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ROC Protocol Specifications Manual (for Emerson FB1000 and FB2000 Series Flow Computers)

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Contents

Section 1: Introduction

This manual provides information required to understand the specifications for the ROC protocol. The intended use is for developing communication drivers to interface with a FB Series flow computer.

The ROC database is broken into individual parameters. Each database parameter is uniquely associated by parameter number and point type. See *Chapter 3, Parameter Lists for Point Types*, for detailed information.

Note:

For simplicity, this manual uses the term "FB Series" when referring to the Emerson FB1100, FB1200, FB2100 and FB2200 flow computers. Unless otherwise noted, the descriptions and procedures apply to all FB Series devices using the ROC protocol.

1.1 Manual Organization

This manual is organized into the following chapters:

Table 1-1: Manual Organization

Chapter	Description
Section 1 Introduction	Describes this manual and provides a summary of the general protocol message format, summary of each opcode, and how to calculate data offsets.
Section 2 Opcodes	Lists each opcode the ROC protocol uses.
Section 3 Parameter Lists for Point Types	Describes ROC point types and data types.
Section 4 CRC-16 Code and Examples	Provides information concerning the cyclical redundancy check the ROC protocol uses.
Section 5 IEEE Floating Point Format	Provides information about the binary representation of floating-point numbers.
Index	Provides an alphabetic listing of items and topics contained in this manual.

1.2 General Protocol Message Format

Tables 1-2 and 1-3 show the various ROC and host protocol message formats. General Message Format - Station "A" Polling Station 'B' for Data/Action:

Table 1-2: General Format – Station "A" Polling Station "B" for Data/Action

Destination (B)		Source (A)		Opcode	Data Length	m Data Bytes							CRC	
unit	group	unit	group		# of bytes	d1	d2	d3	-	-	-	dm	Lsb	msb

Table 1-3: General Format – Station "B" Responding to Station "A"

Destination (B)		Source (A)		Opcode	Data Length	m Data Bytes							CRC	
unit	group	unit	group		# of bytes	d1	d2	d3	-	-	-	dn	Lsb	msb

A message generally contains the following fields, in order from left to right:

Field	Description	
Destination	Specifies the address for the destination device. Destination has two components:	
	Unit	One-byte unit code for the station address. The unit code for a ROC address is user-configurable. For a host, this must be a unique number. **0** represents "broadcast within group" and **240** is the "direct connect address."
	Group	Indicates the group code for the station address. This is user-configurable.
Source	Specifies the address for the source device. Source has two components:	
	Unit	One-byte unit code for the station address. The unit code for a ROC address is user-configurable. For a host, this must be a unique number. **0** represents "broadcast within group" and **240** is the "direct connect address."
	Group	Indicates the group code for the station address. This is user-configurable.
Opcode	Defines the operation code (opcode) action to perform. See *Section 2* for description of supported opcodes.	
# of bytes	Indicates the number of bytes in the data byte field, consisting of the path, desired opcode, number of data bytes for the desired message, and the desired message itself.	
Data Bytes	Contains messages of varying lengths, consisting of the path, desired opcode, number of data bytes for the desired message, and the message itself.	

CRC	Confirms validity of message transmission.	
	lsb	Least significant byte.
	msb	Most significant byte.

Messages are of flexible length. The first six data bytes are used for the header information including: destination, source, opcode, and data length (number of bytes). The length of a message equals the number of data bytes transmitted plus eight overhead bytes (header information and CRC).

The minimum message length is eight bytes if the number of data bytes is zero (no data bytes transmitted). The maximum message length is 248 bytes (240 bytes of data). a byte.

Tables 1-4 and 1-5 provide examples of the messages exchanged if the host requests the current time and date from ROC 13 of Group 5.

Table 1-4: Host Request to ROC

ROC Address		Host Address		Opcode	Data Length	CRC	
unit	group	unit	group	-	# of bytes	Lsb	msb
13	5	1	0	7	0	l	m

Table 1-5: ROC Response to Host

Host Address		ROC Address		Opcode	Data Length	8 Data Bytes								CRC	
unit	group	unit	group	-	# of bytes	d1	d2	d3	-	-	-	-	dn	Lsb	msb
1	0	13	5	7	8	sec	min	hr	day	mo	yr	lyr	dwk	l	m

Note:

Addresses **240,240** and **0,x** are reserved and should not be used.

1.3 Calculating Data Offsets

A data byte offset is the offset (zero-based) from the beginning of a transmit or receive buffer for the data items that comprise the opcode data. The offset of the first data item is always 6 to allow for the header information (bytes 0-5).

Certain data offset values are determined based on the ROC configuration. The data byte offset for each item may be calculated. To calculate the next data offset value, add the previous offset value to the length of the previous data item:

Offset = Previous Offset + Length of Previous Data Item

1.4 Limitations

The following limitations currently exist when FB Series devices use ROC protocol:

- Changes to the meter or history configuration in your FB Series device require you to issue an Opcode 6 to update configuration information before using other Opcodes to read/write data over ROC protocol. Additionally, Opcode 120 must be issued before making any call to retrieve history data.
- New functionality such as Action or Math Blocks parameters cannot be accessed.
- Events for BIN (binary) data types show **only** the new and old value of the changed bit; unchanged bits are not logged as events.
- Events logged for the user mode property associated with a meter other than the first or integral sensor instance (for example, DP_1-**2**, Press_1-**2**, RTD_1-**2**) will all return the same MVS TLP (40,0,3). This may make it difficult for users to determine what specific instance was changed.
- To generate valid EFM data:
  - User Data points cannot be assigned as flow measurement inputs
  - Identical objects cannot be assigned to two different meters
- In cases where value precision is greater in the FB Series device than what was supported by the FloBoss107, the extra digits will be truncated *without* rounding. For example, the "no flow time limit in seconds" for Linear Meters on FB Series devices accepts a floating point number with up to three decimal places (e.g., 5.678) whereas the FloBoss107 supports an integer number. In this case, retrieving the value from the FB Series device over ROC protocol will yield an integer with trailing decimal numbers removed (e.g., 5). See the DNP3 protocol manual for a complete listing of parameter data types used by FB Series devices.
- Meter history collection is limited to Station 1, which resides in group 4. You cannot access the Station 2 history group. Additionally, devices supporting two meter runs must have the second meter history configured in group 4 (station 1).
- Station parameter assignments are primarily configured during a device's initial setup. As previously noted, the FloBoss107's ROC protocol does not have the concept of different stations. As a result, both meters **must** be assigned to Station1/history group 4. For a similar reason, station parameter changes returned via Opcode 122 appear as if they are affecting only meter 1. However, the FlowCal Enterprise software recognizes (via the file's configuration section) that the station parameter change has occurred in meter 2, but since it does not have an associated event, the software highlights the exception. Because there is no associated event to tag precisely when the value changed, it is advisable to make station changes as soon as possible after the SCADA poll (that is, for a 1:00 PM poll, make changes at 1:01PM). To avoid this issue with manually entered gas composition changes, assign each meter to a **separate** Components object.

Section 2: Opcodes

This chapter details each ROC protocol opcode.

2.1 Opcode Overview

Table 2-1 briefly describes each opcode. The tables in this section provide detailed descriptions of the various opcodes used. For each opcode, a brief description of the data bytes is provided. In some cases, the number of data bytes returned for an opcode varies.

Certain opcodes only send data and do not receive data back from the FB Series. For example, Opcode 8 requests the FB Series to set the time and date. The host transmits six to nine data bytes defining the new time and date. The FB Series resets the time and date and sends back an acknowledgment in which the opcode is repeated, but no data bytes are transmitted back. All acknowledgments 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 FB Series had valid Cyclical Redundancy Check (CRC), but contained invalid parameters. For example, if a request was made for information on Analog Input #11, but the FB Series was configured for only eight analog inputs (0 to 7), the FB Series would respond back with the 8-byte message with the opcode equal to 255 (error).

The number of analog inputs varies from device to device. This variability is indicated by listing the first analog input and indicating the remaining analog inputs by a period (“.”). In the following tables, a period in either the Data byte(s) column or the Description of Data column indicates a repetition of the proceeding item for the necessary number of instances.

Table 2-1: Summary of Codes

Opcode	Description
6	Sends FB Series configuration information.
7	Sends current time and date.
8	Sets new time and date.
17	Sets operator identification.
103	Sends system information such as on/off times, manual/alarm status, firmware version, and current time and date.
120	Sends pointers for alarm, event, and history logs.
121	Sends specified number of alarms starting at specified alarm pointer.
122	Sends specified number of events starting at specified event pointer.
130	Sends archived hourly and daily data for specified history point starting at specified history pointer.
136	Requests multiple history points for multiple time periods
165	Sends current history configuration data
166	Sets specified contiguous block of parameters.
167	Sends specified contiguous block of parameters.
180	Sends specified parameters.
181	Sets specified parameters.

Opcode	Description
255	Transmits error messages by FB Series in response to a request with invalid parameters or format.

2.2 Opcode 6 – FB Series

Opcode 6 returns the current configuration of the FB Series device.

Table 2-2: Opcode 6

Opcode 6						
Communication Opcode	Host Request to ROC			ROC Response to Host		
	Data		Description of Data	Data		Description of Data
	Offset	Length		Offset	Length	
Opcode 6: Send ROC Configuration – (FB Series)			No data bytes.	6	1	Number of Discrete Inputs
				7	1	Number of Analog Inputs
				8	1	Number of Discrete Outputs
				9	1	Number of Analog Outputs
				10	1	Number of Active meter runs
				11	1	Number of PIs
				12	1	Number of Active PIDs
				13	1	Number of Tanks – always 0
				14	1	Number of Standard History Points (0 - 60)
				15	1	Number of Extended History Points (0 – 10)
				16	1	Not Used – always 0
				17	1	Not Used – always 0
				18	1	Not Used – always 0
				19	1	Not Used – always 0
				20	1	Not Used – always 0
				21	1	Not Used – always 0
				22	1	Number of Soft Points
				23	1	Number of Comm Ports
				24	1	Device Type, (4 = FB Series)
				25	1	Number of Configurable Opcodes = 0
				26	20	Customer Name
				46-63	1	Not Used – always 0
				64	1	Number of MVS - Point Type 40
				65	1	Number of Run Parameter – Point Type 41
				66	1	Number of Extra Run Parameters – Point Type 42
				67	1	Point Type 43 – Not Used – always 0
				68	1	Number of Radio Power Control Parameters – Point Type 44 = 0

Opcode 6						
Communication Opcode	Host Request to ROC			ROC Response to Host		
	Data		Description of Data	Data		Description of Data
	Offset	Length		Offset	Length	
Opcode 6: Send ROC Configuration – (FB Series) *(Cont'd)*				69	1	Number of Meter Calibration and Sampler – Point Type 45
				70	1	Number of Meter Configuration – Point Type 46
				71	1	Number of Meter Flow Values – Point Type 47
				72	1	Number of PID Control – Point Type 48
				73-84	1	Not Used – always 0
				85	1	Communication Port where Opcode 6 Request Received. 0=COM1 1=COM2 2=COM3 4=Ethernet
				86	1	Operating Mode (always 0) 0=Normal 1=Boot
				87-91	4	Not Used – always 0
				92	1	Maximum number of Standard History points
				93	1	Maximum number of User Defined History points
				94-114	1	Not Used – always 0
				115	1	Number of Ethernet Points – Point Type 80
				116-120	1	Not Used – always 0
				121	1	Number of Extended History Information Points – Point Type 86
				122-234	1	Not Used – always 0

2.3 Opcode 7

Opcode 7 returns the current time and date, the number of years since the last leap year, and the day of week.

Note:

Read the time/date by using Opcodes 167 and 180 and specifying Point Type 12.

Table 2-3: Opcode 7

Opcode 7						
Communication Opcode	Host Request to ROC			ROC Response to Host		
	Data		Description of Data	Data		Description of Data
	Offset	Length		Offset	Length	
Opcode 7: Send Current Time and Date			No data bytes.	6	1	Current Second
				7	1	Current Minute
				8	1	Current Hour
				9	1	Current Day
				10	1	Current Month
				11	1	Current Year
				12	1	Leap Year or Not Leap Year 1 = Leap Year 0 = Not Leap Year
				13	1	Current day of week 1=Sunday...7=Saturday

2.4 Opcode 8

Opcode 8 is the only way to set the real-time clock. The leap year counter provides a mechanism to set the leap year.

Table 2-4: Opcode 8

Opcode 8						
Communication Opcode	Host Request to ROC			ROC Response to Host		
	Data		Description of Data	Data		Description of Data
	Offset	Length		Offset	Length	
Opcode 8: Set Current Time and Date	6	1	Current seconds (0-59)			No data bytes.
	7	1	Current minutes (0-59)			Time and date are set and acknowledgment sent back.
	8	1	Current hour (0-23)			
	9	1	Current day (1-31)			
	10	1	Current month (1-12)			
	11	1	Current year (0-99)			

2.5 Opcode 17

Opcode 17 sets an operator identification code for the communications port through which communications are occurring. The operator identification is logged with an event, indicating the operator responsible for creating the event. The FB Series provides a default operator identification for each communications port.

Once you set the operator identification, it remains set until changed either by:

- Subsequent Opcode 17 requests.
- Inactivity timeout for login
- FB Series initialized by a cold start.

Table 2-5: Opcode 17

Opcode 17						
Communication Opcode	Host Request to ROC			ROC Response to Host		
	Data		Description of Data	Data		Description of Data
	Offset	Length		Offset	Length	
Opcode 17: Set Operator ID – (Accepted only when security is disabled for comm port)	6	3	Operator ID			No data bytes.
or						
Opcode 17: Set Operator ID – (Accepted when User ID and and Password are valid user in device)	6	3	Operator ID			No data bytes.
	9	2	Password			Acknowledgment sent back.
or						
Opcode 17: Set Operator ID – (Accepted when User ID and Password are valid user in device. Access level is ignored as it is based on Role of user configured in device.)	6	3	Operator ID			No data bytes.
	9	2	Password			Acknowledgment sent back.
	11	6	Access Level			
	6	3	Operator ID			
	9	2	Password			
	11	6	“Logout”			

2.6 Opcode 103

Opcode 103 determines the current version of firmware residing in the FB Series, as well as other device-specific information. This opcode is useful in determining which FB Series units should be upgraded.

Table 2-6: Opcode 103

Opcode 103						
Communication Opcode	Host Request to ROC			ROC Response to Host		
	Data		Description of Data	Data		Description of Data
	Offset	Length		Offset	Length	
Opcode 103: Send System Information (Power Off/On Times, Manual/ Alarm Status, Firmware Version.)			No data bytes.	6	6	Last power-off time and date – Always 0
				12	6	Last power-on time and date – Always 0
				18	1	Manual Status flag – Always 0
				19	1	Alarm Status flag – Always 0
				20	40	Product Identification
				60	20	Time and date firmware produced
				80	1	Device Address
				81	1	Device Group
				82	20	Station Name
				102	6	Current time and date: Seconds, minutes, hour, day, month, and year

2.7 Opcode 120

Opcode 120 also sends the current hour (periodic) and day pointers for the history groups and maximum number of logs for each group.

Note:

The FB Series hourly log archive can store up to 1500 entries. Only the most recent 840 can be retrieved through ROC protocol. The daily log can contain up to 365 entries. Only the most recent 35 can be retrieved through ROC protocol.

Table 2-7: Opcode 120

Opcode 120						
Communication Opcode	Host Request to ROC			ROC Response to Host		
	Data		Description of Data	Data		Description of Data
	Offset	Length		Offset	Length	
Opcode 120: Send Pointer for Alarm, Event, and History Index			No data bytes.	6	2	Current Alarm Log pointer (0-239)
				8	2	Current Event Log pointer (0-239)
				10	2	Index to current History Group 4 (Station 1) Hourly History (0-839)
				12	2	Index to current History Group 1 (User Periodic 1) History (0-9)
				14	2	Number of User Periodic 1 History Logs (0-3999)
				16	2	Not Used – Always 0

Opcode 120						
Communication Opcode	Host Request to ROC			ROC Response to Host		
	Data		Description of Data	Data		Description of Data
	Offset	Length		Offset	Length	
Opcode 120: Send Pointer for Alarm, Event, and History Index *(Cont'd)*				18	1	Index to current History Group 4 (Station 1) Daily History (0-34)
				19	1	Not Used – Always 0
				20	1	Not Used – Always 0
				21	1	Not Used – Always 0
				22	2	Maximum number of alarms (240)
				24	2	Maximum number of events (240)
				26	1	Number of Day of Archived Daily History logs (0-34)
				27	1	Number of Days of Archived Hourly History logs (0-34)
				28	1	Number of Days of Archived User Periodic 1 History logs (0-?)
				29	1	Not Used – Always 0
				30	1	Not Used – Always 0
				31	1	Not Used – Always 0

2.8 Opcode 121

Opcode 121 requests alarm data from the Alarm Log in the FB Series. The Alarm Log consists of a maximum of 240 alarms.

Note:

An Opcode 120 request can be used to retrieve the current alarm index pointer.

For calls which start inside the valid alarm index range (0-239) but request data beyond the last index (239), the system will wrap back around to the first index (0) and use those older items to fill the response buffer.

Requests which try to reference values outside the valid alarm index range (>239) will result in an error.

Table 2-8: Opcode 121

Opcode 121						
Communication Opcode	Host Request to ROC			ROC Response to Host		
	Data		Description of Data	Data		Description of Data
	Offset	Length		Offset	Length	
Opcode 121: Send Specified Number of Alarms Starting with Specified Alarm Pointer	6	1	Number of alarms requested (maximum 10)	6	1	Number of alarms being sent
	7	2	Starting Alarm Log pointer (0-239)	7	2	Starting Alarm Log pointer
				9	2	Current Alarm Log pointer
				11	22	1st Alarm:
						Alarm Type (1 byte – see below)
						Alarm Code (1 byte – see below)
						Time and date (6 bytes):
						SS | MM | HH | DD | MM | YY
						Tag (10 bytes)
						Value (4 bytes)
					-	(above repeated as necessary)

Alarm Type: The byte is broken into two nibbles: high nibble equals bits 4 to 7, and low nibble equals bits 0 to 3. A nibble is a four-bit unit or half a byte.

- High nibble equals 1 for DP Sensor alarms
- High nibble equals 2 for SP Sensor alarms
- High nibble equals 3 for PT Sensor alarms
- High nibble equals 5 for I/O point AIs, DIs, PIs, and AOs
- High nibble equals 6 for meter run alarms
- High nibble equals 7 for User Text alarms
- High nibble equals 8 for User Value alarms
- High nibble equals 9 for Integral Sensor alarms
- Low nibble equals 0 means alarm clear
- Low nibble equals 1 means alarm set.
- Low nibble equal to some other value is possible, but not given here (contact factory).

Alarm Code: For an I/O point (high nibble of the Alarm Type byte is 1, 2, 3, or 5):

- 0 = Low Alarm
- 1 = Lo Lo Alarm
- 2 = High Alarm
- 3 = Hi Hi Alarm
- 4 = Rate Alarm
- 5 = Status Change

- 6 = Point Fail
- 7 = Override Mode

For a meter run alarm (the high nibble of the Alarm Type byte is 6):

- 0 = Low Alarm
- 2 = High Alarm
- 6 = No Flow Alarm
- 7 = Manual Mode

For an Integral Sensor alarm (high nibble of the Alarm Type byte is 9):

- 4 = Input Freeze Mode (Calibration in progress)
- 6 = Sensor Communications Fail Alarm
- 7 = Scanning disabled

All other alarms = Invalid Alarm.

Time and Date: Seconds, minute, hour, day, month, and year.

Tag: Ten ASCII characters.

Value: Represents the value at time of the occurrence of the alarm.

2.9 Opcode 122

Opcode 122 requests up to 10 events from the Event Log in the FB Series. The Event Log consists of a fixed number of events. The maximum number of events in the Event Log is returned in Opcode 120. Each event consists of 22 bytes, organized according to the one of the five formats described in *Tables 2-10* through *2-15*. *Table 2-16* shows the format used by each point type.

Note:

An Opcode 120 request can be used to retrieve the current event index pointer.

For calls which start inside the valid event index range (0-239) but request data beyond the last index (239), the system will wrap back around to the first index (0) and use those older items to fill the response buffer.

Requests which try to reference values outside the valid event index range (>239) will result in an error.

Table 2-9: Opcode 122

Opcode 122						
Communication Opcode	Host Request to ROC			ROC Response to Host		
	Data		Description of Data	Data		Description of Data
	Offset	Length		Offset	Length	
Opcode 122: Send Specified Number of Events Starting with the Specified Event Pointer	6	1	Number of events requested (maximum 10)	6	1	Number of events being sent
	7	2	Starting Event Log pointer (0-239)	7	2	Starting Event Log pointer
				9	2	Current Event Log pointer
				11	22	1st Event:
						See *Tables 2-10* through *2-15*, for breakout of these 22 bytes. To determine which format is used by a given point type, see *Table 2-16*.
					-	(above repeated as necessary)

Table 2-10: Event Format 1

Point Type	Parm #	Time and Date Occurrence of Event						Pt #	Operator ID			Event Text									
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
-	-	sec	min	hr	day	mo	yr														

Table 2-11: Event Format 2

Point Type	Parm #	Time and Date Occurrence of Event						Pt #	Operator ID			Old Value				New Value				Not Used or Tag	
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
-	-	sec	min	hr	day	mo	yr														

Notes:

- Old values and New values are formatted in the native data type of the parameter changed with the Least Significant Byte (LSB) first. If the length of the parameter is less than 4 bytes, the Old and New values start at bytes 12 and 16, respectively, with unused bytes at the end of both the Old and New value 4-byte reserved area. For example, if the data type of the parameter changed was a TLP type (3 bytes), the Old value would be entered in bytes 12-14 and the New value would be entered in bytes 16-18, with bytes 15 and 19 unused. Refer to *Section 3.2, ROC Point Type Parameter Definitions*, concerning data types.
- If the length of the parameter is 10 bytes, the New value is entered in both the Old, New, and Tag bytes (12 through 21) and the Old value is not retained. If the length of the parameter is greater than 10 bytes, the first 10 bytes of the New value are entered in the Old, New, and Tag bytes (12 through 21) and the Old value is not retained.

Table 2-12: Event Format 3 from EVT Function

Point Type	Parm #	Time and Date Occurrence of Event						Event Text										Floating Point Value			
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
-	-	sec	min	hr	day	mo	yr														

Table 2-13: Event Format 4

Point Type	Parm #	Time and Date Occurrence of Event						Time and Date per Event						Not Used							
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
-	-	sec	min	hr	day	mo	yr	sec	min	hr	day	mo	yr	x	x	x	x	x	x	x	x

Table 2-14: Event Format 5

Point Type	Parm #	Time and Date Occurrence of Event						Not Used													
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
-	-	sec	min	hr	day	mo	yr	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Table 2-15: Event Format 6

Point Type	Parm #	Time and Date Occurrence of Event						Pt #	Operator ID			Old Value				New Value				Cal Info	
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
79	See Note 1	sec	min	hr	day	mo	yr	See Note 2												See Note 3	See Note 4

1. Defines type of calibration performed:

   0 = Set Zero
   1= SetSpan
   2 = Set Mid-point 1
   3 = Set Mid-point 2
   4 = Set Mid-point 3
   5 = Calibration Verified
   10 = Set Zero Shift/Static Pressure Offset/ RTD Bias
   29 = Calibration Cancelled

2. Logical number of 4088 or Analog Input being calibrated:

   DP_1-1 : 0 (Point type no : 3)
   SP_1-1 : 1 (Point type no : 3)
   PT_1-1 : 2 (Point type no : 3)
   DP_1-2 : 0 (Point type no : 40)
   SP_1-2 : 0 (Point type no : 40)
   PT_1-2 : 0 (Point type no : 40)
   DP_1-3 : 1 (Point type no : 40)

SP_1-3 : 1 (Point type no : 40)

PT_1-3 : 1 (Point type no : 40)

3. Type of point being calibrated (4088=40, AI=3)
4. Defines MVS input being calibrated (only valid when point type is 4088):

   1 = Differential Pressure Input

   2 = Static Pressure Input

   3 = Temperature Input

Table 2-16: Event Format by Point Type

Point Type	Format	Description
1	2	Discrete Input Configuration Variables
2	2	Discrete Output Configuration Variables
3	2	Analog Input Configuration Variables
4	2	Analog Output Configuration Variables
5	2	Pulse Input Configuration Variables
6	2	PID Configuration Variables
7	2	Meter Run Configuration Variables
10	2	Meter Run Flow Rates Parameter
12	2	Clock Configuration Variables
15	2	System Variables
17	2	Soft Points
40	2	Multi-Variable Sensor – (4088B Sensors)
41	2	Meter Run Parameters
42	2	Extra Meter Run Parameters
45	2	Meter Calibration And
46	2	Meter Configuration Parameters
47	2	Meter Flow Values
48	2	PID Control Parameters
145	4	All Power Removed
200	1	Clock Change Event

2.10 Opcode 130

Opcode 130 requests a specified number of hourly or daily data values for a specified history point from history group 1 (User periodic 1) or group 4 (Station 1) starting at a specified history pointer.

The current history index for each group can be retrieved by Opcode 120.

The starting history index specifies the beginning record for hourly values or daily values:

- Daily Values: 840 + x, where x can be 0 – 34 to indicate the starting history index.
- Hourly Values: 0 – 839

Note:

For calls which start inside the valid history index range for **hourly** values (0-839) but request data beyond the last index (839), the system will wrap back around to the first index for hourly values (0) and use those older items to fill the response buffer.

For calls which start inside the valid history index range for **daily** values (840-874) but request data beyond the last index (874), the system will wrap back around to the first index for daily values (840) and use those older items to fill the response buffer.

Requests which try to reference values outside the valid history index range (>874) will result in an error.

To read time values for a particular history group, specify 254 as the history point number. Following is the format of the hourly and daily timestamp value for group 4 (Station 1):

Minute	Hour	Day	Month

Following is the format of the timestamp for group 1(User Periodic 1): Time in seconds since 12:00 a.m. Jan. 1, 1970.

Table 2-17: Opcode 130

Opcode 130						
Communication Opcode	Host Request to ROC			ROC Response to Host		
	Data		Description of Data	Data		Description of Data
	Offset	Length		Offset	Length	
Opcode 130: Send Specified # of Hourly or Daily Data for Specified History Point Extended History	6	1	Type of History: 0 = Hourly or Daily (Standard) 1 = Extended	6	1	Type of History: 0 = Hourly or Daily (Standard) 1 = Extended
	7	1	History Point Number (0-59, for Timestamp specify 254)	7	1	History Point Number
	8	1	Number of history values requested (maximum 60)	8	1	Number of history values being sent
	9	2	Starting history index (0-839 for hourly, 840-874 for daily)	9	4	1st history value
				13	4	2nd history value
					-	(above repeated as necessary)

2.11 Opcode 136

Opcode 136 requests a specified number of user periodic or station 1 data values for a specified starting history index for a specified number of time periods, starting at a specified history point for a specified number of history points.

Opcode 136 returns the history values for the requested user periodic or station 1 history index from the starting history point and continuing until the requested number of history points is completed. The time stamp for the history index will always be returned.

The timestamp is a TIME [UINT32] representing the number of seconds elapsed since 12:00 a.m. Jan. 1, 1970. This can be thought of as row addressing. An error is returned if the day was not found.

The current history index for each group can be retrieved by Opcode 120.

Note:

For calls which start inside the valid history index range for **hourly** values (0-839) but request data beyond the last index (839), the system will wrap back around to the first index for hourly values (0) and use those older items to fill the response buffer.

For calls which start inside the valid history index range for **daily** values (0-34) but request data beyond the last index (34), the system will wrap back around to the first index for daily values (0) and use those older items to fill the response buffer.

Table 2-18: Opcode 136

Opcode 136						
Communication Opcode	Host Request to ROC			ROC Response to Host		
	Data		Description of Data	Data		Description of Data
	Offset	Length		Offset	Length	
Opcode 136: Send specified # of history data for specified history index starting at specified history point	6	1	History Group (Always 0)	6	1	History Group (Always 0)
	7	2	Requested History Index: Hourly: 0 - 839 Daily: 0 – 34 Extended: 0 - 3999 65535 = requests latest history records	7	2	History Index: Hourly: 0 - 839 Daily: 0 – 34 Extended: 0 - 3999 65535 = indicates latest history records
	9	1	Type of History: Hourly = 0 (Standard) Daily = 1 (Standard) Extended = 2	9	2	Current history index
	10	1	Starting history point (0 - 59)	11	1	# of data elements being sent ((# history points + 1) * # time periods) Value is 0 if the request is invalid.
	11	1	# of history points	12	4	Time stamp for 1st time period
	12	1	# of time periods (see note below) ((# history points + 1) * # time periods) must not be greater than 60	16	4	1st history point value
					-	(repeat for number of history points)
					(above repeated for number of time periods)	

Note:

If no time periods are requested, the FB Series device does not return history values.

2.12 Opcode 165

Opcode 165 reads the current configuration for a contiguous group of history points. Opcode 165 reads the configuration of up to 50 history points. When reading the history points, only those points remaining in History Group 4 (Station 1) following the specified starting history point are returned.

Archive Type is defined as:

- 0 – Undefined
- 128 – Average value
- 129 – Integrated value
- 130 – Snapshot, minimum, or maximum value
- 134 – Totalized value

Table 2-19: Opcode 165

Opcode 165							
Communication Opcode	Host Request to ROC			ROC Response to Host			
	Data		Description of Data	Data			Description of Data
	Offset	Length		Offset	Length		
Opcode 165: Reads the current configuration for a contiguous group of history points	6	1	Read/Write option (always 0 – Read)	6	1		0
	7	1	History segment (always 0 = History Group 4)	7	2		0
	8	1	Starting history point index (0 – 59)	8	3		Number of history points sent (1 – 50).
	9	1	Not used - Always 0	9	4	1	Archive Type
						2	Point Type
						3	Point / Logic Number
						4	Parameter Number
				-			(above repeated as necessary)

2.13 Opcode 166

Opcode 166 configures either a single point or a contiguous block of parameters for a single point. This opcode is more efficient than Opcode 181 when the entire, or even partial, point configuration is required.

Table 2-20: Opcode 166

Opcode 166						
Communication Opcode	Host Request to ROC			ROC Response to Host		
	Data		Description of Data	Data		Description of Data
	Offset	Length		Offset	Length	
Opcode 166: Set Specified Contiguous Block of Parameters	6	1	Point Type			No data bytes.
	7	1	Point / Logic Number			Acknowledgment sent back.
	8	1	Number of Parameters			
	9	1	Starting Parameter Number			
	10	x	Data (a contiguous block)			

2.14 Opcode 167

Opcode 167 reads the configuration of a single point or it can be used to read a contiguous block of parameters for a single point. Opcode 167 is more efficient than Opcode 180 when reading the entire, or even partial, point configuration.

Use Opcode 167 to return the location of I/O installed in the FB Series device by "type" and "position in the I/O database." Specify 24 for the point type to indicate this I/O position array.

The "type" indicates the type of I/O module installed. The I/O module types are:

- Undefined – 0
- Discrete Input – 1
- Discrete Output – 2
- Analog Input – 3
- Analog Output – 4
- Pulse Input – 5

The order of the point type values in the array indicate the physical location of the point. This location is used as the "L" value in the TLP value to access point information. For example if the first bytes returned in the array are "03, 03, 03, 03, 03, 04, 04", This first analog input point in the database would be accessed with logical of 0, the fifth with logical of 4, and the first analog output point would be accessed with logical of 5.

Table 2-21: Opcode 167

Opcode 167						
Communication Opcode	Host Request to ROC			ROC Response to Host		
	Data		Description of Data	Data		Description of Data
	Offset	Length		Offset	Length	
Opcode 167: Send Specified Contiguous Block of Parameters	6	1	Point Type	6	1	Point Type
	7	1	Point / Logic Number	7	1	Point / Logic Number
	8	1	Number of Parameters	8	1	Number of Parameters
	9	1	Starting Parameter Number	9	1	Starting Parameter Number
				10	x	Data (a contiguous block)
					-	(above repeated as necessary)

2.15 Opcode 180

Opcode 180 reads several parameters in a single request. The parameters can be from different point numbers and of different point types. The opcode is intended to read any combination of parameters listed in the tables of Chapter 3. The opcode responds with an error response if the response is longer than 240 bytes, or if the request is for an invalid parameter, possibly due to a point that is not configured.

Table 2-22: Opcode 180

Opcode 180						
Communication Opcode	Host Request to ROC			ROC Response to Host		
	Data		Description of Data	Data		Description of Data
	Offset	Length		Offset	Length	
Opcode 180: Send Specified Parameters	6	1	Number of parameters requested	6	1	Number of parameters requested
	7	3 [1	Type of Point	7	[1	Type of Point
		1	Point / Logical Number (0-based)		1	Point / Logical Number (0-based)
		1]	Parameter Number		1]	Parameter Number
		-	(above repeated as necessary)		[x]	Data comprising the parameter
					-	(above repeated as necessary)

2.16 Opcode 181

Opcode 181 sets specific parameters in the FB Series. This opcode is the opposite of Opcode 180 in that it writes values instead of reading them. The FB Series device responds with an acknowledgment. Opcode 181 can be used to configure the operator interface communications ports.

Table 2-23: Opcode 181

Opcode 181						
Communication Opcode	Host Request to ROC			ROC Response to Host		
	Data		Description of Data	Data		Description of Data
	Offset	Length		Offset	Length	
Opcode 181: Set Specified Parameters	6	1	Number of parameters requested			No data bytes.
	7	1	Type of Point			Acknowledgment sent back.
		1	Point / Logical Number (0-based)			
		1	Parameter Number			
		x	Data comprising the parameter			
		-	(above repeated as necessary)			

2.17 Opcode 255 – Error Indicator

Opcode 255 is an error message indicator. This is an 8-byte message with no data bytes included. The opcode is set to 255 to indicate that the message received by the FB Series device had valid Cyclical Redundancy Check (CRC), but contained invalid parameters. For example, if a request was made for information on Analog Input #11, but the FB Series device was configured for only eight analog inputs (0 – 7), then the FB Series device would respond back with the 8-byte message with the opcode equal to 255.

Table 2-24: Opcode 255

Opcode 255						
Communication Opcode	Host Request to ROC			ROC Response to Host		
	Data		Description of Data	Data		Description of Data
	Offset	Length		Offset	Length	
Opcode 255: Invalid Parameters in Request Received by FB Series device			Error message indicator	6	1	Error code (See *Table 2-25*)
				7	1	Opcode that had the error
				8	1	Byte in received message that had the error

Error Codes Returned by Opcode 255 for: FB Series Devices (to be defined)

Table 2-25: Opcode 255 – Error Codes

Error Code	Description
1	Invalid opcode request
2	Invalid parameter number
3	Invalid logical number
4	Invalid point type
5	Received too many data bytes
6	Received too few data bytes
7	Did not receive 1 data byte
8	Did not receive 2 data bytes
9	Did not receive 3 data bytes

Error Code	Description
10	Did not receive 4 data bytes
11	Did not receive 5 data bytes
12	Did not receive 16 data bytes
13	Outside valid address range
14	Invalid history request
16	Invalid event entry
17	Requested too many alarms
18	Requested too many events
19	Write to read only parameter
20	Security error
21	Invalid security logon
25	Database write failed
63	Access level too high

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Section 3: Parameter Lists for Point Types

Configuring FB Series devices requires you to 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.

This section details point types and parameters supported by the FB Series devices.

3.1 ROC Point Types and Data Types

Table 3-1 shows point types and *Table 3-2* shows data types for the FB Series devices. *Tables 3-3* defines the data types found in the parameter tables

Table 3-1: ROC Point Types – FB Series

Point Type	Description	FB Series
0	Configurable Opcode	No
1	Discrete Inputs	Yes
2	Discrete Outputs	Yes
3	Analog Inputs	Yes
4	Analog Outputs	Yes
5	Pulse Inputs	Yes
6	PID Control (see *Point Type 48*)	No
7	AGA Flow Parameters	Yes
8	History Parameters	Yes
10	AGA Flow Values	Yes
12	ROC Clock	Yes
13	System Flags	Yes
14	Communication Ports	No
15	System Variables (ROC Information)	Yes
16	FST Parameters	No
17	Soft Points	Yes
19	Database Setup	Yes
20	Diagnostics	No
21	Information for User Defined Points	Yes
22-39	User Defined Points	No

Point Type	Description	FB Series
40	Multi-Variable Sensor (MVS) Parameters	Yes
41	AGA Run Parameters	Yes
42	Extra Run Parameters	Yes
43	User Lists	No
44	Power Control	No
45	Meter Calibration and Sampler	Yes
46	Meter Configuration Parameters	Yes
47	Meter Flow Values	Yes
48	PID Control Parameters	Yes
52	Battery Parameters	No
53	Modbus Configuration Parameters	No
54	Modbus Function Tables	No
55	Modbus Special Function Table	No
56	AI Calibration	No
57	Keypad / Logon Security Parameters	No
58	Revision Information	No
85	HART Parameters	No
86	Extended History Parameters	Yes

Table 3-2: Data Types

Data Type	Description	Byte Length
AC	ASCII character (groups of 10, 20, or 30 characters)	1 per character
BIN	Binary	1
FLP or FL	Floating Point – IEEE Format	4
INT8, 16, 32	Signed Integer – number of bits follows	1, 2 or 4
TLP	Point Type, Logical or Point Number, and Parameter Number	3
UINT8, 16, 32	Unsigned Integer – number of bits follows	1, 2 or 4

You reference data in the FB Series device by type, location or logical, and parameter (TLP). Type refers to the number of the point type. The location or logical number is a value based on physical input or output. A parameter is a numeric value assigned to each piece of data contained in a given point type. The tables in this section list the parameters numbers and descriptions for each of the point types.

3.1.1 Type, Location/Logical and Parameter (TLPs)

All supported parameters in the database are referenced via a specific TLP number using Point Type (T), Logical Number (L), and Parameter (P).

Interpret the I/O information (for example, 3, 2, 14) in the following way:

- The first number is point type. In this case 3 indicates Analog Input point type.
- The second number is the logical/physical instance of the point type. In this case 2 indicates the physical location of the analog point to be accessed. For I/O points this value is physical location in the database. For non-I/O point types this value is the logical instance of the point type. See the following section for more details on the physical/logical definition.
- The third number is the parameter number. In this case 14 indicates the Filtered Engineering Units parameter value.

3.1.2 Logical/Point Number Details

Within each point type, individual points are referenced by a point number or a logical number. The point numbers the ROC protocol uses for Point Types 1 to 5 are based on a physical input or output (I/O) as stored in the database.

- Physical Point Numbers 0 to 69:

  For Point Types 1 through 5, there are Point Numbers for the field I/O and for the diagnostic inputs as follows:

  — Point Numbers 0 to 63 are assigned to field I/O (integral sensor inputs, on-board RTD, on-board I/O points, extended I/O module points, and optional I/O module points). The user can access the physical location of all I/O points through opcode 167 reading information for point type 24. See the ROC opcode section for additional details.

  Description of I/O point logicals:

  - AI: Logical #3 - 10 (8 possible points)
  - AO: Logical #11 - 18 (8 possible points)
  - DI: Logical #19 - 28 (10 possible points)
  - DO: Logical #29 - 38 (10 possible points)
  - PI: Logical #39 - 48 (10 possible points)

  A few physical locations for analog input points are predefined:

- Location 0: Analog input point for integral sensor differential pressure data
- Location 1: Analog input point for integral sensor static pressure data
- Location 2: Analog input point for on-board RTD data
- Location 3 - 10: Optional I/O board analog inputs
- Location 11 - 18: Optional I/O board analog outputs
- Location 19 - 28: Optional I/O board digital input
- Location 29 - 38: Optional I/O board digital output
- Location 39 - 48: Optional I/O board pulse input
- Location 49 - 63: Unassigned

— Point Numbers 64 to 69 are assigned to the diagnostic (system) I/O.

Note:

The diagnostic points are not supported in the first release of the FB Series Flow Computers.

- Logical Point Numbers 0 to 127:

For all other Point Types the Logical Point Number is 0 to x, where x is one less than the total number of instances that exist for that Point Type. For example, the eight instances of User Data in the new flow computer would be logical numbers 0 through 7 of the softpoint point type for ROC protocol. A more detailed description of logical mapping for each point type is provided in the following sections.

The FB Series flow computers support up to two meter runs. The meter runs can be a mix of DP meters and linear meters. The logical mapping for meter run point types 7, 10, 41, 42, 45, 46, and 47 is shown below.

— Two DP meters
  - Logical 0 = DP Meter 1
  - Logical 1 = DP Meter 2

— Two linear meters
  - Logical 0 = Linear Meter 1
  - Logical 1 = Linear Meter 2

— One DP and one linear meter
  - Logical 0 = DP Meter 1

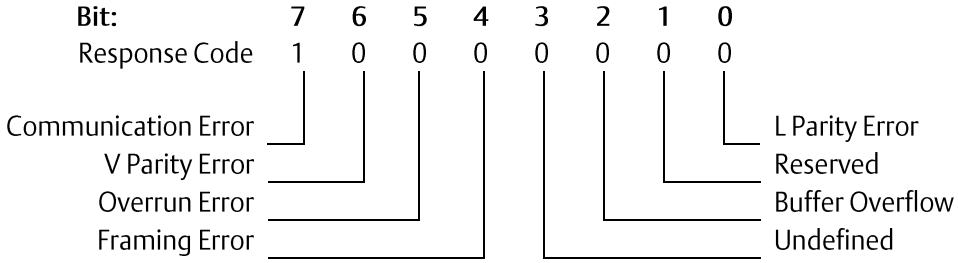
- Logical 1 = Linear Meter 1

Note:

All parameters are 0-based for each point type.

3.1.3 Bit Assignments

The bits in each byte are numbered 0 to 7, right to left, with bit 7 shown the furthest to the left. 1 in any bit indicates that bit is active or enabled.



3.2 ROC Point Type Parameter Definitions

Table 3-1 lists all point types. *Table 3-4* through *3-25* details each of the configurable point types. Each point type table is prefaced by a short description, a statement of the number of logical points (or iterations) of the point type, and the storage location for point type information. Point type tables contain the following information:

Field	Description
Parameter #	Defines the specific parameter number associated with that point type.
Description	Provides a brief description of the parameter, its functionality, and its values.
Data Type	Identifies the type of data being stored (see *Table 3-3*)
Access	Indicates if the parameter can be read from and written to (R/W) or if the parameter is read-only (R/O).
Description	Provides specific information on the implementation of the parameter in the new flow computers.

Table 3-3: Details of Data Types

Data Type	Definition	# of Bytes	Default Range
BIN	Binary	1	0 → 1 For each Bit
AC	ASCII character groups	1 per character	0x20 → 0x7E for each character
INT8	Signed Integer – 8 bits	1	-128 → 127
INT16	Signed Integer – 16 bits	2	-32,768 → 32,767
INT32	Signed Integer – 32 bits	4	-2,147,483,648 → 2,147,483,647
UINT8	Unsigned Integer – 8 bits	1	0 → 255
UINT16	Unsigned Integer – 16 bits	2	0→ 65,535
UINT32	Unsigned Integer – 32 bits	4	0 → 4,294,967,296
FL	Single Precision Floating Point – IEEE Format	4	Any valid IEEE single precision float (see *Section 5*)
TLP	Type, Point or Logical Number, Parameter Number	3	0→255, 0→255, 0→255

3.2.1 Point Type 1: Discrete Input

Description: Point Type 1 provides the parameters for the discrete input.
Number of Logical Points: (0-10) Based on I/O hardware installed and I/O point configuration.

Table 3-4: Point Type 1 – Discrete Input Parameters

Point Type 1: Discrete Input Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
0	R/W	AC10	10	Identifies the point tag.
1	R/W	UINT8	1	Filter (number of either 1-second or 15-second increments)
2	R/O	UINT8	1	Status: 0 = Off 1 = On
3	R/W	BIN	1	DI Mode: Bit 7 – Manual Mode: 0 = Scanning Enabled 1 = Scanning Disabled
	R/O	BIN	1	Bit 6 – Report-by-Exception (RBX) on Set (Not used – always 0) Bit 5 – RBX on Clear (Not used – always 0)
	R/W	BIN	1	Bit 4 – Alarm Enable: 0 = Disable Alarms 1 = Log Alarms
	R/O	BIN	1	Bit 3 – TDI mode enable (Not used – always 0) Bit 2 – Filter Interval: (Always 0) 0 = 1 second 1 = 15 seconds
	R/W	BIN	1	Bit 1 – Latch Enable: 0 = Disable 1 = Enable Bit 0 – Invert Enable: 0 = Disabled 1 = Enabled

Point Type 1: Discrete Input Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
4	R/O	BIN	1	Alarm Status: Bit 7 – Manual Mode Bit 6 – Point Fail Bit 5 – Not used – always 0 Bits 4-0 – TDI Alarms (Not used – always 0)
5	R/O	UINT32	4	Accumulated Value
6	R/O	UINT32	4	On counter (50 millisecond interval)
7	R/O	UINT32	4	Off counter (50 millisecond interval)
8	R/O	INT16	2	0% pulse width (Not used – always 0)
9	R/O	INT16	2	100% pulse width (Not used – always 0)
10	R/O	UINT16	2	Maximum time between pulses (Not used – always 0)
11	R/O	AC10	10	Units - Not used (Not used – always 0)
12	R/O	UINT16	2	Scan Period (50 millisecond intervals) (Not used – always 0)
13	R/O	FL	4	Low Reading (Zero) Engineering Units (EU) (Not used – always 0)
14	R/O	FL	4	High Reading (Span) EU (Not used – always 0)
15	R/O	FL	4	Low Alarm EU (Not used – always 0)
16	R/O	FL	4	High Alarm EU (Not used – always 0)
17	R/O	FL	4	Low Low Alarm EU (Not used – always 0)
18	R/O	FL	4	Hi Hi Alarm EU (Not used – always 0)
19	R/O	FL	4	Rate Alarm EU (Not used – always 0)
20	R/O	FL	4	Alarm Deadband (Not used – always 0)
21	R/O	FL	4	EU Value (Not used – always 0)
22	R/O	UINT16	2	TDI Count (Not used – always 0)

3.2.2 Point Type 2: Discrete Output

Description: Point Type 2 provides the parameters for the discrete output.
Number of Logical Points: (0-10) Based on I/O hardware installed and I/O point configuration.

Table 3-5: Point Type 2 – Discrete Output Parameters

Point Type 2: Discrete Output Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
0	R/W	AC10	10	Identifies the point tag.
1	R/W	UINT16	2	Time On (50 miliseconds intervals)
2	R/O	UINT8	1	Not used – always 0
3	R/W	UINT8	1	Status: 0 = Off 1 = On
4	R/W	BIN	1	DO Mode: Bit 7 – Manual Mode: 0 = Scanning Enabled 1 = Scanning Disabled
	R/O	BIN	1	Bit 6 – Not used – always 0 Bit 5 – Not used – always 0
	R/W	BIN	1	Bit 4 – Clear on Reset: 0 = Disabled – Retain last status 1 = Enabled – Set to fault mode
	R/O	BIN	1	Bit 3 – TDO Enabled: 0 = Disabled 1 = Enabled Bit 2 – Reserved (Do not set this bit) Bit 1 – Toggle: 0 = Disabled 1 = Enabled Bit 0 – Momentary: 0 = Disabled 1 = Enabled

Point Type 2: Discrete Output Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
5	R/O	BIN	1	Alarms Code: Bit 7 – Manual Mode Bit 6 – Point Fail Bits 5 through 0 – Not used – always 0
6	R/O	UINT32	4	Accumulated Value
7	R/O	AC10	10	Units
8	R/W	UINT16	2	Cycle Time
9	R/W	INT16	2	0% Count
10	R/W	INT16	2	100% Count
11	R/O	FL	4	Low reading EU
12	R/O	FL	4	High reading EU
13	R/O	FL	4	EU Value
14	R/O	BIN	1	Alarm Mode: Bit 6 – Report-by-Exception on Set (Not used – always 0) 0 = No RBX on Set 1 = RBX on Set Bits 7 through 0 – Not used – always 0
15	R/O	BIN	1	Scanning Mode: Bits 7 through 1 – Not used – always 0
	R/W	BIN	1	Bit 0 – Scanning Mode: 0 = Automatic 1 = Manual
16	R/W	UINT8	1	Manual state: 0 = Off 1 = On
17	R/O	UINT8	1	Physical state: 0 = Off 1 = On

3.2.3 Point Type 3: Analog Input

Description: Point Type 3 provides the parameters for the analog input.

Number of Logical Points: (0-8) Based on I/O hardware installed and I/O point configuration.
Logical no. 0 - 2 are fixed for DP1-1 (integral sensor DP input), SP1-1 (integral sensor static pressure input) and PT1-1 (on-board RTD input) resp. Logical no. 3-10 shall used for AI. Logical no. 65, 66, 68 are fixed for Battery Voltage, DC Input Voltage, and CPU Board Temperature.

Table 3-6: Point Type 3 – Analog Input Parameters

Point Type 3: Analog Input Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
0	R/W	AC10	10	Identifies the point tag.
1	R/O	AC10	10	Units
2	R/O	UINT16	2	Scan period (50 miliseconds intervals) (Always 20)
3	R/W	UINT16	2	Filter (50 miliseconds intervals)
4	R/W	INT16	2	Adjusted D/A 0%
5	R/W	INT16	2	Adjusted D/A 100%
6	R/W	FL	4	Low Reading (in Engineering Units)
7	R/W	FL	4	High Reading (in Engineering Units)
8	R/W	FL	4	Low Alarm (in Engineering Units)
9	R/W	FL	4	High Alarm (in Engineering Units)
10	R/W	FL	4	Low Low Alarm (in Engineering Units)
11	R/W	FL	4	Hi Hi Alarm (in Engineering Units)
12	R/W	FL	4	Rate Alarm (in Engineering Units)
13	R/W	FL	4	Alarm Deadband
14	R/O	FL	4	Filtered (in Engineering Units)
15	R/W	BIN	1	AI Mode: Bit 7 – Manual Mode: 0 = Scanning Enabled 1 = Scanning Disabled
	R/O	BIN	1	Bit 6 – RBX on Set (Not used – always 0) 0 = Disabled 1 = Enabled Bit 5 – RBX on Clear (Not used – always 0) 0 = Disabled 1 = Enabled

Point Type 3: Analog Input Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
	R/W	BIN	1	Bit 4 – Alarm Enable: 0 = Disabled 1 = Log Alarm
	R/O	BIN	1	Bit 3 – Average Enable: (Not used – always 0) 0 = Disabled 1 = Average Enable Bit 2 – Temp Comp Enable (Not used – always 0)
	R/W	BIN	1	Bit 1 – Clipping: 0 = Disabled 1 = Clipping Enabled Bit 0 – Fault Handling: 0 = Retain Last Value 1 = Set to Fault Value
16	R/O	BIN	1	Alarm Code: Bit 7 – Manual Mode Bit 6 – Point Fail Bit 5 – Not used – always 0 Bit 4 – Rate Alarm Bit 3 – High High Alarm Bit 2 – High Alarm Bit 1 – Low Low Alarm Bit 0 – Low Alarm
17	R/O	INT16	2	Raw D/A Input
18	R/O	UINT16	2	Actual Scan Time (50 millisecond intervals) (Always 20)
19	R/W	FL	4	Fault EU Value
20	R/O	INT16	2	Calibrated Zero Raw – Lowest calibrated raw A/D input
21	R/O	INT16	2	Calibrated Mid-point Raw #1 A/D Value; second-lowest raw A/D input
22	R/O	INT16	2	Calibrated Mid-point Raw #2 A/D Value; third-lowest raw A/D input
23	R/O	INT16	2	Calibrated Mid-point Raw #3 A/D Value; second-highest calibrated raw A/D input
24	R/O	INT16	2	Calibrated Span Raw; highest calibrated raw A/D input
25	R/O	FL	4	Calibrated Zero EU Value; lowest calibrated EU value.

Point Type 3: Analog Input Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
26	R/O	FL	4	Calibrated Mid-point EU #1; second-lowest calibrated EU value
27	R/O	FL	4	Calibrated Mid-point 2 EU #2; third-lowest or highest calibrated EU value
28	R/O	FL	4	Calibrated Mid-point EU #3; second-highest calibrated EU value
29	R/O	FL	4	Calibrated Span EU; highest calibrated EU value
30	R/O	FL	4	Offset (Zero Shift); value to be added to all calculated EU values
31	R/O	FL	4	Calibration Set Value; desired EU value for a calibrated point (Not used – always 0)
32	R/O	FL	4	Calibrated Manual value; the currently EU value of the AI while performing calibration
33	R/O	UINT16	2	Calibration Timer; indicates the number of seconds until a calibration timeout occurs.
34	R/O	UINT8	1	Calibration mode: 0 = No cal active 1 = Start cal 2 = Cal input 3 = Restore cal 4 = End cal
35	R/O	UINT8	1	Calibration type: (Not used – always 0) 0 = No cal active 1 = Set zero 2 = Set span 3 = Set mid1 4 = Set mid2 5 = Set mid3 6 = Set Offset

3.2.4 Point Type 4: Analog Output

Description: Point Type 4 provides the parameters for the analog output.
Number of Logical Points: (0-8) Based on I/O hardware installed and I/O point configuration.

Table 3-7: Point Type 4 – Analog Output Parameters

Point Type 4: Analog Output Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
0	R/W	AC10	10	Identifies the point tag.
1	R/O	AC10	10	Units
2	R/W	INT16	2	Adjusted D/A 0%
3	R/W	INT16	2	Adjusted D/A 100%
4	R/W	FL	4	Low reading EU
5	R/W	FL	4	High reading EU
6	R/O	FL	4	Value in EUs
7	R/W	BIN	1	AO Mode: Bit 7 – Manual Mode: 0 = Normal 1 = Manual
	R/O	BIN	1	Bit 6 – RBX on Set (Not used – always 0) 0 = Disabled 1 = Active Bit 5 – RBX on Clear (Not used – always 0) 0 = Disabled 1 = Active Bit 4 – ALM Enable (Not used – always 0) 0 = Disabled 1 = Log Alarms
	R/W	BIN	1	Bit 3 – Clear on Reset: 0 = Disabled 1 = Enabled
	R/O	BIN	1	Bits 2 through 0 – Not used – always 0

Point Type 4: Analog Output Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
8	R/O	BIN	1	Alarm Code: Bit 7 – Manual Mode Bit 6 – Point Fail Bit 5 through 0 – Not used – always 0
9	R/O	INT16	2	Raw D/A Output
10	R/W	BIN	1	Scanning mode: 0 = Automatic 1 = Manual
11	R/W	FL	4	Manual EU
12	R/O	FL	4	Physical EU

3.2.5 Point Type 5: Pulse Input

Description: Point Type 5 provides the parameters for the pulse input.
Number of Logical Points: (0-10) Based on I/O hardware installed and I/O point configuration.

Table 3-8: Point Type 5 – Pulse Input Parameters

Point Type 5: Pulse Input Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
0	R/W	AC10	10	Identifies the point tag.
1	R/O	AC10	10	Units
2	R/O	UINT8	1	Rate Flag: (Not used – always 0) 0 = Rate 1 = Accumulate 2 = Accum using user entered rollover
3	R/W	UINT8	1	Rate Period: 0 = Minutes 1 = Hours 2 = Days
4	R/O	UINT8	1	Filter Time: (Not used – always 0) 0 = None 1 = 255 in 22 millisecond increments
5	R/W	UINT16	2	Scan Period (50 millisecond intervals)
6	R/W	FL	4	Conversion factor
7	R/W	FL	4	Low Alarm EU
8	R/W	FL	4	High Alarm EU
9	R/W	FL	4	Low Low Alarm EU
10	R/W	FL	4	Hi Hi Alarm EU
11	R/W	FL	4	Rate Alarm EU
12	R/W	FL	4	Alarm Deadband / Rollover Maximum
13	R/W	FL	4	Value in EUs

Point Type 5: Pulse Input Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
14	R/W	BIN	1	PI Mode Bit 7 – Manual Mode: 0 = Normal Scan 1 = Off Scan
	R/O	BIN	1	Bit 6 – RBX on Set (Not used – always 0) 0 = Disabled 1 = Active Bit 5 – RBX on Clear (Not used – always 0) 0 = Disabled 1 = Active
	R/W	BIN	1	Bit 4 – ALM Enable: 0 = Disabled 1 = Log Alarms
	R/O	BIN	1	Bit 3 – Conversion: 1 = Pulses/EU Bits 2 through 0 – Not used – always 0
15	R/O	BIN	1	Alarm Code: Bit 7 – Manual Mode Bit 6 – Point Fail Bit 5 – Not used – always 0 Bit 4 – Rate Alarm Bit 3 – High High Alarm Bit 2 – High Alarm Bit 1 – Low Low Alarm Bit 0 – Low Alarm
16	R/O	UINT32	4	Accumulated Pulse Total
17	R/O	FL	4	Current Rate
18	R/O	FL	4	Today's Total
19	R/O	FL	4	Yesterday's Total
20	R/O	UINT32	4	Pulses for Day
21	R/O	FL	4	Frequency in Hertz

3.2.6 Point Type 7: AGA Flow

Description: Point Type 7 provides the parameters for the AGA flow.
Number of Logical Points: (0-2) Based on product type and meter setup.

Table 3-9: Point Type 7 – AGA Flow Parameters

Point Type 7: AGA Flow Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
0	R/W	AC10	10	Identifies the point tag.
1	R/W	FP	4	Latitude
2	R/W	FP	4	Elevation
3	R/O	BIN	1	Calculation Method: Bit 7 – Differential Flow Calculation Standard: 0 = AGA3 1 = ISO5167 Bit 6 – RBX on Set (Not used – always 0) 0 = Disabled 1 = Active Bit 5 – RBX on Clear (Not used – always 0) 0 = Disabled 1 = Active
	R/W	BIN	1	Bit 4 – ALM Enable: 0 = Disabled 1 = Log Alarms
	R/O	BIN	1	Bit 3 – US or Metric Units: 0 = US 1 = Metric Bit 2 – Limit Meter Run Events: (Not used – always 0) 0 = Event not limited 1 = Events limited Bit 1 – Flow Calculation Method: 0 = Differential 1 = Linear Bit 0 – Not used – always 0

Point Type 7: AGA Flow Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
4	R/O	BIN	1	AGA Configuration Options: Bit 7 – Log Methane Adjustment: (Not used – always 0) 0 = Log 1 = Do not log normalization
	R/W	BIN	1	Bit 6 – Mass/Volume Units (applies to calculation outputs, alarm limits, sampler accumulation, and heating value): 0 = Mass 1 = Volumetric Bit 5 – Gravitational Acceleration Source: 0 = Calculate 1 = Enter Bit 4 – Heating Value Source: 0 = Calculate 1 = Enter Bit 3 – Static Pressure Value: 0 = Gauge 1 = Absolute Bit 2 – Static Pressure Tap Location: 0 = Downstream 1 = Upstream Bit 1 – Specific Gravity Source: 0 = Calculate 1 = Enter Bit 0 – Not used – always 0
5	R/W	FL	4	Specific gravity
6	R/W	FL	4	Heating value
7	R/W	FL	4	Local Gravitational Acceleration
8	R/O	UINT16	2	Scan Period (50 ms intervals) (Always 20)
9	R/W	FP	4	Pipe diameter
10	R/W	FP	4	Orifice diameter
11	R/W	FP	4	Orifice measured (reference) temperature

Point Type 7: AGA Flow Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
12	R/O	UINT8	1	Orifice material: 0 = SS 1 = Monel 2 = CS 3 = 304SS 4 = 316SS 5 = Monel400
13	R/W	AC30	30	Meter run point description Note: The description truncates to 20 characters.
14	R/O	BIN	1	Alarm Code: Bit 7 – Manual Mode (Not used – always 0) Bit 6 – No Flow (Not used – always 0) Bit 5 – Not used – always 0 Bit 4 – Not used – always 0 Bit 3 – Not used – always 0 Bit 2 – High Alarm Bit 1 – Not used – always 0 Bit 0 – Low Alarm
15	R/W	FP	4	Low Alarm EU – Flow
16	R/W	FP	4	High Alarm EU – Flow
17	R/W	FP	4	Viscosity
18	R/W	FL	4	Specific Heat Ratio
19	R/W	FP	4	Contact or Base Pressure
20	R/W	FL	4	Base or contract temperature
21	R/W	FP	4	Low Differential Pressure (hw) Cutoff – Orifice
22	R/W	FP	4	User Correction Factor
23	R/W	FP	4	N_2 – Nitrogen
24	R/W	FP	4	CO_2 – Carbon Dioxide
25	R/W	FP	4	H_2S – Hydrogen Sulfide
26	R/W	FP	4	H_2O – Water
27	R/W	FP	4	He – Helium
28	R/W	FP	4	CH_4 – Methane
29	R/W	FP	4	C_2H_6 – Ethane
30	R/W	FP	4	C_3H_8 – Propane

Point Type 7: AGA Flow Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
31	R/W	FP	4	C_4H_{10} – n-Butane
32	R/W	FP	4	C_4H_{10} – i-Butane
33	R/W	FP	4	C_5H_{12} – n-Pentane
34	R/W	FP	4	C_5H_{12} – i-Pentane
35	R/W	FP	4	C_6H_{14} – n-Hexane
36	R/W	FP	4	C_7H_{16} – n-Heptane
37	R/W	FP	4	C_8H_{18} – n-Octane
38	R/W	FP	4	C_9H_{20} – n-Nonane
39	R/W	FP	4	$C_{10}H_{22}$ – n-Decane
40	R/W	FP	4	O_2 – Oxygen
41	R/W	FP	4	CO – Carbon Monoxide
42	R/W	FP	4	H_2 – Hydrogen
43	R/O	UINT8	1	Not used – always 0
44	R/O	UINT8	1	Enable Stacked Differential Pressure (hw) (Not used – always 0)
45	R/O	TLP	3	Not used – always 0
46	R/O	TLP	3	hw Input Definition (Differential Meter) (Not used – always 0) Uncorrected Flow Rate Input Definition (Linear Meter)
47	R/O	TLP	3	Static Pressure (Pf) Input Definition
48	R/O	TLP	3	Flowing Temperature (Tf) Input Definition
49	R/O	FP	4	Low Differential Pressure (hw) Setpoint (Not used – always 0.0)
50	R/O	FP	4	High Differential Pressure (hw) Setpoint (Not used – always 0.0)
51	R/W	FL	4	Current Differential Pressure (Differential Meter) Uncorrected Flow Rate (Linear Meter)
52	R/W	FL	4	Current Pf – Flowing Pressure
53	R/W	FL	4	Current Tf – Flowing Temperature

3.2.7 Point Type 8: Standard History

Description: Point Type 8 provides the parameters for the standard history.

Number of Logical Points: Logical 0 = Points 1-15 (FB Series station 1 history points 1-15)
Logical 1 = Points 16-30 (FB Series station 1 history points 16-30)
Logical 2 = Points 31-45 (FB Series station 1 history points 31-45)
Logical 3 = Points 46-60 (FB Series station 1 history points 46-60)
Logical 4 = Points 61-75 (Unused – Always 0)
Logical 5 = Points 76-90 (Unused – Always 0)
Logical 6 = Points 91-100 (Unused – Always 0)

Table 3-10: Point Type 8 – Standard History Parameters

Point Type 8: Standard History Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
0	R/O	TLP	3	TLP for tag for history point 1, 16, 31, 46, 61, 76, or 91 (Not used – always 0,0,0)
1	R/O	TLP	3	TLP for value for history point 1, 16, 31, 46, 61, 76, or 91
2	R/O	UINT8	1	History type for history point 1, 16, 31, 46, 61, 76, or 91. 128 = Average 129 = Accumulate 130 = Current Value 134 = Totalize
3	R/O	UINT8	1	Detail of history type for history point 1, 16, 31, 46, 61, 76, or 91. 0 = Snapshot 1 = Minimum 2 = Maximum
4	R/O	TLP	3	TLP for tag for history point 2, 17, 32, 47, 62, 77, or 92. (Not used – always 0,0,0)
5	R/O	TLP	3	TLP value for history point 2, 17, 32, 47, 62, 77, or 92.
6	R/O	UINT8	1	History type for history point 2, 17, 32, 47, 62, 77, or 92.
7	R/O	UINT8	1	Detail of history type for history point 2, 17, 32, 47, 62, 77, or 92.
8	R/O	TLP	3	TLP for tag for history point 3, 18, 33, 48, 63, 78, or 93.
9	R/O	TLP	3	TLP for value of history point 3, 18, 33, 48, 63, 78, or 93.
10	R/O	UINT8	1	History type for history point 3, 18, 33, 48, 63, 78, or 93.
11	R/O	UINT8	1	Detail of history type for history point 3, 18, 33, 48, 63, 78, or 93.

Point Type 8: Standard History Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
12	R/O	TLP	3	TLP for tag for history point 4, 19, 34, 49, 64, 79, or 94.
13	R/O	TLP	3	TLP for value of history point 4, 19, 34, 49, 64, 79, or 94.
14	R/O	UINT8	1	History type for history point 4, 19, 34, 49, 64, 79, or 94.
15	R/O	UINT8	1	Detail of history type for history point 4, 19, 34, 49, 64, 79, or 94.
16	R/O	TLP	3	TLP for value of history point 5, 20, 35, 50, 65, 80, or 95.
17	R/O	TLP	3	TLP for value of history point 5, 20, 35, 50, 65, 80, or 95.
18	R/O	UINT8	1	History type for history point 5, 20, 35, 50, 65, 80, or 95.
19	R/O	UINT8	1	Detail of history type for history point 5, 20, 35, 50, 65, 80, or 95.
20	R/O	TLP	3	TLP for tag of history point 6, 21, 36, 51, 66, 81, or 96.
21	R/O	TLP	3	TLP for value of history point 6, 21, 36, 51, 66, 81, or 96.
22	R/O	UINT8	1	History type for history point 6, 21, 36, 51, 66, 81, or 96.
23	R/O	UINT8	1	Detail of history type for history point 6, 21, 36, 51, 66, 81, or 96.
24	R/O	TLP	3	TLP for tag of history point 7, 22, 37, 52, 67, 82, or 97.
25	R/O	TLP	3	TLP for value of history point 7, 22, 37, 52, 67, 82, or 97.
26	R/O	UINT8	1	History type for history point 7, 22, 37, 52, 67, 82, or 97.
27	R/O	UINT8	1	Detail of history type for history point 7, 22, 37, 52, 67, 82, or 97.
28	R/O	TLP	3	TLP for tag of history point 8, 23, 38, 53, 68, 83, or 98.
29	R/O	TLP	3	TLP for value of history point 8, 23, 38, 53, 68, 83, or 98.
30	R/O	UINT8	1	History type for history point 8, 23, 38, 53, 68, 83, or 98.
31	R/O	UINT8	1	Detail of history type for history point 8, 23, 38, 53, 68, 83, or 98.
32	R/O	TLP	3	TLP for tag for history point 9, 24, 39, 54, 69, 84, or 99.
33	R/O	TLP	3	TLP for value for history point 9, 24, 39, 54, 69, 84, or 99.
34	R/O	UINT8	1	History type for history point 9, 24, 39, 54, 69, 84, or 99.
35	R/O	UINT8	1	Detail of history type for history point 9, 24, 39, 54, 69, 84, or 99.
36	R/O	TLP	3	TLP for tag for history point 10, 25, 40, 55, 70, 85, or 100.
37	R/O	TLP	3	TLP for value for history point 10, 25, 40, 55, 70, 85, or 100.
38	R/O	UINT8	1	History type for history point 10, 25, 40, 55, 70, 85, or 100.
39	R/O	UINT8	1	Detail of history type for history point 10, 25, 40, 55, 70, 85, or 100.
40	R/O	TLP	3	TLP for tag for history point 11, 26, 41, 56, 71, or 86.
41	R/O	TLP	3	TLP for value for history point 11, 26, 41, 56, 71, or 86.
42	R/O	UINT8	1	History type for history point 11, 26, 41, 56, 71, or 86.
43	R/O	UINT8	1	Detail of history type for history point 11, 26, 41, 56, 71, or 86.
44	R/O	TLP	3	TLP for tag for history point 12, 27, 42, 57, 72, or 87.

Point Type 8: Standard History Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
45	R/O	TLP	3	TLP for value for history point 13, 28, 43, 58, 73, or 88.
46	R/O	UINT8	1	History type for history point 13, 28, 43, 58, 73, or 88.
47	R/O	UINT8	1	Detail of history type for history point 13, 28, 43, 58, 73, or 88.
48	R/O	TLP	3	TLP for tag for history point 13, 28, 43, 58, 73, or 88.
49	R/O	TLP	3	TLP for value for history point 13, 28, 43, 58, 73, or 88.
50	R/O	UINT8	1	History type for history point 13, 28, 43, 58, 73, or 88.
51	R/O	UINT8	1	Detail of history type for history point 13, 28, 43, 58, 73, or 88.
52	R/O	TLP	3	TLP for tag for history point 14, 29, 44, 59, 74, or 89.
53	R/O	TLP	3	TLP for value for history point 14, 29, 44, 59, 74, or 89.
54	R/O	UINT8	1	History type for history point 14, 29, 44, 59, 74, or 89.
55	R/O	UINT8	1	Detail of history type for history point 14, 29, 44, 59, 74, or 89.
56	R/O	TLP	3	TLP for tag for history point 15, 30, 45, 60, 75, or 90.
57	R/O	TLP	3	TLP for value for history point 15, 30, 45, 60, 75, or 90.
58	R/O	UINT8	1	History type for history point 15, 30, 45, 60, 75, or 90.
59	R/O	UINT8	1	Detail of history type for history point 15, 30, 45, 60, 75, or 90.

3.2.8 Point Type 10: AGA Flow Calculation

Description: Point Type 10 provides the parameters for the AGA flow calculation.
Number of Logical Points: (0-2) Based on product type and meter setup.

Table 3-11: Point Type 10 – AGA Flow Calculation Parameters

Point Type 10: AGA Flow Calculation Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
0	R/O	FL	4	Differential Pressure (DP) Meter: hw – Meter Differential Pressure Value (Inches H_2O or kPa) Linear Meter: Uncorrected Flow (MCF or km3)
1	R/O	FL	4	Pf – Static Flowing Pressure Value (psi or kPa)
2	R/O	FL	4	Tf – Flowing Temperature Value (°F or °C)
3	R/O	FL	4	Instantaneous Flow (Flow rate per Day) – MCF/Day or km3/Day
4	R/O	FL	4	Instantaneous Energy (Energy rate per Day) – MMBTU/Day or GJ/Day
5	R/O	FL	4	Flow Today – MCF or km3
6	R/O	FL	4	Energy Today – MMBTU or GJ
7	R/O	FL	4	Flow Yesterday – MCF or km3
8	R/O	FL	4	Energy Yesterday – MMBTU or GJ
9	R/O	FL	4	Differential Pressure (DP) Meter: Pressure Extension – hwPf (AGA3) - sqrt(hw) (ISO 5167) Linear Meter: Uncorrected Flow Rate
10	R/O	FL	4	Differential Pressure (DP) Meter: IMV (Integral Multiplier Value) Linear Meter: BMV (Base Multiplier Value)
11	R/O	FL	4	Sample Time (Not used – always 0.0)
12	R/O	FL	4	Differential Pressure (DP) Meter: Expansion Factor (Y) Linear Meter: Fpm
13	R/O	FL	4	Differential Pressure (DP) Meter: Reynolds Number (ReD) Linear Meter: Not used – always 0
14	R/O	FL	4	Differential Pressure (DP) Meter: Ftf (Not used – always 0.0) Linear Meter: Not used – always 0
15	R/O	FL	4	Fpv – Compressibility (Not used – always 0.0) Linear Meter: Not used – always 0
16	R/O	FL	4	Not used – always 0

Point Type 10: AGA Flow Calculation Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
17	R/O	FL	4	Differential Pressure (DP) Meter: AGA 1992 – Cd (Coefficient of discharge) Linear Meter: Ftm
18	R/O	FL	4	Fpb (Not used – always 0.0)
19	R/O	FL	4	Ftb (Not used – always 0.0)
20	R/O	FL	4	Differential Pressure (DP) Meter: Ev-AGA 1992 (Not used – always 0.0) Linear Meter: Not used – always 0
21	R/O	FL	4	Flow Minutes - Not used – always 0

3.2.9 Point Type 12: ROC Clock

Description: Point Type 12 provides the parameters for the ROC clock.
Number of Logical Points: 0 is the only valid logical number.

Table 3-12: Point Type 12 – ROC Clock Parameters

Point Type 12: ROC Clock Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
0	R/O	UINT8	1	Seconds
1	R/O	UINT8	1	Minutes
2	R/O	UINT8	1	Hours
3	R/O	UINT8	1	Day
4	R/O	UINT8	1	Month
5	R/O	UINT8	1	Year
6	R/O	UINT8	1	Leap Year (Not used – always 0)
7	R/O	UINT8	1	Day of Week
8	R/O	UINT8 (6)	1	Time: Seconds, Minutes, Hours, Day, Month, and Year
9	R/O	UINT8	1	Century (Not used – always 0)
10	R/O	UINT8	1	Enables Daylight Savings Time. Valid values are: 0 = Disable 1 = Enable
11	R/O	UINT8	1	Daylight Saving Time Start Hour
12	R/O	UINT8	1	Daylight Saving Time Start Day of Week
13	R/O	UINT8	1	Daylight Saving Time Start Week of Month
14	R/O	UINT8	1	Daylight Saving Time Start Month
15	R/O	UINT32	4	Daylight Saving Time start date and time in binary format (seconds since 1970)
16	R/O	UINT8	1	Daylight Saving Time End Hour
17	R/O	UINT8	1	Daylight Saving Time End Day of Week
18	R/O	UINT8	1	Daylight Saving Time End Week of Month
19	R/O	UINT8	1	Daylight Saving Time End Month
20	R/O	UINT32	4	Daylight Saving Time end date and time in binary format (seconds since 1970)

3.2.10 Point Type 13: System Flag

Description: Point Type 13 provides the parameters for the system flag.
Number of Logical Points: 0 is the only valid logical number.

Table 3-13: Point Type 13 – System Flag Parameters

Point Type 13: System Flag Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
0	R/O	UINT8	1	Indicates the CRC check. Valid values are: (Not used – always 1) 0 = Disabled 1 = Enabled
1	R/O	UINT8	1	Not used – always 0
2	R/O	UINT8	1	Not used – always 0
3	R/O	UINT8	1	Not used – always 0
4	R/O	UINT8	1	Not used – always 0
5	R/O	UINT8	1	Not used – always 0
6	R/O	UINT8	1	Not used – always 0
7	R/O	UINT8	1	Not used – always 0
8	R/O	UINT8	1	RTS test on LOI port (Not used – always 0)
9	R/O	UINT8	1	RTS test on Comm 1 port (Not used – always 0)
10	R/O	UINT8	1	RTS test on Comm 2 port (Not used – always 0)
11	R/O	UINT8	1	Not used – always 0
12	R/O	UINT8	1	Enables I/O scan (Not used – always 0)
13	R/O	UINT8	1	Not used – always 0
14	R/O	UINT8	1	Not used – always 0
15	R/O	UINT8	1	Cold start options (Not used – always 0)
16	R/O	UINT8	1	Warm start (Not used – always 0)
17	R/O	UINT8	1	Read I/O (Not used – always 0)
18	R/O	UINT8	1	Write to config memory (Not used – always 0)
19	R/O	UINT8	1	Config memory write complete (Not used – always 0)
20	R/O	UINT8	1	Enables the event log (Not used – always 0)
21	R/O	UINT8	1	LOI Security: 0 = Disabled 1 = Enabled, managed by password

Point Type 13: System Flag Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
22	R/O	UINT8	1	Comm 1 Security: 0 = Disabled 1 = Enabled, managed by password)
23	R/O	UINT8	1	Comm 2 Security: 0 = Disabled 1 = Enabled, managed by password)
24	R/O	UINT8	1	Not used – always 0
25	R/O	UINT8	1	Pass through mode (Not used – always 0)
26	R/O	UINT8	1	Not used – always 0
27	R/O	UINT8	1	Comm 3 Security: 0 = Disabled 1 = Enabled, managed by password)
28	R/O	UINT8	1	RTS test on Comm 3 port (Not used – always 0)
29	R/O	UINT8	1	Configured number of daily history logs (Not used – always 0)
30	R/O	UINT8	1	History time stamp log: (Not used – always 0) 0 = End of period 1 = Beginning of period
31	R/O	UINT8	1	Archive hourly and daily history on meter setup changes: (Not used – always 0) 0 = Hourly and daily 1 = Hourly only 2 = Neither

3.2.11 Point Type 15: System Variables (ROC Information)

Description: Point Type 15 provides the parameters for the ROC system variables.
Number of Logical Points: 0 is the only valid logical number.

Table 3-14: Point Type 15 – System Variables (ROC Information) Parameters

Point Type 15: System Variables (ROC Information) Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
0	R/W	UINT8	1	Indicates the ROC address.
1	R/W	UINT8	1	Indicates the ROC group.
2	R/O	AC20	20	Indicates the Station Name.
3	R/O	UINT8	1	Indicates the active PIDs.
4	R/O	UINT8	1	Indicates the active AGA meter runs.
5	R/O	UINT8	1	Indicates the number of FST instructions per FST execution cycle. (Not used – always 0)
6	R/O	UINT8	1	Indicates the number of standard history points.
7	R/O	UINT8	1	Indicates the number of extended history points.
8	R/O	UINT8	1	Indicates the number of RAM2/History3 database points. (Not used – always 0)
9	R/O	UINT8	1	Forces End of Day (Not used – always 0)
10	R/W	UINT8	1	Indicates the contract hour.
11	R/O	AC20	20	Indicates the version name (part number).
12	R/O	AC20	20	Provides manufacturing identification.
13	R/O	AC20	20	Indicates the time created.
14	R/O	AC12	12	Provides the unit serial number.
15	R/O	AC20	20	Indicates the customer name.
16	R/O	UINT8	1	Indicates the maximum number of PIDs.
17	R/O	UINT8	1	Indicates the maximum number of AGA meter runs.
18	R/O	UINT8	1	Indicates the maximum number of tanks. (Not used – always 0)
19	R/O	UINT8	1	Indicates the number of FSTs possible. (Not used – always 0)
20	R/O	BIN	1	Indicates the RAM installed. (Not used – always 0)
21	R/O	BIN	1	Indicates the ROM installed. (Not used – always 0)
22	R/O	FL	4	Indicates MPU loading.
23	R/O	BIN	1	Indicates Utilities (Not used – always 0)
24	R/O	UINT16	2	Indicates the type of ROC or FloBoss (107 = FloBoss 107 or FB Series device).

Point Type 15: System Variables (ROC Information) Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
25	R/O	UINT8	1	Indicates the Units flag. Valid values are: 0 = English 1 = Metric (kPa) 2 = Metric (bar)
26	R/O	UINT32	4	Encryption Key 1 (Not used – always 0)
27	R/O	UINT32	4	Encryption Key 2 (Not used – always 0)
28	R/O	UINT32	4	Encryption Key 3 (Not used – always 0)
29	R/O	UINT32	4	Encryption Key 4 (Not used – always 0)
30	R/O	UINT32	4	Encryption Key 5 (Not used – always 0)
31	R/O	UINT32	4	Encryption Key 6 (Not used – always 0)
32	R/O	UINT32	4	Encryption Key 7 (Not used – always 0)
33	R/O	UINT32	4	Encryption Key 8 (Not used – always 0)

3.2.12 Point Type 17: Soft Point

Description: Point Type 17 provides the parameters for soft point data storage.
Number of Logical Points: 8 logicals exist.

Table 3-15: Point Type 17 – Soft Point Parameters

Point Type 17: Soft Point Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
0	R/W	AC10	10	Identifies the point tag.
1	R/W	UINT16	2	Integer flag
2	R/W	FLP	4	Data #1
3	R/W	FLP	4	Data #2
4	R/W	FLP	4	Data #3
5	R/W	FLP	4	Data #4
6	R/W	FLP	4	Data #5
7	R/W	FLP	4	Data #6
8	R/W	FLP	4	Data #7
9	R/W	FLP	4	Data #8
10	R/W	FLP	4	Data #9
11	R/W	FLP	4	Data #10
12	R/W	FLP	4	Data #11
13	R/W	FLP	4	Data #12
14	R/W	FLP	4	Data #13
15	R/W	FLP	4	Data #14
16	R/W	FLP	4	Data #15
17	R/W	FLP	4	Data #16
18	R/W	FLP	4	Data #17
19	R/W	FLP	4	Data #18
20	R/W	FLP	4	Data #19
21	R/W	FLP	4	Data #20
22	R/W	UINT8	1	Event logging: 0 = Log events 1 = Do not log events)

3.2.13 Point Type 19: Database

Description: Point Type 19 provides the parameters for the database.
Number of Logical Points: Logicals 1-60 are mapped to FB Series Station 1, History Points 1-60.
Logicals 61-100 are unmapped and return all zero values.

Table 3-16: Point Type 19 – Database Parameters

Point Type 19: Database Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
0	R/O	FL	4	Identifies the point tag (Not used – always 0,0,0)
1	R/O	UINT8	1	Archive Type: 128 = Average 129 = Accumulate 130 = Current Value 134 = Totalize
2	R/O	UINT8	1	Point Type
3	R/O	UINT8	1	Logical Number
4	R/O	UINT8	1	Parameter Number
5	R/O	FL	4	Last Daily Value (Not used – always 0.0)
6	R/O	FL	4	Last Hour's Total (Not used – always 0.0)
7	R/O	AC10	10	User-specified text typically used for history value units.

3.2.14 Point Type 21: User Defined Point

Description: Point Type 20 provides the parameters for the user defined point.
Number of Logical Points: 20 logicals can be accessed. FB Series devices do not support user programs. All parameters will return zero values when read.

Table 3-17: Point Type 21 – User Defined Point Parameters

Point Type 21: User Defined Point Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
0	R/O	AC20	20	Point Type Description (Not used – always 0)
1	R/O	UINT32	4	Template Pointer (Not used – always 0)
2	R/O	UINT8	1	Number of Parameters (Not used – always 0)
3	R/O	UINT8	1	Display Number (Not used – always 0)

3.2.15 Point Type 40: Multi-Variable Sensor

Description: Point Type 40 provides the parameters for the multi-variable sensor.
Number of Logical Points: (0-2) Based on product type and licensing.

Table 3-18: Point Type 40 – Multi-Variable Sensor Parameters

Point Type 40: Multi-Variable Sensor Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
0	R/W	AC10	10	Provides point tag ID.
1	R/W	UINT8	1	Sensor address
2	R/O	BIN	1	Sensor Configuration: Bit 7 – Sensor Type: (Not used – always 0) 0 = MVS205 1 = 3095FB/4088B
	R/W	BIN	1	Bits 6 through 4 – Not used – always 0 Bit 3 – Failure Mode: 0 = Set to fault value 1 = Hold last good value
	R/O	BIN	1	Bit 2 – Pressure Tap Location (Not used – always 0) 0 = Upstream 1 = Downstream Bit 1 – Calibration Temp: (Not used – always 0) 0 = H_2O at 15.4°C (60°F) 1 = H_2O at 19.8°C (68°F) Bit 0 = Units of Measure: 0 = US 1 = Metric
3	R/W	UINT8	1	Poll Mode: 0 = Off Scan 1 = Normal Poll 2 = Input Freeze 4 = Conf Poll 5 = Set Tag & Addr 6 = Calibrate
4	R/O	UINT8	1	Interface revision

Point Type 40: Multi-Variable Sensor Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
5	R/O	BIN	1	Sensor Status: Bit 7 - Off Scan Flag: 0 = On Scan 1 = Off Scan Bit 6 – 485 Comm Status: 0 = Good 1 = Failed Bit 5 – Sensor Comm Status: 0 = Good 1 = Failed Bit 4 – Input Freeze Flag: 0 = Normal 1 = Frozen Bit 3 – Not used – always 0 Bit 2 – Process Temp Status: 0 = Good 1 = Failure Bit 1 – Static Press Status: 0 = Good 1 = Failure Bit 0 – Diff Press Status: 0 = Good 1 = Failure
6	R/O	BIN	1	Sensor Alarms: Bit 7 – Not used – always 0 Bit 6 – Not used – always 0 Bit 5 – PT High Alarm Bit 4 – AP High Alarm Bit 3 – DP High Alarm Bit 2 – PT Low Alarm Bit 1 – AP Low Alarm Bit 0 – DP Low Alarm
7	R/O	FL	4	Sensor Voltage (Not used – always 0.0)
8	R/W	FL	4	Differential Pressure (DP) Reading

Point Type 40: Multi-Variable Sensor Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
9	R/W	FL	4	Static Pressure (AP) Reading
10	R/W	FL	4	Temperature (PT) Reading
11	R/O	FL	4	DP Reverse Flow
12	R/O	FL	4	DP Static Pressure Effect (Zero Shift)
13	R/O	FL	4	DP Minimum Calibration Point Value
14	R/O	FL	4	DP Mid Point 1 Calibration Value
15	R/O	FL	4	DP Mid Point 2 Calibration Value
16	R/O	FL	4	DP Mid Point 3 Calibration Value
17	R/O	FL	4	DP Maximum Calibration Point Value
18	R/O	FL	4	AP Minimum Calibration Point Value
19	R/O	FL	4	AP Mid Point 1 Calibration Value
20	R/O	FL	4	AP Mid Point 2 Calibration Value
21	R/O	FL	4	AP Mid Point 3 Calibration Value
22	R/O	FL	4	AP Maximum Calibration Point Value
23	R/O	FL	4	PT Minimum Calibration Point Value
24	R/O	FL	4	PT Mid Point 1 Calibration Value
25	R/O	FL	4	PT Mid Point 2 Calibration Value
26	R/O	FL	4	PT Mid Point 3 Calibration Value
27	R/O	FL	4	PT Maximum Calibration Point Value
28	R/O	UINT8	1	Calibration Command (Not used – always 0)
29	R/O	UINT8	1	Calibration Type (Not used – always 0)
30	R/O	FL	4	Calibrate Set Value (Not used – always 0.0)
31	R/O	FL	4	Manual DP Value (used in calibration only)
32	R/O	FL	4	Manual AP Value (used in calibration only)
33	R/O	FL	4	Manual PT Value (used in calibration only)

Point Type 40: Multi-Variable Sensor Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
34	R/O	BIN	1	DP Mode: Bit 7 – Not used – always 0 Bit 6 – SRBX on Set: (Not used – always 0) 0 = Disable 1 = Enable Bit 5 – SRBX on Clear: (Not used – always 0) 0 = Disable 1 = Enable
	R/W	BIN	1	Bit 4 – DP Alarm Enable: 0 = Disable 1 = Enable
	R/O	BIN	1	Bits 3 through 1 – Not used – always 0 Bit 0 – Sensor Alarm Enable (All inputs) (Not used – always 0) 0 = Disabled 1 = Enabled
35	R/O	BIN	1	DP Alarm Code: Bit 7 – Not used – always 0 Bit 6 – Point Fail Bit 5 – Not used – always 0 Bit 4 – Not used – always 0 Bit 3 – Not used – always 0 Bit 2 – High Alarm Bit 1 – Not used – always 0 Bit 0 – Low Alarm
36	R/W	FL	4	DP Low Alarm
37	R/W	FL	4	DP High Alarm
38	R/W	FL	4	DP Deadband
39	R/W	FL	4	DP Alarm Fault Value
40	R/W	BIN	1	AP Mode: Bit 4 – Alarm Enabled: 0 = Disabled 1 = Enabled
	R/O	BIN	1	Bits 7, 6, 5, 3, 2, 1 and 0 – Not used – always 0

Point Type 40: Multi-Variable Sensor Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
41	R/O	BIN	1	AP Alarm Code: Bit 7 – Not used – always 0 Bit 6 – Point Fail Bit 5 – Not used – always 0 Bit 4 – Not used – always 0 Bit 3 – Not used – always 0 Bit 2 – High Alarm Bit 1 – Not used – always 0 Bit 0 – Low Alarm
42	R/W	FL	4	AP Low Alarm
43	R/W	FL	4	AP High Alarm
44	R/W	FL	4	AP Deadband
45	R/W	FL	4	AP Alarm Fault Value
46	R/W	BIN	1	PT Mode: Bit 4 – Alarm Enabled: 0 = Disabled 1 = Enabled
	R/O	BIN	1	Bits 7, 6, 5, 3, 2, 1 and 0 – Not used – always 0
47	R/O	BIN	1	PT Alarm Code: Bit 7 – Not used – always 0 Bit 6 – Point Fail Bit 5 – Not used – always 0 Bit 4 – Not used – always 0 Bit 3 – Not used – always 0 Bit 2 – High Alarm Bit 1 – Not used – always 0 Bit 0 – Low Alarm
48	R/W	FL	4	PT Low Alarm
49	R/W	FL	4	PT High Alarm
50	R/W	FL	4	PT Deadband
51	R/W	FL	4	PT Fault Value
52	R/O	FL	4	PT Bias
53	R/O	FL	4	Static Pressure Offset
54	R/O	UINT16	2	Configuration Change Counter

Point Type 40: Multi-Variable Sensor Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
55	R/O	UINT8	1	Sensor Type: (Not used – always 0) 0 = Unknown 1 = 4088A 2 = 4088B 3 = 3095FB 4 = MVS205

3.2.16 Point Type 41: Run

Description: Point Type 41 provides the run parameters.
Number of Logical Points: (0-2) Based on product type and meter setup.

Table 3-19: Point Type 41 – Run Parameters

Point Type 41: Run Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
0	R/W	AC10	10	Identifies point tag.
1	R/W	FL	4	Atmospheric pressure
2	R/W	BIN	1	Calculation Method: Bit 7 – K Factor Calculation: 0 = Single 1 = Multiple
	R/O	BIN	1	Bits 6 – Not used – always 0
	R/W	BIN	1	Bit 5 – Gas Quality Input Mode: 0 = Constant 1 = Live
	R/O	BIN	1	Bit 4 – BTU Dry: (Always 0) 0 = See Bit 3 1 = As Delivered
	R/W	BIN	1	Bit 3 – BTU Basis: 0 = Dry 1 = Wet Bit 2 – Atmospheric Pressure: 0 = Calculated 1 = Entered
	R/O	BIN	1	Bit 1 – AGA8 Gross Characterization Method: 0 = Gross 2 1 = Gross 1 Bit 0 = AGA8 Characterization Method: 0 = Detailed 1 = Gross
3	R/O	TLP	3	Not used – always 0
4	R/W	FL	4	Pipe reference temperature

Point Type 41: Run Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
5	R/W	UINT8	1	Pipe Material: 0 = SS 1 = Not used – always 0 2 = CS 3 = 304SS 4 = 316SS 5 = Monel400
6	R/O	UINT8	1	Not used
7	R/O	FL	4	Orifice: Cd – AGA 1992 Turbine: Ftm
8	R/O	FL	4	Reynolds Number
9	R/O	FL	4	Orifice: Expansion Factor (Y) Turbine: Fpm
10	R/O	FL	4	Fpb Factor (Not used – always 0.0)
11	R/O	FL	4	Ftb Factor (Not used – always 0.0)
12	R/O	FL	4	Ftf Factor (Not used – always 0.0)
13	R/O	FL	4	Fgr Fator (Not used – always 0.0)
14	R/O	FL	4	Fpv (Compressibility) Factor
15	R/O	UINT8	1	Hist Pt Num 1 – Not used – always 0
16	R/O	UINT8	1	Hist Rollup 1 – Not used - always 0
17	R/O	TLP	3	Hist Param 1 – Not used - always 0,0,0
18	R/O	FL	4	Hist Conversion 1 – Not used - always 0
19	R/O	UINT8	1	Hist Pt Num 2 – Not used – always 0
20	R/O	UINT8	1	Hist Rollup 2 – Not used - always 0
21	R/O	TLP	3	Hist Param 2 – Not used - always 0,0,0
22	R/O	FL	4	Hist Conversion 2 – Not used - always 0
23	R/O	UINT8	1	Hist Pt Num 3 – Not used – always 0
24	R/O	UINT8	1	Hist Rollup 3 – Not used - always 0
25	R/O	TLP	3	Hist Param 3 – Not used - always 0,0,0
26	R/O	FL	4	Hist Conversion 3 – Not used - always 0
27	R/O	UINT8	1	Hist Pt Num 4 – Not used – always 0
28	R/O	UINT8	1	Hist Rollup 4 – Not used - always 0
29	R/O	TLP	3	Hist Param 4 – Not used - always 0,0,0

Point Type 41: Run Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
30	R/O	FL	4	Hist Conversion 4 – Not used - always 0
31	R/O	UINT8	1	Hist Pt Num 5 – Not used – always 0
32	R/O	UINT8	1	Hist Rollup 5 – Not used - always 0
33	R/O	TLP	3	Hist Param 5 – Not used - always 0,0,0
34	R/O	FL	4	Hist Conversion 5 – Not used - always 0
35	R/O	UINT8	1	Hist Pt Num 6 – Not used – always 0
36	R/O	UINT8	1	Hist Rollup 6 – Not used - always 0
37	R/O	TLP	3	Hist Param 6 – Not used - always 0,0,0
38	R/O	FL	4	Hist Conversion 6 – Not used - always 0
39	R/O	UINT8	1	Hist Pt Num 7 – Not used – always 0
40	R/O	UINT8	1	Hist Rollup 7 – Not used - always 0
41	R/O	TLP	3	Hist Param 7 – Not used - always 0,0,0
42	R/O	FL	4	Hist Conversion 7 – Not used - always 0
43	R/O	UINT8	1	Hist Pt Num 8 – Not used – always 0
44	R/O	UINT8	1	Hist Rollup 8 – Not used - always 0
45	R/O	TLP	3	Hist Param 8 – Not used - always 0,0,0
46	R/O	FL	4	Hist Conversion 8 – Not used - always 0
47	R/O	UINT8	1	Hist Pt Num 9 – Not used – always 0
48	R/O	UINT8	1	Hist Rollup 9 – Not used - always 0
49	R/O	TLP	3	Hist Param 9 – Not used - always 0,0,0
50	R/O	FL	4	Hist Conversion 9 – Not used - always 0
51	R/O	UINT8	1	Hist Pt Num 10 – Not used – always 0
52	R/O	UINT8	1	Hist Rollup 10 – Not used - always 0
53	R/O	TLP	3	Hist Param 10 – Not used - always 0,0,0
54	R/O	FL	4	Hist Conversion 10 – Not used - always 0
55	R/O	UINT8	1	Hist Pt Num 11 – Not used – always 0
56	R/O	UINT8	1	Hist Rollup 11 – Not used - always 0
57	R/O	TLP	3	Hist Param 11 – Not used - always 0,0,0
58	R/O	FL	4	Hist Conversion 11 – Not used - always 0
59	R/O	UINT8	1	Hist Pt Num 12 – Not used – always 0
60	R/O	UINT8	1	Hist Rollup 12 – Not used - always 0

Point Type 41: Run Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
61	R/O	TLP	3	Hist Param 12 – Not used - always 0,0,0
62	R/O	FL	4	Hist Conversion 12 – Not used - always 0
63	R/O	UINT8	1	Hist Pt Num 13 – Not used – always 0
64	R/O	UINT8	1	Hist Rollup 13 – Not used - always 0
65	R/O	TLP	3	Hist Param 13 – Not used - always 0,0,0
66	R/O	FL	4	Hist Conversion 13 – Not used - always 0
67	R/O	UINT8	1	Hist Pt Num 14 – Not used – always 0
68	R/O	UINT8	1	Hist Rollup 14 – Not used - always 0
69	R/O	TLP	3	Hist Param 14 – Not used - always 0,0,0
70	R/O	FL	4	Hist Conversion 14 – Not used - always 0
71	R/O	UINT8	1	Hist Pt Num 15 – Not used – always 0
72	R/O	UINT8	1	Hist Rollup 15 – Not used - always 0
73	R/O	TLP	3	Hist Param 15 – Not used - always 0,0,0
74	R/O	FL	4	Hist Conversion 15 – Not used - always 0
75	R/O	UINT8	1	Hist Pt Num 16 – Not used – always 0
76	R/O	UINT8	1	Hist Rollup 16 – Not used - always 0
77	R/O	TLP	3	Hist Param1 6 – Not used - always 0,0,0
78	R/O	FLP	4	Hist Conversion 16 – Not used - always 0

3.2.17 Point Type 42: Extra AGA Run

Description: Point Type 42 provides the extra AGA run parameters.
Number of Logical Points: (0-2) Based on product type and meter setup.

Table 3-20: Point Type 42 – Extra AGA Run Parameters

Point Type 42: Extra AGA Run Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
0	R/W	AC10	10	Identifies point tag.
1	R/O	FLP	4	Flow Today – MCF (km3)
2	R/O	FLP	4	Flow Yesterday – MCF (km3)
3	R/O	FLP	4	Flow Month – MCF (km3)
4	R/O	FLP	4	Flow Previous Month – MCF (km3)
5	R/O	FLP	4	Flow Accumulated (rollover at 1,000,000)
6	R/O	FLP	4	Minutes Today
7	R/O	FLP	4	Minutes Yesterday
8	R/O	FLP	4	Minutes Month
9	R/O	FLP	4	Minutes Previous Month
10	R/O	FLP	4	Minutes Accumulated (rollover at 1,000,000) – MCF (km3)
11	R/O	FLP	4	Energy Today – MMBTU (GJ)
12	R/O	FLP	4	Energy Yesterday – MMBTU (GJ)
13	R/O	FLP	4	Energy Month – MMBTU (GJ)
14	R/O	FLP	4	Energy Previous Month – MMBTU (GJ)
15	R/O	FLP	4	Energy Accumulated (rollover at 1,000,000) – MCF (km3)
16	R/O	FLP	4	Uncorrected Today – MCF (km3)
17	R/O	FLP	4	Uncorrected Yesterday – MCF (km3)
18	R/O	FLP	4	Uncorrected Month – MCF (km3)
19	R/O	FLP	4	Uncorrected Previous Month – MCF (km3)
20	R/O	FLP	4	Uncorrected Accumulation (rollover at 1,000,000) – MCF (km3)
21	R/O	FLP	4	Orifice Plate Bore Diameter at flowing temperature – d
22	R/O	FLP	4	Meter Tube (pipe) Internal Diameter at flowing temperature – D
23	R/O	FLP	4	Beta – Diameter Ratio
24	R/O	FLP	4	Ev (Velocity of Approach) – AGA 1992
25	R/O	FLP	4	Cd (Coefficient of discharge) – AGA 1992

Point Type 42: Extra AGA Run Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
26	R/O	FLP	4	Reynolds Number
27	R/O	FLP	4	Upstream Absolute Static Pressure
28	R/O	FLP	4	Molecular Weight

3.2.18 Point Type 45: Meter Calibration and Sampler

Description: Point Type 45 provides the meter calibration and sampler parameters.
Number of Logical Points: (0-2) Based on product type and meter setup.

Table 3-21: Point Type 45 – Meter Calibration and Sampler Parameters

Point Type 45: Meter Calibration and Sampler Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
0		BIN	1	Calibration Options: Bit 7 – Not used – always 0 Bit 6 – Not used – always 0 Bit 5 – Not used – always 0 Bit 4 – Not used – always 0 Bit 3 – Not used – always 0 Bit 2 – Differential Pressure Deadweight Calibrator (Not used – always 0) Bit 1 – Static Pressure Deadweight Calibrator (Not used – always 0) Bit 0 – Not used – always 0
1	R/O			Not used – always 0
2	R/O			Not used – always 0
3	R/O	FL	4	Calibrated Weights Gravitational Acceleration (Not used – always 0.0)
4	R/O			Not used – always 0
5	R/O			Not used – always 0
6	R/W	FL	4	User Correction Factor
7	R/O	UINT8	1	Sampler Enable. Valid values are: (Not used – always 0) 0 = Disabled 1 = Enabled
8	R/O	FL	4	Sampler Accumulation Trigger (Not used – always 0)
9	R/O	FL	4	Sampler Duration (in seconds) (Not used – always 0)
10	R/O			Not used – always 0
11	R/O			Not used – always 0
12	R/O			Not used – always 0
13	R/O			Not used – always 0
14	R/O	TLP	3	TLP for sampler. Must be discrete output configured in momentary mode. (Not used – always 0,0,0)

3.2.19 Point Type 46: Meter Configuration

Description: Point Type 46 provides the meter configuration parameters.
Number of Logical Points: (0-2) Based on product type and meter setup.

Table 3-22: Point Type 46 – Meter Configuration Parameters

Point Type 46: Meter Configuration Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
0	R/W	AC10	10	Identifies point tag.
1	R/W	AC30	30	Describes point Note: The description truncates to 20 characters.
2	R/W	BIN	1	Calculation Method: Bit 7 – Differential Flow Calculation Standard: 0 = AGA3 1 = ISO5167
	R/O	BIN	1	Bit 6 – RBX on Set: (Not used – always 0) 0 = No RBX 1 = Enable RBX Bit 5 – RBX on Clear: (Not used – always 0) 0 = No RBX 1 = Enable RBX Bit 4 – Meter Run Alarming: (Not used – always 0) 0 = Disabled 1 = Enabled Bit 3 – Units of Measurement: 0 = English 1 = Metric Bit 2 – Log Meter Run Limit Events: (Not used – always 0) 0 = Log Events 1 = Do not log Bit 1 – Flow Calculation Method: 0 = Differential 1 = Linear Bit 0 – Not used – always 0

Point Type 46: Meter Configuration Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
3	R/W	BIN	1	Indicates Calculation Method II: Bit 7 – K-factor Calculation: 0 = Single 1 = Multiple
	R/O	BIN	1	Bit 6 – Not used – always 0
	R/W	BIN	1	Bit 5 – Gas Quality Input Mode: 0 = Constant 1 = Live
	R/O	BIN	1	Bit 4 – Heating Value Delivered Basis: (Not used – always 0) 0 = Ignored 1 = As Delivered Bit 3 – Heating value Dry or Wet Basis: 0 = Dry 1 = Wet
	R/W	BIN	1	Bit 2 – Atmospheric Pressure Source: 0 = Calculated 1 = Entered
	R/O	BIN	1	Bit 1 – AGA8 Gross Characterization Method: 0 = Gross 2 1 = Gross 1 Bit 0 – AGA8 Characterization Method: 0 = Detailed 1 = Gross
4	R/O	BIN	1	Options: Bit 7 – Log Methane Assignment: (Not used – always 0) 0 = Log 1 = Do not log

Point Type 46: Meter Configuration Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
	R/W	BIN	1	Bit 6 – Units for HV, alarm limits, and sample accum: 0 = Mass 1 = Volume Bit 5 – Gravitational Acceleration Source: 0 = Calculate 1 = Entered Bit 4 – Heating Value Source: 0 = Calculate 1 = Entered Bit 3 – Static Pressure Value: 0 = Gauge 1 = Absolute Bit 2 – Static Pressure Tap Location: 0 = Downstream 1 = Upstream Bit 1 – Specific Gravity Source: 0 = Calculate 1 = Entered Bit 0 – Type of pressure tap: 0 = Flange 1 = Pipe
5	R/O	UINT8	1	Contract Hour (Not used – always 0)
6	R/O	FL	4	Integral Multiplier Period – Orifice (minutes) (Not used – always 0) Base Multiplier Period – Turbine (minutes) (Not used – always 0)
7	R/W	FL	4	Pipe Diameter (inches or mm)
8	R/W	FL	4	Pipe Reference Temperature (degrees F or C)
9	R/W	UINT8	1	Pipe Material: 0 = SS 1 = Monel 2 = CS 3 = 304SS 4 = 316SS 5 = Monel400
10	R/W	FL	4	Orifice plate diameter (inches or millimeters)

Point Type 46: Meter Configuration Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
11	R/W	FL	4	Orifice plate reference temperature (degrees F or C)
12	R/W	UINT8	1	Orifice Material: 0 = SS 1 = Not used – always 0 2 = CS 3 = 304SS 4 = 316SS 5 = Monel400
13	R/W	FL	4	Base or contract pressure (psia or kPa)
14	R/W	FL	4	Base or contract temperature
15	R/W	FL	4	Atmospheric pressure
16	R/W	FL	4	Specific gravity
17	R/W	FL	4	Heating value
18	R/W	FL	4	Viscosity
19	R/W	FL	4	Specific Heat Ratio
20	R/W	FL	4	Elevation (ft or m)
21	R/W	FL	4	Latitude (degrees)
22	R/W	FL	4	Local Gravitational Acceleration (Read) Local Gravitational Acceleration (Write)
23	R/W	FL	4	Nitrogen (N_2) composition, in mole %
24	R/W	FL	4	Carbon Dioxide (CO_2) composition, in mole %
25	R/W	FL	4	Hydrogen Sulfide (H_2S) composition, in mole %
26	R/W	FL	4	Water (H_2O) composition, in mole %
27	R/W	FL	4	He Helium
28	R/W	FL	4	Methane (CH_4) composition, in mole %
29	R/W	FL	4	Ethane (C_2H_6) composition, in mole %
30	R/W	FL	4	Propane (C_3H_8) composition, in mole %
31	R/W	FL	4	n-Butane (C_4H_{10}) composition, in mole %
32	R/W	FL	4	i-Butane (C_4H_{10}) composition, in mole %
33	R/W	FL	4	n-Pentane (C_5H_{12}) composition, in mole %
34	R/W	FL	4	i-Pentane (C_5H_{12}) composition, in mole %
35	R/W	FL	4	n-Hexane (C_6H_{14}) composition, in mole %
36	R/W	FL	4	n-Heptane (C_7H_{16}) composition, in mole %

Point Type 46: Meter Configuration Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
37	R/W	FL	4	n-Octane (C_8H_{18}) composition, in mole %
38	R/W	FL	4	n-Nonane (C_9H_{20}) composition, in mole %
39	R/W	FL	4	n-Decane ($C_{10}H_{22}$) composition, in mole %
40	R/W	FL	4	Oxygen (O_2) composition, in mole %
41	R/W	FL	4	Carbon Monoxide (CO) composition, in mole %
42	R/W	FL	4	Hydrogen (H_2) composition, in mole %
43	R/W	FL	4	Differential Meter: Low hw Cutoff Linear Meter: K-factor
44	R/O	FL	4	Differential Meter: Stacked DP High Switch Point (Not used – always 0)
	R/W	FL	4	Linear Meter: Low Flowrate Cutoff
45	R/O	FL	4	Differential Meter: Stacked DP Low Switch Point (Not used – always 0) Linear Meter: Not used – always 0
46	R/O	UINT8	1	Differential Meter: Stacked DP (Not used – always 0) 0 = Disabled 1 = Enabled Linear Meter: Not used – always 0
47	R/O	TLP	3	Differential Meter: Stacked DP Input Definition (Not used – always 0) Linear Meter: Not Used
48	R/O	TLP	3	Differential Meter: hw Input Definition Linear Meter: Uncorrected Flow Rate Input Definition
49	R/O	TLP	3	Static Pressure (Pf) Input Definition
50	R/O	TLP	3	Flowing Temperature (Tf) Input Definition
51	R/W	FL	4	Differential Meter: Current Differential Pressure Linear Meter: Uncorrected Flow Rate
52	R/W	FL	4	Current Pf – Flowing Pressure
53	R/W	FL	4	Current Tf – Flowing Temperature

Point Type 46: Meter Configuration Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
54	R/O	BIN	1	Alarm Code: Bit 7 – Manual Mode: (Not used – always 0) 0 = No alarm 1 = In alarm Bit 6 – No Flow: (Not used – always 0) 0 = No alarm 1 = In alarm Bit 5 – Flow Rate Register Discrepancy (Not used – always 0) Bit 4 – Total Counts Register Discrepancy (Not Used – always 0) Bit 3 – Not used – always 0
	R/O	BIN	1	Bit 2 – High Alarm 0 = No alarm 1 = In alarm
	R/O	BIN	1	Bit 1 – Not used – always 0
	R/O	BIN	1	Bit 0 – Low Alarm 0 = No alarm 1 = In alarm
55	R/W	FL	4	Low Alarm Flow Limit
56	R/W	FL	4	High Alarm Flow Limit
57	R/W	UINT8	1	History Averaging Technique: 1 = Flow-dependent time-weighted linear averaging 2 = Flow-dependent time-weighted formulaic averaging 3 = Flow-weighted linear averaging 4 = Flow-weighted formulaic averaging 5 = Linear averaging
58	R/O	UINT8	1	Full Recalculation Flag: (Not used – always 0) 0 = No recalc active 1 = Force full recalc)
59	R/O	TLP	3	Differential Meter: Not used – always 0 Linear Meter: Input definition for multiple K-factor calculation
60	R/O	FL	4	Differential Meter: Not used – always 0 Linear Meter: Deadband for multiple K-factor calculation (Not used – always 0)

Point Type 46: Meter Configuration Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
61	R/W	FL	4	Differential Meter: Not used – always 0 Linear Meter: Lowest K-factor
62	R/W	FL	4	Differential Meter: Not used – always 0 Linear Meter: 2nd K-factor
63	R/W	FL	4	Differential Meter: Not used – always 0 Linear Meter: 3rd K-factor
64	R/W	FL	4	Differential Meter: Not used – always 0 Linear Meter: 4th K-factor
65	R/W	FL	4	Differential Meter: Not used – always 0 Linear Meter: 5th K-factor
66	R/W	FL	4	Differential Meter: Not used – always 0 Linear Meter: Lowest K-factor EU
67	R/W	FL	4	Differential Meter: Not used – always 0 Linear Meter: 2nd K-factor EU
68	R/W	FL	4	Differential Meter: Not used – always 0 Linear Meter: 3rd K-factor EU
69	R/W	FL	4	Differential Meter: Not used – always 0 Linear Meter: 4th K-factor EU
70	R/W	FL	4	Differential Meter: Not used – always 0 Linear Meter: 5th K-factor EU
71	R/W	FL	4	Differential Meter: Not used – always 0 Linear Meter: 6th K-factor
72	R/W	FL	4	Differential Meter: Not used – always 0 Linear Meter: 7th K-factor
73	R/W	FL	4	Differential Meter: Not used – always 0 Linear Meter: 8th K-factor
74	R/W	FL	4	Differential Meter: Not used – always 0 Linear Meter: 9th K-factor
75	R/W	FL	4	Differential Meter: Not used – always 0 Linear Meter: 10th K-factor
76	R/W	FL	4	Differential Meter: Not used – always 0 Linear Meter: 11th K-factor

Point Type 46: Meter Configuration Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
77	R/W	FL	4	Differential Meter: Not used – always 0 Linear Meter: Highest K-factor
78	R/W	FL	4	Differential Meter: Not used – always 0 Linear Meter: 6th K-factor EU
79	R/W	FL	4	Differential Meter: Not used – always 0 Linear Meter: 7th K-factor EU
80	R/W	FL	4	Differential Meter: Not used – always 0 Linear Meter: 8th K-factor EU
81	R/W	FL	4	Differential Meter: Not used – always 0 Linear Meter: 9th K-factor EU
82	R/W	FL	4	Differential Meter: Not used – always 0 Linear Meter: 10th K-factor EU
83	R/W	FL	4	Differential Meter: Not used – always 0 Linear Meter: 11th K-factor EU
84	R/W	FL	4	Differential Meter: Not used – always 0 Linear Meter: Highest K-factor EU
85	R/W	FL	4	Argon (Ar) composition; units are mole percentage
86	R/O	BIN	1	Configuration status, byte 4: Bit 7 – Not used – always 0 Bit 6 – Not used – always 0 Bit 5 – Not used – always 0
	R/W	BIN	1	Bit 4 – Source of the Joule-Thomson coefficient: 0 = Calculate 1 = Entered Bit 3 – Calculation of the upstream temperature: 0 = Disabled 1 = Enabled

Point Type 46: Meter Configuration Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
	R/O	BIN	1	Bit 2 – Temperature tap location: (Not used – always 0) 0 = Downstream 1 = Upstream Bit 1 – Flow rate time basis for alarming: (Not used – always 0) 0 = Daily rate 1 = Hourly rate Bit 0 – Source of the pressure loss in % (Not used – always 0) 0 = Calculate 1 = Entered
87	R/W	UINT32	4	Differential Meter: Not used – always 0 Linear Meter: No flow time limit in seconds
88	R/W	UINT8	1	Differential Meter: ISO 5167 Meter Type. Valid values are: 0 = Orifice Flange 1 = Orifice Corner Tap 2 = Orifice D and D/2 Taps 10 = Venturi Tube Linear Meter: Not used – always 0
89	R/W	FL	4	User Venturi Coefficient of Discharge
90	R/W	FL	4	Alarm Deadband
91	R/O	FL	4	ISO5167 Pressure Loss
92	R/W	FL	4	ISO5167 Joule-Thompson coefficient
93	R/W	BIN	1	API Options: Bit 7 – Not used – always 0 Bit 6 – Not used – always 0 Bit 5 – Not used – always 0 Bit 4 – Not used – always 0 Bit 3 – Not used – always 0 Bit 2 – Not used – always 0 Bit 1 – Expansion Factory Calculation: 0 = AGA3 1992 1 = AGA3 2011 Bit 0 – API 21.1 Averaging Technique: (Not used – always 0) 0 = Before 2011 1 = 2011

3.2.20 Point Type 47: Meter Flow

Description: Point Type 47 provides the meter flow parameters.
Number of Logical Points: (0-2) Based on product type and meter setup.

Table 3-23: Point Type 47 – Meter Flow Parameters

Point Type 47: Meter Flow Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
0	R/O	FL	4	Flow rate per day (MCF/Day or km3/Day)
1	R/O	FL	4	Energy rate per day (MMBTU/Day or GJoules/Day)
2	R/O	FL	4	Flow rate per hour (CF/Hr or m3/Hr)
3	R/O	FL	4	Energy rate per hour (BTU/Hr or MJoules/Hr)
4	R/O	FL	4	Differential Meter: Pressure Extension Linear Meter: Uncorrected Flow
5	R/O	FL	4	Differential Meter: Expansion Factor Linear Meter: Fpm
6	R/O	FL	4	Differential Meter: CdFT Linear Meter: Not used – always 0
7	R/O	FL	4	Orifice: Fm (Not used – always 0.0) Turbine: Ftm
8	R/O	FL	4	Base pressure factor (Fpb) (Not used – always 0.0)
9	R/O	FL	4	Base temperature factor (Ftb) (Not used – always 0.0)
10	R/O	FL	4	Flowing temperature factor (Ftf) (Not used – always 0.0)
11	R/O	FL	4	Real gas relative density factor (Fgr) (Not used – always 0.0)
12	R/O	FL	4	Supercompressibility factor (Fpv) (Not used – always 0.0)
13	R/O	FL	4	Compressibility at standard conditions (Zs)
14	R/O	FL	4	Compressibility at base conditions (Zb)
15	R/O	FL	4	Compressibility at flowing conditions (Zf1)
16	R/O	FL	4	Orifice: Integral Multiplier Value (IMV) Turbine: Base Multiplier Value (BMv)
17	R/O	FL	4	Differential Meter: Orifice Plate Bore Diameter at flowing conditions (D) Linear Meter: Not used – always 0
18	R/O	FL	4	Differential Meter: Meter Tube Internal Diameter at flowing conditions (D) Linear Meter: Not used – always 0
19	R/O	FL	4	Differential Meter: Diameter Ratio (Beta)

Point Type 47: Meter Flow Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
				Linear Meter: Not used – always 0
20	R/O	FL	4	Differential Meter: Velocity of Approach (Ev) Linear Meter: Not used – always 0
21	R/O	FL	4	Differential Meter: Average hw Linear Meter: Total counts during last BMP (if pulse input)
22	R/O	FL	4	Average flowing pressure (Pf)
23	R/O	FL	4	Average flowing temperature (Tf)
24	R/O	FL	4	Flowing Density
25	R/O	FL	4	Base Density
26	R/O	FL	4	Differential Meter: Reynolds Number Linear Meter: Not used – always 0
27	R/O	FL	4	Differential Meter: Upstream Static Pressure Linear Meter: Not used – always 0
28	R/O	FL	4	Molecular weight
29	R/O	FL	4	Fam - Not used – always 0
30	R/O	FL	4	Fwt - Not used – always 0
31	R/O	FL	4	Fwl - Not used – always 0
32	R/O	FL	4	Local gravitation correction for deadweight tester static pressure (F_{pwl}) (Not used – always 0)
33	R/O	FL	4	Local gravitation correction for deadweight tester diff pressure (F_{pwl}) (Not used – always 0)
34	R/O	FL	4	Fhgm - Not used – always 0
35	R/O	FL	4	Fhgt - Not used – always 0
36	R/O	FL	4	Volumetric flow today (MCF or km3)
37	R/O	FL	4	Volumetric flow yesterday (MCF or km3)
38	R/O	FL	4	Volumetric flow this month (MCF or km3)
39	R/O	FL	4	Volumetric flow for previous month (MCF or km3)
40	R/O	FL	4	Volumetric accumulated flow since the last reset (MCF or km3)
41	R/O	FL	4	Minutes of flow today
42	R/O	FL	4	Minutes of flow yesterday
43	R/O	FL	4	Minutes of flow this month
44	R/O	FL	4	Minutes of flow for the previous month
45	R/O	FL	4	Accumulated minutes of flow since the last reset
46	R/O	FL	4	Energy Today (MMBTU or GJoules)
47	R/O	FL	4	Energy Yesterday (MMBTU or GJoules)

Point Type 47: Meter Flow Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
48	R/O	FL	4	Energy this Month (MMBTU or GJoules)
49	R/O	FL	4	Energy for the Previous Month (MMBTU or GJoules)
50	R/O	FL	4	Energy accumulated since the last reset (MMBTU or GJoules)
51	R/O	FL	4	Uncorrected Today (MCF or km3)
52	R/O	FL	4	Uncorrected Yesterday (MCF or km3)
53	R/O	FL	4	Uncorrected Month (MCF or km3)
54	R/O	FL	4	Uncorrected Previous Month (MCF or km3)
55	R/O	FL	4	Uncorrected Accumulation (MCF or km3)
56	R/O	UINT8	1	Partial Recalculation Flag: (Not used – always 0) 0 = No recalc 1 = Partial recalc 2 = Full recalc)
57	R/O	UINT8	1	Redundant Flow Rate per Day – Not used – always 0
58	R/O	UINT8	1	Redundant Total Counts – Not used – always 0
59	R/O	UINT32	4	Differential Meter: Not used – always 0 Linear Meter: Accumulated Pulses
60	R/O	UINT8	1	Current Flow Status: (Not used – always 0) 0 = Not flowing 1 = Flowing)
61	R/O	FL	4	Daily Mass Flow Rate (Mlb/Day or Tonnes/Day)
62	R/O	FL	4	Hourly Mass Flow Rate (lb/Hr or kg/Hr)
63	R/O	FL	4	Mass Flow Today (Mlb or Tonnes)
64	R/O	FL	4	Mass Flow Yesterday (Mlb or Tonnes)
65	R/O	FL	4	Mass Flow Current Month (Mlb or Tonnes)
66	R/O	FL	4	Mass Flow Previous Month (Mlb or Tonnes)
67	R/O	FL	4	Mass Flow Accumulated since last reset (Mlb or Tonnes)
68	R/O	BIN	1	Flow calculation configuration:

Point Type 47: Meter Flow Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
				Bit 7 – Not used – always 0 Bit 6 – Not used – always 0 Bit 5 – Not used – always 0 Bit 4 – Not used – always 0 Bit 3 – Phase of Fluid: 0 = Gas 1 = Liquid Bit 2 – Flow Calculation Basis: (Not used – always 0) 0 = Volumetric 1 = Mass Bit 1 – Source of Properties Calculation: (Not used – always 0) 0 = Firmware 1 = User Program Bit 0 – Source of Flow Calculation: (Not used – always 0) 0 = Firmware 1 = User Program
69	R/O	FL	4	Differential Meter: Not used – always 0 Linear Meter: AGA7: Pressure multiplier (Pf / Pb)
70	R/O	FL	4	Differential Meter: Not used – always 0 Linear Meter: AGA7: Temperature multiplier (Tb / Tf)
71	R/O	FL	4	Differential Meter: Not used – always 0 Linear Meter: AGA7: Compressibility multiplier (Zb / Zf)
72	R/O	AC20	20	Description of the standard used to calculate the flow rates of the fluid (Not used – always blank)
73	R/O	AC20	20	Description of the standard used to calculate the properties of the fluid (Not used – always blank)
74	R/O	FL	4	Returns 0
75	R/O	UINT8	1	Heating value table in use: (Not used – always 0) 0 = GPA2145-09 1 = ISO6976@15°C 2 = ISO6976@20°C

3.2.21 Point Type 48: PID Control

Description: Point Type 48 provides the PID control parameters.
Number of Logical Points: (0-3) Based on product type and licensing.

Table 3-24: Point Type 48 – PID Control Parameters

Point Type 48: PID Control Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
0	R/W	AC10	10	Identifies the point tag.
1	R/W	BIN	1	Control Type: Bit 7 – PID Scanning Status: 0 = Enabled 1 = Disabled Bit 6 – Setpoint Tracks PV in Manual: 0 = Enabled 1 = Disabled
	R/O	BIN	1	Bit 5 – Not used
	R/W	BIN	1	Bit 4 – Scanning Status After Restart: 0 = Enable scanning 1 = Disable scanning Bit 3 – Primary/Override Selection: 0 = Low select 1 = High select Bit 2 – Output Type: 0 = Analog 1 = High Discrete Bit 1 – Primary/Override: 0 = Primary only 1 = Primary and override Bit 0 – Source of Flow Calculation: 0 = Manual 1 = Automatic

Point Type 48: PID Control Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
2	R/O	UINT8	1	Active Loop Status: 0 = Inactive 1 = Primary controlling 2 = Override controlling)
3	R/W	FL	4	Loop Period (in seconds)
4	R/O	FL	4	Actual Loop Period (in seconds)
5	R/W	TLP	3	Primary PV Input Point TLP
6	R/W	FL	4	Setpoint of primary loop
7	R/W	FL	4	Maximum setpoint change rate of the primary loop
8	R/W	FL	4	Primary Proportional Gain
9	R/W	FL	4	Primary Reset (Integral) Gain
10	R/W	FL	4	Primary Rate (Derivative) Gain
11	R/O	FL	4	Primary Scale Factor (Not used – always 0)
12	R/O	FL	4	Primary Integral Deadband (Not used – always 0)
13	R/W	FL	4	Primary loop process variable (PV)
14	R/O	FL	4	Change in output calculated by the primary loop
15	R/W	TLP	3	TLP for the process variable fo the override loop.
16	R/W	FL	4	Setpoint of the override loop
17	R/W	FL	4	Maximum setpoint change rate of the override loop
18	R/W	FL	4	Proportional gain of the override loop
19	R/W	FL	4	Override Reset (Integral) Gain
20	R/W	FL	4	Derivative gain of the override loop; units are minutes.
22	R/O	FL	4	Integral deadband of the override loop (Not used – always 0)
23	R/W	FL	4	Process variable (PV) of the override loop
24	R/O	FL	4	Change in output calculated by the override loop
25	R/O	FL	4	Current Output of PID
26	R/W	TLP	3	PID Output Point (AO or Open DO)
27	R/W	TLP	3	Second Output of PID (Close DO)
28	R/W	FL	4	Low limit of the value written to the AO or to the DO for decreases
29	R/W	FL	4	High limit of the value written to the AO or to the DO for increases

Point Type 48: PID Control Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
30	R/O	UINT8	1	Control Loop Selection: (Not used – always 0) 0 = Accept change from either loop 1 = Accept change from primary only 2 = Accept change from override only)
31	R/O	FL	4	Returns 0
32	R/O	AC10	10	Primary Loop PV and Setpoint Units (Not used – always 0)
33	R/O	AC10	10	Override PV Look and Setpoint Units (Not used – always 0)
34	R/O	AC10	10	PID Output Units (Not used – always 0)
35	R/O	FL	4	Low EU value for the primary loop's and setpoint for LCD bar graph. (Not used – always 0.0)
36	R/O	FL	4	High EU value for the primary loop's PV and setpoint for LCD bar graph. (Not used – always 0)
37	R/O	FL	4	Low EU value for the override loop's PV and setpoint for LCD bar graph. (Not used – always 0)
38	R/O	FL	4	High EU value for the override loop's PV and setpoint for LCD bar graph. (Not used – always 0)

3.2.22 Point Type 86: Extended History

Description: Point Type 86 provides the extended history parameters.
Number of Logical Points: 1 logical for up to 50 extended history points.
Parameters 2-41 are mapped to FB Series User Periodic Group 1 history points 1-10.
Parameters 42-201 are unmapped and will return zero values for all parameters

Table 3-25: Point Type 86 – Extended History Parameters

Point Type 86: Extended History Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
0	R/O	UINT8	1	Maximum number of extended history points
1	R/O	UINT8	1	Log Interval (in minutes) (1-60)
2	R/O	TLP	3	Tag TLP for history point 1 (Not used – always 0)
3	R/O	TLP	3	Value TLP for history point 1
4	R/O	UINT8	1	Archive type for history point 1: 128 = Average 129 = Accumulate 130 = Snapshot 134 = Totalize
5	R/O	UINT8	1	Average/Rate Type for history point 1: 0 = No Detail 1 = Minimum Value 2 = Maximum Value 5 = Linear Average 10 = 1 Second Accumulation Period
6	R/O	TLP	3	Tag TLP for history point 2 (Not used – always 0,0,0)
7	R/O	TLP	3	Value TLP for history point 2
8	R/O	UINT8	1	Archive type for history point 2
9	R/O	UINT8	1	Average/Rate Type for history point 2
10	R/O	TLP	3	Tag TLP for history point 3 (Not used – always 0,0,0)
11	R/O	TLP	3	Value TLP for history point 3
12	R/O	UINT8	1	Archive type for history point 3
13	R/O	UINT8	1	Average/Rate Type for history point 3
14	R/O	TLP	3	Tag TLP for history point 4 (Not used – always 0,0,0)
15	R/O	TLP	3	Value TLP for history point 4

Point Type 86: Extended History Parameters				
Parameter #	**Access**	**Data Type**	**Length**	**Description**
16	R/O	UINT8	1	Archive type for history point 4
17	R/O	UINT8	1	Average/Rate Type for history point 4
18	R/O	TLP	3	Tag TLP for history point 5 (Not used – always 0,0,0)
19	R/O	TLP	3	Value TLP for history point 5
20	R/O	UINT8	1	Archive type for history point 5
21	R/O	UINT8	1	Average/Rate Type for history point 5
22	R/O	TLP	3	Tag TLP for history point 6 (Not used – always 0,0,0)
23	R/O	TLP	3	Value TLP for history point 6
24	R/O	UINT8	1	Archive type for history point 6
25	R/O	UINT8	1	Average/Rate Type for history point 6
26	R/O	TLP	3	Tag TLP for history point 7 (Not used – always 0,0,0)
27	R/O	TLP	3	Value TLP for history point 7
28	R/O	UINT8	1	Archive type for history point 7
29	R/O	UINT8	1	Average/Rate Type for history point 7
30	R/O	TLP	3	Tag TLP for history point 8 (Not used – always 0,0,0)
31	R/O	TLP	3	Value TLP for history point 8
32	R/O	UINT8	1	Archive type for history point 8
33	R/O	UINT8	1	Average/Rate Type for history point 8
34	R/O	TLP	3	Tag TLP for history point 9 (Not used – always 0,0,0)
35	R/O	TLP	3	Value TLP for history point 9
36	R/O	UINT8	1	Archive type for history point 9
37	R/O	UINT8	1	Average/Rate Type for history point 9
38	R/O	TLP	3	Tag TLP for history point 10 (Not used – always 0,0,0)
39	R/O	TLP	3	Value TLP for history point 10
40	R/O	UINT8	1	Archive type for history point 10
41	R/O	UINT8	1	Average/Rate Type for history point 10
42-198	R/O	TLP	3	Tag TLP for history point 11-25 (Not used – always 0,0,0)
43-199	R/O	TLP	3	Value TLP for history point 11-25 (Not used – always 0,0,0)
44-200	R/O	UINT8	1	Archive type for history point 11-25 (Not used – always 0)
45-201	R/O	UINT8	1	Average/Rate Type for history point 11-25 (Not used – always 0)

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Section 4: CRC-16 Code and Example

The ROC protocol applies a cyclical redundancy check (CRC) to the message string to produce a 16-bit remainder. This remainder is referred to as the CRC-16 code. The CRC-16 code is appended to the end of the message string.

The ROC uses the 16-bit polynomial CRC-16:

X16 + X15 + X2 + 1

The ROC uses the standard GPLIB CRC routine, and calculates CRC by table lookup, with the initial condition of 0000 (zeros).

For example, the activity of a host computer setting an operator identification in a ROC364 is logged in the events for subsequent configuration changes by the host computer.

ROC Address		Host Address		Opcode	Data Length	8 Data Bytes			CRC	
unit	group	Unit	group	-	# of bytes	d1	d2	d3	lsb	msb
1	2	1	0	17	3	'M'	'O'	'C'	133	24

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Section 5: IEEE Floating Point Format

In general, the FB Series devices uses IEEE format for binary representation of floating-point numbers (see ANSI/IEEE standard 754-1985 for further details).

The single-precision (4-byte) floating-point format consists of a 1-bit sign (s), an 8-bit biased exponent (e), and a 23-bit mantissa (m):

MSB			LSB
seeeeeee	emmmmmmm	mmmmmmmm	mmmmmmmm
31 – 24	23 – 16	15 – 18	7 – 0

where:

MSB = most significant byte

LSB = least significant byte

However, in the ROC protocol, the bytes of each floating-point number are returned in the following order:

Floating-Point format:

LSB		LSB+1		MSB-1		MSB	
7	0	15	8	23	16	31	24

Likewise for integers:

Integer format:

LSB		MSB	
7	0	15	8

Long Integer format:

LSB		LSB+1		MSB+1		MSB	
7	0	15	8	23	16	31	24

Note:

For signed integers, the MSB contains the sign in its highest numbered bit.

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Index

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