

**V-Cone Metering Program
(For the FloBoss 103)**

**User Manual
(QER 03Q022)**

**Form A6147
December 2005**

Revision Tracking Sheet

December 2005

This manual may be revised periodically to incorporate new or updated information. The revision date of each page appears at the bottom of the page opposite the page number. A change in revision date to any page also changes the date of the manual that appears on the front cover. Listed below is the revision date of each page (if applicable):

Page	Revision
All pages	Dec-05
All pages	Jul-03

FloBoss and ROCLINK are marks of one of the Emerson Process Management companies. The Emerson logo is a trademark and service mark of Emerson Electric Co. All other marks are the property of their respective owners.

© Fisher Controls International, LLC. 2000-2005. All rights reserved. Printed in the U.S.A.
www.EmersonProcess.com/flow

While this information is presented in good faith and believed to be accurate, Fisher Controls does not guarantee satisfactory results from reliance upon such information. Nothing contained herein is to be construed as a warranty or guarantee, express or implied, regarding the performance, merchantability, fitness or any other matter with respect to the products, nor as a recommendation to use any product or process in conflict with any patent. Fisher Controls reserves the right, without notice, to alter or improve the designs or specifications of the products described herein.

Table of Contents

	Page
1 INTRODUCTION	1
1.1 Scope and Organization	1
1.2 Product Overview	1
1.2.1 V-Cone Flow Calculations.....	2
1.3 Program Requirements.....	2
2 INSTALLATION	3
2.1 Downloading the Program	3
3 CONFIGURATION.....	7
3.1 Device Information Screen	7
3.2 Meter Setup Screen – General Tab	8
3.3 Meter Setup Screen – Inputs Tab.....	9
3.4 Meter Setup Screen – Gas Quality Tab.....	10
3.5 Meter Setup Screen – Advanced Tab.....	11
3.6 V-Cone Setup Screen.....	12
3.7 Saving the Configuration	16

1 INTRODUCTION

1.1 Scope and Organization

This document serves as the user manual for the V-Cone Metering User Program (QER 03Q022), which is intended for use in a FloBoss™ 103. This manual describes how to download and configure this program (referred to as the “V-Cone program” or “the program” throughout the rest of this manual). You access and configure this program using ROCLINK™ 800 Configuration Software (version 1.60 or greater) loaded on an IBM-compatible personal computer running Windows® 98, ME, NT 4.0 (with Service Pack 6), 2000 (with Service Pack 2), or XP.

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 FloBoss 103, the manual becomes a reference tool.

This manual has the following major sections:

- ◆ Section 1 – Introduction
- ◆ Section 2 – Installation
- ◆ Section 3 – Configuration

This manual assumes that you are familiar with the FloBoss unit and its configuration. For more information, refer to the *FloBoss 103 Flow Manager Instruction Manual* (Form A6114) or the *ROCLINK 800 Configuration Software User Manual* (Form A6121).

1.2 Product Overview

The program allows a FloBoss 103 to calculate flow rates, integrate volumes, and create historical values when the differential input (MVS) for a gas flow calculation comes from a McCrometer V-Cone meter rather than an orifice plate. Gas compressibility calculations are implemented using FloBoss firmware and AGA8 1992 standards.

The FloBoss 103 reads flow inputs (differential pressure, temperature, and static pressure) and calculates an instantaneous rate once every second. Also, at a user-configured scan period it performs an AGA8 1992 calculation (or other properties calculation), followed by volume integration.

The program is designed for the composition ranges and fluids of natural gas and other related hydrocarbons, as defined in AGA Report #8, 1992 editions. The program itself does not perform gas or fluid property calculations. Instead, it obtains gas properties either from FloBoss firmware (using AGA8 1992 standards) or from a separate user program installed in the FloBoss.

The 03Q022 components are:

- ◆ A McCrometer V-Cone Meter that outputs an analog differential pressure signal.
- ◆ The V-Cone Metering user program that loads into FloBoss memory to provide support for the McCrometer V-Cone flow calculations.
- ◆ This manual.

1.2.1 V-Cone Flow Calculation

The V-Cone Flow calculation provides an instantaneous flow rate that is adjusted to contract pressure and temperature, which you can define using the application-specific V-Cone screen.

Note: For further information on V-Cone calculations, equations, and flowcharts, refer to the publications library on the McCrometer website (www.mccrometer.com).

1.3 Program Requirements

You download the V-Cone Metering program to—and then run it from—the Flash and RAM memory on the FloBoss 103. The V-Cone program is compatible **only** with firmware version 2.12 (or greater) of the FloBoss 103. Download and configure the program using the ROCLINK 800 Configuration software (version 1.60 or greater).

The downloadable program is:

File Name	Unit	Task	Code Space	Data Space	UDP
FB103VC1.BIN	FloBoss 103	User 1	790000–79FFFF	46C000–46CFFF	22

Note: You must connect a PC to the FloBoss unit'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* (Form A6121).

2 INSTALLATION

This section provides instructions for installing the V-Cone Metering program into FloBoss memory. 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.

To download the user program using ROCLINK 800 software:

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

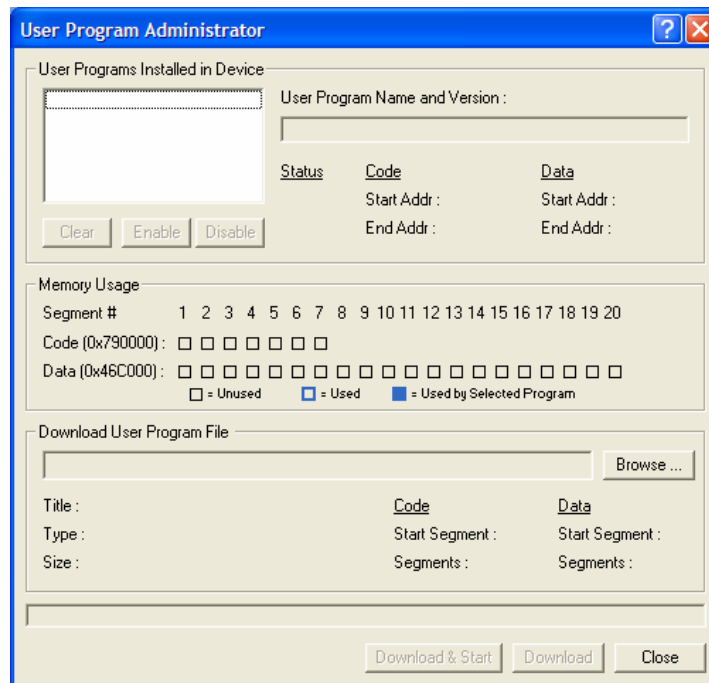


Figure 1. User Program Administrator

5. Click **Browse** in the Download User Program File frame. The Select User Program File screen displays (see Figure 2).
6. 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:

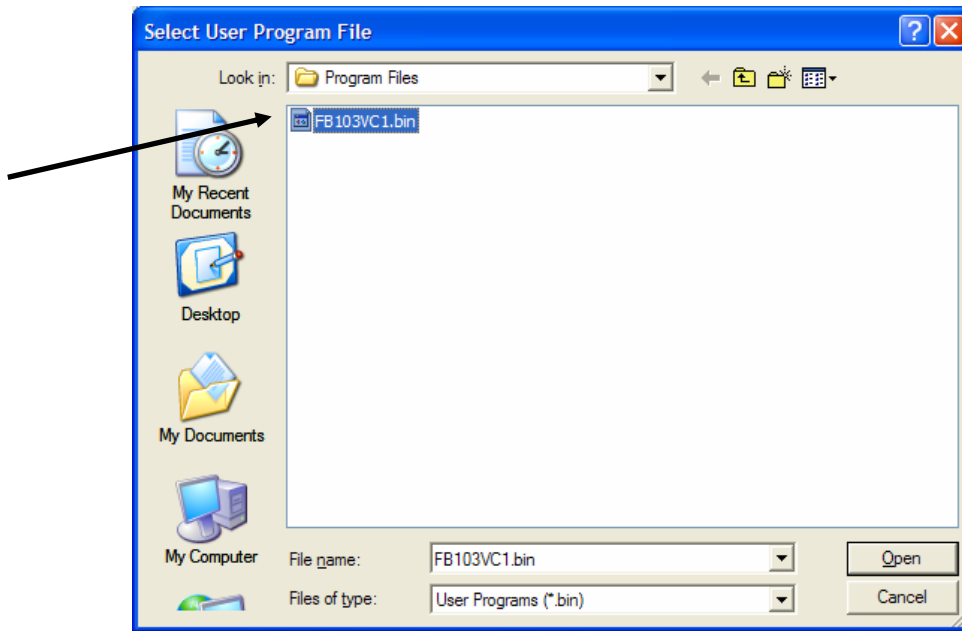


Figure 2. Select User Program File

7. 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:

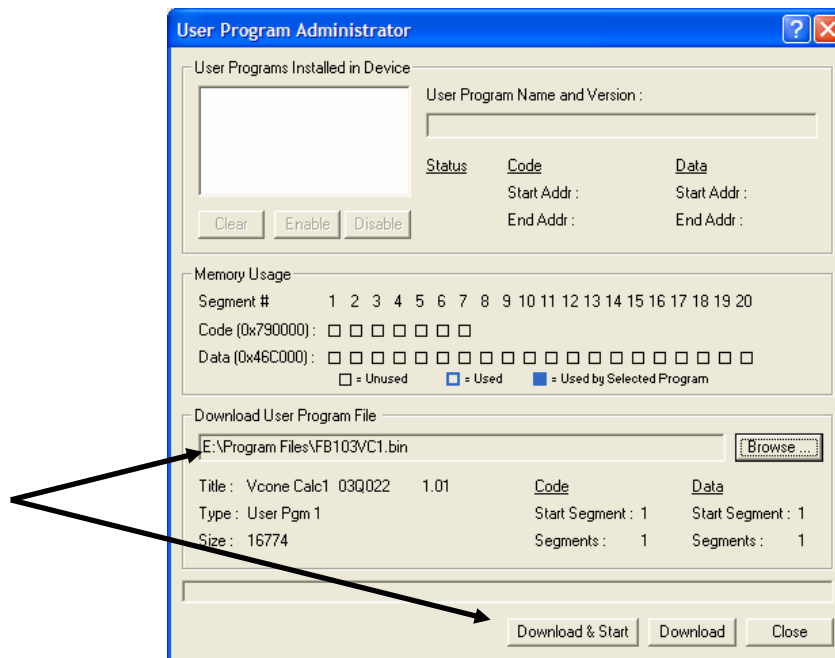


Figure 3. User Program Administrator

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

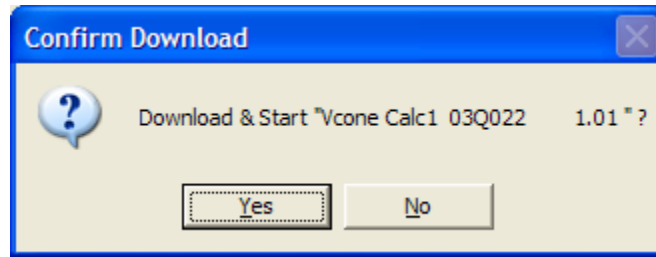


Figure 4. Confirm Download

- 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:

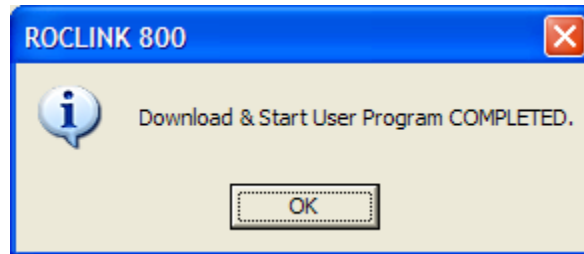


Figure 5. ROCLINK 800 Download Confirmation

- 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 in that frame shows the device status as “ON” (indicating a successful Warm Start).
 - ◆ The Memory Usage frame indicates the memory the program uses.

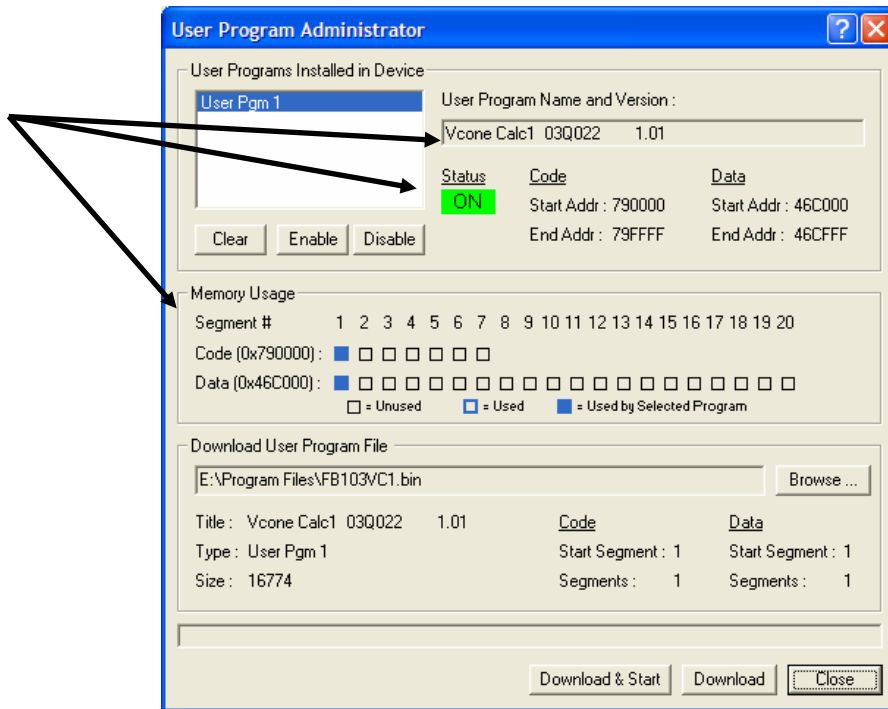


Figure 6. User Program Administrator

11. Click **Close**. The ROCLINK 800 screen displays and the download is complete.

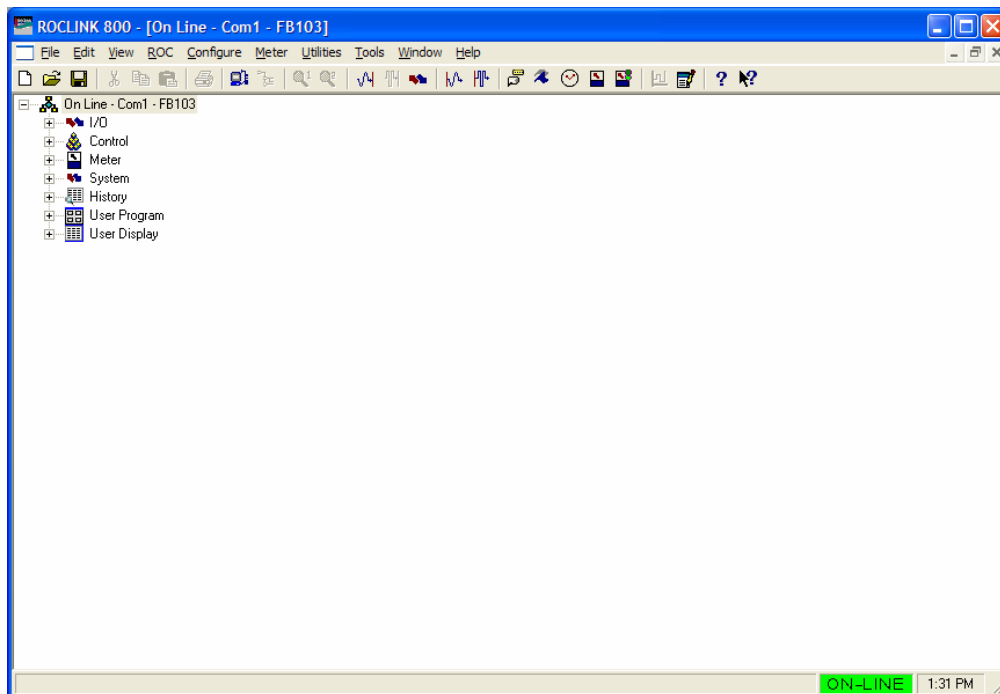


Figure 7. ROCLINK 800

3 CONFIGURATION

After you have loaded the V-Cone Metering program, you configure it using the ROCLINK 800 software. To do this, you use two standard ROCLINK 800 screens (Device Information and Meter Setup) and a program-specific screen (V-Cone Setup):

- ◆ Use the Device Information screen to select U.S. or Metric engineering units.
- ◆ Use the General, Inputs, Gas Quality, and Advanced tabs on the Meter Setup screen to set general parameters.
- ◆ Use the V-Cone Setup screen to set the program-specific parameters.

3.1 Device Information Screen

Use this screen to check the default units.

1. From the ROCLINK 800 screen, select **ROC > Information**. The Device Information screen displays.

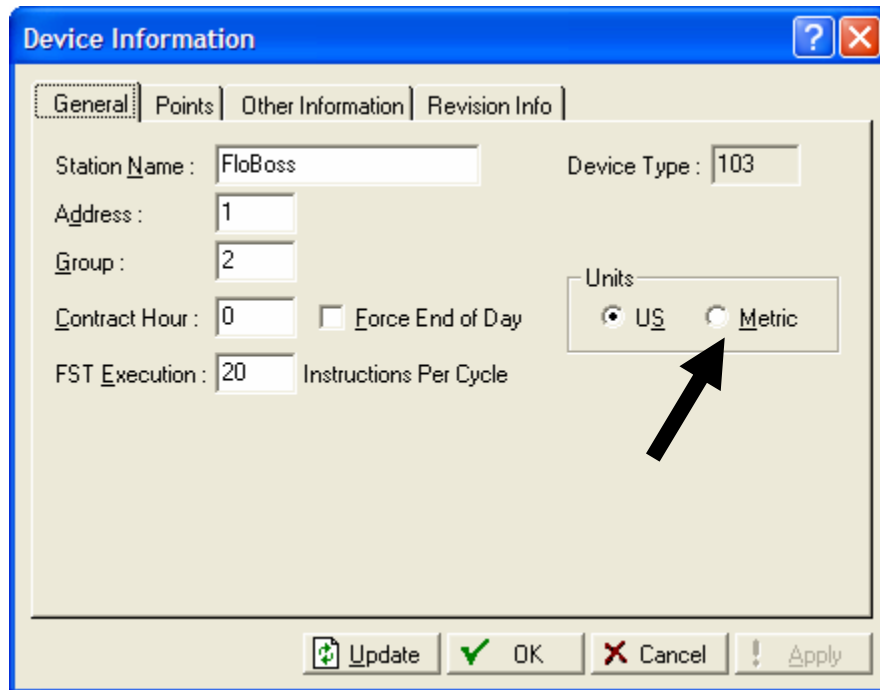


Figure 8. Device Information

2. Review—and change as necessary—the value in the following field:

Field	Description
Units	Sets the engineering units the program uses. US or Metric are valid options for this program.

3. Click **Apply** if you changed the value in this field.
4. Click **OK** to return to the ROCLINK 800 screen.

3.2 Meter Setup Screen – General Tab

Use the General tab on the Meter Setup screen to define the meter type, calculation standard, and values for the pipe and orifice diameters.

1. From the ROCLINK 800 screen, select **Meter > Setup**. The Meter Setup screen displays.
2. Select the **General** tab.

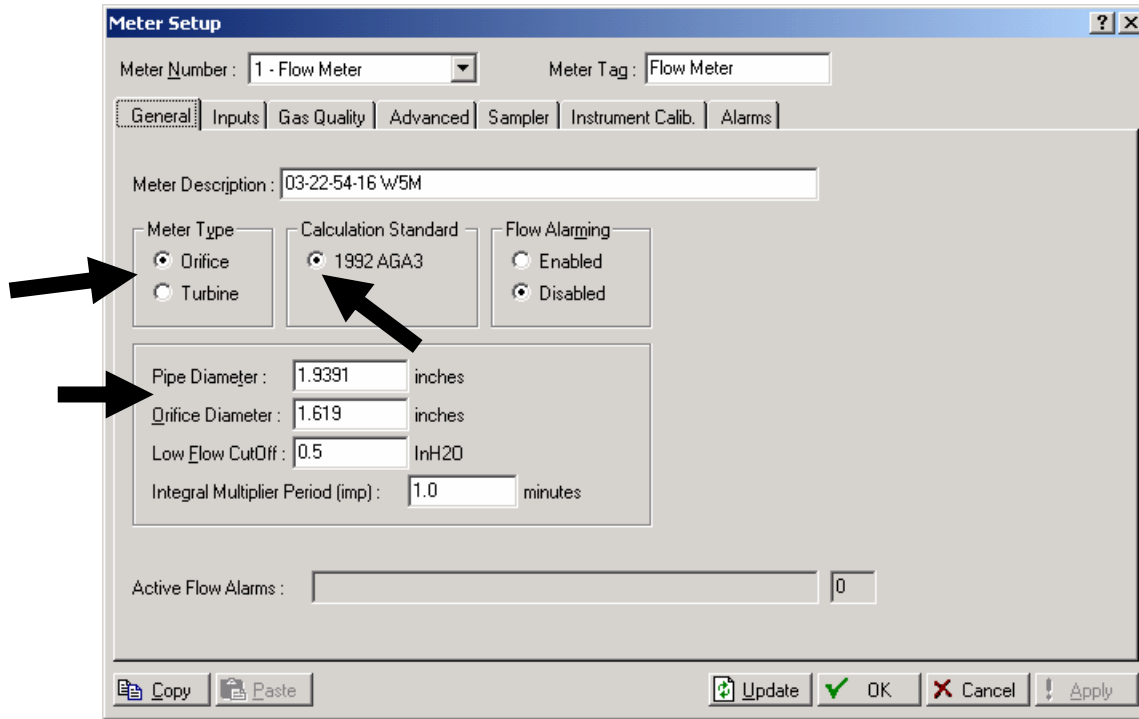


Figure 9. Meter Setup General Tab

3. Assure that the Orifice and 1992 AGA3 radio buttons are clicked and complete the Pipe Diameter and Orifice Diameter fields. The Orifice Diameter field indicates the diameter of the V-Cone Meter. Review the remainder of the screen to make sure that the values correspond to your organization’s requirements.

Note: The Low Flow Cutoff field defines the differential pressure at which the program assumes no valid flow is present and sets the instantaneous flow rate to zero. The Integral Multiplier Period (imp) field defines the period (in minutes) at which the program performs the AGA8 gas property calculations and integrates volumes. Valid values are from **1** to **60**.

4. Click **Apply** to save any changes. Go to Section 3.3.

3.3 Meter Setup Screen – Inputs Tab

Use the Inputs tab on the Meter Setup screen to identify the I/O definitions and values for differential pressure, static pressure, and temperature.

1. From the Meter Setup screen, select the **Inputs** tab.

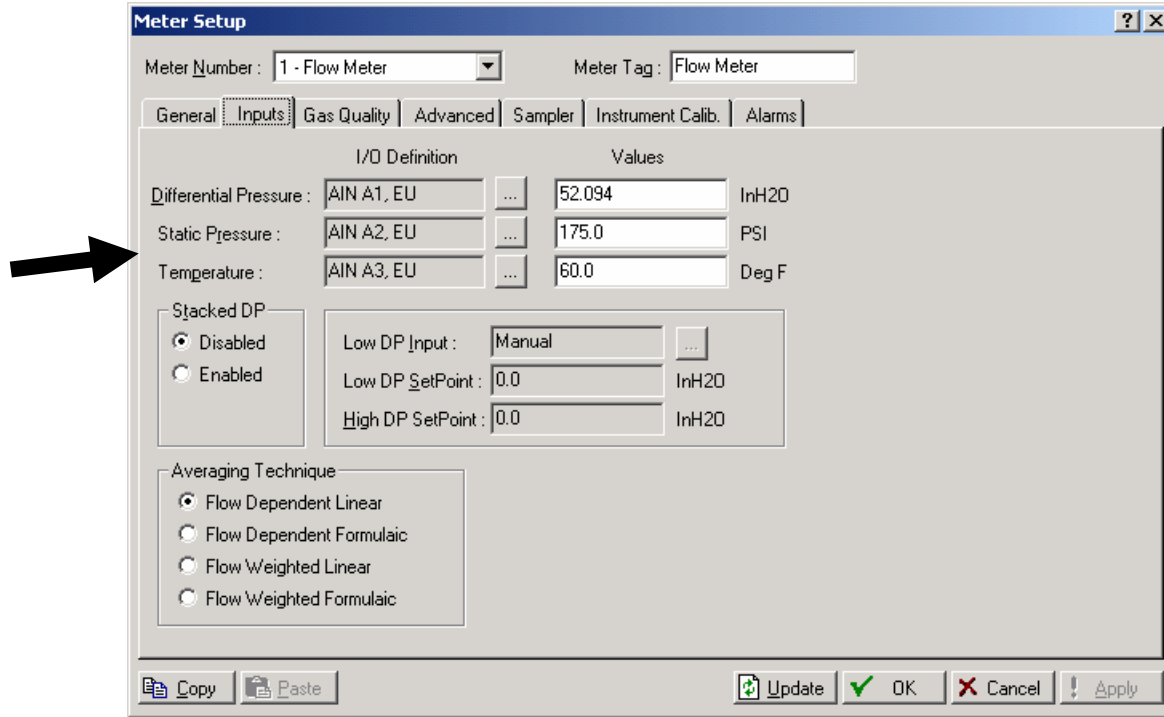


Figure 10. Meter Setup Inputs Tab

2. Complete the Differential Pressure, Static Pressure, and Temperature definitions and values. Review the rest of the screen to make sure that the values correspond to your organization’s requirements.
3. Click **Apply** to save any changes. Go to Section 3.4.

3.4 Meter Setup Screen – Gas Quality Tab

Use the Gas Quality tab on the Meter Setup screen to define gas composition.

1. From the Meter Setup screen, select the **Gas Quality** tab.

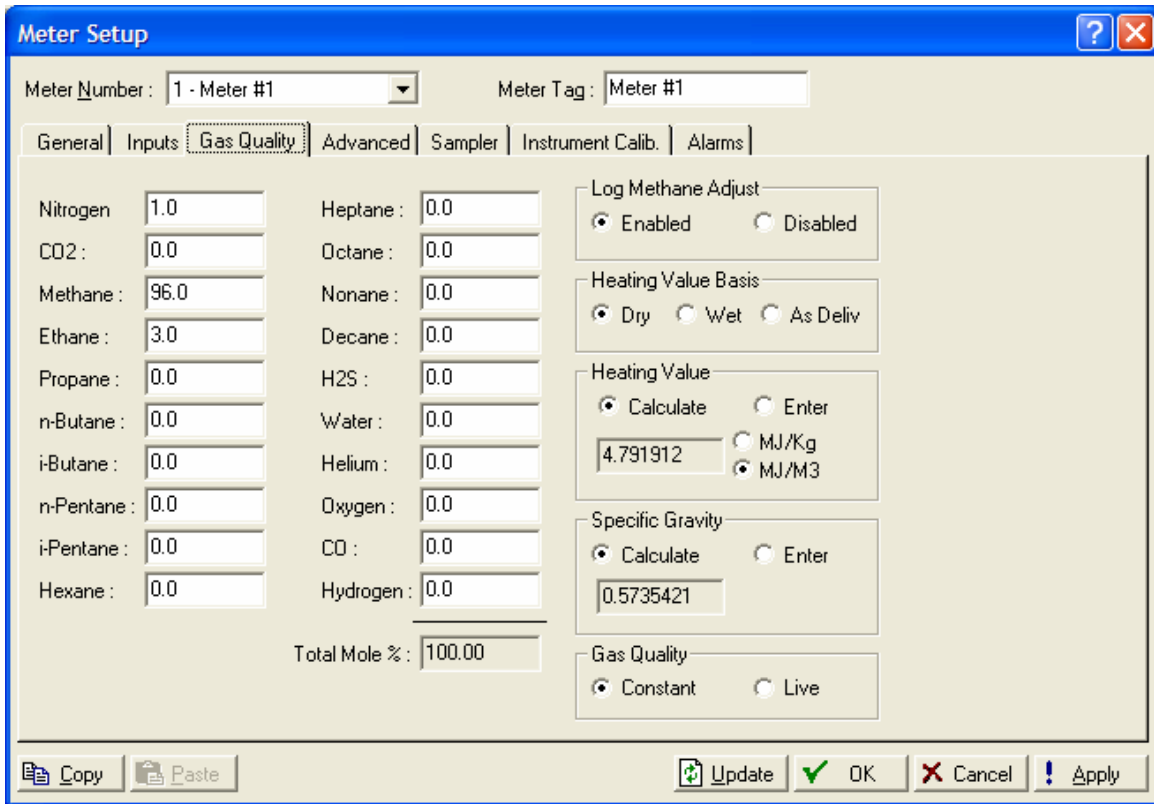


Figure 11. Meter Setup Gas Quality Tab

2. Review the values on this screen to make sure that they correspond to your organization's requirements.
3. Click **Apply** to save any changes. Go to Section 3.5.

3.5 Meter Setup Screen – Advanced Tab

Use the Advanced tab on the Meter Setup screen to set base pressure and base temperature.

1. From the Meter Setup screen, select the **Advanced** tab.

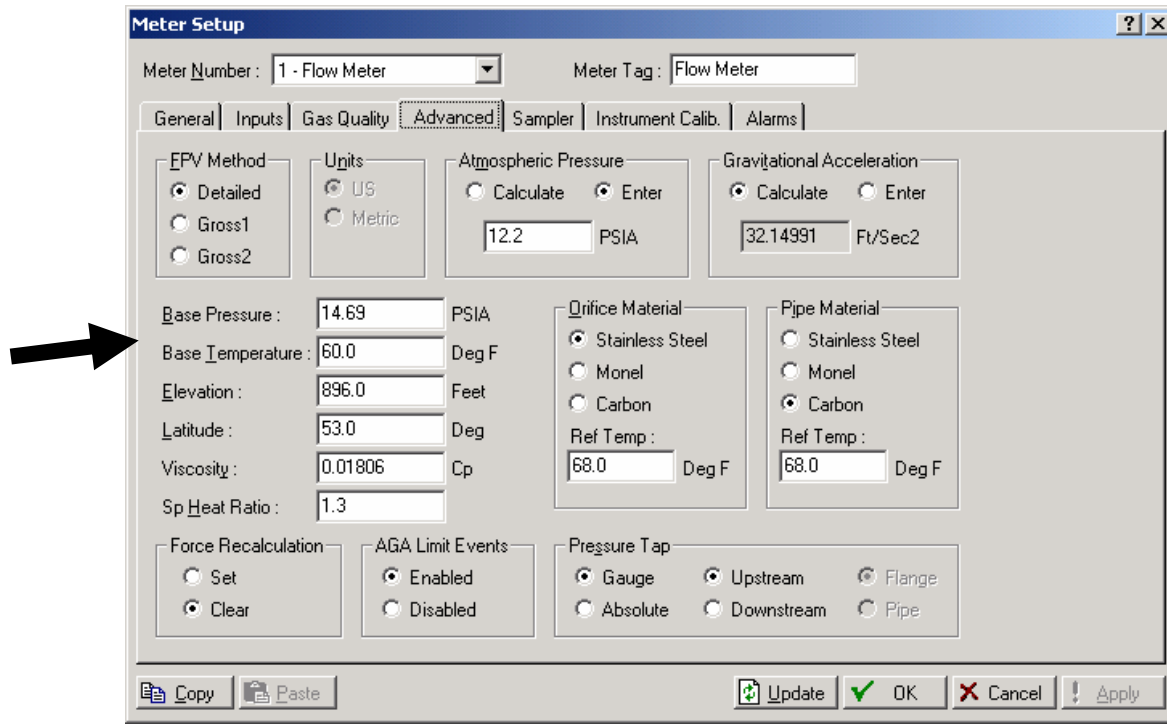


Figure 12. Meter Setup Advanced Tab

2. Review any values you enter—especially for Base Pressure and Base Temperature—on this screen to make sure that they correspond to your organization’s requirements.
3. Click **Apply** to save any changes. Go to Section 3.6.

3.6 V-Cone Setup Screen

The V-Cone Setup screen enables you to enter program-specific configuration parameters and displays calculated values.

To access this screen:

1. Click **Meter > V-Cone Setup** from the ROCLINK configuration menu:

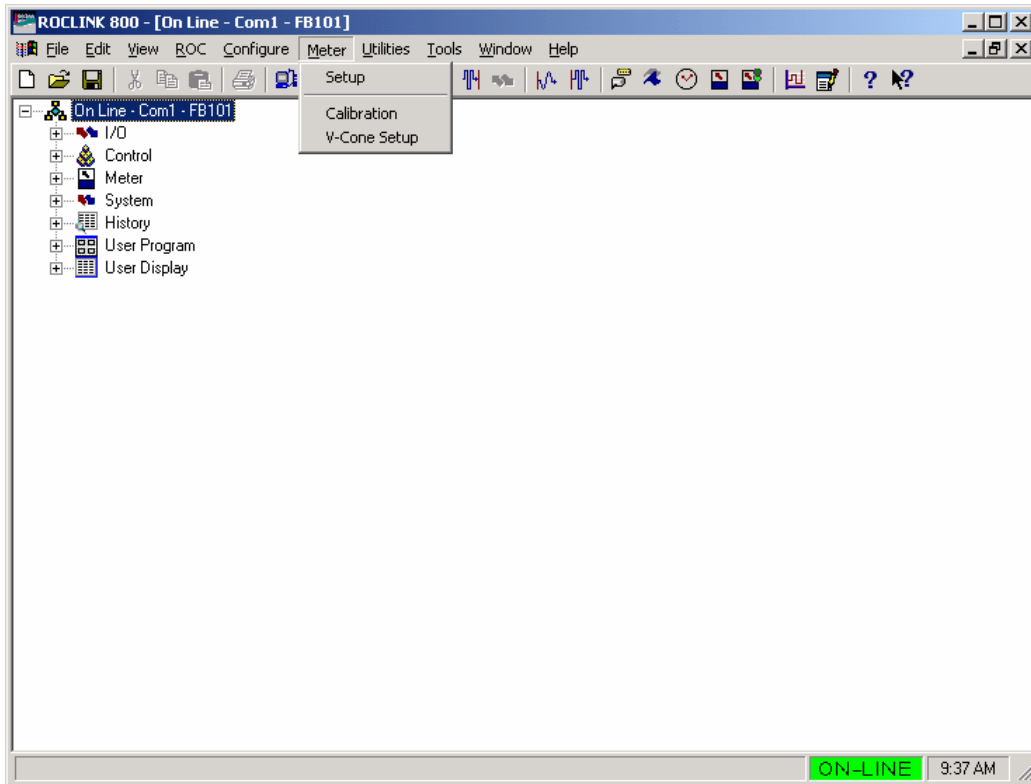


Figure 13. ROCLINK 800

2. The V-Cone Setup screen displays (see Figure 14):

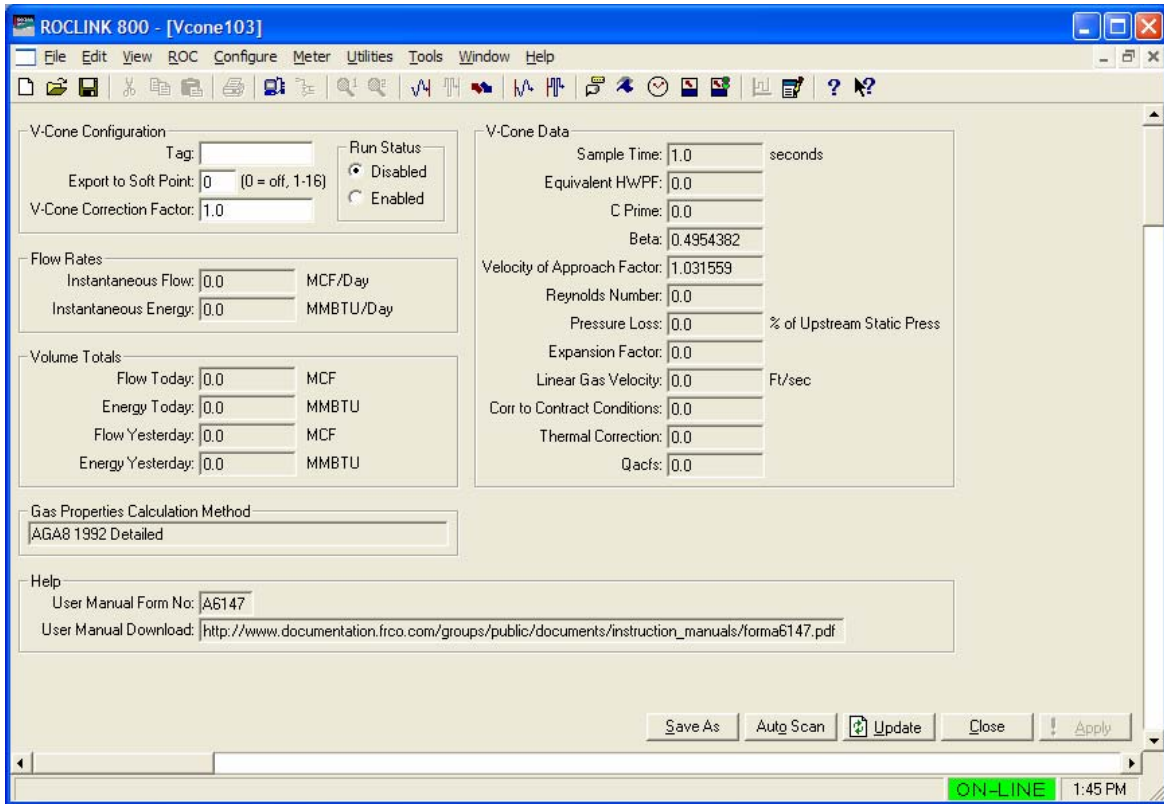


Figure 14. V-Cone Setup

- Complete the screen fields based on your organization's requirements.

Field	Description
Tag	A 10-character description that uniquely identifies the meter run.
Run Status	Selects the flow calculation for the meter run. Select Enabled to execute the V-Cone flow calculation or select Disabled to use the AGA3 flow calculation.
Export to Soft Point	Enables a host to access data from a softpoint if it cannot access the data through other means. Valid values are 0 (disable the access) or 1 through 16 (enable the access and indicate the softpoint to use):
	1 Instantaneous Flow Rate (MCF/Day or km3/Day)
	2 Instantaneous Energy Rate (MMBTU/ Day or GJ/Day)
	3 Accumulated Flow Today (MCF or km3)
	4 Accumulated Energy Today (MMBTU or GJ)
	5 Accumulated Flow Yesterday (MCF or km3)
	6 Accumulated Energy Yesterday (MMBTU or GJ)
	7 Equivalent HWPF
	8 Equivalent Cprime
	9 Calculation Period (Seconds)
	10 Beta
	11 Velocity of Approach
	12 Reynolds Number

Field	Description
Export to Soft Point (cont.)	13 Pressure Loss
	14 Expansion Factor
	15 Linear Gas Velocity
	16 Correction to Contract Conditions
	17 Thermal Correction Factor
V-Cone Correction Factor	Sets the meter correction factor (sometimes referred to as the meter coefficient). This value is typically provided by the meter supplier in the form of a data sheet or calibration sheet for each individual meter.
Instantaneous Flow	This read-only field shows the calculated volumetric flow rate in MCF/Day or km ³ /Day
Instantaneous Energy	This read-only field shows the calculated energy rate in MMBTU/Day GJoules/Day.
Flow Today	This read-only field shows the accumulated volumetric flow in the current contract day in MCF or km ³ .
Energy Today	This read-only field shows the accumulated energy in the current contract day in MMBTU or GJoules.
Flow Yesterday	This read-only field shows volumetric flow accumulated in the previous contract day in MCF or km ³ .
Energy Yesterday	This read-only field shows the accumulated energy in the previous contract day in MMBTU or GJoules.
Sample Time	This read-only field shows the current rate calculation period, in seconds. Note: This value should always be 1.0 during normal operation. A value greater than 1.0 may indicate the unit is overloaded.
Equivalent HWPF	This read-only field shows the value of HwPf if the AGA3 flow calculation is active (V-Cone calculation not enabled). The equivalent value for HwPf is shown when the V-Cone calculation is enabled. V-Cone formula: $HwPf = Y * \text{Sqrt} (DP_{psf} / DensFlow)$, <i>Y being the expansion factor.</i>
C Prime	This read-only field shows the value of C Prime if the AGA3 flow calculation is active (V-Cone calculation not enabled). The equivalent value for C Prime is shown when the V-Cone calculation is enabled. V-Cone formula: $C\ Prime = C_{acfs} \times 86.4$ (for C_{acfs} description see V-Cone documentation, 86.4 factor translates cft/sec to MCF/Day)
Beta	This read-only field shows the diameter ratio as calculated by the AGA3 equation or V-Cone equation. V-Cone Formula: $Beta = \text{Sqrt} (1 - d^2/D^2)$, (both diameters at Tf) for V-Cone calculations
Velocity of Approach Factor	This read-only field shows the calculated velocity of approach factor. V-Cone Formula: $Velocity\ of\ Approach = 1 / \text{sqrt} (1 - Beta^4)$
Reynolds Number	This read-only field shows the calculated Reynolds Number for the active calculation (AGA3 or V-Cone). V-Cone Formula: $Reynolds = 123.9 \times velocity\ (ft/sec) \times D\ (inches\ at\ Tf) \times Density\ (lbm/cft) / viscosity\ (cP)$

Field	Description
Pressure Loss	This read-only field shows the pressure loss in % of Upstream Static Pressure. The program forces this value to zero when the V-Cone calculation is disabled.
Expansion Factor	This read-only field shows the calculated expansion factor for the active calculation (AGA3 or V-Cone). V-Cone Formula: Refer to V-Cone equipment documentation for details on the expansion factor equation.
Linear Gas Velocity	This read-only field shows the calculated Linear gas velocity in ft/sec or m/sec. The program forces this value to zero when the V-Cone calculation is disabled. V-Cone Formula: $Velocity = 4 \times Q_{acfs} (cft/sec) / (Pi \times D^2 (at Tf))$, <i>Qacfs being the uncorrected flow.</i>
Corr to Contract Conditions	This read-only field shows the calculated correction to contract conditions based on the V-Cone equation. The program forces this value to zero when the V-Cone calculation is disabled. V-Cone Formula: $Correction = (P_L / P_b) \times (T_b / T_L) \times (Z_b / Z_L)$. The b subscript refers to contract conditions while L subscript refers to flow/line conditions.
Thermal Correction	This read-only field shows the calculated thermal correction factor. The program forces this value to zero when the V-Cone calculation is disabled.
Qacfs	This read-only field shows the uncorrected flow rate in Actual Cubic Feet/Second. The program forces this value to zero when the V-Cone calculation is disabled.
Gas Properties Calculation Method	This read-only field shows the gas or fluid properties calculation used to calculate and provide gas compressibility, density, and heating value. Note: For gas volume calculations, this field may show AGA8 1992 Detailed if the FloBoss 103 internal AGA8 properties calculation is active. If a separate gas properties user program is active in the unit, the field displays the name of the standards calculation implemented in that program. None displays in the field when no valid properties user program is active in the unit.
Help	This read-only field displays the URL location for an electronic copy of this user manual.

4. Click **Apply** to save any changes you have made to this screen.
5. Click **OK** to close this screen. This completes the process of configuring the V-Cone program. Proceed to Section 3.7 to save your configuration.

3.7 Saving the Configuration

Whenever you modify or change the configuration, save the final configuration to memory. To save the configuration:

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

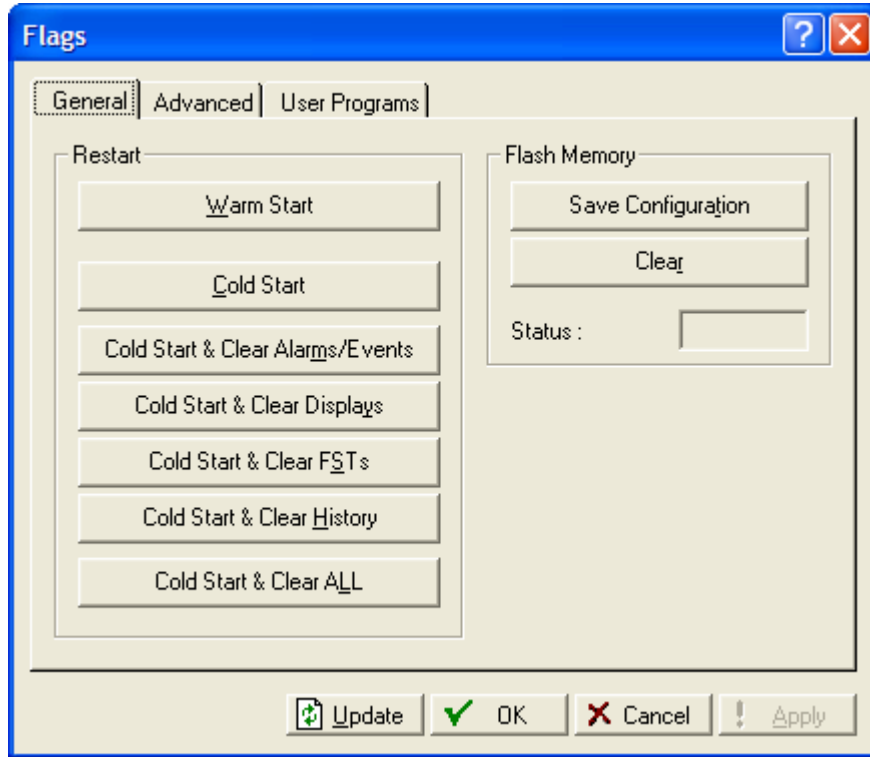


Figure 15. Flags

2. Click **Save Configuration**. A verification message displays:

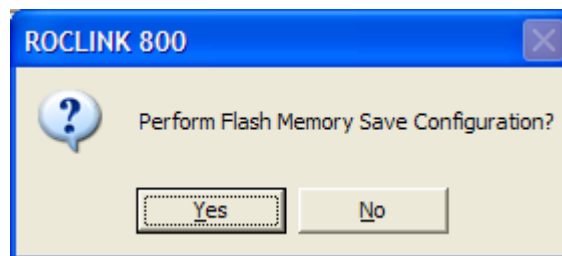


Figure 16. Save Verification

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

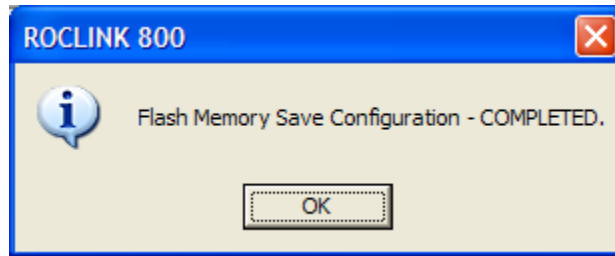


Figure 17. Confirmation

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.

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

Emerson Process Management
Flow Computer Division
Marshalltown, Iowa 50158 USA
Houston, TX 77065 USA
Pickering, North Yorkshire UK Y018 7JA
Website: www.EmersonProcess.com/flow

