLP	4	Base or Contract Pressure (psia or kPa)	PBASE
14	R/W	FLP	4	Base or Contract Temperature (degrees F or C)	TBASE
15	R/W	FLP	4	Atmospheric Pressure (psia or kPa)	ATMPRS
16	R/W	FLP	4	Specific Gravity	SPGR
17	R/W	FLP	4	Heating Value	GASHV
18	R/W	FLP	4	Viscosity (lbm/ft-sec or cP)	VISCOS
19	R/W	FLP	4	Specific Heat Ratio	SPHTRA
20	R/W	FLP	4	Elevation (ft or m)	ELEVAT
21	R/W	FLP	4	Latitude	LATUDE
22	R/W	FLP	4	Local Gravitational Acceleration (ft/sec^2 or M/sec^2)	GRAVIT
23	R/W	FLP	4	N_2 Nitrogen	NITROG
24	R/W	FLP	4	CO_2 Carbon Dioxide	CARBDI
25	R/W	FLP	4	H_2S Hydrogen Sulfide	HYDSUL
26	R/W	FLP	4	H_2O Water	WATER
27	R/W	FLP	4	He Helium	HELIUM
28	R/W	FLP	4	CH_4 Methane	METHAN
29	R/W	FLP	4	C_2H_6 Ethane	ETHANE
30	R/W	FLP	4	C_3H_8 Propane	PROPAN
31	R/W	FLP	4	C_4H_{10} n-Butane	NBUTAN

Parameter Number	Read-Write	Data Type	Length	Description	Abbr.
32	R/W	FLP	4	C_4H_{10} i-Butane	IBUTAN
33	R/W	FLP	4	C_5H_{12} n-Pentane	NPENTA
34	R/W	FLP	4	C_5H_{12} i-Pentane	IPENTA
35	R/W	FLP	4	C_6H_{14} n-Hexane	NHEXAN
36	R/W	FLP	4	C_7H_{16} n-Heptane	NHEPTA
37	R/W	FLP	4	C_8H_{18} n-Octane	NOCTAN
38	R/W	FLP	4	C_9H_{20} n-Nonane	NNONAN
39	R/W	FLP	4	$C_{10}H_{22}$ n-Decane	NDECAN
40	R/W	FLP	4	O_2 Oxygen	OXYGEN
41	R/W	FLP	4	CO Carbon Monoxide	CARBMO
42	R/W	FLP	4	H_2 Hydrogen	HYDROG
43	R/W	FLP	4	Low hw Cutoff	LOFLOW
44	R/W	FLP	4	High hw Setpoint – Differential Pressure	LODPSP
45	R/W	FLP	4	Low hw Setpoint – Differential Pressure	HIDPSP
46	R/W	UINT 8	1	Enable Stacked hw – Differential Pressure	STDPEN
47	R/W	TLP	3	Low hw TLP – Differential Pressure	LO_TYP
48	R/W	TLP	3	hw TLP	DP_TYP
49	R/W	TLP	3	Pf TLP	FP_TYP
50	R/W	TLP	3	Tf TLP	TP_TYP
51	R/W	FLP	4	hw – Orifice Differential Pressure	CURDP
52	R/W	FLP	4	Pf – Flowing Pressure	CURSP
53	R/W	FLP	4	Tf – Flowing Temperature (degrees F or C)	CURTP
54	R/O	BIN	1	Alarm Code: Bit 7 – Manual Mode 0 = No Alarm Present 1 = Alarm Present Bit 6 – No Flow 0 = No Alarm Present 1 = Alarm Present Bit 5 – Flow Rate Register Discrepancy 0 = No Alarm Present 1 = Alarm Present Bit 4 – Total Counts Register Discrepancy 0 = No Alarm Present 1 = Alarm Present Bit 3 – Not Used Bit 2 – High Alarm 0 = No Alarm Present 1 = Alarm Present Bit 1 – Not Used Bit 0 – Low Alarm 0 = No Alarm Present 1 = Alarm Present	ALARM
55	R/W	FLP	4	Low Alarm Flow (1000 ft^3/day or m^3/day)	LOALM
56	R/W	FLP	4	High Alarm Flow (1000 ft^3/day or m^3/day)	HIALM
57	R/W	UINT 8	1	Averaging Technique	AVGTYP
58	R/W	UINT 8	1	Full Recalculation Flag	FUCALL

Table C-19. Point Type 47 – Meter Flow Values

Parameter Number	Read-Write	Data Type	Length	Description	Abbr.
0	R/O	FLP	4	Flow rate per day (MCF or km^3)	FLOWDY
1	R/O	FLP	4	Energy rate per day (MMBTU or GJoules)	ENGDAY
2	R/O	FLP	4	Flow rate per hour (CF or M3)	FLOWHR
3	R/O	FLP	4	Energy rate per hour (BTU or MJoules)	ENGHR
4	R/O	FLP	4	Pressure Extension (hwPf)	HWPF
5	R/O	FLP	4	Expansion Factor – Orifice	EXPFTR
6	R/O	FLP	4	CdFT – AGA 1992	FR
7	R/O	FLP	4	Fn – Orifice AGA 1992 (FloBoss 100-series and FloBoss 500-series Backward Compatibility)	FB
8	R/O	FLP	4	Fpb	FPB
9	R/O	FLP	4	Ftb	FTB
10	R/O	FLP	4	Ftf	FTF
11	R/O	FLP	4	Fgr	FGR
12	R/O	FLP	4	Fpv	FPV
13	R/O	FLP	4	Zs – AGA 1992	FA
14	R/O	FLP	4	Zb	ZB
15	R/O	FLP	4	Zf1 – AGA 1992	ZF
16	R/O	FLP	4	IMV – AGA 1992	IMV
17	R/O	FLP	4	Orifice Plate Bore Diameter (d) (inches or millimeter)	BORIDA
18	R/O	FLP	4	Meter Tube Internal Diameter (D) (inches or millimeter)	TUBDIA
19	R/O	FLP	4	Diameter Ratio (Beta)	BETA
20	R/O	FLP	4	Velocity of Approach (Ev) – AGA 1992	VELAPP
21	R/O	FLP	4	Average hw\	AVGDP
22	R/O	FLP	4	Average Pf – used during IMV calculation in psia	AVGAP
23	R/O	FLP	4	Average Tf – used during IMV calculation in Rankin	AVGTP
24	R/O	FLP	4	Density	DENS
25	R/O	FLP	4	Base Density	BASDEN
26	R/O	FLP	4	Reynolds Number	REYNLD
27	R/O	FLP	4	Upstream Static Pressure (PSIG, psia or kPa)	UPSPR
28	R/O	FLP	4	Molecular Weight	MOLWGT
29	R/O	FLP	4	Fam	FAM
30	R/O	FLP	4	Fwt	FWT
31	R/O	FLP	4	Fwl	FWL
32	R/O	FLP	4	Fpwl (Static)	FPWLSP
33	R/O	FLP	4	Fpwl (Differential)	FPWLDP
34	R/O	FLP	4	Fhgm	FHGM
35	R/O	FLP	4	Fhgt	FHGT
36	R/O	FLP	4	Flow Today (MCF or km^3)	FLOTDY
37	R/O	FLP	4	Flow Yesterday (MCF or km^3)	FLOOYDY
38	R/O	FLP	4	Flow Month (MCF or km^3)	FLOMTH
39	R/O	FLP	4	Flow Previous Month (MCF or km^3)	FLOPRV
40	R/O	FLP	4	Flow Accumulated (MCF or km^3)	FLOACC
41	R/O	FLP	4	Minutes Today	MINTDY
42	R/O	FLP	4	Minutes Yesterday	MINYDY
43	R/O	FLP	4	Minutes Month	MINMTH
44	R/O	FLP	4	Minutes Previous Month	MINPRV
45	R/O	FLP	4	Minutes Accumulated	MINACC
46	R/O	FLP	4	Energy Today (MMBTU or GJoules)	ENGTDY
47	R/O	FLP	4	Energy Yesterday (MMBTU or GJoules)	ENGYDY
48	R/O	FLP	4	Energy Month (MMBTU or GJoules)	ENGMTH
49	R/O	FLP	4	Energy Previous Month (MMBTU or GJoules)	ENGPRV

Parameter Number	Read-Write	Data Type	Length	Description	Abbr.
50	R/O	FLP	4	Energy Accumulated (MMBTU or GJoules)	ENGACC
51	R/O	FLP	4	Uncorrected Today (MCF or km^3)	UCCTDY
52	R/O	FLP	4	Uncorrected Yesterday (MCF or km^3)	UCCYDY
53	R/O	FLP	4	Uncorrected Month (MCF or km^3)	UCCMTH
54	R/O	FLP	4	Uncorrected Previous Month (MCF or km^3)	UCCPRV
55	R/O	FLP	4	Uncorrected Accumulated (MCF or km^3)	UCCACC
56	R/O	UINT 8	1	Partial Recalculation Flag	PACALC

Table C-20. Point Type 53 – Modbus Configuration Parameters

Parameter Number	Read-Write	Data Type	Length	Description	Abbr.

0	R/W	BIN	1	Options:
				    Bits 4 through 7 – Not Used
				    Bit 3 – Modbus Type
				        0 = Standard
				        1 = Modbus with EFM Extensions
				    Bit 2 – Byte Order
				        0 = Least Significant Byte (LSB)
				        1 = Most Significant Byte (MSB)
				    Bit 1 – Log Modbus Events
				        0 = Log to Event Log
				        1 = No Logging
				    Bit 0 – Modbus Type
				        0 = RTU
				        1 = ASCII
					OPTIONS

1	R/O	UINT 8	1	Status	STATUS
2	R/W	INT 16	2	High Integer Scale	HIGHINT
3	R/W	INT 16	2	Low Integer Scale	LOINT
4	R/W	FLP	4	High Float Scale #1	HFLT1
5	R/W	FLP	4	Low Float Scale #1	LFLT1
6	R/W	FLP	4	High Float Scale #2	HFLT2
7	R/W	FLP	4	Low Float Scale #2	LFLT2
8	R/W	FLP	4	High Float Scale #3	HFLT3
9	R/W	FLP	4	Low Float Scale #3	LFLT3
10	R/W	FLP	4	High Float Scale #4	HFLT4
11	R/W	FLP	4	Low Float Scale #4	LFLT4
12	R/W	FLP	4	High Float Scale #5	HFLT5
13	R/W	FLP	4	Low Float Scale #5	LFLT5
14	R/W	FLP	4	High Float Scale #6	HFLT6
15	R/W	FLP	4	Low Float Scale #6	LFLT6
16	R/W	FLP	4	High Float Scale #7	HFLT7
17	R/W	FLP	4	Low Float Scale #7	LFLT7
18	R/W	FLP	4	High Float Scale #8	HFLT8
19	R/W	FLP	4	Low Float Scale #8	LFLT8

Table C-21. Point Type 54 – Modbus Function Table

Parameter Number	Read-Write	Data Type	Length	Description	Abbr.
0	R/W	AC	20	Point Tag Identification	TAG
1	R/W	UINT 16	2	Start Register #1	START1
2	R/W	UINT 16	2	End Register #1	END1
3	R/W	TLP	3	Parameter(s)	PARA1
4	R/W	UINT 8	1	Conversion Code	CONV1
5	R/W	UINT 16	2	Start Register #2	START2
6	R/W	UINT 16	2	End Register #2	END2
7	R/W	TLP	3	Parameter(s)	PARA2
8	R/W	UINT 8	1	Conversion Code	CONV2
9	R/W	UINT 16	2	Start Register #3	START3
10	R/W	UINT 16	2	End Register #3	END3
11	R/W	TLP	3	Parameter(s)	PARA3
12	R/W	UINT 8	1	Conversion Code	CONV3
13	R/W	UINT 16	2	Start Register #4	START4
14	R/W	UINT 16	2	End Register #4	END4
15	R/W	TLP	3	Parameter(s)	PARA4
16	R/W	UINT 8	1	Conversion Code	CONV4
17	R/W	UINT 16	2	Start Register #5	START5
18	R/W	UINT 16	2	End Register #5	END5
19	R/W	TLP	3	Parameter(s)	PARA5
20	R/W	UINT 8	1	Conversion Code	CONV5
21	R/W	UINT 16	2	Start Register #6	START6
22	R/W	UINT 16	2	End Register #6	END6
23	R/W	TLP	3	Parameter(s)	PARA6
24	R/W	UINT 8	1	Conversion Code	CONV6
25	R/W	UINT 16	2	Start Register #7	START7
26	R/W	UINT 16	2	End Register #7	END7
27	R/W	TLP	3	Parameter(s)	PARA7
28	R/W	UINT 8	1	Conversion Code	CONV7
29	R/W	UINT 16	2	Start Register #8	START8
30	R/W	UINT 16	2	End Register #8	END8
31	R/W	TLP	3	Parameter(s)	PARA8
32	R/W	UINT 8	1	Conversion Code	CONV8
33	R/W	UINT 16	2	Start Register #9	START9
34	R/W	UINT 16	2	End Register #9	END9
35	R/W	TLP	3	Parameter(s)	PARA9
36	R/W	UINT 8	1	Conversion Code	CONV9
37	R/W	UINT 16	2	Start Register #10	START10
38	R/W	UINT 16	2	End Register #10	END10
39	R/W	TLP	3	Parameter(s)	PARA10
40	R/W	UINT 8	1	Conversion Code	CONV10
41	R/W	UINT 16	2	Start Register #11	START11
42	R/W	UINT 16	2	End Register #11	END11
43	R/W	TLP	3	Parameter(s)	PARA11
44	R/W	UINT 8	1	Conversion Code	CONV11
45	R/W	UINT 16	2	Start Register #12	START12
46	R/W	UINT 16	2	End Register #12	END12
47	R/W	TLP	3	Parameter(s)	PARA12
48	R/W	UINT 8	1	Conversion Code	CONV12
49	R/W	UINT 16	2	Start Register #13	START13
50	R/W	UINT 16	2	End Register #13	END13

Parameter Number	Read-Write	Data Type	Length	Description	Abbr.
51	R/W	TLP	3	Parameter(s)	PARA13
52	R/W	UINT 8	1	Conversion Code	CONV13
53	R/W	UINT 16	2	Start Register #14	START14
54	R/W	UINT 16	2	End Register #14	END14
55	R/W	TLP	3	Parameter(s)	PARA14
56	R/W	UINT 8	1	Conversion Code	CONV14
57	R/W	UINT 16	2	Start Register #15	START15
58	R/W	UINT 16	2	End Register #15	END15
59	R/W	TLP	3	Parameter(s)	PARA15
60	R/W	UINT 8	1	Conversion Code	CONV15

Table C-22. Point Type 55 – Modbus Special Function Table

Parameter Number	Read-Write	Data Type	Length	Description	Abbr.
0	R/W	UINT 16	2	Event / Alarm Register	EVTALRM
1	R/W	UINT 16	2	Periodic History Index Register	PERIODIC
2	R/W	UINT 16	2	Daily History Index Register	DAILY
3	R/O	UINT 16	2	Spare	SPARE
4	R/O	UINT 8	1	History Format	FORMAT
5	R/W	UINT 16	2	History Archive Register #1	ARCREG1
6	R/W	UINT 8	1	Start History Point	START1
7	R/W	UINT 8	1	End History Point	END1
8	R/W	UINT 8	1	Type of History Archive	TYPE1
9	R/W	UINT 8	1	Conversion Code	CONV1
10	R/W	UINT 16	2	History Archive Register #2	ARCREG2
11	R/W	UINT 8	1	Start History Point	START2
12	R/W	UINT 8	1	End History Point	END2
13	R/W	UINT 8	1	Type of History Archive	TYPE2
14	R/W	UINT 8	1	Conversion Code	CONV2
15	R/W	UINT 16	2	History Archive Register #3	ARCREG3
16	R/W	UINT 8	1	Start History Point	START3
17	R/W	UINT 8	1	End History Point	END3
18	R/W	UINT 8	1	Type of History Archive	TYPE3
19	R/W	UINT 8	1	Conversion Code	CONV3
20	R/W	UINT 16	2	History Archive Register #4	ARCREG4
21	R/W	UINT 8	1	Start History Point	START4
22	R/W	UINT 8	1	End History Point	END4
23	R/W	UINT 8	1	Type of History Archive	TYPE4
24	R/W	UINT 8	1	Conversion Code	CONV4
25	R/W	UINT 16	2	History Archive Register #5	ARCREG5
26	R/W	UINT 8	1	Start History Point	START5
27	R/W	UINT 8	1	End History Point	END5
28	R/W	UINT 8	1	Type of History Archive	TYPE5
29	R/W	UINT 8	1	Conversion Code	CONV5
30	R/W	UINT 16	2	History Archive Register #6	ARCREG6
31	R/W	UINT 8	1	Start History Point	START6
32	R/W	UINT 8	1	End History Point	END6
33	R/W	UINT 8	1	Type of History Archive	TYPE6
34	R/W	UINT 8	1	Conversion Code	CONV6
35	R/W	UINT 16	2	History Archive Register #7	ARCREG7
36	R/W	UINT 8	1	Start History Point	START7

Parameter Number	Read-Write	Data Type	Length	Description	Abbr.
37	R/W	UINT 8	1	End History Point	END7
38	R/W	UINT 8	1	Type of History Archive	TYPE7
39	R/W	UINT 8	1	Conversion Code	CONV7
40	R/W	UINT 16	2	History Archive Register #8	ARCREG8
41	R/W	UINT 8	1	Start History Point	START8
42	R/W	UINT 8	1	End History Point	END8
43	R/W	UINT 8	1	Type of History Archive	TYPE8
44	R/W	UINT 8	1	Conversion Code	CONV8
45	R/W	UINT 16	2	History Archive Register #9	ARCREG9
46	R/W	UINT 8	1	Start History Point	START9
47	R/W	UINT 8	1	End History Point	END9
48	R/W	UINT 8	1	Type of History Archive	TYPE9
49	R/W	UINT 8	1	Conversion Code	CONV9
50	R/W	UINT 16	2	History Archive Register #10	ARCREG10
51	R/W	UINT 8	1	Start History Point	START10
52	R/W	UINT 8	1	End History Point	END10
53	R/W	UINT 8	1	Type of History Archive	TYPE10
54	R/W	UINT 8	1	Conversion Code	CONV10

Table C-23. Point Type 56 – Analog Input Calibration Parameters

Parameter Number	Read-Write	Data Type	Length	Description	Abbr.
0	R/W	AC	10	Point Tag Identification	TAG
1	R/W	INT 16	2	Raw Value 1	RAW1
2	R/W	INT 16	2	Raw Value 2	RAW2
3	R/W	INT 16	2	Raw Value 3	RAW3
4	R/W	INT 16	2	Raw Value 4	RAW4
5	R/W	INT 16	2	Raw Value 5	RAW5
6	R/W	FLP	4	EU Value 1	EU1
7	R/W	FLP	4	EU Value 2	EU2
8	R/W	FLP	4	EU Value 3	EU3
9	R/W	FLP	4	EU Value 4	EU4
10	R/W	FLP	4	EU Value 5	EU5
11	R/O	FLP	4	Press Effect	PRESSEFF
12	R/W	FLP	4	Set EU Value	SETVAL
13	R/O	FLP	4	Manual EU	MANUAL
14	R/O	UINT 16	2	Timer	TIMER
15	R/W	UINT 8	1	Mode	MODE
16	R/W	UINT 8	1	Type	TYPE

Table C-24. Point Type 58 – Revision Information

Parameter Number	Read-Write	Data Type	Length	Description	Abbr.
0	R/O	AC	20	Device Firmware Description	DESC
1	R/O	AC	10	Part Number	PART#
2	R/O	AC	10	Version	VERSION
3	R/O	UINT 8	1	Information Present Flag	PRESENT

Table C-25. Point Type 86 – Extended History Parameters

Parameter Number	Read-Write	Data Type	Length	Description	Abbr.
0	R/O	UINT 8	1	Maximum number of Extended History Points	MAXPTS
1	R/W	UINT 8	1	Sample Log Interval – Units in Minutes	INTERVAL
2	R/W	TLP	3	Point Tag Identification TLP	TAG#1
3	R/W	TLP	3	Extended History Log Point #1	HST#1
4	R/W	UINT 8	1	Archive Type	ARCH1
5	R/W	UINT 8	1	Averaging or Rate Type	AVG#1
6	R/W	TLP	3	Point Tag Identification TLP	TAG#2
7	R/W	TLP	3	History Log Point #2	HST#2
8	R/W	UINT 8	1	Archive Type	ARCH2
9	R/W	UINT 8	1	Averaging or Rate Type	AVG#2
10	R/W	TLP	3	Point Tag Identification TLP	TAG#3
11	R/W	TLP	3	History Log Point #3	HST#3
12	R/W	UINT 8	1	Archive Type	ARCH3
13	R/W	UINT 8	1	Averaging or Rate Type	AVG#3
14	R/W	TLP	3	Point Tag Identification TLP	TAG#4
15	R/W	TLP	3	History Log Point #4	HST#4
16	R/W	UINT 8	1	Archive Type	ARCH4
17	R/W	UINT 8	1	Averaging or Rate Type	AVG#4
18	R/W	TLP	3	Point Tag Identification TLP	TAG#5
19	R/W	TLP	3	History Log Point #5	HST#5
20	R/W	UINT 8	1	Archive Type	ARCH5
21	R/W	UINT 8	1	Averaging or Rate Type	AVG#5
22	R/W	TLP	3	Point Tag Identification TLP	TAG#6
23	R/W	TLP	3	History Log Point #6	HST#6
24	R/W	UINT 8	1	Archive Type	ARCH6
25	R/W	UINT 8	1	Averaging or Rate Type	AVG#6
26	R/W	TLP	3	Point Tag Identification TLP	TAG#7
27	R/W	TLP	3	History Log Point #7	HST#7
28	R/W	UINT 8	1	Archive Type	ARCH7
29	R/W	UINT 8	1	Averaging or Rate Type	AVG#7
30	R/W	TLP	3	Point Tag Identification TLP	TAG#8
31	R/W	TLP	3	History Log Point #8	HST#8
32	R/W	UINT 8	1	Archive Type	ARCH8
33	R/W	UINT 8	1	Averaging or Rate Type	AVG#8
34	R/W	TLP	3	Point Tag Identification TLP	TAG#9
35	R/W	TLP	3	History Log Point #9	HST#9
36	R/W	UINT 8	1	Archive Type	ARCH9
37	R/W	UINT 8	1	Averaging or Rate Type	AVG#9
38	R/W	TLP	3	Point Tag Identification TLP	TAG#10
39	R/W	TLP	3	History Log Point #10	HST#10
40	R/W	UINT 8	1	Archive Type	ARCH10

Parameter Number	Read-Write	Data Type	Length	Description	Abbr.
41	R/W	UINT 8	1	Averaging or Rate Type	AVG#10
42	R/W	TLP	3	Point Tag Identification TLP	TAG#11
43	R/W	TLP	3	History Log Point #11	HST#11
44	R/W	UINT 8	1	Archive Type	ARCH11
45	R/W	UINT 8	1	Averaging or Rate Type	AVG#11
46	R/W	TLP	3	Point Tag Identification TLP	TAG#12
47	R/W	TLP	3	History Log Point #12	HST#12
48	R/W	UINT 8	1	Archive Type	ARCH12
49	R/W	UINT 8	1	Averaging or Rate Type	AVG#12
50	R/W	TLP	3	Point Tag Identification TLP	TAG#13
51	R/W	TLP	3	History Log Point #13	HST#13
52	R/W	UINT 8	1	Archive Type	ARCH13
53	R/W	UINT 8	1	Averaging or Rate Type	AVG#13
54	R/W	TLP	3	Point Tag Identification TLP	TAG#14
55	R/W	TLP	3	History Log Point #14	HST#14
56	R/W	UINT 8	1	Archive Type	ARCH14
57	R/W	UINT 8	1	Averaging or Rate Type	AVG#14
58	R/W	TLP	3	Point Tag Identification TLP	TAG#15
59	R/W	TLP	3	History Log Point #15	HST#15
60	R/W	UINT 8	1	Archive Type	ARCH15
61	R/W	UINT 8	1	Averaging or Rate Type	AVG#15

Glossary

A

A/D - Analog to Digital

AGA - American Gas Association.

AI - Analog Input.

AO - Analog Output.

Analog - Analog data is represented by a continuous variable, such as an electrical current signal.

AP - Absolute Pressure.

ASCII - American (National) Standard Code for Information Interchange.

Attribute - A parameter that provides information about an aspect of a database point. For example, the alarm attribute is an attribute that uniquely identifies the configured value of an alarm.

B

Built-in I/O - I/O channels that are fabricated into the 3095FC and do not require a separate option. Also called "on-board" I/O.

C

COMM - Abbreviation for communications. Most commonly used as comm port, referring to the communication port of the 3095FC.

Configuration - Typically, the software setup of a device, such as a 3095FC, that can often be defined and changed by the user. Can also mean the hardware assembly scheme.

Configuration Tree - When a configuration file is open in Rosemount User Interface Software, the Configuration Tree View menu appears.

CRC - Cyclical Redundancy Check

CSA - Canadian Standards Association.

CTS - Clear To Send modem communications signal.

D

DB - Database.

dB - Decibel. A unit for expressing the ratio of the magnitudes of two electric signals on a logarithmic scale.

DCD - Data Carrier Detect modem communications signal.

Deadband - A value that is an inactive zone above the low limits and below the high limits. The purpose of the deadband is to prevent a value such as an alarm from being set and cleared continuously when the input value is oscillating around the specified limit. This also prevents the logs or data storage location from being overfilled with data.

Directory View - The Communication Directory tree provides a tree style means of navigating through the PC Comm Ports and the 3095FC Comm Ports setup screens.

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Discrete - Input or output that is non-continuous, typically representing two levels such as on/off.

DP - Differential Pressure.

DSR - Data Set Ready modem communications signal.

DTR - Data Terminal Ready modem communications signal.

Duty Cycle - Proportion of time during a cycle that a device is activated. A short duty cycle conserves power for I/O channels, radios, and such.

DVM - Digital voltmeter.

Sensor Module - Dual-Variable Sensor. Provides static and DP inputs to a 3095FC.

E

EFM - Electronic Flow Metering or Measurement./

EIA-232 - Serial Communications Protocol using three or more signal lines, intended for short distances. Also referred to as RS-232.

EIA-422 - Serial Communication Protocol using four signal lines. Also referred to as the RS-422 standard.

EIA-485 - Serial Communications Protocol requiring only two signal lines. Can allow up to 32 devices to be connected together in a daisy-chained fashion. Also referred to as RS-485.

EMI - Electro-magnetic interference.

ESD - Electronic Static Discharge.

EU - Engineering Units.

F

Firmware - Internal software that is factory-loaded into a form of ROM. In the 3095FC, the firmware supplies the software used for gathering input data, converting raw input data calculated values, storing values, and providing control signals.

Flash ROM - A type of read-only memory that can be electrically re-programmed. It is a form of permanent memory and requires no backup power.

FSK - Frequency shift keyed.

G

GFA - Ground fault analysis.

GND - Electrical ground, such as used by the 3095FC power supply.

GP - Gauge Pressure.

H

HistoryLink Utility - HistoryLink utility allows the user to access and retrieve the 10-Minute History from the 3095FC. The HistoryLink utility supplements Rosemount User Interface for Windows Software.

Holding Register - Analog output number value to be read.

hw - DP.

I, J

IC - Industry Canada, more recently know an Measurement Canada, which grants custody transfer approvals on certain 3095FC units. IC can also mean integrated circuit.

ID - Identification

IEC - Industrial Electrical Code.

IEEE - Institute of Electrical and Electronic Engineers. the Open System Interconnection (OSI) reference model and an international standard for the organization of local area networks (LANs) established by the INternational Standards Organization (ISO) and the IEEE.

IMV - Integral Multiplier Value.

Input - Digital input, a bit to be read.

Input Register - Input numeric value to be read.

I/O - Input/Output.

IRQ - Interrupt Request. Hardware address oriented.

ISO - Organization internationale de normalisation (International Standards Organization)

IV - Integral Value

K

KB - Kilobytes.

kHz - Kilohertz.

L

LCD - Liquid Crystal Display. Display only device used for reading data.

LED - Light-emitting diode.

LOI - Local Operator Interface. Refers to the serial (RS-232) port on the 3095FC through which local communications are established, typically for configuration software running on a PC.

LRC - Longitudinal Redundancy Checking error checking.

M

mA - Milliamp(s); one thousandth of an ampere.

Manual Mode - Scanning is disabled.

Modbus - A device communications protocol developed by Gould-Modicon.

mW - Milliwatts, or 0.001 watt.

mV - Millivolts, or 0.001 volt.

N

NEC - National Electrical Code.

NEMA - National Electrical Manufacturer's Association.

O

OH - Off-Hook modem communications signal.

Off-line - Accomplished while the target device is not connected (by a communications link). For example, off-line configuration is configuring a 3095FC in an electronic file that is later loaded into the 3095FC.

Ohms - Units of electrical resistance.

On-line - Accomplished while connected (by a communications link) to the target device. For example, on-line configuration is configuring a Rosemount User Interface Software while connected to it, so that current parameter values are viewed and new values can be loaded immediately.

OP - Operator Port; see LOI.

Opcode - Type of message protocol used by the 3095FC to communicate with Rosemount User Interface Software, as well as host PC with Rosemount User Interface Software driver software.

P, Q

Parameter - A property of a point that typically can be configured or set by the user. For example, the Point Tag ID is a parameter of an Analog Input point. Parameters are normally edited by using configuration software running on a PC.

Pf - Flowing pressure.

PC - Personal computer.

P/PD - Pressure / DP

PI - Pulse Input. Also referred to as PIN.

Point - Software-oriented term for an I/O channel or some other function, such as a flow calculation. Points are defined by a collection of parameters.

Point Number - The number of an I/O point as installed in the 3095FC system.

Point Type - The point type attribute defines the database point to have one of the possible types of pints available to the system. The point type determines the basic functions of a point.

Preset - Number value previously determined for a register.

PRI - Primary PID control loop.

Protocol - A set of standards that enables communication or file transfers between two PCs. Parameters include baud rate, parity, data bits, stop bit, and the type of duplex.

PSTN - Public Switched Telephone Network.

PT - Process Temperature.

PTI - Periodic Timer Interrupt

PTC - Positive Temperature Coefficient.

PTT - Push-to-Talk signal.

Pulse - Transient variation of a signal whose value is normally constant.

PV - Process variable or process value.

R

RAM - Random Access Memory. In a 3095FC, it is used to store history, data, most user programs, and additional configuration data.

RBX - Report-by-exception. In a 3095FC, it always refers to spontaneous RBX, in which the 3095FC contacts the host to report an alarm condition.

RFI - Radio frequency interference.

RI - Ring Indicator modem communications signal.

User Interface Software - Remote Operations Controller is a microprocessor-based unit that provides remote monitoring and control.

Rosemount User Interface Software - Configuration software used to configure 3095FC units.

ROM - Read-only memory. Typically used to store firmware.

RTC - Real-time clock.

RTD - Resistance Temperature Detector.

RTS - Ready to Send modem communications signal.

RTU - Remote Terminal Unit.

RXD - Received Data communications signal.

S

Script - An uncompiled text file (such as keystrokes for a macro) that is interpreted by a program to perform certain functions. Typically, scripts can be easily created or edited by the end-user to customize the software.

*Soft Point*s - A type of point with generic parameters that can be configured to hold data as desired by the user.

SP - Setpoint, or Static Pressure.

SPI - Slow Pulse Input.

SPK - Speaker.

SRAM - Static Random Access Memory. Stores data as long as power is applied; typically backed up by a lithium battery or super capacitor.

SRBX - Spontaneous Report-by-Execution. Refer to RBX.

SVA - Signal Value Analog. Stored in the Results Register.

SVD - Signal Value Discrete. Stored in the Compare Flag.

T-Z

Tf - Flowing temperature.

TLP - Type (of point), Logical (or point) number, and Parameter number.

TXD - Transmitted Data communications signal.

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This product powers PlantWeb through diagnostics including device temperature limit and low battery voltage.

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