Linear Meter Flow Calculation Program (For the FloBoss 107)

User Manual (QER 08Q026)

Form A6261 October 2008



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1 INTRODUCTION

1.1 Scope and Organization

This document serves as the user manual for the Linear Meter Flow Calculation User Program (QER 08Q026), which is intended for use in a FloBoss[™] 107 (FB107). This manual describes how to download and configure this program (referred to as the "Linear Meter program" or "the program" throughout the rest of this manual). You access and configure this program using ROCLINK[™] 800 Configuration Software (version 1.80 or greater) loaded on an IBM[®]-compatible personal computer (PC) running Windows[®] 2000 (with Service Pack 2), Windows XP, or Windows Vista.

The sections in this manual provide information in a sequence appropriate for first-time users. Once you become familiar with the procedures and the software running in a FB107, the manual becomes a reference tool.

This manual has the following major sections:

- Section 1 Introduction
- Section 2 Installation
- Section 3 Configuration
- Section 4 Reference

This manual assumes that you are familiar with the FB107 and its configuration. For more information, refer to the following manuals:

- FloBoss 107 Flow Manager Instruction Manual (Form A6206)
- ROCLINK 800 Configuration Software User Manual (for FB107) (Form A6217)

1.2 Product Overview

The Linear Meter program allows a FB107 to interface with meters whose flow input is proportional to either the mass flow or the uncorrected volumetric flow. Meter types with a flow input that is proportional to the uncorrected volumetric flow include turbine, vortex, ultrasonic, and positive displacement meters. Meter types with flow input that is proportional to the mass flow include Coriolis meters. Volume and mass flow rates and totals are calculated and stored for both volumetric and mass meters. The program uses the corresponding meter run point in the FB107's firmware to store Linear Meter calculated values and accumulations. Additional configuration parameters are located in the program's user-defined point types.

You enable the Linear Meter calculation for meter runs with Linear Meter hardware installed. With the calculation enabled, the FB107 bypasses the standard meter run flow calculations and performs the Linear Meter calculation instead. All standard meter run parameters, as well as the additional Linear Meter parameters, are available for assignment to Modbus registers, PID control loops, historical archiving, and FST functions.

The program is designed to calculate flows of natural gas and other related hydrocarbons, as defined in *AGA Report #8, 1992* edition and included in the FB107 firmware, or fluids whose properties are provided by a separate user program installed in the FB107. The only fluid properties used by the Linear Meter program are the flowing and base densities.

1.3 Program Requirements

You download the Linear Meter program to—and then run it from—the Flash and RAM memory on the FloBoss 107 with firmware version 1.10 (or greater). Download and configure the program using the ROCLINK 800 Configuration software version 1.80 (or greater).

The downloadable program is:

File Name	Target Unit/	User Defined	Flash Used	DRAM Used	ROCKLINK 800	Display
	Version	Point (UDP)	(in bytes)	(in bytes)	Version	Number
LinearMeter_5.bin	1.10	31, 32	8,265	16,384	1.80	32, 33

Note: You must connect a PC to the FloBoss's LOI port before starting the download.

For information on viewing the memory allocation of user programs, refer to the *ROCLINK 800 Configuration Software User Manual (for FB107)* (Form A6217).

2 INSTALLATION

This section provides instructions for installing the Linear Meter program into the FB107. Read *Section 1.3* of this manual for program requirements.

2.1 Downloading the Program

This section provides instructions for installing the user program into FloBoss memory.

Note: Connect a PC to the FloBoss's LOI port before starting the download.

To download the user program:

- 1. Start and logon to ROCLINK 800.
- 2. Select ROC > Direct Connect to connect to the FloBoss unit.
- **3.** Select **Utilities** > **User Program Administrator** from the ROCLINK menu bar. The User Program Administrator screen displays (see *Figure 1*):

User Program Administrator		? 🛛
User Programs Installed in Device		
1 - No Program 2 - No Program 3 - No Program 4 - No Program 5 - No Program 6 - No Program	Name: No Program Version : Created : CRC : 0x0 Entry Pt : Displays :	Library Version : DRAM Used : 0 FLASH Used : 0
Clear Start Stop	Status : Empty	
Download User Program File		
		Browse
Name :		Download & Start Download
Version :		
Created :		
CRC:		
Size :		
)		Dipdate Close

Figure 1. User Program Administrator

- **4.** Click **Browse** in the Download User Program File frame. The Select User Program File screen displays (see *Figure 2*).
- **5.** Select the path and user program file to download from the CD-ROM. (Program files are typically located in the Program Files folder on the CD-ROM). As *Figure 2* shows, the screen lists all valid user program files with the .BIN extension:

Select User Pro	gram File					? 🗙
Look in:	Program Files		•	(-	r 🔝 📩	
My Recent Documents	LinearMeter_5					
My Documents						
My Computer	File <u>n</u> ame:	LinearMeter_5			•	<u>O</u> pen
	Files of type:	User Programs (*.bin)			•	Cancel

Figure 2. Select User Program File

6. Click **Open** to select the program file. The User Program Administrator screen displays. As shown in *Figure 3*, note that the Download User Program File frame identifies the selected program and that the **Download & Start** button is active:

	User Program Administrator		? 🛛
	User Programs Installed in Device		
	1 - No Program 2 - No Program 3 - No Program 4 - No Program 5 - No Program 6 - No Program	Name : No Program Version : Created : CRC : 0x0 Entry Pt :	Library Version : DRAM Used : 0 FLASH Used : 0
		Displays :	
	Clear Start Stop	Status : Empty	
	Download User Program File	vin	(Browse)
	Name : Linear Meter Version : Rev. 1.01 <u>Created : 16/57</u> 2008 4:09:45 PM CBC : 0x38E		Download & Start Download
-	Size : 8265		
			Dipdate Close

Figure 3. User Program Administrator

7. Click **Download & Start** to begin loading the selected programs. The following message displays:



Figure 4. Confirm Download

Note: For the FB107, ROCLINK800 assigns program positions based on memory allocations. For this reason, the Linear Meter program automatically installs as program 5.

8. Click **Yes** to begin the download. During the download, the program performs a warm start, creates an event in the event log, and—when the download completes—displays the following message:

ROCLIN	K 800 🛛 🔀
٩	Download & Start User Program COMPLETED.
	ОК

Figure 5. ROCLINK 800 Download Confirmation

- 9. Click OK. The User Program Administrator screen displays (see *Figure 6*). Note that:
 - The User Programs Installed in Device frame identifies the loaded program.
 - The Status field indicates that the program is running.

	User Program Administrator		? 🛛
<	User Programs Installed in Device 1 - No Program 2 - No Program 3 - No Program 4 - No Program 5 - Linear Meter 6 - No Program	Name : Linear Meter Version : Rev. 1.01 Created : 10/09/2008 16:09:45 CRC : 0x38E Entry Pt : 0x5E0000 Displays : 32, 33	Library Version : Rev. 1 DRAM Used : 16384 FLASH Used : 8265
	Clear Start Stop Download User Program File	bin	Browse
	J		Update Close

Figure 6. User Program Administrator

10. Click **Close** and proceed to *Section 3* to configure the program.

3 CONFIGURATION

After you have downloaded and started the Linear Meter program, you configure the program and view calculation results using the ROCLINK 800 software. To do this, you use two program-specific screens (Linear Meter Setup and Linear Meter Values):

- Use the Linear Meter Setup screen to set the parameters for the meter run.
- Use the Linear Meter Values screen to view results from the Linear Meter calculations.
- **Note:** Configure history points after you configure the Linear Meter program. To configure history points, refer to *Table 7-2. EFM History Points (AGA 7)* in *Section 10.2* of the *ROCLINK800 Configuration Software User Manual (for FloBoss 107), Form A6217.*

E ROCLINK 800 - [On Line - Com1 - FB107	- FB107]	http://www.chicagotribune.com/entertainment/sns-ap-mccain-foo-fighters.0.993881.
Eile Edit View ROC Configure Meter Utili	ties <u>T</u> ools <u>W</u> indow <u>H</u> elp	_ 8 ×
🗅 🚅 🖬 시 타 🖻 🗇 🎥 약 역	🖲 va 19 🐜 ka 🏦 🗗 🍣 🛞 🗳 🕍 🗉	₽ ? №
Image: Solution of the soluti	O O <th>Image: Section 1 Section 1 Section 1 Image: Section 1 Expansion Rack Deviation 2 Nov 17, 2006 8:32</th>	Image: Section 1 Section 1 Section 1 Image: Section 1 Expansion Rack Deviation 2 Nov 17, 2006 8:32
<		
		ON-LINE 3:08 PM

Figure 7. ROCLINK 800

3.1 Linear Meter Setup Screen

Once you have successfully loaded the Linear Meter program into the FloBoss, you can access the Linear Meter Setup screen and configure the meter runs.

To access this screen:

- 1. Click User Program > Linear Meter > Display #32, Linear Meter Setup from the ROCLINK configuration tree:
- 2. Double-click #1, Meter #1. The Linear Meter screen displays (see *Figure 14*):

E ROCLINK 800 - [Linear Meter Setup]			
Elle Edit View ROC Configure Meter Utilities Tools	Window Help		- 8 ×
D 🛎 🖬 X 🖻 🛍 🍜 🕮 🍹 🔍 🔍 🖊	🐜 M- III- 🛱 冬 🤆) 🎴 📑 🗖 📑 ! ? 🌾	
Point Number : 1 - Meter #1 💌 Program Status: 1	Program Running	Active Calculations	^
		Flow: Coriolis	
Meter Tag: Meter #1 Meter Description: Meter #1 Des	cription	Fluid Props: JAGA8-92 Detailed	
General Inputs Advanced Fluid Properties Sampl	er Calibration Factors Alar	rms	
11 III III III III III		EL 41 1	
Linear Meter Meter Type	Alarms, and Sampler	C Enabled	
Enabled Mass (Coriolis)	Volume	Disabled	
C Disabled	C Mass		
Base Multiplier Value			
BMV: 1.0	Minutes		
Aurophice Track sizes			
Averaging Technique Elow Dependent Linear			
C Flow Dependent Formulaic			
C Flow Weighted Linear			
C Flow Weighted Formulaic			
Active Flow Alarms: None			
<u>P</u> rint	Save As Auto Scan	D Dpdate Close	Apply
•			
Point Type 31		ON-LINE	3:19 PM

Figure 8. Linear Meter Setup

- **Note:** Six fields at the top of the screen (Point number, Program Status, Meter Tag, Meter Description, Active Calculations Flow, and Active Calculations Fluid Props) appear on all tabs.
- 3. Review—and change as necessary—the values in the following fields:

Field	Description
Point Number	Selects the meter run to configure. Click \checkmark to display all defined instances. Clicking a different meter run causes the screen to display the values for that meter run.

Field	Description
Program Status	This read-only field shows the current state of the user program. Valid values are: Program Not Loaded , Program Loaded – Not Started , Program Running , Program Shutting Down , and Not Running – Library Version Error.
Meter Tag	Sets the unique identifier for the selected meter.
Meter Description	Sets the description of the selected meter.
Flow	This read-only field shows the flow calculation standard currently performing flow calculations for the selected meter run.
Fluid Props	This read-only field shows the properties calculation standard currently performing properties calculations for the selected meter run.

4. Click Apply to save your changes, and proceed to *Section 3.1.1* to configure the General tab.

3.1.1 Linear Meter Setup Screen – General Tab

Use the General tab (which displays when you access the Linear Meter Setup screen) to enable the Linear Meter calculation, specify the averaging technique used by the program, and define program-specific options.

ROCLINK 800 - [Linear Meter Setup]	
Ele Edit <u>V</u> iew <u>R</u> OC <u>C</u> onfigure <u>M</u> eter <u>U</u> tilities <u>T</u> ools <u>W</u> indow <u>H</u> elp	_ 8 ×
D 😅 🖬 3, 🖻 🛍 49 92 強 44 44 14 🐜 14 👖 7 🖗 28 🗳 14 💕 12 12 12 12 12 12 12 1	
Point Number : 1 • Meter #1 Program Status: Program Running Flow: Calculations Flow: Coriolis	
Meter Tag: Meter #1 Meter Description: Meter #1 Description Fluid Props: AGA8-92 Detailed	
General Inputs Advanced Fluid Properties Sampler Calibration Factors Alarms	
Linear Meter Meter Type Units for Heating Value, Flow Alarming Enabled Disabled Base Multiplier Value BMV: 1.0 Minutes Flow Alarming Enabled Plow Alarming Enabled Disabled Base Multiplier Value BMV: 1.0 Minutes Flow Alarming Enabled	
C Flow Weighted Linear	
Active Flow Alarms: None	
<u>Print</u> <u>Save As</u> <u>Auto Scan</u> Dedate <u>Dose</u> !	
Point Type 31 ON-LINE	3:19 PM

Figure 9. Linear Meter, General Tab

1. Review—and change as necessary—the values in the following fields:

Field	Description
Linear Meter	Enables or disables the Linear Meter program to perform the flow calculations for the selected meter run. Valid selections are Enabled or Disabled.
Meter Type	Sets the type of meter associated with the meter run. Valid selections are Volume (volume metering device such as a turbine meter) or Mass (Micro Motion Coriolis Mass Meter or similar mass meter). This field is hidden when the Linear Meter is Disabled for the meter run.
Units for Heating Value, Alarms, and Sampler	Sets the type of units used for heating value, alarms, and sampler of the meter run. Valid selections are Volume, (units are BTU/CF or MJ/M3, Ft ³ or M3, etc) and Mass (units are BTU/Lb or MJ/Kg, Lb or Kg, etc).
Flow Alarming	Enables or disables flow alarming for the meter. If enabled, alarm status changes are added to the Alarm Log. Use the Alarms tab to configure the alarms. If disabled, no alarm generates for this meter, regardless of the alarm configuration.

Field	Description		
Base Multiplier Period (BMP) or Integral Multiplier Period (IMP)	Sets, in minutes, how frequently the system recalculates the fluid properties and resulting Base Multiplier Value (BMV) (per the API measurement standard <i>Chapter 21, Section 1</i>). If the flow calculation for the meter run is AGA3-92, ISO5167-2003, or another calculation standard where the flow input is a differential pressure, this field is labeled Integral Multiplier Period (IMP).		
Averaging Technique	Sets the averaging technique for determining the average static pressure and flowing temperature during each BMP/IMP for the meter run. If the flow input is from a differential pressure meter, the average differential pressure is also determined. For further details, see API measurement standard <i>Chapter 21, Section 1, Appendix B.</i> Valid selections are:		
	Flow Dependant Linear	Calculates the average static pressure and average flowing temperature with equal weighting given to each sample when there is flow through the meter. For samples in which there is no flow, the value is not included in the average. However, if there is no flow during the BMP/IMP, averages are determined using all of the samples.	
	Flow Dependant Formulaic	Calculates averages for the static pressure and flowing temperature where each sample is raised to the power to which the parameter is raised in the flow equation, with equal weighting given to each sample when there is flow through meter. For samples where there is no flow, the value is not included in the averaging. However, if there is no flow during the BMP/IMP, averages are determined using all of the samples. At the end of the BMP/IMP, the resulting average is raised to the reciprocal of the power to which the value is raised in the flow equation.	
		Note: Flow Dependent Linear and Flow Dependent Formulaic averaging yield the same result when used with linear meters.	
	Flow Weighted Linear	Calculates averages for the static pressure and flowing temperature with weighting for a sample being the ratio of the flow through the meter at the time of the sample to the total flow during the BMP/IMP. For samples where there is no flow, the value is not included in the average. However, if there is no flow during the BMP/IMP, averages are determined using all of the samples.	
	Flow Weighted Formulaic	 Calculates averages for the static pressure and flowing temperature where each sample is raised to the power to which the parameter is raised in the flow equation, with weighting for a sample being the ratio of the flow at the time of the sample to the total flow during the BMP/IMP. For samples where there is no flow, the value is not included in the average. However, if there is no flow during the BMP/IMP, averages are determined using all of the samples. At the end of the BMP/IMP, the resulting average is raised to the reciprocal of the power to which the value is raised in the flow equation. With a linear meter, flow weighted formulaic averaging yields the same result as flow weighted linear averaging. Note: Flow Weighted Linear and Flow Weighted Formulaic averaging yield the same result when used with linear meters. 	

Field	Description
Active Flow Alarms	This display-only field shows any alarm currently active. For example, Low indicates that the calculated flow is below the Low Alarm limit. Other alarms can include High , No Flow , and Manual Mode .

2. Click Apply to save any changes, and proceed to *Section 3.1.2* to configure the Inputs tab.

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GA8-92 Detailed

3.1.2 Linear Meter Setup – Inputs Tab

Use the Inputs tab to define the inputs used by the Linear Meter calculation.

To access this screen:

1. Select the Inputs tab on the Linear Meter Setup screen. One of the following four screens display:

🚟 ROCLINK 800 - [Linear Meter Setup]	🚰 ROCLINK 800 - [Linear Meter Setup]
Eile Edit View ROC Configure Meter Utilities Iools Window Help	Ele Edit View ROC Configure Meter Utilities Tools Window Help
- D 🖆 🖬 X 🖻 🖻 🤃 🕼 🗣 🔍 🍕 M H 🐜 M H 🖥 🎜 冬 🛇 🖺 🚰 U 💕 ? N	! 📃 🖻 🖶 X 🖻 🛍 🔗 💷 🍹 🔍 🍳 M 🕂 ቚ M 🕂 🖉 冬 🕑 🖺 💕 L
Point Number: 1 - Meter #1 Image: Program Status: Program	Point Number: 1 · Meter #1 Image: Program Status: Program Running Active Calcula d Meter Tag: Meter #1 Meter Description: Meter #1 Description Fluid Propr:
General Inputs Advanced Fluid Properties Sampler Calibration Factors Alarms Values //0 Definition Values Values Values Values Values C Enabled © Dinabled Static Pressue: AIN A3, EU 150.0 PSIG Puder/C1 (Hz) No Flow Time: 10 secs 50.0 Deg F 0.0 0.0 Static K Factor: 0.1723 pulses/C1 0.0 0.0 0.0 0.0 1 0.0 0.0 0.0 0.0 0.0 0.0 0.0 Static K Factor: 0.1723 pulses/C1 0.0 0.0 0.0 0.0 0.0 1 0.0 0.0 0.0 0.0 0.0 0.0 0.0 1.0 0.0	General Inputs Advanced Fluid Properties Sampler Calibration Factors Alarms Uncorrected Volume: [SFP 1, DATA1

Figure 10(a). Linear Meter Setup, Inputs tab (Meter Type is Volume, I/O Definition is a PI Point)

(Meter Type is Volume, I/O Definition is	s a PI Point) (Mete	er Type is Volume, I/O Definitio	n is an Analog Value)
ROCLINK 800 - [Linear Meter Setup]	E ROCLINK	800 - [Linear Meter Setup]	
Elle Edit View ROC Configure Meter Utilities Tools Window Help	Ele Edit	⊻iew ROC ⊆onfigure Meter Utilities Iools Window Help	
D 😂 🖶 X 🖻 🖻 🚳 🖬 🍃 🔍 🤍 / // 🔸 🕪 🎜 🍣 谷 🎴	📓 🖂 💕 🤶 🕅	X 🖻 🖻 🥔 😼 🔍 🔍 M M ቚ 🕪 🗗 🎜	' 冬 🕑 🖺 📑 📃 📑 🛛 ? 🌾
Point Number : 1 - Meter #1 Program Status: Program Running Acti	Point Number :	1 - Meter #1 Program Status: Program Running	Active Calculations
Meter Tag: Meter #1 Meter Description: Meter #1 Description Flui	id Props: AGA8-92 Detailed Meter Tag: N	feter #1 Meter Description: Meter #1 Description	Fluid Props: AGA8-92 Detailed
General Inputs Advanced Fluid Properties Sampler Calibration Factors Alarm: I/O Definition Values Values Values Values Values Static Pressure: AIN A3, EU [50.0 Peg F Pill 1 0 No Flow Time: 10 secs 5 0 3 0 4 0 5 0 9 0 0 11 10 11 11 12 12 11 12	Factors General abled © Disabled Mass Static Frequency Static 0 0.0 0 0 0.0 0 0 0.0 0 0 0.0 0 0 0.0 0 0 0.0 0 0 0.0 0 0 0.0 0 0 0.0 0 0 0.0 0 0 0.0 0	Input: Advanced Fluid Properties Sampler Calibration Factors I/O Definition Values SFP 1, DATA1 225, 5273 MIb/Day Pressure: AIN A3, EU 150.0 PSIG erature: AIN A10, EU 50.0 Deg F Flow Cutof: 1.0 MIb/Day : K Factor: 0.3379921 putres/Lb	s Alarms

Figure 10(c). Linear Meter Setup, Inputs tab (Meter Type is Mass, I/O Definition is a PI Point)

Figure 10(d). Linear Meter Setup, Inputs tab (Meter Type is Mass, I/O Definition is an Analog Value)

Figure 10(b). Linear Meter Setup, Inputs tab

Note: The Linear Meter Enabled/Disabled selection on the General tab must be set to Enabled to view this tab.

2. Review—and change as necessary—the values in the following fields:

Field	Description
Uncorrected Volume	Sets the parameter for the uncorrected volume flow rate from the meter. Click display the Select TLP dialog box you use to assign the parameter. The units for the uncorrected volume value are MCF/Day or kM ³ /Day.
	If the parameter for the uncorrected volume flow rate is from a PI point, select parameter 13 (EU). If the parameter for the uncorrected volume flow rate is an analog value, select that parameter.
	Note : This field displays only if the meter type is volume.
Mass	Sets the parameter for the mass flow rate from the meter. Click display the Select TLP dialog box you use to assign the parameter. The units of the mass are Mlb/Day or Tonnes/Day.
	If the parameter for the mass flow rate is from a PI point, select parameter 13 (EU). If the parameter for the mass is an analog value, select that parameter.
	Note: This field displays only if the meter type is mass (Coriolis).
Static Pressure	Sets the parameter for the static pressure. Click to display the Select TLP dialog box you use to assign the parameter. The units for the static pressure are PSIG/PSIA or kPa(g)/kPa(a).
Temperature	Sets the parameter for the flowing temperature of the fluid. Click to display the Select TLP dialog box you use to assign the parameter. The units for the flowing temperature are Deg F or Deg C.
No Flow Time	Sets the amount of time without a pulse, in seconds, before the no flow status is set.
	Note : This field displays only if the I/O Definition for the flow rate parameter is a PI point.
Low Flow Cutoff	Sets the low flow cutoff point. When the value of the flow input parameter is less than or equal to this value, the calculated flow rate is set to zero and, if alarming is enabled, the No Flow alarm status is set and an entry is made in the Alarm Log. The units of the low flow cutoff are MCF/Day or kM ³ /Day.
	Note : This field displays only if the I/O Definition for the flow rate parameter is an analog value.
Static K Factor	Sets the K factor when the variable K factor is disabled or the I/O definition for the flow rate parameter is an analog value. If the flow rate parameter is an analog value, pulses are generated from the analog value and added to the total pulses stored in parameter 59 of point type 47.
	If the variable K factor is enabled, the static K factor is the last K factor calculated from the variable K factor table.
	The K factor is the number of pulses per unit of flow. The units are pulses/Cf, pulses/M3, pulses/Lb, or pulses/Kg.
Variable K Factors	Enables the use of the variable K Factor table and sets the K Factor values over a range of pulse frequencies. The units of the values of the K Factor are pulses/Cf, pulses/M ³ , pulses/Lb, or pulses/Kg. The units of the pulse frequencies are Hz. If this field is Disabled , the Static K Factor is used.
	Note : These fields displays only if the I/O Definition for the flow rate parameter is a PI point.

3. Click Apply to save any changes, and proceed to *Section 3.1.3* to configure the Advanced tab.

3.1.3 Linear Meter Setup Screen – Advanced Tab

Use the Advanced tab to define additional meter run information for the Linear Meter flow calculation.

To access this screen:

1. Select the **Advanced** tab on the Linear Meter Setup screen. One of the following two screens display:

🖀 ROCLINK 800 - [Linear Meter Setup]	🖀 ROCLINK 800 - [Linear Meter Setup]
Ele Edit View ROC Configure Meter Utilities Tools Window Help r	Ele Edit View ROC Configure Meter Utilities Tools Window Help
D 📽 🖬 🙏 📾 📾 🥔 🕸 '등 약 약 사 귀 🐝 사 🏦 🎜 🏈 🖺 달 빈 💕 ? 🥴	D 📽 🖬 🗼 📾 📾 📾 🕸 🦻 역 역 🕢 개 🐜 🕪 🏴 🗦 冬 🛇 🖺 🔮 🔟 💕 🤉 💖
Point Number : 1 - Meter #1 Program Status: Program Running Pick Point Number : 1 - Meter #1 Program Status: Program Running Pick Pick Pick Pick Pick Pick Pick Pick	Point Number: 1 - Meter #1 Program Status: Program Running Point Calculations Prov. [Corolis Pr
Meter Tag: Meter #1 Meter Description Meter #1 Description Philo Propr: (AGA8-32 Detailed	Meter Tag: Meter #1 Meter Description: Meter #1 Description Fluid Props: [AlsA8-92 Detailed
General Inputs Advanced Fluid Properties Sampler Calibration Factors Alarms	General Inputs Advanced Fluid Properties Sampler Calibration Factors Alarms
Atmospheric Pressure Gravitational Acceleration	Atmospheric Pressure Gravitational Acceleration
Calculate (* Enter (* Calculate (* Enter	C Calculate C Enter
14.45 PSIA [32.14398 Ft/Sec2	14.45 PSIA 32.14398 Ft/Sec2
	Correction for Pressure Effect on Mass Flow Accuracy
Base Pressure: 14.73 PSIA	Base Pressure: 14.73 PSIA
Base Temperature: 60.0 Deg F	Base Temperature: 60.0 Deg F Calibration Pressure: 100.0 PSIG
Elevation: 500.0 Feet	Elevation: 500.0 Feet Pressure Effect: -0.002 %/PSI
Latitude: 35.0 Deg	Latitude: 35.0 Deg Note: The flow computer implementation of the correction for pressure effect on mass flow accuracy requires the Pressure Effect to be entered as a negative number as indicated in the sensor product data sheet.
Force Recalculation Limit Meter Events Pressure Tap © Set © Enabled © Gauge © Dear © Disabled © Absolute	Force Recalculation Limit Meter Events Pressure Tap C Set C Enabled C Gauge C Clear C Disabled C Absolute

Figure 11(a). Linear Meter Setup, Advanced tab (Meter Type is Volume)

Figure 11(b). Linear Meter Setup, Advanced tab (Meter Type is Mass)

Note: The Linear Meter Enabled/Disabled selection on the General tab must be set to Enabled to view this tab.

2. Review—and change as necessary—the values in the following fields:

Field	Description
Atmospheric Pressure	Sets how the program determines atmospheric pressure (absolute) at the metering location. Valid selections are Calculate (calculate atmospheric pressure from other parameters defined on this screen) or Enter (use the value, either as PSIA or kPa(a), entered in the field in this frame). The default is Enter .
	Note: If you select Enter, the value must be greater than zero.
Gravitational Acceleration	Sets how the program determines gravitational acceleration at the metering location. Valid selections are Calculate (calculate gravitational acceleration from other parameters defined on this screen) or Enter (use the value, either as Ft/Sec ² or M/Sec ² , entered in the field in this frame). The default is Calculate .
	Note: If you select Enter, the value must be greater than zero.
Base Pressure	Sets, in PSIA or kPa(a), the flow measurement base pressure specified in the gas contract.
Base Temperature	Sets, in degrees Fahrenheit or degrees Celsius, the flow measurement base temperature specified in the gas contract.

Field	Description	
Elevation	Sets, in feet or meters above sea level, the elevation of the metering location.	
Latitude	Sets, in degrees, the latitude of the metering location.	
Correction for Pressure Effect on	Enables or disables the correction of the mass flow input due to pressure effects.	
Mass Flow Accuracy	Note: This field displays only if the meter type is mass (Coriolis).	
Calibration Pressure	Sets the calibration pressure of the mass flow meter for determining the pressure effect correction of the mass flow input. Units are PSIG or kPa(g).	
	Note: This field displays only if the meter type is mass (Coriolis).	
Pressure Effect	Sets the coefficient for the effect of pressure on the mass flow accuracy. Units are %/PSI or %/kPa.	
	Note: The flow computer implementation of the correction for pressure effect on mass flow accuracy requires the Pressure Effect to be entered as a negative number as indicated in the sensor product data sheet.	
Force Recalculation	Forces the program to recalculate the flow without waiting for the next normal recalculation. Select Set and click Apply to force the recalculation.	
	Note: You define normal recalculation periods using the Base Multiplier Period field (located on the Linear Meter Setup screen's General tab).	
Limit Meter Events	Sets whether the FB107 logs all flow-related events. Valid selections are Enabled (log all events) or Disabled (do not log events).	
Pressure Tap	Sets the reference of the static pressure. This field must match how the sensor or transmitter actually measures the static pressure. Valid selections are Gauge and Absolute.	

3. Click **Apply** to save any changes, and proceed to *Section 3.1.4* to configure the Fluid Properties tab.

3.1.4 Linear Meter Setup Screen – Fluid Properties Tab

Use the Fluid Properties tab to define the fluid composition and other properties.

To access this screen:

1. Select the Fluid Properties tab on the Linear Meter Setup screen.

ROCLINK 800 - [Linear Meter Setup]			
	is Tools Window Help _ & X		
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Point Number : 1 - Meter #1 Progra	am Status: Program Running Flow: Calculations		
Meter Fag. Meter #1 Meter Description. Me	ever #1 Description		
General Inputs Advanced Fluid Properties Sampler Calibration Factors Alarms			
Nitrogen: 1.0 Heptane:	0.0 • Detailed C Gross1 C Gross2		
CO2: 0.0 Octane:	0.0 Calculate Calculate		
Methane: 96.0 Nonane:	0.0 1025.0 BTU/CF		
Ethane: 3.0 Decane: [0.0 Heating Value Basis		
Propane: 0.0 H2S:			
n-Butane: 0.0 Water:	0.0 C Calculate Enter		
i-Butane: 0.0 Helium:	0.0		
n-Pentane: 0.0 Oxygen:			
i-Pentane: 0.0 CO:	0.0 So Heat Bation 1.3		
Hexane: 0.0 Hydrogen:			
Argon:	0.0 Gas Quality Constant C Live		
Total Mole %:	100 Log Methane Adjust		
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Print Save As Auto Scan 🔀 Update Close ! Apply			
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Point Type 31	ON-LINE 3:33 PM		

Figure 12. Linear Meter Setup, Fluid Properties tab

Note: The Linear Meter Enabled/Disabled selection on the General tab must be set to Enabled and the active fluid properties calculation must be AGA8-92 to view this tab.

2. Review—and change as necessary—the values in the following fields:

Field	Description	-	
Composition	Sets the mole p Detailed, the val Method is Gross Method is Gross	Sets the mole percent for each gas component. If the FPV Method is Detailed, the value in the Total Mole % field must equal 100%. If the FPV Method is Gross1, only the mole % of CO_2 must be entered. If the FPV Method is Gross2, the mole % of CO_2 and the mole % of N_2 must be entered.	
FPV Method	Sets the method calculations. Val	d of determining the compressibility factors for AGA8 lide selections are:	
	Detailed	Requires the natural gas composition in mole percent to be entered for all components.	
	Gross1	Requires the specific gravity of the natural gas, the real gas gross heating value per unit volume, and the	

Field	Description		
		mole % of CO_2 to be entered.	
FPV Method (continued)	Gross2	Requires the specific gravity of the natural gas, the mole % of CO_2 , and the mole % of N_2 to be entered.	
	Note : If you choose either Gross1 or Gross2 , you must manually enter values for Specific Gravity and Heating Value on this screen. Gross2 only requires a value for Heating Value if you're calculating the gas energy flow.		
	While the Detailed method provides the highest accuracy in a broad range of measurement conditions, you can use either of the Gross methods when:		
	 Temperature 	e is between 32°F and 130°F (0°C and 54°C).	
	 Pressure is b 	petween 0 and 1200 PSIA (0 and 8274 kPa(a)).	
	 Gas compos AGA8 report 	ition is within the Normal range, as defined in the 1992.	
Heating Value	Sets how the system determines the heating value of the gas. Valid selections are Calculate (allow the system to calculate the heating value from the gas composition data) or Enter (use the value specified in the energy calculation).		
	Note: Set the Units for the General tal units (BTU/CF	<i>or Heating Value, Alarms, and Sampler</i> parameter on b to select volume or mass measurement in English or BTU/Lb) or metric units (MJ/M ³ or MJ/Kg).	
Heating Value Basis	Identifies the basis the system uses to determine the heating value for flow or energy calculations. Valid selections are:		
	Dry	No water vapor present in gas.	
	Wet	Saturated water vapor present in gas.	
		Note : When you select this option, the FB107 calculates the mole percentage of water based on the algorithm from IAPWS—IF97 standards and adjusts the other mole percentages accordingly.	
	As Delivered	Gas may contain some water vapor.	
Specific Gravity	 Sets the ratio of the molar mass of the gas to the molar mass of the air. Value selections are Calculate (the system calculates the value) and Enter (use the specific value for the flow calculation). Note: If you select Enter, the value should represent the gas at standard conditions and cannot be less that 0.07. 		
Viscosity	Sets the dynamic viscosity of the flowing gas. Units are Lbm/Ft-Sec (English units) or cP (metric units).		
Sp Heat Ratio	Sets the specific heat ratio of the gas (defined as the specific heat of the gas at constant pressure divided by the specific heat of the gas at constant volume). Accepted practice for natural gas applications is to use a value of 1.3, which was used to develop the expansion factor tables in the AGA 3 Report – Part 3. If entered, the value must be greater than zero.		
Gas Quality	Sets the source for the gas compositions and other properties. Valid selections are Constant (readings are manually entered and changes are added to the event log) or Live (readings come from a gas chromatograph or are periodically downloaded from a host and changes are not added to the event log).		

Field	Description
Log Methane Adjust	Sets if system adjustments to the methane composition are added to the event log. Valid selections are Enabled (adjustments are added to the event log) or Disabled (adjustments are not added to the event log).

3. Click **Apply** to save any changes, and proceed to *Section 3.1.5* to configure the Sampler tab.

3.1.5 Linear Meter Setup Screen – Sampler Tab

Use the Sampler tab to set up the discrete output (DO) to send a pulse output to another device, such as an odorizer, or to control a gas sampler for a meter run.

To access this screen:

1. Select the **Sampler** tab on the Linear Meter Setup screen.

ROCLINK 800 - Linear Meter Setup	
Point Number : 1 - Meter #1 Program Status: Program Running	
Flow: Juonois	
Meter Tag: Meter #1 Meter Description: Meter #1 Description	
General Inputs Advanced Fluid Properties Sampler Calibration Factors Alarms	
C Exabled	
Output Print II. J. G	
oupuk roinik. jonderined	
Sampler Accum: 1000.0 CF	
Sampler Duration: 1.0 Seconds	
Print Save As Auto Scan 🕅 Undate Close	Applu
Point Type 31 ON-LINE	3:33 PM

Figure 13. Linear Meter Setup, Sampler tab

Note: The Linear Meter Enabled/Disabled selection on the General tab must be set to Enabled to view this tab.

2. Review—and change as necessary—the values in the following fields:

Field	Description
Sampler Control	Enables sampling for the meter run. When enabled, the Output Point is set when the previous flow matches or exceeds the value in the Sampler Accum field.
Output Point	Sets the parameter for the output to drive the sampler. Clickto display the Select TLP dialog box you use to define the parameter. It must be parameter 3 of a DO point.
Sampler Accum	Sets the quantity of fluid that must pass before the status of the Output Point is set. Units are Cf, M^3 , Lb, or Kg based on the Units Type for Heating Value, Alarms, and Sampler on the General tab.

Field	Description
Sampler Duration	Sets the duration, in seconds, for holding the status of the Output Point to ON when the quantity of fluid passed matches or exceeds the Sampler Accum.

3. Click **Apply** to save any changes, and proceed to *Section 3.1.6* to configure the Calibration Factors tab.

3.1.6 Linear Meter Setup Screen – Calibration Factors Tab

Use the Calibration Factors tab to define information related to pressure calibration.

To access this screen:

1. Select the Calibration Factors tab on the Linear Meter Setup screen.

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Elle Edit View ROC Configure Meter Utilities Tools Window Help	_ 7 ×
 D 🖆 🖬	
Point Number : 1 · Meter #1 Program Status: Program Running Flow: Coriolis Flow: Coriolis Flow: Coriolis	
Meter Tag: Meter #1 Meter Description: Meter #1 Description	
General Inputs Advanced Fluid Properties Sampler Calibration Factors Alarms	
Dead Weight Calibration	
© No	
C Yes	
Calibrated Gray Accel	
32.14398 Ft/Sec2	
User Correction Factor: 1.0	
Print Save As Auto Scan Dose	
Point Tune 21	>3/24 PM
UN-EINE	0.041 M

Figure 14. Linear Meter Setup, Calibration Factor tab

Note: The Linear Meter Enabled/Disabled selection on the General tab must be set to Enabled to view this tab.

2. Review—and change as necessary—the values in the following fields:

Field	Description
Dead Weight Calibration: Static Pressure	Sets if the program compensates the static pressure value for the difference between the gravitational acceleration at the location where the static pressure was calibrated and the gravitational acceleration associated with the dead weight calibrator.
Calibrated Gravitational Acceleration	Sets the gravitational acceleration associated with the dead weight calibrator. The units are Ft/Sec ² or M/Sec ² .
User Correction Factor	Sets a multiplier value to adjust the flow for factors not included with the Linear Meter User program.
	Note: Use the default value of 1.0 if no correction is desired.

3. Click **Apply** to save any changes, and proceed to *Section 3.1.7* to configure the Alarms tab.

3.1.7 Linear Meter Setup Screen – Alarms Tab

Use the Alarms tab to define information related to flow alarming.

To access this screen:

1. Select the Alarms tab on the Linear Meter Setup screen.

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Elle Edit View ROC Configure Meter Utilities Tools Window Help	_ 7 ×
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Point Number : 1 - Meter #1 Program Status: Program Running Flow: Coriolis	
Meter Tag: Meter #1 Meter Description: Meter #1 Description Fluid Props: [AGA8-32 Detailed	
General Inputs Advanced Fluid Properties Sampler Calibration Factors Alarms Flow Alarms Time Basis for Alarming Alarm on Daily Flow Rate Alarm on Hourly Flow Rate Low Alarm Limit: 0.0 MCF/Day High Alarm Limit: 10000.0 MCF/Day Alarm Deadband: 0.0 MCF/Day BBX Alarming On Alarm Set On Alarm Set and Clear 	
Print Save As Auto Scan 🔁 Update Diose ! 🛆	pply 🚽
	<u> </u>
Point Type 31 ON-LINE 3:	34 PM 🛛 🍂

Figure 15. Linear Meter Setup, Alarms tab

- **Note:** The Linear Meter Enabled/Disabled selection on the General tab must be set to Enabled to view this tab.
- 2. Review—and change as necessary—the values in the following fields:

Field	Description
Time Basis for Alarming	Sets the parameter whose value is to be used for alarming. If Alarm on Daily Flow Rate is selected, the daily volume or mass flow rate is used for alarming. If Alarm on Hourly Flow Rate is selected, the hourly volume or mass flow rate is used for alarming. The use of the volume or mass flow rate is dependent on the Units Type for Heating Value, Alarms, and Sampler on the General tab.
Low Alarm Limit	Sets the value below which the calculated flowrate must fall to generate a low alarm. The units are MCF/Day, CF/Hour, Mlb/Day, Lb/Hour, kM ³ /Day, M ³ /Hour, Tonnes/Day, or Kg/Hour.

Field	Description		
High Alarm Limit	Sets the value above which the calculated flowrate must rise to generate a high alarm. The units are MCF/Day, CF/Hour, Mlb/Day, Lb/Hour, kM ³ /Day, M ³ /Hour, Tonnes/Day, or Kg/Hour.		
Alarm Deadband	Sets a value that defines a zone above the Low Alarm limit and below the High Alarm limit. When an alarm condition is set, the flowrate must clear the alarm limit plus the zone defined by the deadband, before the alarm condition clears. This deadband prevents the system from setting and clearing the alarm continuously when the input value is oscillating around the alarm limit. The units are MCF/Day, CF/Hour, Mlb/Day, Lb/Hour, kM ³ /Day, M ³ /Hour, Tonnes/Day, or Kg/Hour.		
RBX Alarming	Sets alarming options for initiating Report-by-Exception messages. These messages are sent out through communication ports that have RBX mode enabled.		
	Disabled	RBX Alarming is turned off.	
	On Alarm Set	When the point enters an alarm condition, the FB107 generates a Report-by-Exception message to the host.	
	On Alarm Clear	When the point leaves an alarm condition, the FB107 generates a Report-by-Exception message to the host.	
	On Alarm Set and Clear	In either condition, an RBX message generates to the host.	

3. Click **Apply** to save any changes.

4. Click **Close** to close this screen, and proceed to *Section 3.2* to configure the Linear Meter Values screen.

3.2 Linear Meter Values Screen

Use this screen to view the results and calculation factors used in Linear Meter calculations

To access this screen:

- 1. Click User Program > Linear Meter > Display #32, Linear Meter Values from the ROCLINK configuration tree:
- 2. Double-click #1, Meter #1. The Linear Meter Values screen displays:

ROCLINK 800 - [Linear Meter	Values]			
Eile Edit View ROC Configure	<u>M</u> eter <u>U</u> tilities <u>T</u> ool	s <u>W</u> indow <u>H</u> elp		_ 8 ×
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Point Number : 1 - Meter #1 💌	Program Status: Pr	rogram Running	Active Calculations	_
,	-		Flow: Coriolis	
Meter Tag: Meter #1 Meter [Description: Meter #1 Des	scription	Fluid Props: AGA8-92 Detailed	
Values Factors				
Input Values				
Uncompensated f	dass: 255.6273 Mlb/D)ay		
Static Pres	sure: 150.0 PSIG			
Flowing Temper	ature: 50.0 Deg F	-		
Current Flow Rates Volume	Enera	וע	Mass	
242922.8 Cf/Hour	24899580	0.0 BTU/Hour	10661.8 Lb/Hour	
5830.146 MCF/Da	y 5975.9	MMBTU/Day		
Accumulation	MCE	MMBTU MIK	Minutes	
Today:	1720.841 1	763.866 75.52704	425.0333	
Yesterday:	5830.146 5	975.899 255.8832	1440.0	
Month:	71837.16	0045220.0 9452.072	27784.4	
Prev Month:	6420.26 6	580766.0 4434.52	8205.85	
Accumulated:	78257.42 6	25990.2 13886.59	35990.25	
	Pri	int Save As A	uto Scan 🔀 Hodate 🗐 Close	1 E Apolu 1
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Figure 16. Linear Meter Values

- **Note:** Six fields at the top of the screen (Point number, Program Status, Meter Tag, Meter Description, Active Calculations Flow, and Active Calculations Fluid Props) appear on all tabs.
- **3.** Review—and change as necessary—the values in the following fields:

Field	Description
Point Number	Selects the meter run to configure. Click ▼ to display all defined instances. Clicking a different meter run causes the screen to display the values for that meter run.
Program Status	This read-only field shows the current state of the user program. Valid values are: Program Not Loaded , Program Loaded – Not Started , Program Running , Program Shutting Down , and Not Running – Library Version Error.

Field	Description
Meter Tag	This read-only field shows the unique identifier for the selected meter.
Meter Description	This read-only field shows the description of the selected meter.
Active Calculations: Flow	This read-only field shows the flow calculation standard currently performing flow calculations for the selected meter run.
Active Calculations: Fluid Props	This read-only field shows the properties calculation standard currently performing properties calculations for the selected meter run.

4. Click Apply to save any changes, and proceed to *Section 3.2.1* to configure the Values tab.

3.2.1 Linear Meter Values –Values Tab

Use the Values tab (which displays one of the following three screens when you access the Linear Meter Values screen) to view results of the Linear Meter calculations.

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Eile E	dit ⊻iew <u>R</u> OC :	<u>C</u> onfigure <u>M</u> el	ter <u>U</u> tilities	<u>T</u> ools <u>W</u> indow	Help				
) 🚅 🕻	X 🖻 🖻	🕘 😫 🍡	Q1 Q2	M 🗄 🐝 🗌	M 🕪 🖉	冬 🕑 🗳 📽	🖂 🚮 🤶 🕅		
oint Numb	er: 1 · Meter #1	•	Program Statu	s: Program Runn	ing	Active Calcu Flow:	lations Linear Volume		
Meter Tag: Meter #1 Meter Description: Meter #1 Description Fluid Props: [AGA8-92 Detailed									
	Values Factors	1							
	Input Values								
	Uncorr	rected Volume:	500.0 M	CF/Day					
	S	itatic Pressure:	150.0 P	SIG					
	Flowing	Temperature:							
	Current Flow Ra	tes							
	Volume	1	E	nergy		Mass 10651.14 Lb/Hour			
	242679.8	Ci/Hour	24874	46800.0 BTU/	Hour				
	5824.315	MCF/Day	5969.	923 MMB	TU/Day	255.6273	255.6273 Mlb/D ay		
	Accumulation	Uncorrected	MCE	MMRTH	мь	Minutes			
	Today	0.2199074	2 494209	2 556564	0 10947	0.6333333			
	Verbuden	0.2100014	0.0	2.00004	0.10041	-			
	r esterday:	JU.U	10.0		10.0				
	Month:	0.2199074	2.56162	2.556564	0.10947	0.6333333			
	Prev Month:	0.0	0.0	0.0	0.0	0.0			



Figure 17(a). Linear Meter Values, Values tab (Meter Type is Volume)

Figure 17(b). Linear Meter Values, Values tab (Meter Type is Mass)

🚟 ROCLINK 800 - [Linear Meter Vali	ues]									
🗌 File Edit View ROC Configure Me	ter Utilities	Tools Window	Help							
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Soint Number : 1 - Meter #1 Y Program Status: Program Running Active Calculations Flow: AGA3.92 AGA3.92 Active Calculations										
Meter Tag: Meter #1 Meter Description: Meter #1 Description Fluid Props: AGA8-92 Detailed										
Values Factors										
Input Values										
Differential Pressure:	150.0 li	nH20								
Static Pressure:	150.0 F	sig								
Flowing Temperature:	, БО.О. Г	ien F								
rioning remperature.	100.0	(cg)								
Current Flow Rates										
Volume	E	nergy		Mass						
699279.1 Cf/Hour	7167	61100.0 BTU/	Hour	30691.13 L	b/Hour					
16782.7 MCF/Day	1720	2.27 MMB1	U/Day	736.5872 M	llb/D ay					
Accumulation										
	MCF	MMBTU	МЬ	Minutes						
Today: 233.8613 239.7078 10.2641 27.31667										
Yesterday:	0.0	0.0	0.0	0.0						
Month:	10.2641	27.31667								
Prev Month: 0.0 0.0 0.0 0.0										
Accumulated:	233.8613	239.7078	10.2641	27.31667						

Figure 17(c). Linear Meter Values, Values tab (Linear Meter Type is Disabled, Calculation Standard is AGA3-92 or ISO5167-2003) **1.** Review the values in the following fields:

Field	Description
Uncorrected Volume	This read-only field displays uncorrected volume flow rate, which is the volumetric flow input before any density correction is applied. The units are MCF/Day or kM3/Day.
	Note: This field displays only if the meter type is volume.
Uncompensated Mass	This read-only field displays uncompensated mass flow rate, which is the mass flow input before pressure compensation is applied. The units are Mlb/Day or Tonnes/Day.
	Note: This field displays only if the meter type is mass (Coriolis).
Differential Pressure	This read-only field displays current differential pressure. The units are INH2O or kPa.
	Note: This field displays only if Linear Meter is disabled for the meter run and the flow input for the meter run is a differential pressure.
Static Pressure	This read-only field displays current static pressure in PSIG, PSIA, kPa(g) or kPa(a).
Flowing Temperature	This read-only field displays current flowing temperature in Deg F or Deg C.
Current Flow Rate – Volume	This read-only field displays current hourly and daily flow rates in CF/Hour and MCF/Day or M3/hr and kM3/Day.
Current Flow Rate – Energy	This read-only field displays current hourly and daily energy rates in BTU/Hour and MMBTU/Day or MJ/Hour and GJ/Day.
Current Flow Rate – Mass	This read-only field displays current hourly and daily mass rates in Lb/Hour and Mlb/Day or Kg/Hour and Tonnes/Day.
Accumulation – Uncorrected	This read-only field displays uncorrected volume total flow in MCF or Km3 for the current day, the previous day, the current month, the previous month, and the accumulated total since the accumulator last reset.
Accumulation – MCF	This read-only field displays total flow in MCF or kM3 for the current day, the previous day, the current month, the previous month, and the accumulated total since the accumulator last reset.
Accumulation – MMBTU	This read-only field displays total energy in MMBTU or GJoules for the current day, the previous day, the current month, the previous month, and the accumulated total since the accumulator last reset.
Accumulation – MIb	This read-only field displays total mass in Mlb or Tonnes for the current day, the previous day, the current month, the previous month, and the accumulated total since the accumulator last reset.
Accumulation – Minutes	This read-only field displays flowing time in Minutes for the current day, the previous day, the current month, the previous month, and the accumulated total since the accumulator last reset.

2. Click **Apply** to save any changes and proceed to *Section 3.2.2* to configure the Calculated Factors tab.

3.2.2 Linear Meter Values Screen – Calculated Factors Tab

Use this tab to view calculation factors used in Linear Meter calculations.

To access this screen:

1. Select the **Factors** tab on the Linear Meter Values screen. One of the following two screens display:



Figure 18(a). Linear Meter Values, Values tab (Meter Type is Volume)

Figure 18(b). Linear Meter Values, Values tab (Meter Type is Mass)

Note: The Linear Meter Enabled/Disabled selection on the General tab of the Linear Meter Setup screen must be set to Enabled to view this tab.

2. Review the values in the following fields:

Field	Description
Uncorrected Volume	This read-only field displays the uncorrected volume flow rate, which is the volumetric flow input before any density correction is applied. The units are MCF/Day or kM3/Day.
	Note: This field displays only if the meter type is volume.
Uncompensated Mass	This read-only field displays the uncompensated mass flow rate, which is the mass flow input before the correction for pressure effect is applied. The units are Mlb/Day or Tonnes/Day.
	Note: This field displays only if the meter type is mass (Coriolis).
Flowing Density	This read-only field shows the calculated density at flowing conditions in Lb/CF or Kg/M3.
Base Density	This read-only field shows the calculated density at base conditions in Lb/CF or Kg/M3.

Field	Description					
BMV	This read-only field displays the base multiplier value (BMV), which is the factor for multiplying by the uncorrected volume flow rate to determine the corrected volume flow rate.					
	Note: This field displays only if the meter type is volume.					
Pressure Effect Correction Factor	This read-only field displays the pressure effect correction factor, which is calculated from the pressure effect coefficient and the difference between the flowing and calibration pressures.					
	Note: This field displays only if the meter type is mass (Coriolis).					

3. Click **Apply** to save any changes.

4. Click Close to close this screen. Proceed to *Section 3.3* to save your configuration.

3.3 Saving the Configuration

Whenever you modify or change the configuration, it is a good practice to save the final configuration to memory. To save the configuration:

1. Select **ROC** > **Flags**. The Flags screen displays:

Flags	? 🛛
General Advanced	
Restart	Flash Memory
Warm Start	Save Configuration
<u>C</u> old Start	<u> </u>
Cold Start & Clear Alar <u>m</u> s/Events	Status :
Cold Start & Clear Displays	
Cold Start & Clear F <u>S</u> Ts	
Cold Start & Clear <u>H</u> istory	
Cold Start & Clear A <u>L</u> L	
Dpdate 1	Cancel Apply

Figure 19. Flags

2. Click Save Configuration. A verification message displays:



Figure 20. Save Verification

3. Click **Yes.** When the save process completes, a confirmation message displays:



Figure 21. Confirmation

Note: Depending on the size and complexity of the user program, this process may take several minutes. When the process ends, the Status field on the Flags screen displays *Completed*.

4. Click Update on the Flags screen. This completes the process of saving your new configuration.

Note: For archive purposes, you should also save this configuration to your PC's hard drive or a removable media (such as a diskette or a flash drive) using the **File** > **Save Configuration** option on the ROCLINK 800 menu bar.

4 REFERENCE

This section provides calculation details and tables of information on the user defined points used by the Linear Meter Flow Calculation program.

- Calculation Details
- Point Type 31: Linear Meter Setup
- Point Type 32: Linear Meter Values

4.1 Calculation Details

The Linear Meter flow calculations are based on equations presented in the following flow calculation standards.

- Measurement of Gas by Turbine Meters, Transmission Measurement Committee Report No. 7, American Gas Association (AGA), Second Revision, April, 1996.
- Measurement of Natural Gas by Coriolis Meter, AGA Report No. 11, API MPMS 14.9, Transmission Measurement Committee,, American Gas Association (AGA), 2003.

Each of these flow calculation standards can be implemented using the Linear Meter program. However, AGA7 is already available with the FB107 Application Firmware, so it is recommended to use that implementation for meter runs requiring AGA7.

If the meter type is specified as volume, the flow calculations are as follows.

$$\begin{split} Q_b &= Q_f * \rho_f \, / \, \rho_b \\ q_m &= Q_b * \rho_b \end{split}$$

where:

 Q_b = Volumetric flow at base conditions. Units are MCF or kM3.

 Q_f = Volumetric flow at flowing conditions (uncorrected flow). Units are MCF or kM3.

 q_m = Mass flow. Units are Mlb or Tonnes.

 ρ_b = Density at base conditions. Units are Lb/CF or Kg/M³.

 ρ_f = Density at flowing conditions. Units are Lb/CF or Kg/M³.

If the meter type is specified as mass (Coriolis), the flow calculations are as follows.

$$q_m = q_{m,u} * F_P$$
$$Q_b = q_m / \rho_b$$

where:

 F_P = Correction for pressure effect on the mass flow accuracy.

 Q_b = Volumetric flow at base conditions. Units are MCF or kM3.

 q_m = Mass flow. Units are Mlb or Tonnes.

 $q_{m,u}$ = Mass flow before correction for pressure effect. Units are Mlb or Tonnes. ρ_b = Density at base conditions. Units are Lb/CF or Kg/M³. If correction for pressure effect is enabled:

 $F_P = 1.0 / (1.0 + (K_P / 100.0) * (P_f - P_c))$

where:

 K_P = Pressure effect coefficient. Units are %/PSIG or %/kPa(g). P_f = Calibration pressure. Units are PSIG or kPa(g) P_c = Flowing pressure. Units are PSIG or kPa(g)

If correction for pressure effect is disabled:

 $F_{P} = 1.0$

With both volume and mass meters, the flow inputs are updated once a second, from which approximations of the flow rates and totals are calculated. The approximated flow totals are revised at the specified base multiplier period (BMP) using the total of the flow input, base density, and average flowing density, which is recalculated using the average pressure and temperature during the BMP.

4.2 Point Type 31: Linear Meter Setup

Point type 31 contains the parameters for configuring the Linear Meter program. There are four logicals of this point type (one logical for each meter run).

Point Type	31: Linear Meter Setup						
Parm #	Name	Access	Data Type	Length	Range	Default	Description of functionality and meaning of values
0	Point Tag ID	R/O	AC	10	0x20 -> 0x7E for	""	Point tag identification. This value is copied
					Each ASCII		from point type 46, parameter 0.
					character		
1	Enable Linear Meter	inear Meter R/W	UINT8	1	0 -> 1	0	Enable/disable status of the linear meter flow calculation for the meter run. Valid values are:
							0 = Disable
							1 = Enable
2	Meter Type	R/W	UINT8	1	0 -> 1	0	Type of meter. Valid values are:
							0 = Volume – The flow input is proportional to the uncorrected volumetric flow.
							1 = Mass (Coriolis) – The flow input is proportional to the mass flow.
3	Press Effect Enable	s Effect Enable R/W	R/W UINT8 1	1	0 -> 1	0	If the meter type is volume:
							Not used.
							If the meter type is mass (Coriolis):
							Enable/disable the correction for the pressure effect on the mass flow accuracy. Valid values are:
							0 = Disable
							1 = Enable
4	Calibration Pressure	Calibration Pressure R/W FL	R/W FLP	4	Any floating point	0.0	If the meter type is volume:
					number		Not used.
							If the meter type is mass:
							Calibration pressure of the mass meter from which the correction for the pressure effect on the mass flow accuracy is determined. Units are PSIG or kPa(q).

Parm #	Name	Access	Data Type	Length	Range	Default	Description of functionality and meaning of values
5	Press Effect Coeff	R/W	FLP	4	Any floating point number	0.0	If the meter type is volume: Not used. If the meter type is mass:
							Pressure effect coefficient for the mass meter. Units are %/PSIG or %/kPa(g). The correction for pressure effect on mass flow accuracy requires the pressure effect coefficient to be a negative number as indicated in the sensor product data sheet.

Point Type 31: Linear Meter Setup

4.3 Point Type 32: Linear Meter Values

Point type 32 contains the calculated parameters for the Linear Meter program. There are four logicals of this point type (one logical for each meter run).

Point Type	31: Linear Meter Setup								
Parm #	Name	Access	Data Type	Length	Range	Default	Description of functionality and meaning of values		
0	Point Tag ID	R/O	AC 10	AC	AC	10	0x20 -> 0x7E for	** **	Point tag identification. This value is copied
					Each ASCII		from point type 46, parameter 0.		
					character				
1	Press Effect Factor	R/O FLP	FLP 4	4	Any floating point	1.0	If the meter type is volume:		
				number		Not used.			
							If the meter type is mass (Coriolis):		
							Pressure effect correction factor, which is calculated from the pressure effect coefficient and the difference between the flowing and calibration pressures.		

If you have comments or questions regarding this manual, please direct them to your local sales representative or contact:

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