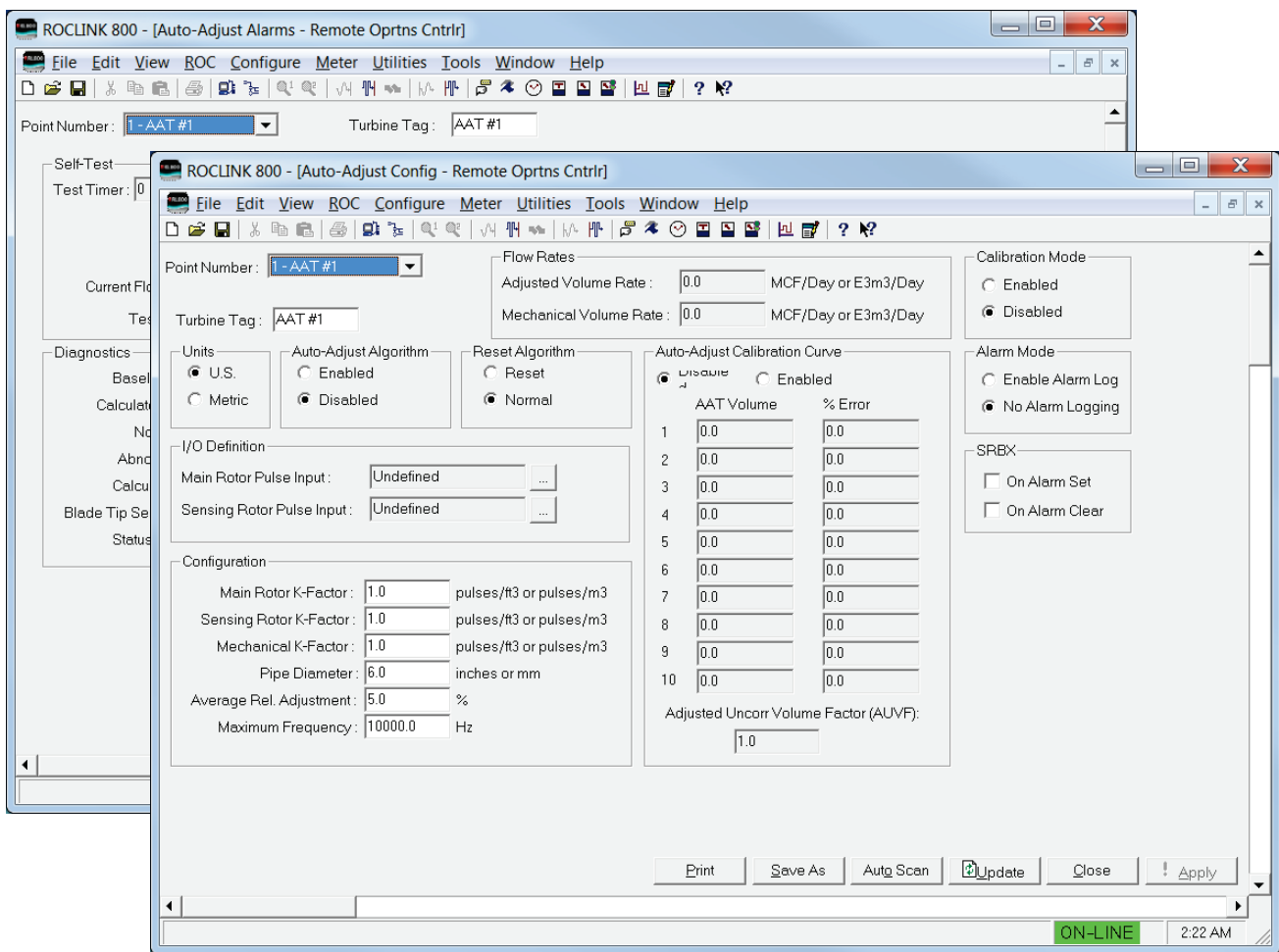


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June 2016

Sensus Auto-Adjust™ Program User Manual (for ROC800-Series Remote Operations Controllers)



Revision Tracking Sheet

June 2016

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):

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Contents

Chapter 1 – Introduction	1-1
1.1 Scope and Organization.....	1-1
1.2 Product Overview.....	1-2
1.3 Program Requirements.....	1-2
1.3.1 License Keys	1-3
Chapter 2 – Installation	2-1
2.1 Wiring the Auto-Adjust Turbo-Meter (using Pulse Input Module)	2-1
2.2 Wiring the Auto-Adjust Turbo-Meter (using Advanced Pulse Module)	2-3
2.3 Installing the License Key	2-5
2.3.1 Verifying the License Key Installation.....	2-6
2.4 Downloading the Auto-Adjust Program.....	2-7
2.5 MPU Loading Threshold	2-11
Chapter 3 – Configuration	3-1
3.1 Auto-Adjust Configuration Screen.....	3-2
3.2 Auto-Adjust Alarms Screen.....	3-7
3.3 Saving the Configuration.....	3-10
Chapter – 4 Reference Materials	4-1
4.1 Example Calibration Data Report	4-1
4.2 Point Type 62/63: Auto-Adjust Program Configuration.....	4-3

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Chapter 1 – Introduction

In This Chapter

1.1	Scope and Organization	1-1
1.2	Product Overview	1-2
1.3	Program Requirements.....	1-2
1.3.1	License Keys	1-3

This chapter describes the structure of this manual and presents an overview of the Sensus Auto-Adjust™ Program for the ROC800-Series Remote Operations Controller.

1.1 Scope and Organization

This document serves as the user manual for the Sensus Auto-Adjust™ Turbo-Meter program, which is intended for use in the ROC800-Series Remote Operations Controllers (“ROC800s”). This manual describes how to download, install, and configure the Sensus Auto-Adjust Turbo-Meter user program (referred to as the “Auto-Adjust program” or “the program” throughout the rest of this manual). You access and configure this program using ROCLINK™ 800 Configuration Software (version 1.74 or greater) loaded on a personal computer (PC) running Microsoft® Windows® 7 (32-bit or 64-bit).

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, 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 ROC800s and their configuration. For more information, refer to the following manuals:

- *ROC800-Series Remote Operations Controller Instruction Manual (part D301217X012)*
- *ROCLINK 800 Configuration Software User Manual (part D301250X012)*

1.2 Product Overview

The Auto-Adjust program enables a ROC800 to read the pulse counters once each second for all configured and run-enabled Auto-Adjust points. The program calculates an “adjusted volume rate” based on the frequency variations between the main and sensing rotors on the Turbo-Meter. Using the AAT Volume and % Error values from the Turbo-Meter calibration report (see the example calibration report included in *Section 4*, Reference Materials), you enter these values in the Auto-Adjust Calibration Curve pane on the Auto-Adjust Configuration screen (see *Figure 17*). The program uses these calibration-based correction values to calculate an “adjusted uncorrected volume factor,” or AUVF. If you enable the Auto-adjust calibration curve, the program applies the AUVF factor to the adjusted volume rate. The adjusted volume rate is the parameter that should be used as the uncorrected volume input to the AGA 7 calculations, which results in a volume flow rate at base conditions.

The adjusted volume calculation provides a measurement registration that adjusts flow values back to original factory calibration accuracy, thus compensating for meter changes or abnormal flow conditions.

Note: When using the Auto-Adjust program on a ROC800, you don’t need to use any other equipment to interface with an Auto-Adjust Turbo-Meter.

For further information on the Auto-Adjust calculations, equations, and flowcharts, refer to the Auto-Adjust Turbo-Meter Algorithms manual available from Sensus Metering Systems (www.sensus.com).

1.3 Program Requirements

For programs being installed on a ROC800-Series 1, the Auto-Adjust program is compatible with version 2.02 (or greater) of the firmware and with version 1.74 (or greater) of the ROCLINK 800 software. For programs being installed on a ROC800-Series 2, the Auto-Adjust program is compatible with version 3.00 (or greater) of the firmware and with version 1.87 (or greater) of the ROCLINK 800 software.

Program specifics include:

File Name	Target Unit/Version	User Defined Point (UDP)	Flash Used (in bytes)	SRAM Used (in bytes)	DRAM Used (in bytes)	ROCLINK 800 Version	Display Number
Auto-Adjust.62.tar	ROC800 Series 1 2.02	62	28874	2631	114688	1.74 (or greater)	5, 6
	ROC800 Series 2 3.00	62	28874	2631	114688	1.87 (or greater)	5, 6

Auto-Adjust.63.tar	ROC800 Series 1 2.02	63	28874	2631	114688	1.74 (or greater)	5, 6
	ROC800 Series 2 3.00	63	28874	2631	114688	1.74 (or greater)	5, 6

Note: You must connect a PC to the ROC800'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* (part D301250X012).

1.3.1 License Keys

License keys, when matched with valid license codes, grant access to applications such as the Auto-Adjust program.

The term “license key” refers to the physical piece of hardware that can contain up to seven different licenses (refer to *Figure 1*). Each ROC800 can have none, one, or two license keys installed. If you remove a license key after enabling an application, the firmware disables the task from running. This prevents unauthorized execution of protected applications in a ROC800.

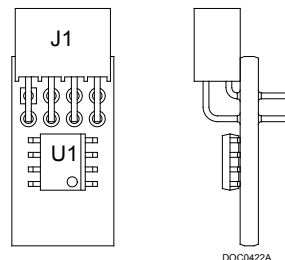


Figure 1. License Key

You must install the following license keys to use the Auto-Adjust Program.

- Auto-Adjust License Key.

Note: Each Auto-Adjust Turbo-Meter requires a **separate** license. For example, to enable two Auto-Adjust Turbo-Meter calculations, **two** Auto-Adjust licenses must be present on the license key.

- AGA_3/7/8 License Key (**not included in this program**).

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Chapter 2 – Installation

In This Chapter

2.1 Wiring the Auto-Adjust Turbo-Meter (using Pulse Input Module)	2-1
2.2 Wiring the Auto-Adjust Turbo-Meter (using Advanced Pulse Module)	2-3
2.3 Installing the License Key	2-5
2.3.1 Verifying the License Key Installation	2-6
2.4 Downloading the Auto-Adjust Program.....	2-7
2.5 MPU Loading Threshold	2-11

This section provides instructions for installing the Auto-Adjust program. Read *Section 1.3* of this manual for program requirements.

Note: The program and license key can be installed in any order. The manual shows the installation of the license key first.

2.1 Wiring the Auto-Adjust Turbo-Meter (using Pulse Input Module)

Wiring a ROC800 to a Sensus Auto-Adjust™ Turbo-Meter requires that you use a Dual-Channel safety barrier. You can purchase the safety barrier from Sensus. Install the safety barrier in the Safe Area with the ROC800, not in the Hazardous Area with the Turbo-Meter.

You can install either a **blade tip** sensor Turbo-Meter (refer to *Figure 2* and Invensys drawing MM-1922-B) or a **slot** sensor Turbo-Meter (refer to *Figure 3* and Invensys drawing MM-2126-B).

If you are installing a **blade tip** sensor Turbo-Meter, refer to *Figure 2* and Invensys drawing MM-1922-B. Use two Dual-Channel safety barriers and a power safety barrier. The power for each of the Dual-Channel safety barriers should be 24 volt dc. You cannot power both barriers from the Pulse Input module.

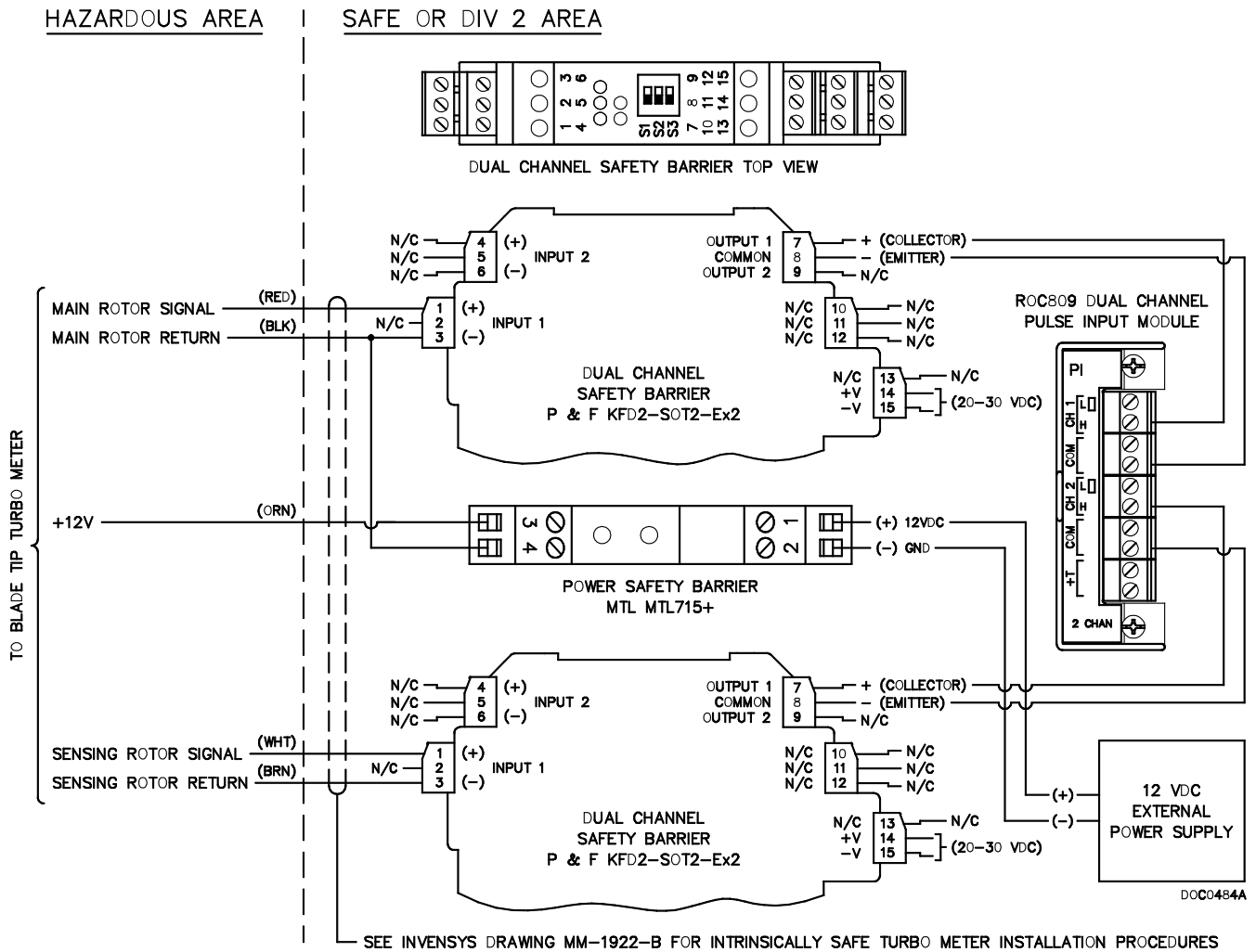


Figure 2. Turbo-Meter with Blade Tip Sensor Installation (Pulse Input Module)

If you are installing a **slot** sensor Turbo-Meter, refer to *Figure 3* and Invensys drawing MM-2126-B. The power for the Dual-Channel safety barrier can come from the Pulse Input module's +T connection. When you configure the PI module (using ROCLINK 800), set the +T channel to 24 Volts dc.

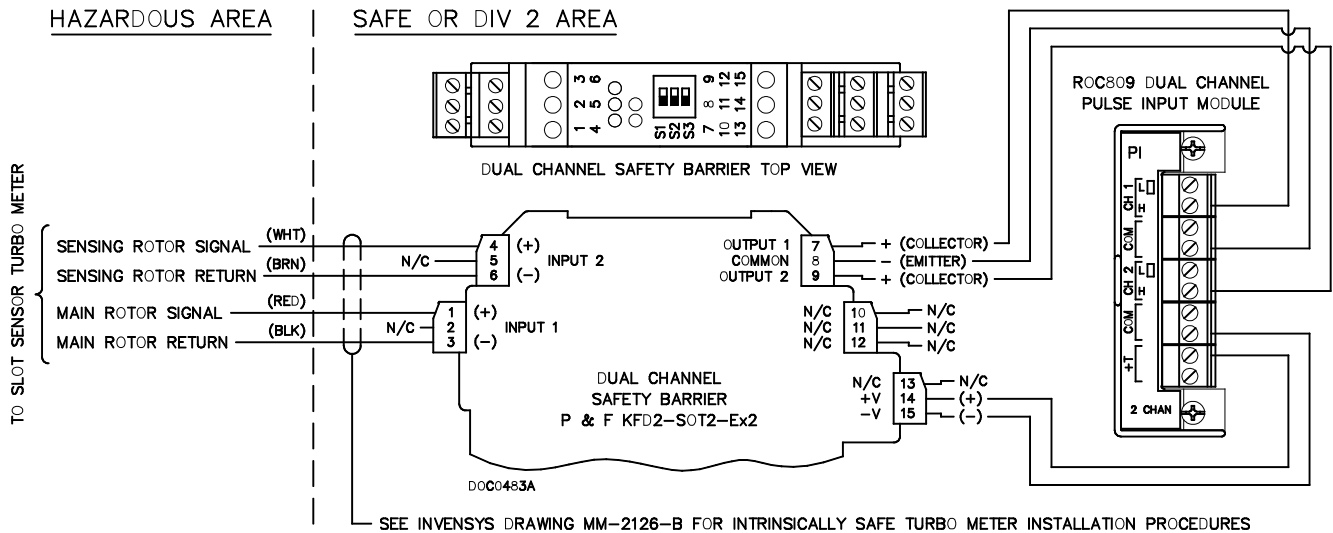


Figure 3. Turbo-Meter with Slot Sensor Installation (Pulse Input Module)

Note: For either the blade tip or slot sensor Turbo-Meter, be sure to follow all instructions on the Invensys drawings and on any literature that accompanies the safety barrier and Turbo-Meter.

2.2 Wiring the Auto-Adjust Turbo-Meter (using Advanced Pulse Module)

Wiring a ROC800 to a Sensus Auto-Adjust™ Turbo-Meter requires that you use a Dual-Channel safety barrier. You can purchase the safety barrier from Sensus. Install the safety barrier in the Safe Area with the ROC800, not in the Hazardous Area with the Turbo-Meter.

You can install either a **blade tip** sensor Turbo-Meter (refer to *Figure 4*) or a **slot** sensor Turbo-Meter (refer to *Figure 5*).

If you are installing a **blade tip** sensor Turbo-Meter, refer to *Figure 4*. Use two Dual-Channel safety barriers and a power safety barrier. The power for each of the Dual-Channel safety barriers should be 24 volt dc. You cannot power both barriers from the Advanced Pulse Module.

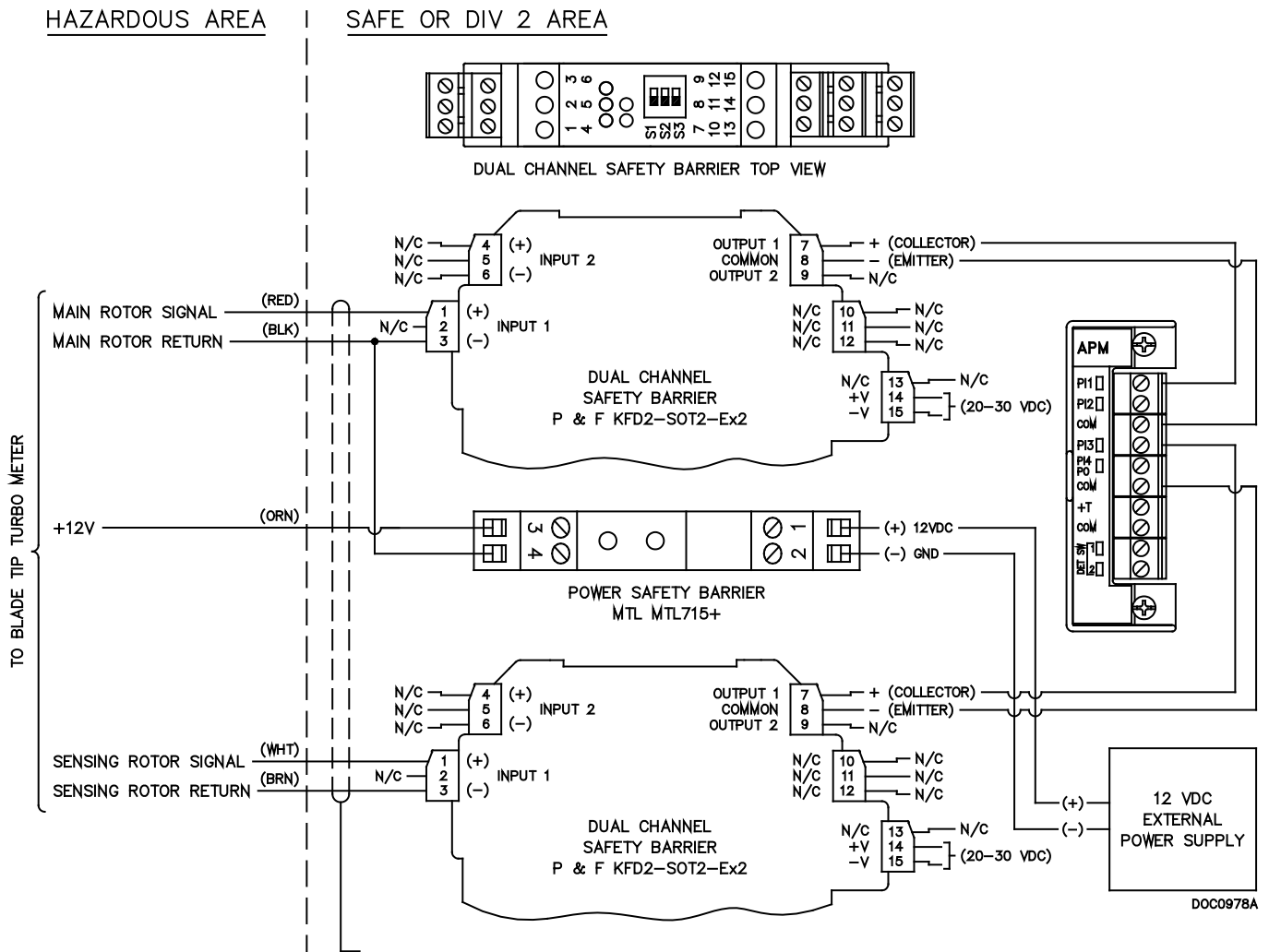


Figure 4. Turbo-Meter with Blade Tip Sensor Installation (Advanced Pulse Module)

If you are installing a **slot** sensor Turbo-Meter, refer to Figure 5. The power for the Dual-Channel safety barrier can come from the Pulse Input module's +T connection. When you configure the PI module (using ROCLINK 800), set the +T channel to 24 Volts dc.

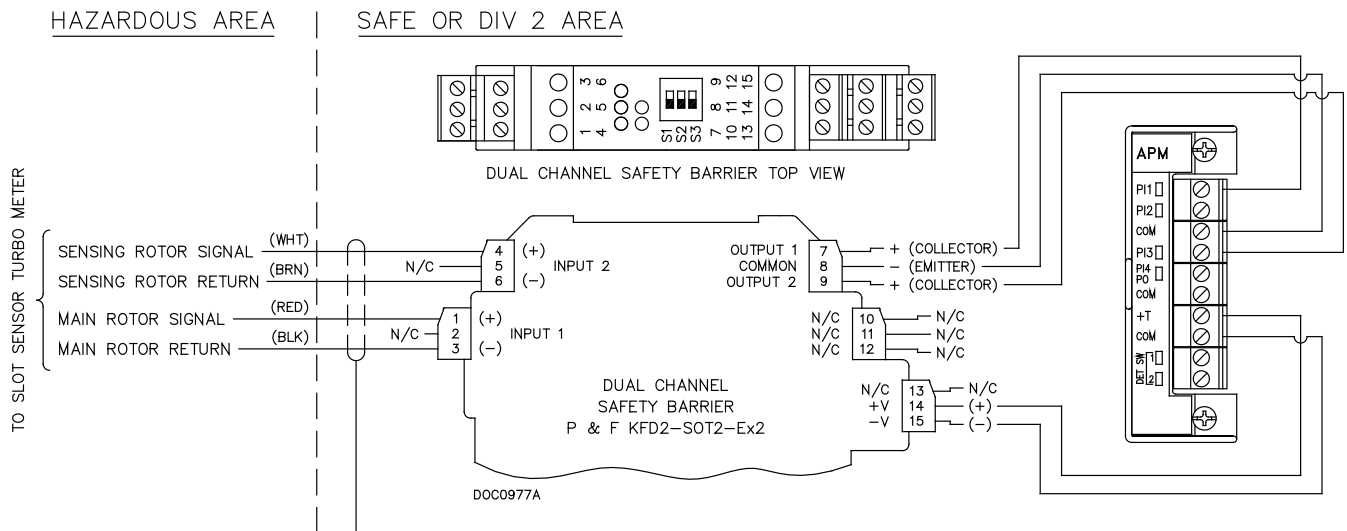


Figure 5. Turbo-Meter with Slot Sensor Installation (Advanced Pulse Module)

Note: For either the blade tip or slot sensor Turbo-Meter, be sure to follow all instructions on the drawings and on any literature that accompanies the safety barrier and Turbo-Meter.

2.3 Installing the License Key

If you order the Auto-Adjust program for a new ROC800, your ROC800 is delivered with the license key installed. Go to *Section 2.3*.

If you order the program for an existing ROC800, you must install the license key yourself.



Caution

Failure to exercise proper electrostatic discharge precautions, such as wearing a grounded wrist strap may reset the processor or damage electronic components, resulting in interrupted operations.

When working on units located in a hazardous area (where explosive gases may be present), make sure the area is in a non-hazardous state before performing these procedures. Performing these procedures in a hazardous area could result in personal injury or property damage.

To install a license key:

1. Remove power from the ROC800.
2. Remove the wire channel cover.
3. Unscrew the screws from the Central Processing Unit (CPU) faceplate.
4. Remove the CPU faceplate.
5. Place the license key in the appropriate terminal slot (**P4** or **P6**) in the CPU.

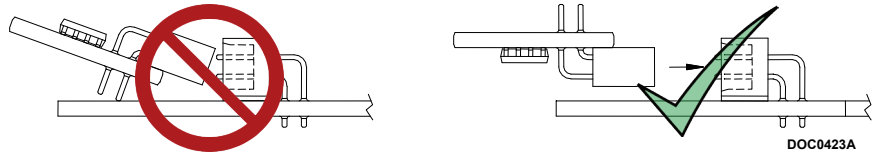


Figure 6. License Key Installation

Note: When using a single license key, install it in **slot P4**.

6. Press the license key into the terminal until it is firmly seated (refer to *Figure 6*).
7. Replace the CPU faceplate.
8. Replace the screws on the CPU faceplate.
9. Replace the wire channel cover.
10. Restore power to the ROC800.

2.3.1 Verifying the License Key Installation

After you install the license key, you can verify whether the ROC800 recognizes the key. From the ROCLINK 800 screen, select **Utilities > License Key Administrator**. The License Key Administrator screen displays:

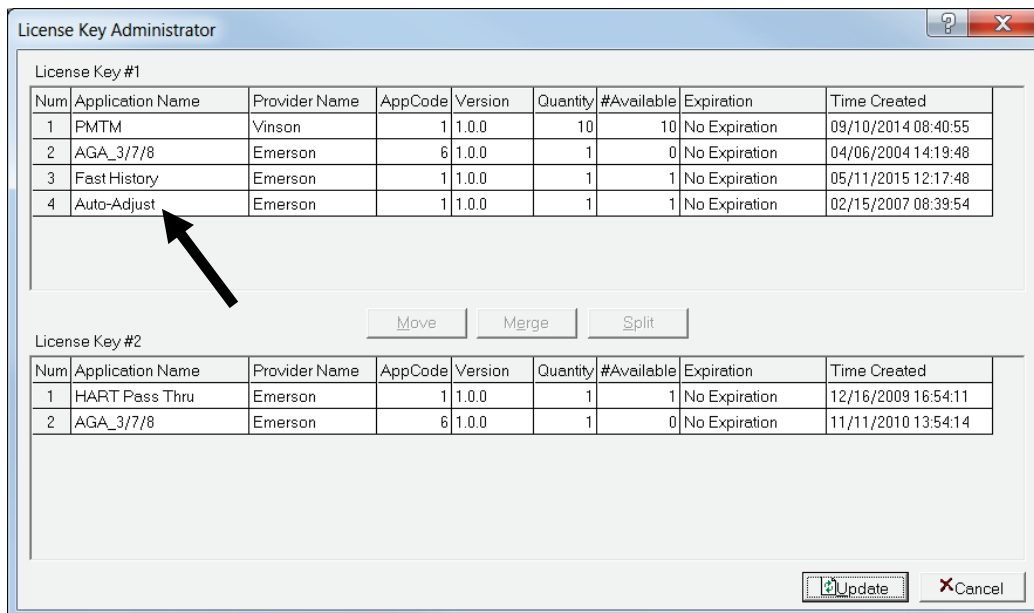


Figure 7. License Key Administrator

The Auto-Adjust program appears in the Application Name column. (For further information on the License Key Administrator screen, refer to the *ROCLINK 800 Configuration Software User Manual* (part D301250X012).

Note: The value in the App Code field on this screen indicates the total number of supported meters available on this ROC800.

After you verify that the license key is correctly installed and recognized, proceed to *Section 2.3*.

2.4 Downloading the Auto-Adjust Program

This section provides instructions for installing the Auto-Adjust program file into the Flash memory on the ROC800.

Note: Two versions of the program are included. Installation and operation are identical between the two programs, but they use different point type locations. The manual shows installation of Auto-Adjust.62.tar. Choose the version of the program that uses a point type not currently in use by other programs on your ROC800.

To download the program using ROCLINK 800 software:

1. Connect the ROC to your computer using the LOI port.
2. Start and logon to ROCLINK 800.
3. Select **Utilities > User Program Administrator** from the ROCLINK menu bar. The User Program Administrator screen displays (see *Figure 8*):

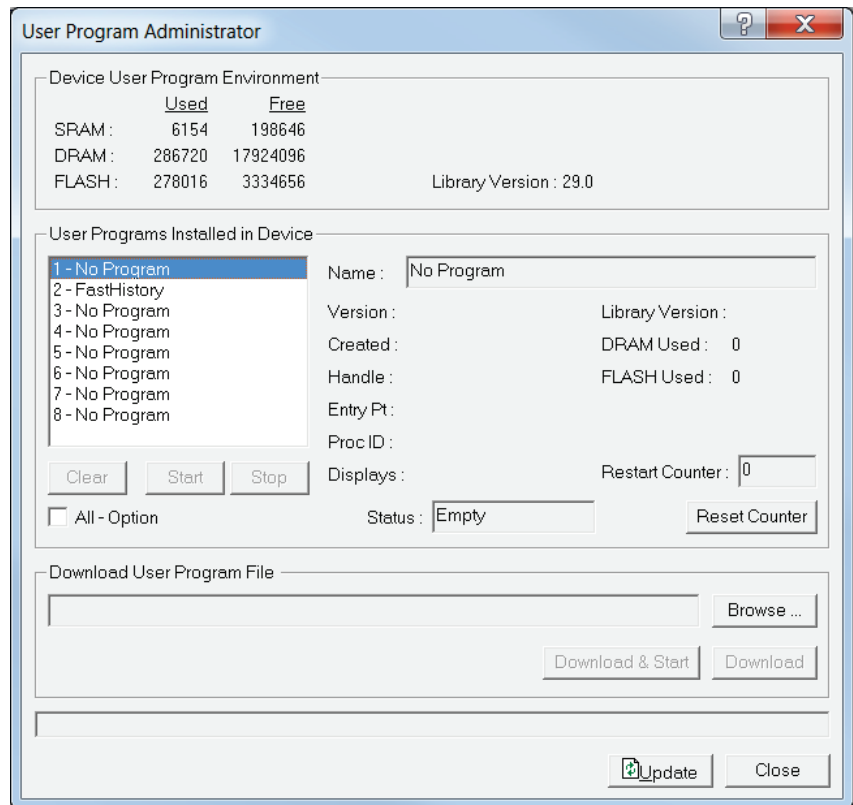


Figure 8. User Program Administrator

4. Select any empty program number (in this case, number 1) in which to download the program.
5. Click **Browse** in the Download User Program File frame. The Select User Program File screen displays (see *Figure 9*).
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 9* shows, the screen lists all valid user program files with the .TAR extension:

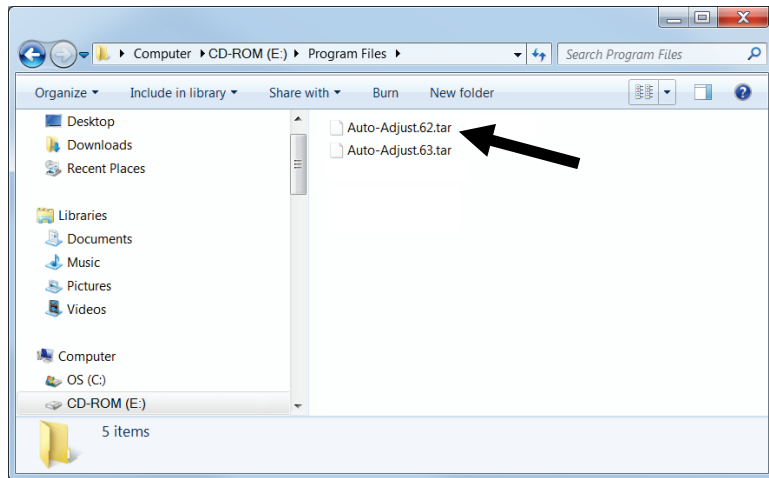


Figure 9. Select User Program File

7. Click **Open** to select the program file. The User Program Administrator screen displays. As shown in *Figure 10*, note that the Download User Program File frame identifies the selected program and that the **Download & Start** button is active:

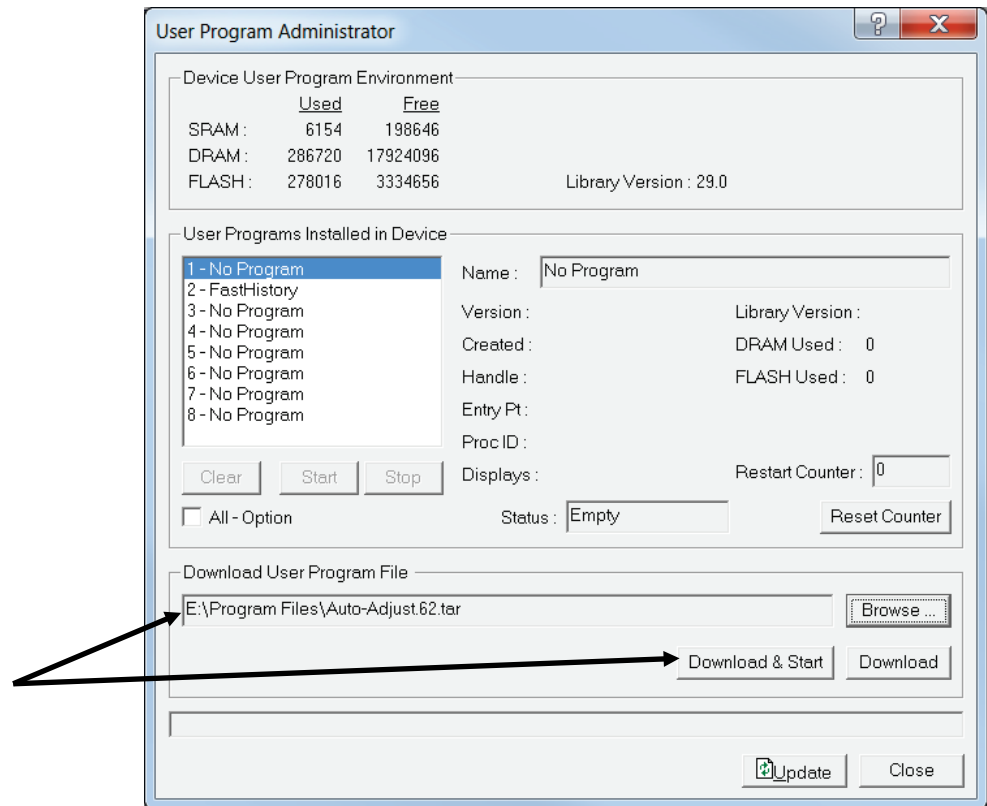


Figure 10. User Program Administrator

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

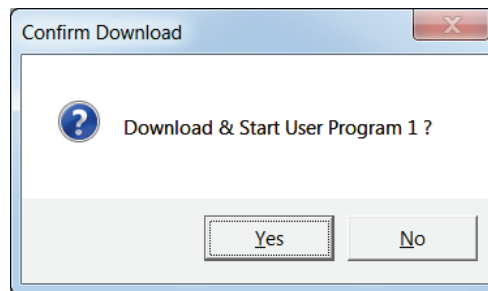


Figure 11. Confirm Download

9. Click **Yes** to begin the download. When the download completes the following message displays:

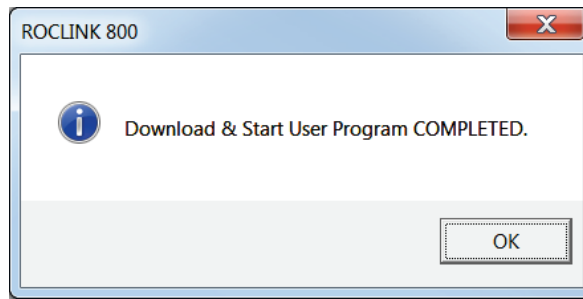


Figure 12. ROCLINK 800 Download Confirmation

10. Click **OK**. The User Program Administrator screen displays (see Figure 13). Note that:

- The Device User Program Environment frame reflects the use of system memory.
- The User Programs Installed in Device frame identifies the installed program(s).

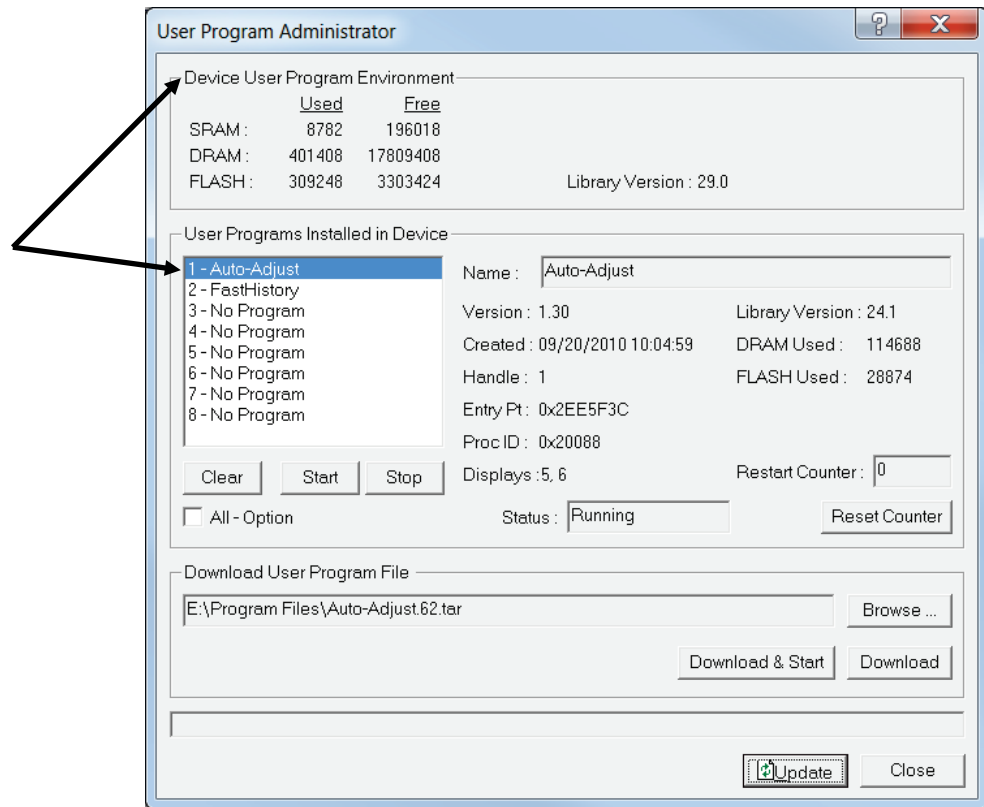


Figure 13. User Program Administrator

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

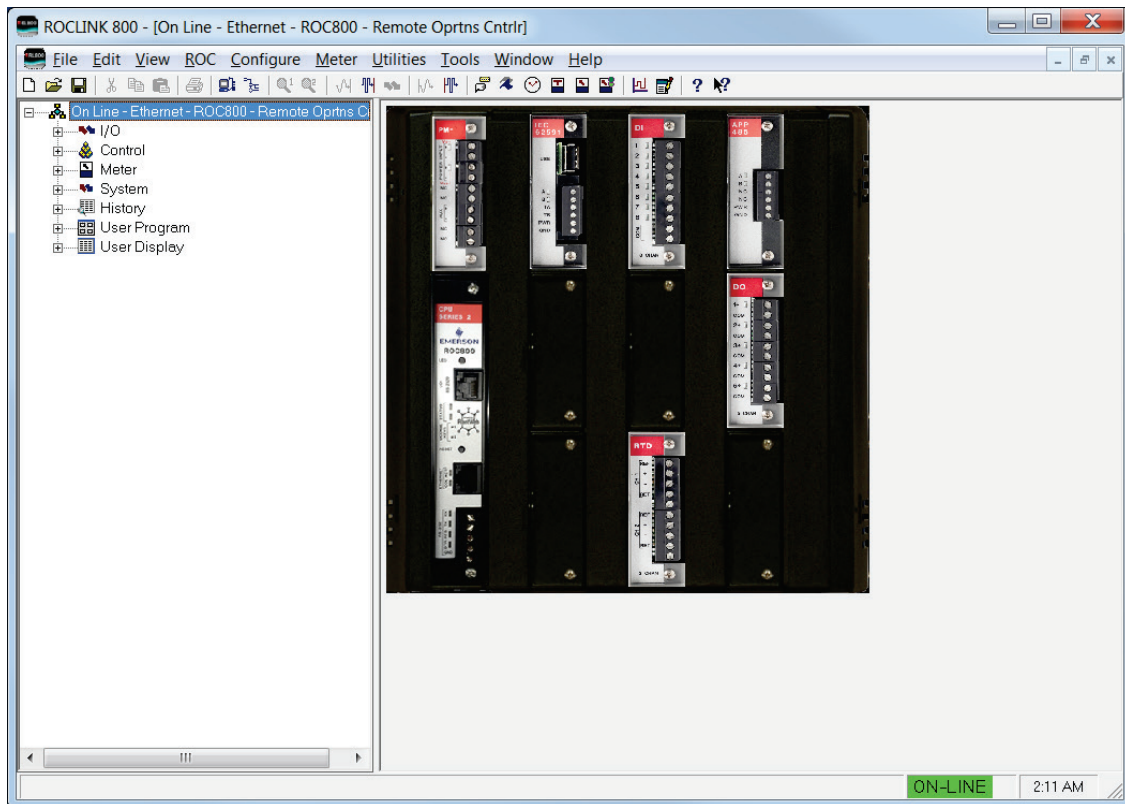


Figure 14. ROCLINK 800

2.5 MPU Loading Threshold

To maximize the performance of your ROC800 device, always verify the performance of specific application combinations before using them in the field to ensure the MPU load typically remains **below 85%** with peak MPU loading levels **below 95%**.

To check the current MPU load at any time, select **ROC > Information > Other Information** and review the value in the MPU loading field.

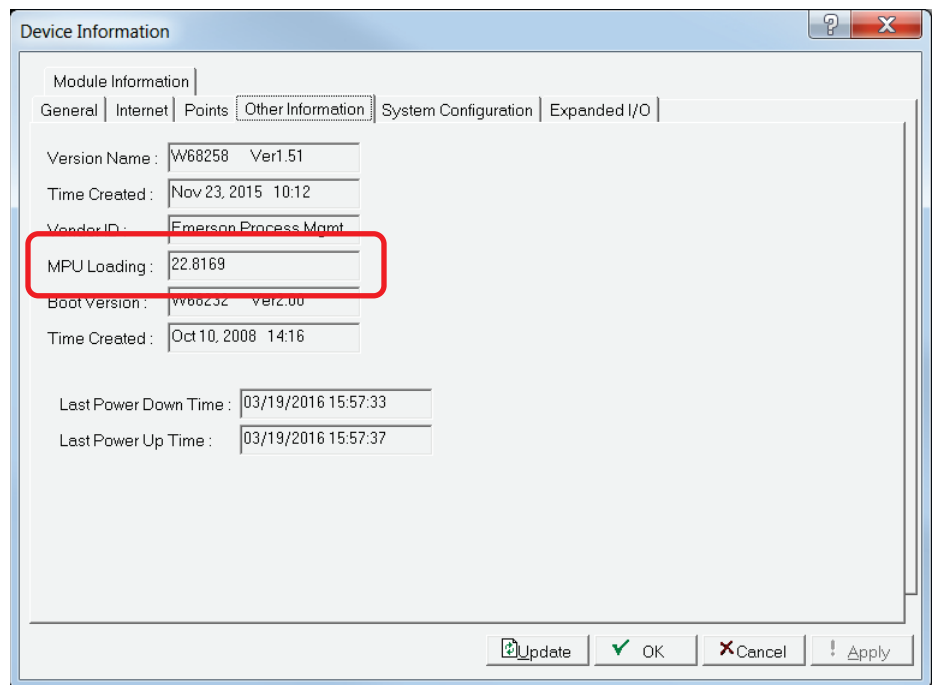


Figure 15. MPU Loading

Chapter 3 – Configuration

In This Chapter

3.1	Auto-Adjust Configuration Screen	3-2
3.2	Auto-Adjust Alarms Screen	3-7
3.3	Saving the Configuration	3-10

After you have loaded the Auto-Adjust program on the ROC800, you configure the program using two program-specific screens (Auto-Adjust Configuration and Auto-Adjust Alarms):

- Use the Auto-Adjust Configuration screen to set a number of program configuration values (including inputs, factor values, and other parameters) and enable the calculations.
- Use the Auto-Adjust Alarms screen to view active program-specific alarms.

To configure the program (after logging onto ROCLINK 800 and successfully installing the program and license key), proceed through the program screens as shown in this section.

Note: Once you have completed the configuration process for the Auto-Adjust program, review the ROCLINK 800 turbine meter setup screen and the station setup screen to which the turbine meter belongs to determine if any additional configuration is required. You can configure either the Adjusted or Mechanical (un-adjusted) flow rate as the uncorrected flow rate for a turbine meter (AGA 7). The Turbine Meter point type includes all parameters that need to be archived for collection by the EFM reports.

You can access the program-specific screens from the main ROCLINK 800 screen:

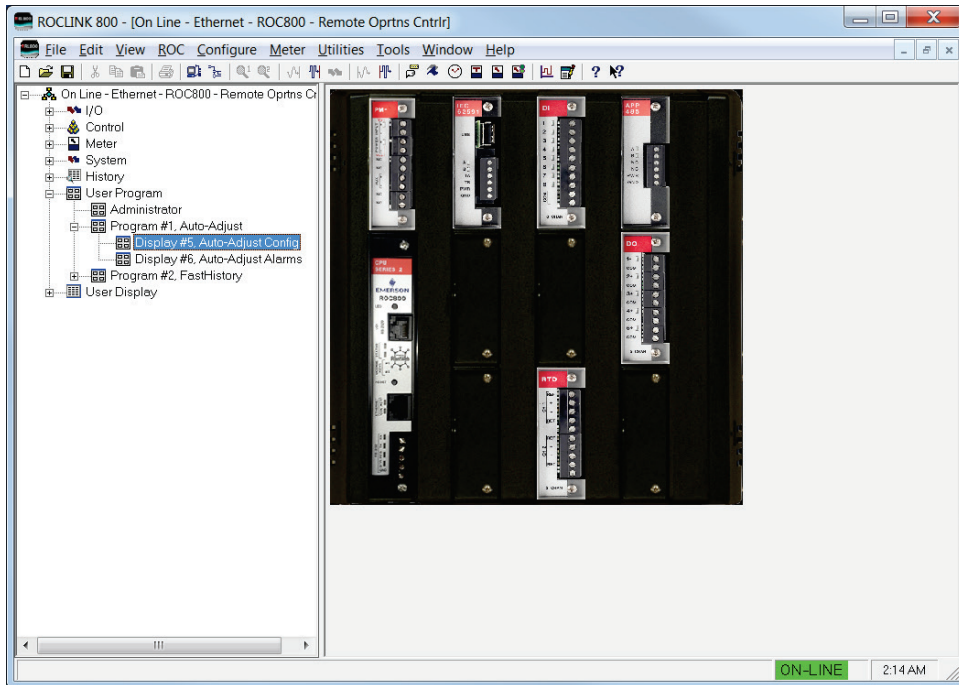


Figure 16. ROCLINK 800

3.1 Auto-Adjust Configuration Screen

Use this screen to set configuration values for the Auto-Adjust program.
To access this screen:

1. From the Directory Tree, select **User Program > Program #1, Auto-Adjust > Display #5, Auto-Adjust Config**,
2. Double-click. The Auto-Adjust Configuration screen displays:

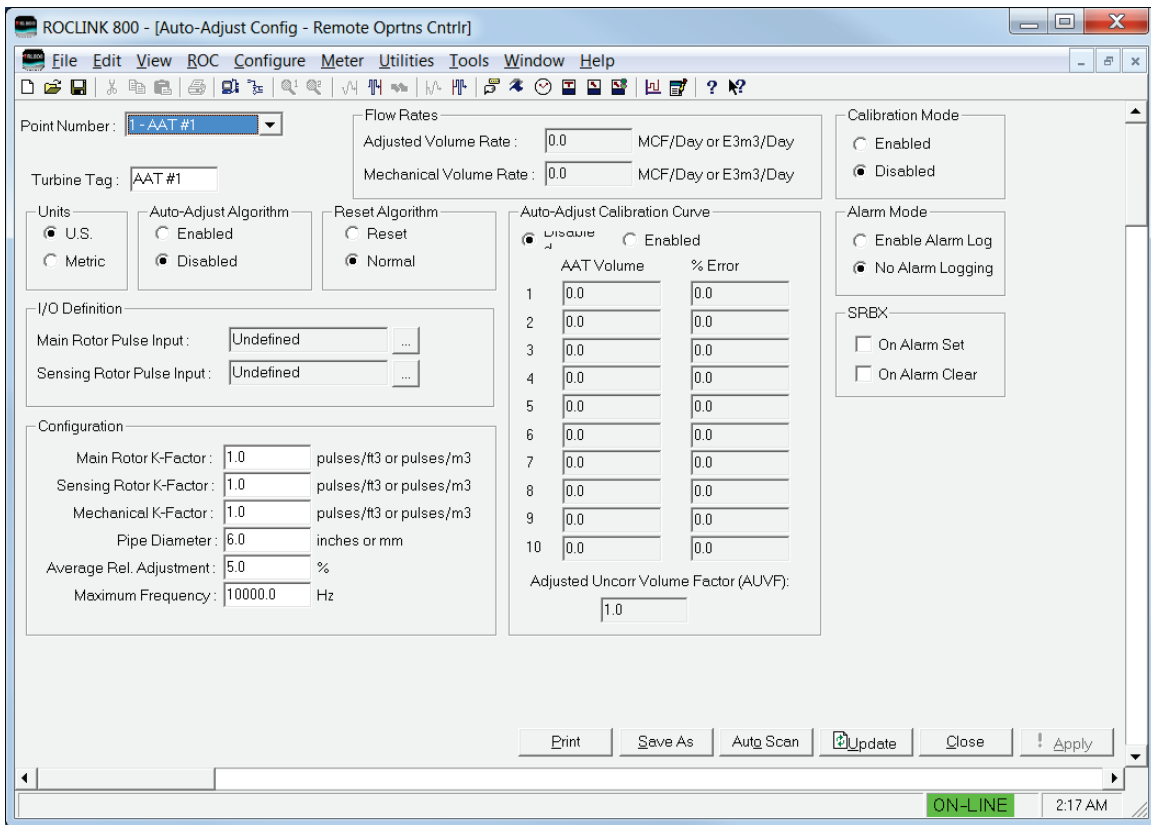


Figure 17. Auto-Adjust Configuration

3. Review the values in the following fields:

Field	Description
Point Number	Indicates the Auto-Adjust point to be configured. Click ▼ to display all available points.
Turbine Tag	Displays the name associated with this turbine. This tag can be up to 10 characters in length.
Adjusted Volume Rate	Indicates, in MCF/day or KM ³ /day, the flow rate determined by the auto-adjust algorithm and the AUVF (if enabled) at flowing conditions. The system updates this value once per second. This is a parameter that should be used as input to the AGA 7 calculations.

Field	Description
Mechanical Volume Rate	<p>Indicates, in MCF/day or KM³/day, the un-adjusted flow rate based on the main rotor pulses and the mechanical K-factor. The system updates this value once per second.</p> <p>This parameter does not have compensation from the auto-adjust algorithm.</p> <p>Note: The AGA 7 firmware expects a flow rate (in either MCF/day or KM³/day) when reading an uncorrected value other than from a pulse input point. You can configure either the adjusted or mechanical volume rate as the uncorrected flow rate input to the AGA 7 calculation. AGA reads the input once per second, back-calculates a virtual pulse rate from the AGA 7 K-factor, and stores the value as the raw pulse accumulation. You can then archive this parameter for EFM re-calculations.</p>
Calibration Mode	<p>Sets the rotor calibration mode. Valid values are Enabled (which uses a self-checking cycle of 2,500 rotations) or Disabled (which uses the standard cycle of 25,000 rotations). The default is Disabled. Selecting Enabled shortens the amount of cycle used during calibration of the ROC800.</p>
Units	<p>Indicates the measurement units the program uses for calculations. Valid values are US or Metric.</p>
Auto-Adjust Algorithm	<p>Indicates the state of the Auto-Adjust Turbo-Meter defined in this logical. Valid values are Enabled (active) or Disabled (inactive). The default is Disabled.</p>
Reset Algorithm	<p>Forces, when the Auto-Adjust algorithm is enabled, the algorithm to reset (as with a warm start). The reset clears all accumulators and timers associated with the self-checking algorithm and, when complete, returns the program to Normal setting. Valid values are Normal (do not force the reset) or Reset (force the reset). The default is Normal.</p>
Main Pulse Rotor Input	<p>Indicates the particular pulse input for the turbine's main rotor. Click "... " to display a TLP screen to define the input. The program ignores the selected parameter for a pulse input. If you are selecting an Advance Pulse Module (APM) input, select the appropriate pulse count parameter.</p>
Sensing Rotor Pulse Input	<p>Indicates the particular pulse input for the turbine's sensing rotor. Click "... " to display a TLP screen to define the input. The program ignores the selected parameter for a pulse input. If you are selecting an Advance Pulse Module (APM) input, select the appropriate pulse count parameter.</p>
Main Rotor K-Factor	<p>Indicates, in pulses/ft³ or pulses/m³, a scaling K-factor the program uses to convert the main rotor pulses to either pulses/ft³ or pulses/m³.</p>

Field	Description
Sensing Rotor K-Factor	Indicates, in pulses/ft ³ or pulses/m ³ , a scaling K-factor the program uses to convert the sensing rotor pulses to either pulses/ft ³ or pulses/m ³ .
Mechanical K-Factor	Indicates, in pulses/ft ³ or pulses/m ³ , a K-factor as provided from the Equimeter calibration sheet. The program uses this value to calculate a Mechanical Volume rate or un-adjusted volume, which matches the Turbo-Meter mechanical totalizer volume.
Pipe Diameter	Indicates, in inches or mm, the pipe's approximate internal diameter. Note: The program uses this value to complete the Blade Tip Sensor Factor field on the Auto-Adjust Alarms screen.
Average Rel. Adjustment	Indicates, as a percentage, the average relative adjustment for the auto-adjust algorithm determined at factory calibration.
Maximum Frequency	Indicates, in Hz, the maximum frequency value the program uses when calculating the meter load, expressed as Current Frequency or Maximum Frequency.
Auto-Adjust Calibration Curve	Activates the Auto-Adjust Calibration Curve calculation. Valid values are Enabled (calculate the Adjusted Uncorrected Volume Factor [AUVF]) or Disabled (do not allow the AUVF calculation, which is equal to an AUVF of 1.00). Note: If you enable the calibration curve, the program applies the AUVF factor to the result of the auto-adjust algorithm to calculate the adjusted volume rate at flowing conditions. If you disable the calibration curve, the adjusted volume rate reflects the result of the auto-adjust algorithm with no correction for the calibration curve.

Field	Description
AAT Volume	<p>Sets the AAT volume for up to 10 pairs of AAT Volume-%Err numbers on the calibration curve. The program uses this value (along with the value in the % Err field) to linearly interpolate the Adjusted Volume Rate. The values are typically listed on the meter calibration sheet as the “line rate.”</p> <p>Note: When you enter values for each AAT Volume-% Err pair, ensure that the AAT Volume component for each pair is greater than the AAT volume component of the immediately previous pair. Otherwise the program ignores the first lower and all subsequent pairs, regardless of the value of the AAT Volume component. For example, in the pair sequence (where the first value represents the AAT Volume and the second value is the % Error):</p> <p style="margin-left: 40px;">Pair 1: 100, -0.5 Pair 2: 300, 0.3 Pair 3: 800, 1.2 Pair 4: 500, 1.1 Pair 5: 1000, 0.7</p> <p>The AAT Volume in pair 4 is less than the AAT Volume in pair 3. The program then uses the % Err value of 1.2 for any volume above 800, regardless of what you’ve defined in pairs 4 or 5.</p>
% Error	<p>Sets the % Error value for up to 10 pairs of AAT Volume-% Err numbers on the calibration curve. The program uses this value (along with the value in the AAT Volume field) to linearly interpolate the Adjusted Volume Rate. The values are typically listed on the meter calibration sheet as the “% error adjusted.”</p>
Adjusted Uncorr Volume Factor (AUVF)	<p>This read-only field displays the Adjusted Uncorrected Volume Factor (AUVF), which the program calculates as equal to $[1 / (\% \text{ Err}/100) + 1]$.</p>
Alarm Mode	<p>Sets if the ROC800 stores alarms related to the Auto-Adjust user program in the device alarm log. Valid selections are Enable Alarm Log and No Alarm Logging. The default is No Alarm Logging.</p>
SRBX	<p>Sets when the program generates a Spontaneous Report by Exception (SRBX) Valid selections are On Alarm Set (generate a report when an alarm sets) and On Alarm Clear (generate a report when an alarm clears).</p>

4. Click **Apply** to save your changes.
5. Click **OK** to close the screen. Proceed to *Section 3.2* to configure alarms.

3.2 Auto-Adjust Alarms Screen

Use this screen to specify the alarms for the Auto-Adjust program. To access this screen:

1. From the Directory Tree, select **User Program > Program #1, Auto-Adjust > Display #6, Auto-Adjust Alarms**.
2. Double-click. The Auto-Adjust Alarms screen displays:

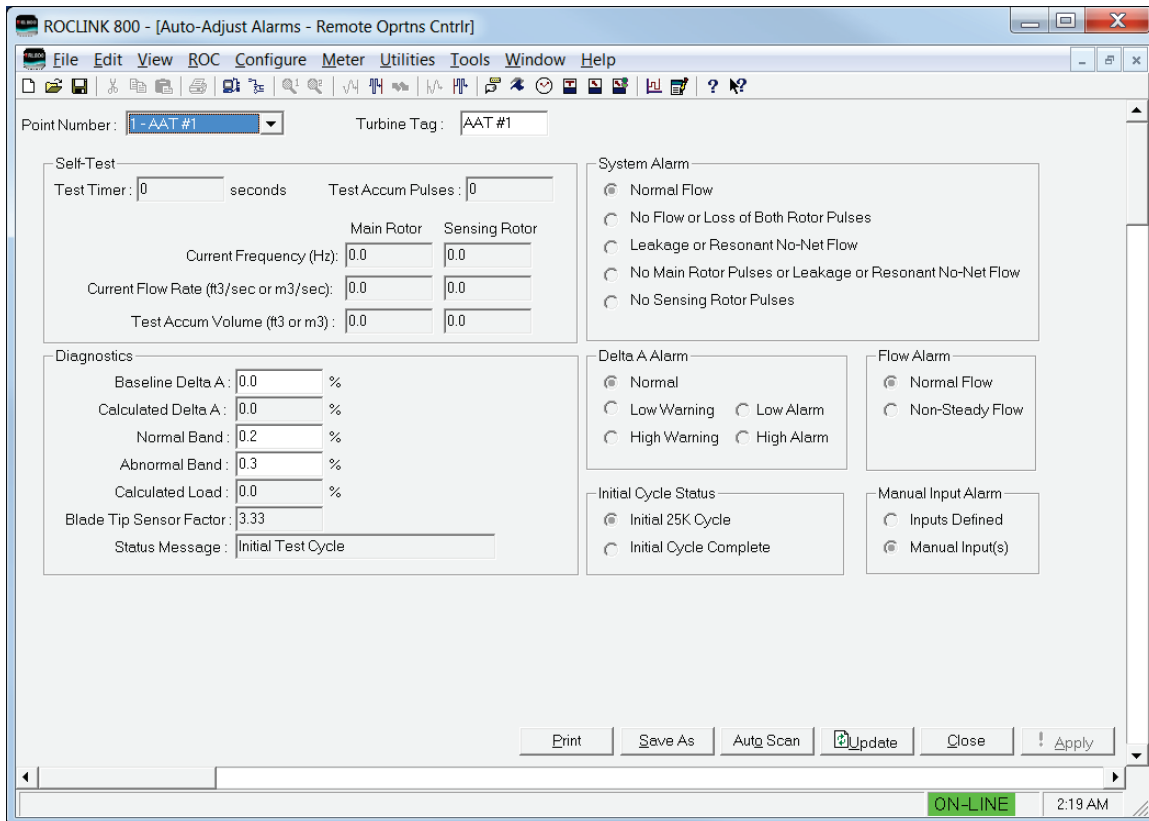


Figure 18. Auto-Adjust Alarms

3. Review the values in the following fields:

Field	Description
Point Number	Indicates the Auto-Adjust point to be configured. Click ▼ to display all available points.
Turbine Tag	Displays the name associated with this turbine. This tag can be up to 10 characters in length.
Test Timer	This read-only field shows the number of seconds elapsed since the program last started the Auto-Adjust self-checking calculation. The program resets this value either after 512 seconds or when the main rotor reaches 25,000 pulses, whichever occurs first.

Field	Description
Test Accum Pulses	This read-only field shows the rotor pulses accumulated during the current self-checking calculation cycle. A self-checking calculation cycle takes either 25,000 rotor rotations or 512 seconds, whichever occurs first.
Current Frequency	This read-only field shows, in Hz, the current frequency for both the main and sensing rotors. The program updates this value once each second.
Current Flow Rate	This read-only field shows, in ft ³ /second or m ³ /second, the raw volumetric rate for both the main and sensing rotors. The program calculates this value as pulse/second divided by K-factor for the rotor.
Test Accum Volume	This read-only field shows, in ft ³ or m ³ , the raw volume values for both the main and sensing rotors during the current self-adjusting calculation cycle.
Baseline Delta A	<p>Indicates, as a percentage, the baseline delta adjustment (Delta A) value derived either from the factory calibration curve or the initial field testing.</p> <p>Note: The program's run-time warning and alarm limits depend on this value. For example, the program calculates the low warning limit as the Baseline Delta Adjustment value minus the Normal Band value and the high alarm limit as the Baseline Delta Adjustment value plus the Abnormal Band value.</p>
Calculated Delta A	This read-only field shows, as a percentage, the system-calculated delta adjustment (Delta A) value. This value is the amount of change that has occurred in the meter or flow condition compared to its original calibration value. The program refreshes this value at least every 512 seconds or 25,000 rotations of the main rotor.
Normal Band	Indicates, as a percentage, the normal limits above and below the Baseline Delta A value. The default value is 0.2 . If the percentage exceeds this value, the program triggers a warning.
Abnormal Band	Indicates, as a percentage, the abnormal limits above and below the Baseline Delta A value. The default value is 0.3 . If the percentage exceeds this value, the program triggers an alarm.
Calculated Load	This read-only field shows, as a percentage, the instantaneous turbine load, calculated as the current main rotor frequency divided by the maximum frequency. The program updates this value once every second.

Field	Description
Blade Tip Sensor Factor	<p>This read-only field shows a predefined factor based on the value entered in the Pipe Diameter field on the Auto-Adjust Configuration screen.</p> <p>Note: The program considers any pipe diameter between 7 and 10 inches as 8 inches, to correspond to the Sensus meter choices of 4, 6, 8, and 12 inches.</p>
Status Message	<p>This read-only field shows the status of the Auto-Adjust turbine. The values displayed in this field correspond to the values defined in the various Alarm panes (on the right-hand side of the Auto-Adjust Alarms screen).</p>
System Alarm	<p>This read-only field Indicates the current system status.</p>
Delta A Alarm	<p>This read-only field indicates whether the program-calculated deviation from the average relative adjustment is within normal limits.</p>
Flow Alarm	<p>Indicates the status of the ratio between the sensing rotor's volume and the main rotor's volume. Valid values are Normal Flow (the ratio is steady) or Non-Steady Flow (the ratios are below acceptable limits).</p>
Initial Cycle Status	<p>This read-only field indicates whether the initial cycle has started or is complete.</p>
Manual Input Alarm	<p>This read-only field indicates whether one or both Pulse Inputs to the Auto-Adjust algorithm are undefined on the I/O Definition pane on the Auto-Adjust Configuration screen. Valid values are Inputs Defined (you have defined TLP values in the I/O Definition pane for both the main and sensing rotors) or Manual Inputs (you have not defined TLP values in the I/O Definition pane for both the main and sensing rotors).</p>

4. Click **Apply** to save your changes.
5. Click **OK** to close the screen. Proceed to *Section 3.3* to save the 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:

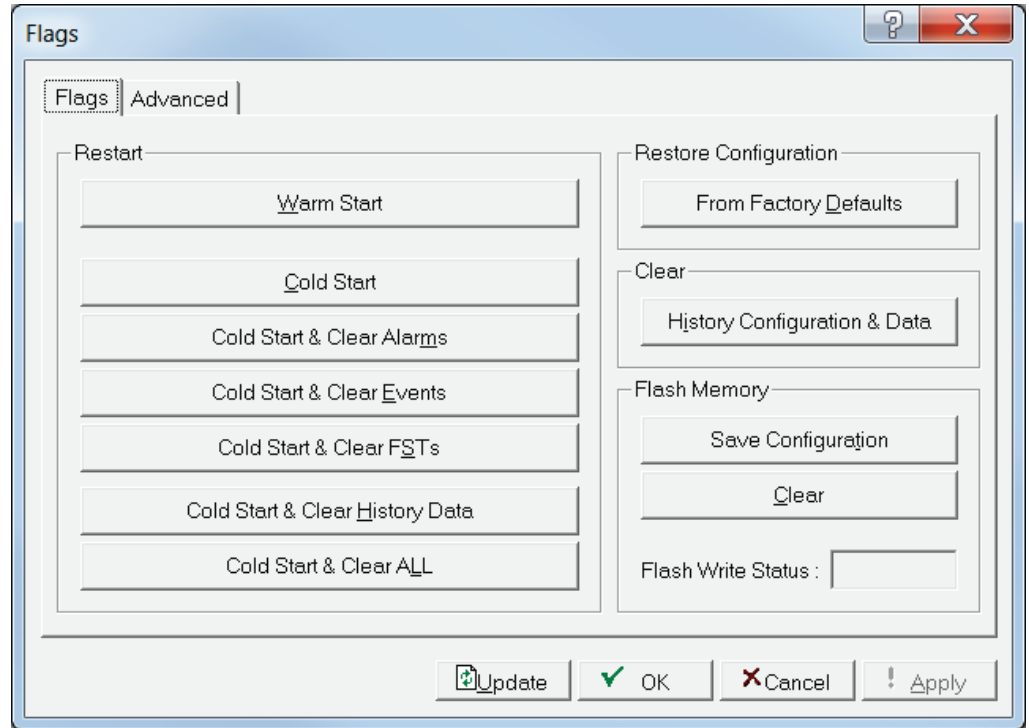


Figure 19. Flags screen

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

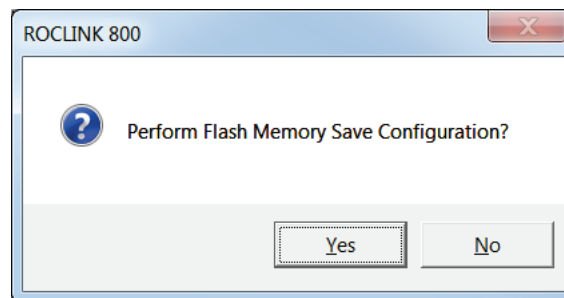


Figure 20. Perform screen

3. Click **Yes**. A confirmation message displays:



Figure 21. Flags screen

4. Click **OK** to begin the save process. The Flash Write Status field on the Flags screen displays *In Progress*. When the process ends, the Status field on the Flags screen displays *Completed*.
5. 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 flash drive) using the **File > Save Configuration** option on the ROCLINK 800 menu bar.

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Chapter 4 – Reference Materials

In This Chapter

4.1	Example Calibration Data Report.....	4-1
4.2	Point Type 62/63: Auto-Adjust Program Configuration	4-3

This section provides an example calibration data report and a table of information on the user-defined point type 62/63, which the Auto-Adjust program uses.

Note: Point type 62/63 includes all the parameters that need to be archived for EFM reports. However, you may need to configure the Adjusted or Mechanical (un-adjusted) flow rate as the uncorrected flow input for a turbine meter (AGA 7).

4.1 Example Calibration Data Report

Following is an example calibration data report, which a calibration service provides.

Applicant: Flow Computer Division

Meter Type:

Meter S/N 29835647
 Model ATT-230
 Meter Capacity 230000 act/h

Auto Adjust Test Data (As Left)

Medium: Natural Gas
Pressure: 896.33 (PSI)
Temperature: 81.83 (°F)
Density: 2.86 (Lbs/ft3)
Compressibility: 0.90062

Ave. Rel. Adj. 9.9713 %
M.R. Factor 6.9211 p/ft3
S.R. Factor p/ft3

Gear Set

Prover Rate (Acf/hr)	AAT Vol (Acf/hr)	M.R. Freq Hz	S.R. Freq Hz	M.R.Vol	S.R.Vol	Error (%)	Delta A (%)
226318.16	225280.68	476.7708	54.4584	247991.64	22710.96	-0.46	0.110
183957.54	183279.74	387.6479	44.0127	201634.50	18354.76	-0.37	0.043
139660.54	139173.91	294.2501	33.2823	153053.76	13879.85	-0.35	0.002
114882.18	114688.51	242.3503	27.2631	126058.14	11369.64	-0.17	-0.058
80701.70	80702.71	170.5003	19.1417	88685.47	7982.75	0.00	-0.080
57863.88	57933.97	122.3862	13.7280	63659.00	5725.03	0.12	-0.089
34801.46	34885.32	73.7133	8.2884	38341.87	3456.56	0.24	-0.063
23147.60	23221.87	49.0866	5.5402	25532.30	2310.43	0.32	-0.022
11761.08	11825.83	25.0156	2.8439	13011.81	1185.98	0.55	0.057
6544.63	6596.35	13.9485	1.5801	7255.29	658.94	0.79	0.018
2424.77	2452.19	5.1582	0.5535	2683.02	230.84	1.13	-0.558

For example, for data set 1, the AAT Vol value is 225280.68 and the % error is -0.46. The program then calculates the adjustment factor as:

$$\text{AUVF Factor} = 1 / ((\%err/100) + 1) = 1 / ((-0.46/100) + 1) = \mathbf{1.004621}$$

The adjusted volume rate at flowing conditions, if the calibration curve is enabled, would then be approximately:

$$\text{Adjusted volume rate (used as input to the AGA)} = \text{value from AAT algorithm} * \text{factor} = 225850 * 1.004621 = \mathbf{226318}$$

4.2 Point Type 62/63: Auto-Adjust Program Configuration

Point type 62/63 contains the parameters used to configure the Auto-Adjust turbine meter and the results of the Auto-Adjust calculation. The program maintains up to 12 logical points (depending on the available licenses) and saves point type 62/63 information to internal configuration memory.

Point Type 62/63: Auto-Adjust Program Configuration

Parm #	Name	Access	Program or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
0	Point Tag ID	R/W	User	AC	10	0x20 → 0x7E for each ASCII character	"AAT #X" where X is the meter number	1.00	Identification name for the Auto-Adjust meter. Values must be printable ASCII characters.
1	Units	R/W	User	UINT8	1	0 → 1	0	1.00	Indicates the engineering units for calculated values. 0 = US Unit 1 = Metric Units.
2	Calculation Option	R/W	User	UINT8	1	0 → 1	0	1.00	Indicates whether a flow calculation is enabled for this turbine meter. 0 = Disabled 1 = Enabled.
3	Reset	R/W	User	UINT8	1	0 → 1	0	1.00	Selection performs a reset on the self-checking routine of the Auto-Adjust turbine meter. Selecting a reset clears all accumulations and timers associated with the self-checking routine. 0 = Normal 1 = Reset.
4	Main Rotor Pulse Input	R/W	User	TLP	3	TLP 0,0,0, TLP 105,5 → 148, TLP 141,5, TLP 141,8, TLP 141,11, TLP 141,14, TLP 141,17, TLP 141,19	0,0,0	1.00	Pulse input feed from main rotor on the auto-adjust turbine meter. Requires a Pulse Input module (PI) or an Advance Pulse Module (APM).
5	Main Rotor K-Factor	R/W	User	Float	4	Any positive, non-zero, valid IEEE 754 float	1.0	1.00	Scale factor to convert main rotor pulses to volume in pulses/ft ³ or pulses/m ³ .
6	Main Rotor Frequency	R/O	Program	Float	4	0 → positive valid IEEE 754 float	0.0	1.00	Current frequency of the main rotor pulse stream in pulses/second.

Point Type 62/63: Auto-Adjust Program Configuration

Parm #	Name	Access	Program or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
7	Main Rotor Volume Rate	R/O	Program	Float	4	0 → positive valid IEEE 754 float	0.0	1.00	Current un-adjusted volumetric flow rate of the main rotor in ft ³ /second or m ³ /second.
8	Main Rotor Test Accum Volume	R/O	Program	Float	4	0 → positive valid IEEE 754 float	0.0	1.00	Accumulated volume from the main rotor for the current self-checking routine in ft ³ or m ³ .
9	Test Accum Pulses	R/O	Program	UINT32	4	0 → 4,294,967,295	0.0	1.00	Accumulated pulses from the main rotor for the current self-checking routine.
10	Sensing Rotor Pulse Input	R/W	User	TLP	3	TLP 0,0,0, TLP 105,5 → 148, TLP 141,5, TLP 141,8, TLP 141,11, TLP 141,14, TLP 141,17, TLP 141,19	0,0,0	1.00	Pulse input feed from sensing rotor on the auto-adjust turbine meter. Requires a Pulse Input module (PI) or an Advance Pulse Module (APM).
11	Sensing Rotor K-Factor	R/W	User	Float	4	Any positive, non-zero, valid IEEE 754 float	1.0	1.00	Scale factor to convert the sensing rotor pulses to volume in pulses/ft ³ or pulses/m ³ .
12	Sensing Rotor Frequency	R/O	Program	Float	4	0 → positive valid IEEE 754 float	0.0	1.00	Current frequency of the sensing rotor pulse stream in pulses/second.
13	Sensing Rotor Volume Rate	R/O	Program	Float	4	0 → positive valid IEEE 754 float	0.0	1.00	Current un-adjusted volumetric flow rate of the sensing rotor in ft ³ /second or m ³ /second.
14	Sensing Rotor Test Accum Volume	R/O	Program	Float	4	0 → positive valid IEEE 754 float	0.0	1.00	Accumulated volume from the sensing rotor for the current self-checking routine in ft ³ or m ³ .
15	Adjusted Flow Rate	R/O	Program	Float	4	0 → positive valid IEEE 754 float	0.0	1.00	Adjusted volumetric flow rate at flowing conditions in MCF/Day or E3m ³ /Day. This is the flow rate calculated using the Auto-Adjust algorithm and corrected for AUVF (if enabled).
16	Mechanical Flow Rate	R/O	Program	Float	4	0 → positive valid IEEE 754 float	0.0	1.00	Un-adjusted or mechanical volumetric flow rate in MCF/Day or E3m ³ /Day. This value reflects the main rotor pulses converted to volume using the mechanical K-Factor (parameter #25).

Point Type 62/63: Auto-Adjust Program Configuration

Parm #	Name	Access	Program or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
17	Self-Test Timer	R/O	Program	U16	2	0 → 65535	0	1.00	Amount of time elapsed in the current self-checking cycle in seconds.
18	Pipe Diameter	R/W	User	Float	4	Any positive, non-zero, valid IEEE 754 float	6.0	1.00	Internal diameter of the meter piping in inches or mm. A blade tip sensor factor (parameter #19) is determined based on this diameter.
19	Blade Factor	R/O	Program	Float	4	2.0, 2.5, 3.33, or 4.0	3.33	1.00	Factor used to determine a minimum main rotor frequency to perform self-checking function.
20	Maximum Frequency	R/W	User	Float	4	Any positive, non-zero, valid IEEE 754 float	10000.0	1.00	Maximum rated frequency of the main rotor in Hz. This value is used to calculate a percent load on the meter (parameter #21).
21	Calculated Load	R/O	Program	Float	4	0.0 → 100.0	0.0	1.00	Percent load on the meter based on the user entered maximum frequency (parameter #20).
22	Average Relative Adjustment	R/W	User	Float	4	0.0 → 100.0	0.0	1.00	Average relative adjustment (%) determined at factory calibration.
23	Baseline Delta A	R/W	User	Float	4	-100.0 → 100.0	0.00	1.00	Average delta A values determined over a period of time during normal flow rates above 10% of meter capacity.
24	Calculated Delta A	R/O	Program	Float	4	-100.0 → 100.0	0.00	1.00	Percent deviation from Average Relative Adjustment (parameter #22).
25	Mechanical K-Factor	R/W	User	Float	4	Any positive, non-zero, valid IEEE 754 float	1.00	1.00	Scale factor to convert the main rotor pulses to volume without adjustment from the sensing rotor in pulses/ft ³ or pulses/m ³ .
26	Normal Band	R/W	User	Float	4	0.0 → 100.0	0.2	1.00	Allowable limit above and below the baseline delta A (parameter #23) above which a warning indication is displayed.

Point Type 62/63: Auto-Adjust Program Configuration

Parm #	Name	Access	Program or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
27	Abnormal Band	R/W	User	Float	4	0.0 → 100.0	0.3	1.00	Allowable limit above and below the baseline delta A (parameter #23) above which an alarm indication is displayed.
28	System Alarm	R/O	Program	UINT8	1	0 → 4	0	1.00	System alarm indicating the condition of the Auto-Adjust turbine meter. 0 = Normal Flow 1 = No Flow or Loss of Both Rotor Pulses 2 = Leakage Flow or Resonant No-Net Flow 3 = No Main Rotor Pulses or Leakage Flow or Resonant No-Net Flow 4 = No Sensing Rotor Pulses.
29	Delta A Alarm	R/O	Program	UINT8	1	0 → 4	0	1.00	Status indicating whether calculated deviation from Average Relative Adjustment is within normal limits. 0 = Normal, 1 = Low Warning 2 = High Warning 3 = Low Alarm 4 = High Alarm.
30	Non-Steady Flow Alarm	R/O	Program	UINT8	1	0 → 1	0	1.00	Status indicating that the ratio of the sensing rotor volume to main rotor volume is below acceptable limits. 0 = Normal Flow 1 = Non-Steady Flow.
31	Manual Input Alarm	R/O	Program	UINT8	1	0 → 1	0	1.00	Status indicating one or both of the inputs to the Auto-Adjust algorithm are undefined.
32	Initial Cycle Status	R/O	Program	UINT8	1	0 → 1	0	1.00	Status indicating whether the initial self-checking cycle has been completed or not. 0 = Initial cycle complete 1 = Initial cycle in progress.

Point Type 62/63: Auto-Adjust Program Configuration

Parm #	Name	Access	Program or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
33	Auto-Adjust Status Message	R/O	Program	AC	20	“Non-Steady Flow Alarm” or “Non-Steady Flow Warn” or “NoFlow/Loss Both Pls” or “Leak/Res No-Net Flow” or “NoMR Pls/Leakage/Res” or “No Sensing Pulses” or “Initial Test Cycle” or “Abnormal Alarm Low” or “Abnormal Warning Low” or “Abnormal Alarm High” or “Abnormal Warning Hi” or “Self Check OK”	“Initial Test Cycle”	1.00	Status message indicating current alarm conditions.
34	Auto-Adjust Calibration Mode	R/W	User	UINT8	1	0 → 1	0	1.00	Selects calibration mode 0 = Normal Calibration Mode (max of 25,000 pulses) 1 = Test Calibration Mode (max of 2500 pulses)
35	Adjusted Uncorrected Volume Factor Option	R/W	User	UINT8	1	0 → 1	0	1.00	Activates the calculation of the Adjusted Uncorrected Volume Factor (AUVF) 0 = Do not calculate 1 = Calculate and apply AUVF
36	Adjusted Uncorrected Volume Factor	R/O	Program	Float	4	0.0 →10.0	0.0	1.20	The adjusted uncorrected volume factor calculated from the calibration data report.
37	Auto Adjust Volume 1 % Error	R/W	User	Float	4	Any positive non-zero valid IEEE 754 float	0.0	1.20	Percentage error for calibration volume 1.
38	Auto Adjust Volume 1	R/W	User	Float	4	Any positive non-zero valid IEEE 754 float	0.0	1.20	Calibrated volume 1 in MCF/day or E3m ³ /day.
39	Auto Adjust Volume 2 % Error	R/W	User	Float	4	Any positive non-zero valid IEEE 754 float	0.0	1.20	Percentage error for calibration volume 2.
40	Auto Adjust Volume 2	R/W	User	Float	4	Any positive non-zero valid IEEE 754 float	0.0	1.20	Calibrated volume 2 in MCF/day or E3m ³ /day.

Point Type 62/63: Auto-Adjust Program Configuration

Parm #	Name	Access	Program or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
41	Auto Adjust Volume 3 % Error	R/W	User	Float	4	Any positive non-zero valid IEEE 754 float	0.0	1.20	Percentage error for calibration volume 3.
42	Auto Adjust Volume 3	R/W	User	Float	4	Any positive non-zero valid IEEE 754 float	0.0	1.20	Calibrated volume 3 in MCF/day or E3m ³ /day.
43	Auto Adjust Volume 4 % Error	R/W	User	Float	4	Any positive non-zero valid IEEE 754 float	0.0	1.20	Percentage error for calibration volume 4.
44	Auto Adjust Volume 4	R/W	User	Float	4	Any positive non-zero valid IEEE 754 float	0.0	1.20	Calibrated volume 4 in MCF/day or E3m ³ /day.
45	Auto Adjust Volume 5 % Error	R/W	User	Float	4	Any positive non-zero valid IEEE 754 float	0.0	1.20	Percentage error for calibration volume 5.
46	Auto Adjust Volume 5	R/W	User	Float	4	Any positive non-zero valid IEEE 754 float	0.0	1.20	Calibrated volume 5 in MCF/day or E3m ³ /day.
47	Auto Adjust Volume 6 % Error	R/W	User	Float	4	Any positive non-zero valid IEEE 754 float	0.0	1.20	Percentage error for calibration volume 6.
48	Auto Adjust Volume 6	R/W	User	Float	4	Any positive non-zero valid IEEE 754 float	0.0	1.20	Calibrated volume 6 in MCF/day or E3m ³ /day.
49	Auto Adjust Volume 7 % Error	R/W	User	Float	4	Any positive non-zero valid IEEE 754 float	0.0	1.20	Percentage error for calibration volume 7.
50	Auto Adjust Volume 7	R/W	User	Float	4	Any positive non-zero valid IEEE 754 float	0.0	1.20	Calibrated volume 7 in MCF/day or E3m ³ /day.
51	Auto Adjust Volume 8 % Error	R/W	User	Float	4	Any positive non-zero valid IEEE 754 float	0.0	1.20	Percentage error for calibration volume 8.
52	Auto Adjust Volume 8	R/W	User	Float	4	Any positive non-zero valid IEEE 754 float	0.0	1.20	Calibrated volume 8 in MCF/day or E3m ³ /day.
53	Auto Adjust Volume 9 % Error	R/W	User	Float	4	Any positive non-zero valid IEEE 754 float	0.0	1.20	Percentage error for calibration volume 9.
54	Auto Adjust Volume 9	R/W	User	Float	4	Any positive non-zero valid IEEE 754 float	0.0	1.20	Calibrated volume 9 in MCF/day or E3m ³ /day.

Point Type 62/63: Auto-Adjust Program Configuration

Parm #	Name	Access	Program or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
55	Auto Adjust Volume 10 % Error	R/W	User	Float	4	Any positive non-zero valid IEEE 754 float	0.0	1.20	Percentage error for calibration volume 10.
56	Auto Adjust Volume 10	R/W	User	Float	4	Any positive non-zero valid IEEE 754 float	0.0	1.20	Calibrated volume 10 in MCF/day or E3m ³ /day.
57	Alarm Log Option	R/W	User	UINT8	1	0 → 1	0	1.30	Indicates if when an Auto-Adjust related alarm occurs, if it should be entered in the device's alarm log. 0 = No Alarm Logging 1 = Enable Alarm Log
58	Alarm SRBX on Set	RW	User	UNIT8	1	0 → 1	0	1.30	Indicates a SRBX alarm is desired if an alarm condition occurs. 0 = SRBX on Set Disabled 1 = SRBX on Set Enabled
59	Alarm SRBX on Clear	RW	User	UNIT8	1	0 → 1	0	1.30	Indicates a SRBX alarm is desired if an alarm condition clears. 0 = SRBX on Clear Disabled 1 = SRBX on Clear Enabled

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