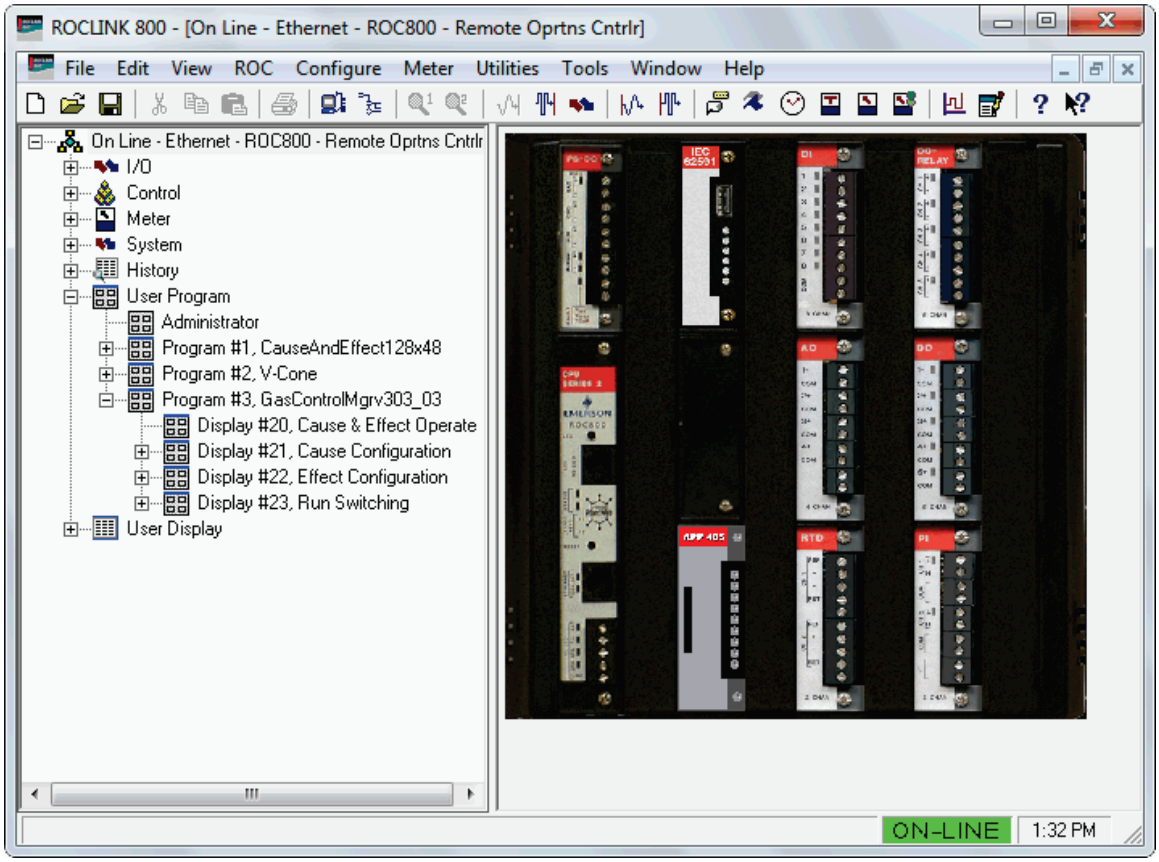
Part D301748X012
August 2014

Gas Control Manager Program
User Manual (for the ROC800-Series)



Remote Automation Solutions

EMERSON
Process Management

Revision Tracking Sheet

August 2014

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
Initial release	Aug-14

Contents

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Chapter 1 – Introduction

⚠ Caution

When implementing control using this product, observe best industry practices as suggested by applicable and appropriate environmental, health, and safety organizations. While this product can be used as A safety component in a system, it is NOT intended or designed to be the ONLY safety mechanism in that system.

This chapter describes the structure of this manual and presents an overview and installation instructions of the Gas Control Manager Program for the ROC800-Series Remote Operations Controller (ROC800).

1.1. Scope and Organization

This document is the user manual for the Gas Control Manager Program for use in the ROC800.

This manual describes how to download and configure this program (referred to as the "Gas Control Manager Program" or "the program" throughout the rest of this manual). You access and configure this program using ROCLINK™ 800 Configuration Software (version 2.20 or greater) loaded on a personal computer (PC) running Windows® 2000 (with Service Pack 2), Windows XP (with Service Pack 3), Windows Vista (32-bit), or Windows 7 (32-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 running in a ROC800, the manual becomes a reference tool.

This manual has the following major sections:

- *Chapter 1 – Introduction*
- *Chapter 2 – Installation*
- *Chapter 3 – Configuration*
- *Chapter 4 – Reference*

This manual assumes that you are familiar with the ROC800 and its configuration. For more information, refer to the following manuals:

- *ROC800-Series Remote Operations Controller Instruction Manual* (Form A6175).
- *ROCLINK 800 Configuration Software User Manual (for ROC800-Series)* (Form A6218).

1.2. Product Overview

The Gas Control Manager Program contains two parts: *EFM Applications* and *Cause and Effect*. This manual describes both parts of the program, in two sections. The first section covers the *EFM Applications*, and the second section covers *Cause and Effect.*

1.2.1. EFM Applications

The *EFM Applications User Program* is designed to allow you to configure the Emerson Process Management ROC and ROC800 products to do common gas measurement functions such as station emergency shutdown, outputting a 4-20mA signal proportional to an input or calculation, resettable total meter accumulators for volume/energy and run switching. Normally, a user would have to write FSTs to accomplish these tasks.

1.2.2. Cause and Effect

The *Gas Control Manager User Program* supports 16 causes and 8 effects. The program is designed to allow you to configure the Emerson Process Management ROC and ROC800 products to do logical operations without writing FSTs. A Cause would typically monitor a selected point that would be logically evaluated against a user defined set-point. Any tripped Cause linked to an Effect will force the action defined in that Effect. The layout of the configuration screens is such that you can configure logic by inputting entries from a Cause and Effect matrix. In many cases you can input the effects and causes line by line through the entire matrix. Each Cause configuration screen and Effect configuration screen will apply to a tag line in the user's Cause & Effect matrix.

1.3. Program Requirements

You download the Gas Control Manager Program to the Flash and RAM memory on the ROC800 with firmware version 3.50 (or greater). Download and configure the program using ROCLINK 800 Configuration software version 2.20 (or greater).

The downloadable program is:

File Name	Target Unit/ Version	User Defined Points (UDP)	Flash Used (in bytes)	DRAM Used (in bytes)	ROCLINK 800 Version	Display Number
GasControlMgrv 305_01.tar	ROC800 3.50	71, 72, 73	128845	114688	2.20	20, 21, 22, 23

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 (for ROC800-Series)* (Form A6218).

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Chapter 2 – Installation

This section provides instructions for installing the Gas Control Manager program into the ROC800. Read *Section 1.3* of this manual for program requirements.

Notes:

- The computer running ROCLINK 800 must be connected to the Local Operator Interface (LOI) port before you begin the download.
- The program and license key can be installed in any order. The manual shows the installation of the license key first.
- The installation process and functionality is the same for all versions of the Gas Control Manager program.

2.1. Installing the License Key

If you order the Gas Control Manager program for a new ROC800, your ROC800 is delivered with the license key installed. Go to *Section 2.2*. 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.

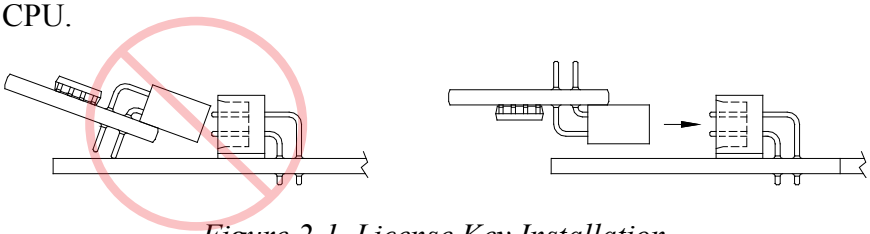

Figure 2-1. License Key Installation

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 2–1*).
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.

2.1.1 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:

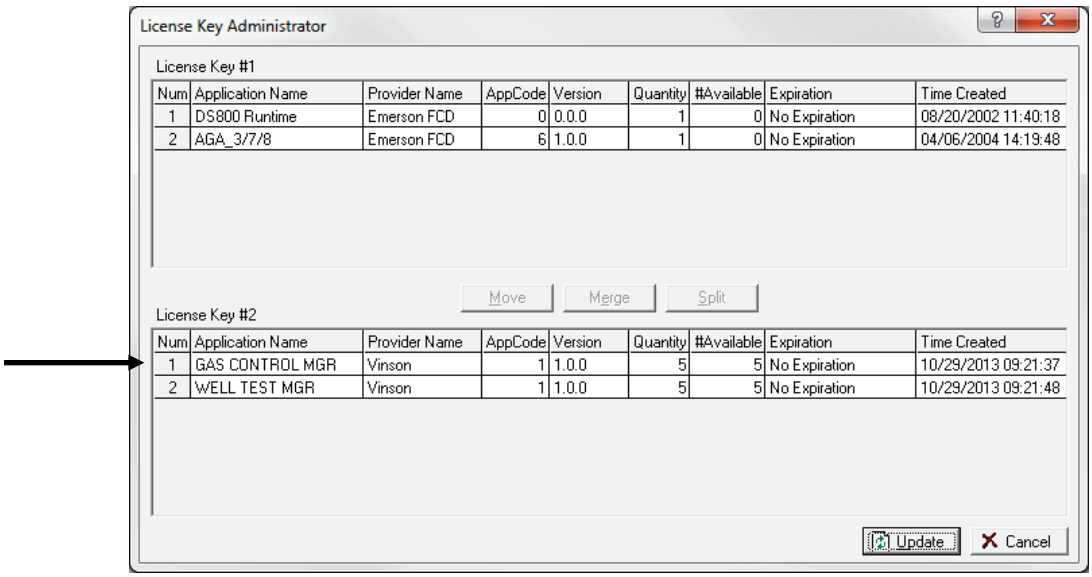

Figure 2-2. License Key Administrator

Gas Control Mgr appears in the Application Name column. [For further information on the License Key Administrator screen, refer to *Section 2.4* of the *ROCLINK 800 Configuration Software User Manual (for ROC800-Series)* (Form A6218).]

After you verify that the license key is correctly installed and recognized, proceed to *Section 2.2* to download the user programs.

2.2. Downloading the Program

This section provides instructions for installing the user program into ROC800 memory.

Note: Connect a PC to the ROC800'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 ROC800 unit.
3. Select **Utilities** > **User Program Administrator** from the ROCLINK menu bar. The User Program Administrator screen displays (see *Figure 3*):

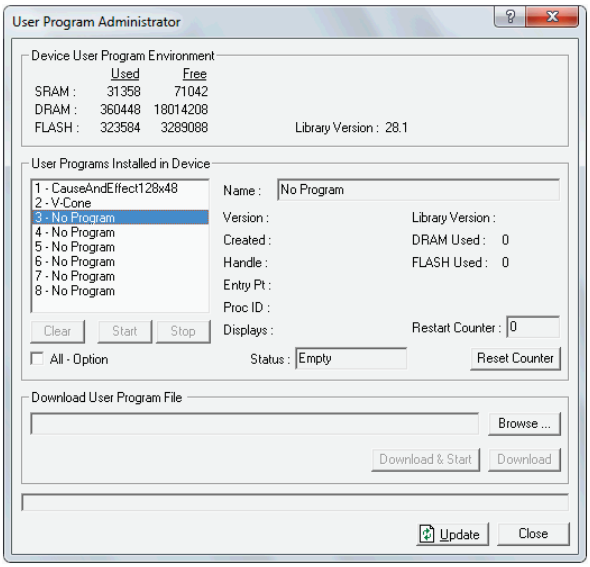

Figure 3. User Program Administrator

4. Click **Browse** in the Download User Program File frame. The Select User Program File screen displays (see *Figure 4*).
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 4* shows, the screen lists all valid user program files with the .TAR extension:

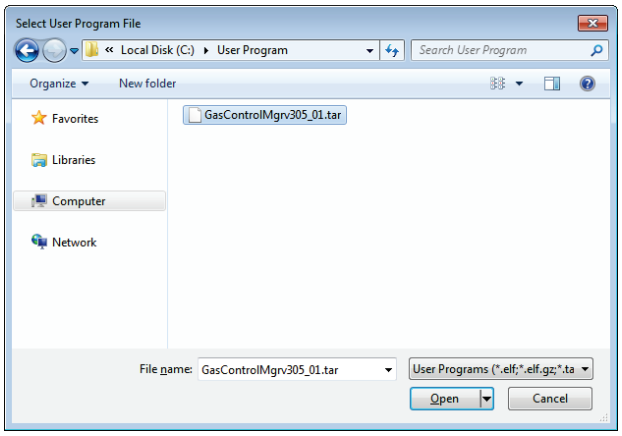

Figure 4. Select User Program File

6. Click **Open** to select the program file. The User Program Administrator screen displays. As shown in *Figure 5*, note that the

Download User Program File frame identifies the selected program and that the **Download & Start** button is active:

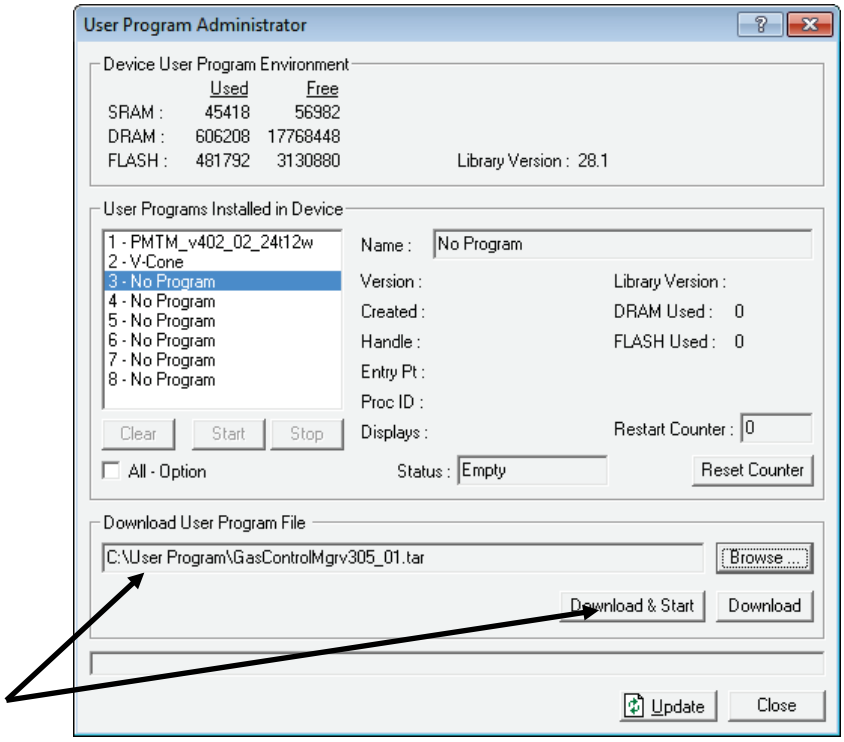

Figure 5. User Program Administrator

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

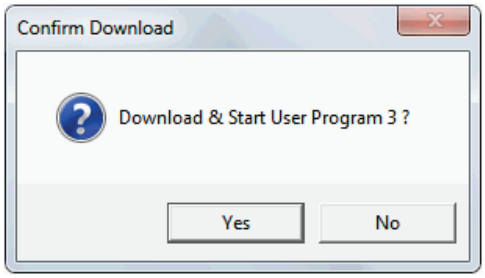

Figure 6. Confirm Download

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:

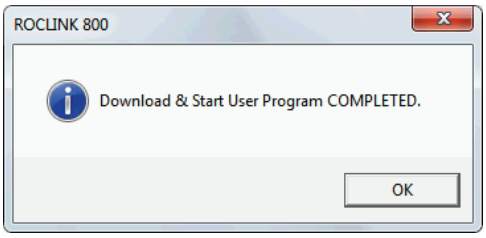

Figure 7. ROCLINK 800 Download Confirmation

9. Click **OK**. The User Program Administrator screen displays (see *Figure 8*). Note that:

- The User Programs Installed in Device frame identifies the loaded program.
- The Status field indicates that the program is running.

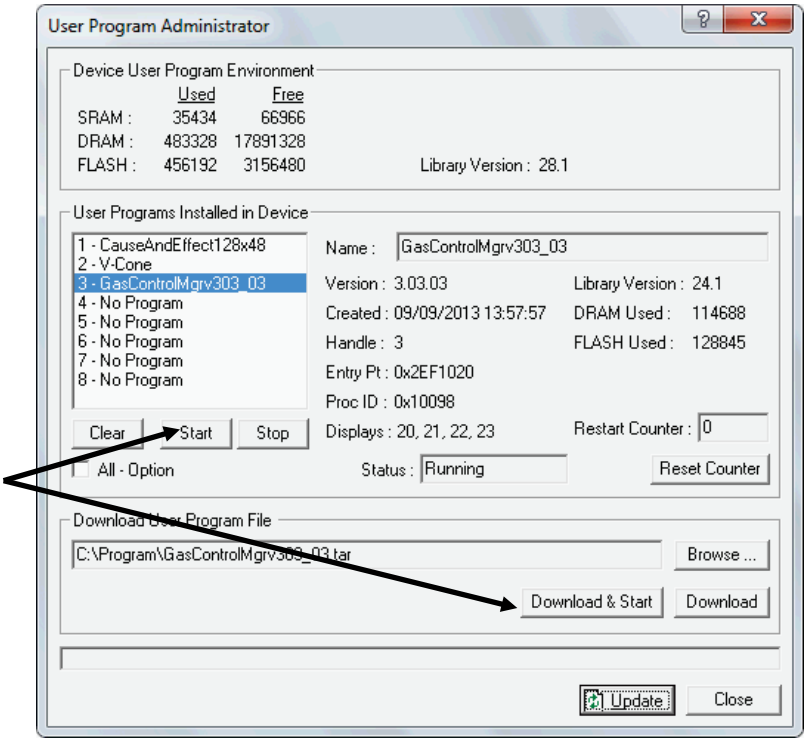

Figure 8. User Program Administrator

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

Note: Installing a user program without a license key allows you only to view the program screens (that is, the program outputs no data). Installing the license key enables the program to read from the meter **and** output data.

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Chapter 3 – Configuration

After you download and start the Gas Control Manager Program, configure the program using ROCLINK 800 software. To do this, use the program-specific Gas Control Manager Program screen.

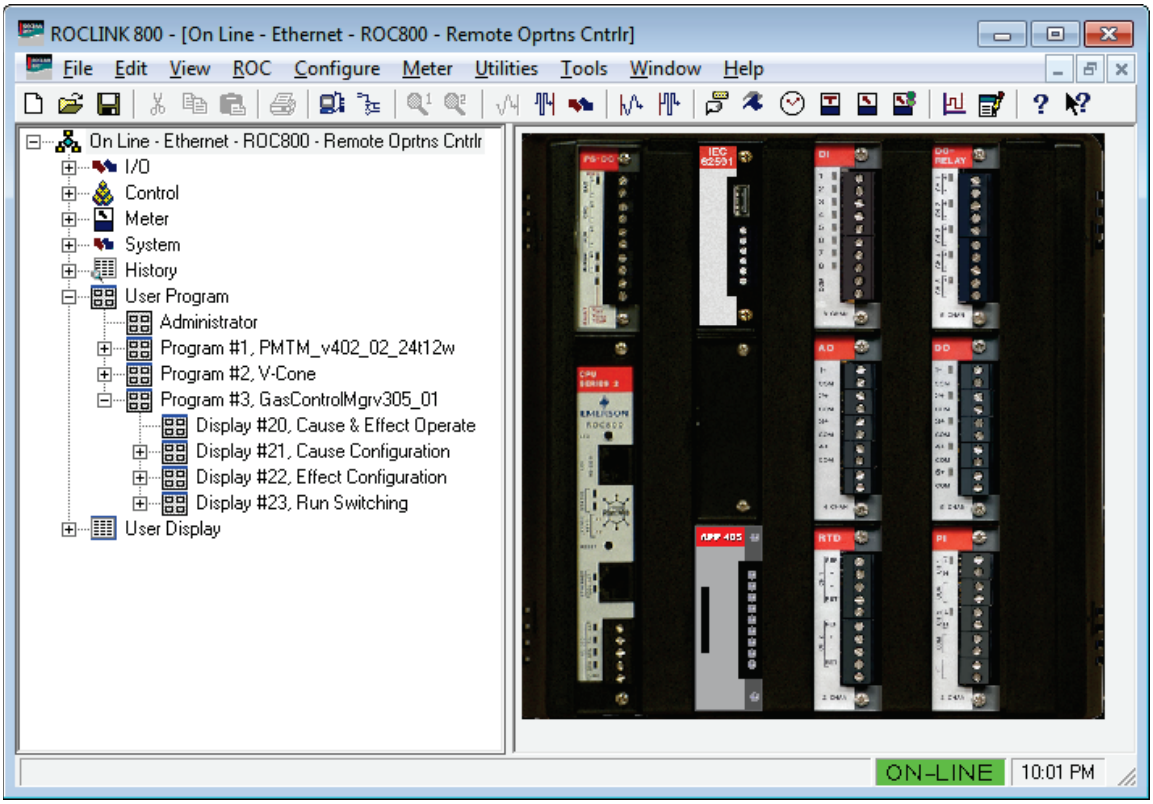


Figure 9. ROCLINK 800

3.1. EFM Applications

Once you have successfully loaded the Gas Control Manager program into the ROC800, you can access the Gas Control Manager screens. To start the EFM Applications:

1. Double-click an ROC800 device or click the **Direct Connect** icon in the toolbar.
2. The device window opens. Select **User Program** > **Gas Control Mgr** in the ROCLINK configuration tree.
3. Double-click **Display #23, Run Switching**.
4. You will see a display for each station. Double-click a station to see the *Run Switching* window for that station.

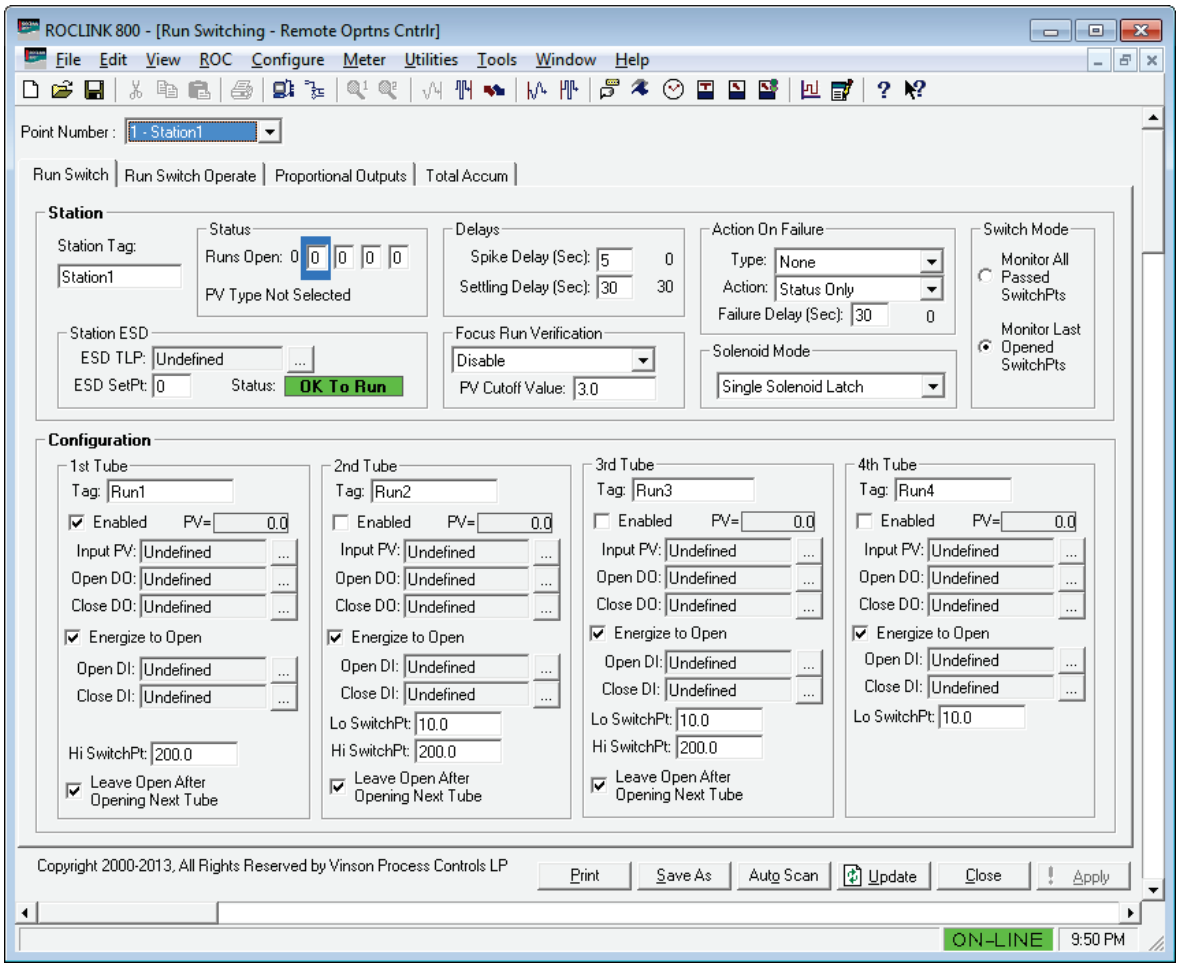


Figure 10. Run Switch tab – Run Switching screen

The *Run Switch* tab is divided into two main sections: *Station Configuration* and *Tube Configuration:*

- **Station Configuration**. Use this section to configure global settings that affect all tubes in the station. Four run switching stations are available.
- **Tube Configuration**. Use this section to configure switching for up to four runs. You define your input and output points, set high and low points, and choose when to open and close runs.

3.1.1. Run Switching – Run Switch Tab: Station Settings

Use this section to configure global settings that affect all tubes in the station. Four run switching stations are available.

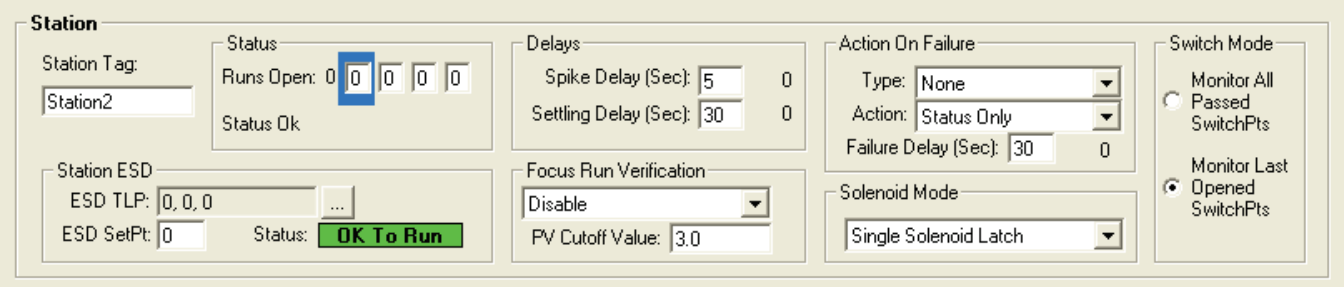


Figure 11. Station settings of the Run Switch tab

1. Review the values in the following fields:

Field	Description
Station Tag	Use this field to name your station. The default value is Station1.
Status	The first number reflects the total number of runs (flow tubes) that the program believes is currently open. The next four fields show the status of each of the four tubes. The values are 1 (open) or 0 (closed). The blue box frames the tube that is in focus or control.
Status Message Display	Provides information for the following run switching conditions. The code number is available in Run Switching Parameter 81: 0 = Status OK 1 = Station ESD 2 = PV Type Not Selected 3 = Invalid Open DO Type 4 = Invalid Open DO Param 5 = Invalid Close DO Type 6 = Invalid Close DO Param 7 = Invalid Open DI Type 8 = Invalid Open DI Param 9 = Invalid Close DI Type 10 = Invalid Close DI Param 11 = Illegal Flow Tube 1 12 = Illegal Flow Tube 2 13 = Illegal Flow Tube 3 14 = Illegal Flow Tube 4 15 = Illegal DI Tube 1 16 = Illegal DI Tube 2 17 = Illegal DI Tube 3 18 = Illegal DI Tube 4
Delays	Use the Spike and Settling delays to set how long the system waits before taking action.

Field	Description	
Spike Delay	Delay time in seconds. The program examines this field whenever a run's Input TLP value goes above or below its high or low set point. The condition must remain in effect for the number of seconds specified in this field before any run-switching executes. The delay provides a filter for the process variables. The Spike Delay time is also used when switching **down to** a lower tube that has been closed or **up from** a lower tube that will be closed (this happens when "Leave Open After Opening Next Tube" is unchecked). Before the program closes that tube, it must see flow (a PV value greater than the PV Cutoff Value) for the tube just opened, for the amount of time specified in the Spike Delay. Maximum value is **255** seconds.	
Settling Delay	Delay time in seconds. This delay goes into effect immediately after a run switches. During the delay, the new focus run remains in focus, so no comparisons occur for any more possible switching. This allows process conditions to stabilize after the previous change before any more decisions are made. Maximum value is **255** seconds.	
Switch Mode	Indicates how the tubes are monitored.	
	Monitor All	Monitor all passed switch points. For example, if all four tubes had been opened, choosing this option causes the system to monitor the switch points in all four tubes.
	Monitor Last Opened	Monitor only the switch point that was last activated. For example, if all four tubes had been opened, choosing this option causes the system to monitor the switch points in tube 4 only.
Solenoid Mode	Selects a method for controlling the run switching valve activations. The selected mode applies to **all** valves, and impacts status messages that notify whether relevant selections for digital outputs and digital inputs have been made. Valid values are:	
	Single Solenoid Latch	The Open DO selection is defined for each valve used which opens and closes the valve by energizing or de-energizing a solenoid. The Open and Close DI selections can be defined and monitored to verify valve travel if needed.

Field	Description	
	Dual Solenoid Latch	The Open DO selection defines the output signal to open the valve. The program will hold this state until a signal to close is issued. The Close DO selection will define the output signal to close the valve. One or the other solenoids will always be on. The Open and Close DI selections can be defined and monitored to verify valve travel if needed.
	Dual Solenoid Latch with DI Reset	In this mode the outputs behave as a Dual Solenoid Latch, but the solenoid resets or releases after the valve travels and the valve DI limit switches detect that valve position.
	Dual Solenoid Momentary	In this mode, selections are made for an open and close DO that turn on momentarily while the valve travels and then turn off. The ROC800 Point I/O Time On setting for that DO determines the duration of the momentary pulse. The Open and Close DI selections can be defined and monitored to verify valve travel if needed.
Focus Run Verification	Verifies the focus (control) tube by continually monitoring the verification method of each enabled tube. The highest number tube that is verified to be flowing is set as the focus tube. This feedback causes the proper DO state to be asserted to establish proper focus. Valid values are:	
	Disable	No Run Verification
	PV Flow Sensing	Compares Input PV to the PV Cutoff Value to determine whether a flow condition exists for that tube. The highest number tube that is flowing becomes the focus tube.
	DI State	Examines the state of the digital inputs for each tube to determine the focus tube. The highest number tube with its digital inputs indicating “valve open” becomes the focus tube. If these DI points are “Undefined,” this evaluation is not made.
PV Cutoff Value	The low flow cutoff value that defines a threshold for a valid flow sensing condition. The program also uses this value to establish a valid flow for the Action On Failure mode Illegal PV Flow.	

Field	Description	
Station ESD	Configures the Emergency Shutdown feature. If you leave this field "Undefined" the ESD is not activated. This feature can also be used for routine station shut-in. When tripped, an ESD closes all run switching valves to provide positive shut-in. A Set condition is logged to the alarm log. The program restores the run switching function when the ESD condition clears, and sends a Clear condition to the alarm log.	
ESD TLP	Defines the TLP the program monitors for emergency shutdown.	
Action On Failure	Verifies tube flowing conditions or DI states relative to the focus tube depending on the selected Failure Type. Various actions are possible based on the selection. No evaluations are made until after the Failure Delay counter to allow run switching to stabilize before applying any actions are applied. Valid values are:	
	Type: None	Disables any failure evaluation.
	Type: Illegal PV Flow	Evaluates valid tube flow by using the PV Cutoff Value in the Focus Run Verification section, which determines if a tube is actually open or closed.
	Type: Illegal DI State	Uses digital input states to determine if a tube is actually open or closed.
	Action: Status Only	Generates a status message code to indicate a Failure condition.
	Action: Alarm Log	Sends a Failure condition to the alarm log that contains the status message code number.
	Action: Disable Tube & Alarm Log	Disables the tube where the Failure condition is identified and logs that tube as OFF in the alarm log. If this tube was not the last tube enabled, run switching skips the disabled tube and uses the next tube for control.
Failure Delay (Sec)	All Action On Failures are performed after the Settling Delay plus the Failure Delay setting in seconds. Maximum value is **255** seconds.	

2. Click **Apply** to save your changes.
3. Proceed to *Section 3.1.2, Run Switching – Run Switch Tab:* Tube Settings.

Focus Run Verification methods can be used to assure the run switching program's focus tube is what is actually happening. An example of this is a valve with momentary solenoids that do not change state when the output is pulsed. If this were to occur, the program would switch focus and lose sight of the actual valve states. This may be most useful for dual

solenoids that do not hold their states such as Momentary or DI Reset modes.

An example of what happens in the event of a valve switch failure: Tube 3 has just pulsed to close because of low DP. Ordinarily tube 2 becomes the focus run. But as long as flow is still sensed in tube 3, it remains the focus run. After the settling time expires (default 30 seconds), if tube 3 still has low DP, the program will pulse to close tube 3 again and wait another settling period.

3.1.2. Run Switching – Run Switch Tab: Tube Settings

Use this section to configure switching for up to four runs. You define your input and output points, set high and low points, and choose when to open and close runs.

In the Run Switching section, you can configure switching for up to four runs, using various types of input and output points. The program supports both non-latching and latching (such as Versa® Valve or Magna-Latch) solenoids and has configurable high and low switch points, and the option of closing the previous run when opening another.

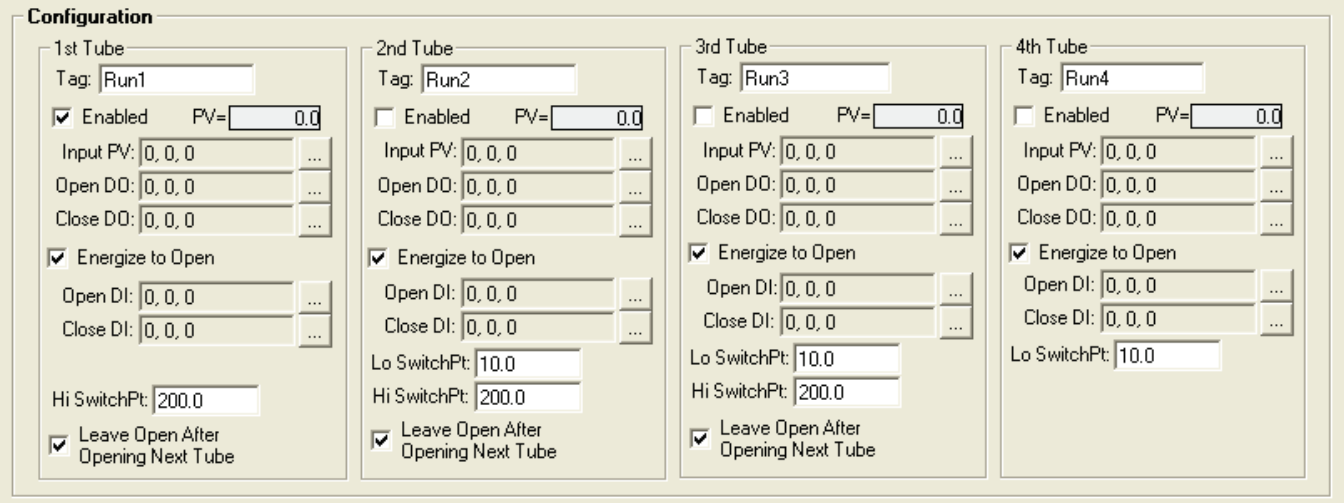


Figure 12. Station settings of the Run Switch tab

Notice that the Run 1 configuration has no Lo SwitchPt field. This is because the Lo SwitchPt field triggers a run to be closed and closing Run 1 would result in no flow at the station. Conversely, notice that the Run 4 configuration has no Hi SwitchPt or Leave Open fields. This is because there is no Run 5 to be opened after Run 4.

1. Review the values in the following fields:

Field	Description
Tag	A 10-character field that identifies the meters that makes up the run-switching scheme. This tag is useful for documentation purposes (screen prints, etc.).

Field	Description
Enabled	Select this checkbox to enable a run for the run-switching scheme. You must enable at least two runs in order to do run-switching. If only one of the four runs is enabled, no action is done. The left-most run (Run 1) is the primary run (open during lowest/all flow conditions). The focus starts on the left and moves to the right. Normally, at least Run 1 and Run 2 would be enabled to do run-switching with two meters. However, the program allows you to skip runs (taken out of service) so the run-switching functionality is still valid even with Run 1 disabled (as long as you have enabled two or more **other** runs).
Input PV TLP	Specifies the points in the ROC800 that are defined as variable inputs to the run-switching function. For **orifice** measurement, these are typically differential pressures (DPs) which are the “Meter Input” parameter used in flow calculations. For **linear** measurement, actual uncorrected flow is typically selected. If you leave this field “Undefined” the program displays a PV Type Not Selected status message. The field shown as PV displays the current value of the selected Input PV.
Open DO TLP	Specifies the points in the ROC800 that are wired to the valve solenoids. These should be digital output points. They can be wired to either non-latching solenoids (energized/de-energized) or latching solenoids (such as Versa Valves or Magna-Latches). All enabled tubes must use an Open DO with the exception of the base tube (the first enabled tube), which is optional. If the base tube has no actuated switching valve, the DO will be “Undefined”.
Close DO TLP	Will be used unless the Single Solenoid Mode is selected or the base tube has no physical actuated valve in which case the DO is “Undefined.” For more information about open and close DO, refer to *Section 3.1.3. About Open and Close DO*.
Energize to Open	Select to energize the Open DO to open the valve and open the run. If this box is not selected, the program turns off the Open DO to open the valve.
Open DI TLP	Selects the Open DI from available points on the ROC800. The TLP automatically uses the STATUS parameter regardless of what parameter is selected. This selection is mandatory only for the Solenoid Mode Dual Solenoid Latch – DI Reset. Otherwise the point can be used for monitoring purposes or left as “Undefined” if the valve has no limit switches.

Field	Description
Close DI TLP	Select the Close DI from available points on the ROC800. The TLP automatically uses the STATUS parameter regardless of what parameter is selected. This selection is mandatory only for the Solenoid Mode Dual Solenoid Latch – DI Reset. Otherwise the point can be used for monitoring purposes or left as "Undefined" if the valve has no limit switches.
Lo Switch Pt	Indicates the low value that the program compares to the value of the Input TLP for each run. In the run-switching function the right-most (furthest to the right) run open is the focus run. When the value of the focus run's "Input TLP" is less than or equal to its low set point for a certain amount of time (spike delay), the run closes. When using "Monitor All Passed SwitchPts," if any of the runs is below its low set point, the focus run closes and focus shifts to the next enabled run to the left. **Note:** The units of this field are actual Engineering Units (not percentages).
Hi Switch Pt	Indicates the high value that the program compares to the value of the Input TLP for each run. In the run-switching function the right-most (furthest to the right) run open is the focus run. When the value of the focus run's "Input TLP" is greater than or equal to its high set point for a certain amount of time (spike delay), the next enabled run to the right opens. When using "Monitor All Passed SwitchPts," if any of the runs is above its high set point, the next enabled run to the right of focus opens and focus shifts to that run. Notice that Run4 has no "Hi Switch Pt" field as there is no openable run to its right (all available runs are already open). **Note:** The units of this field are actual Engineering Units (not percentages).
Leave Open After Opening Next Tube	Select this checkbox if, during expansion, each run remains open when focus shifts to the next enabled run to the right. If you do not select this checkbox, each run opens only when it is the focus run (there is only one run open at all times). When a run loses focus it remains open while monitoring the new focus run (to either the left or right). When flow is detected on the new focus run (Input TLP value is greater than one, for the spike delay time), the previous focus closes.

2. Click **Apply** to save your changes.
3. Proceed to *Section 3.1.3, Run Switching – Run Switch Operate Tab*.

3.1.3. Run Switching – Run Switch Operate Tab

Use this tab to view information about the stations.

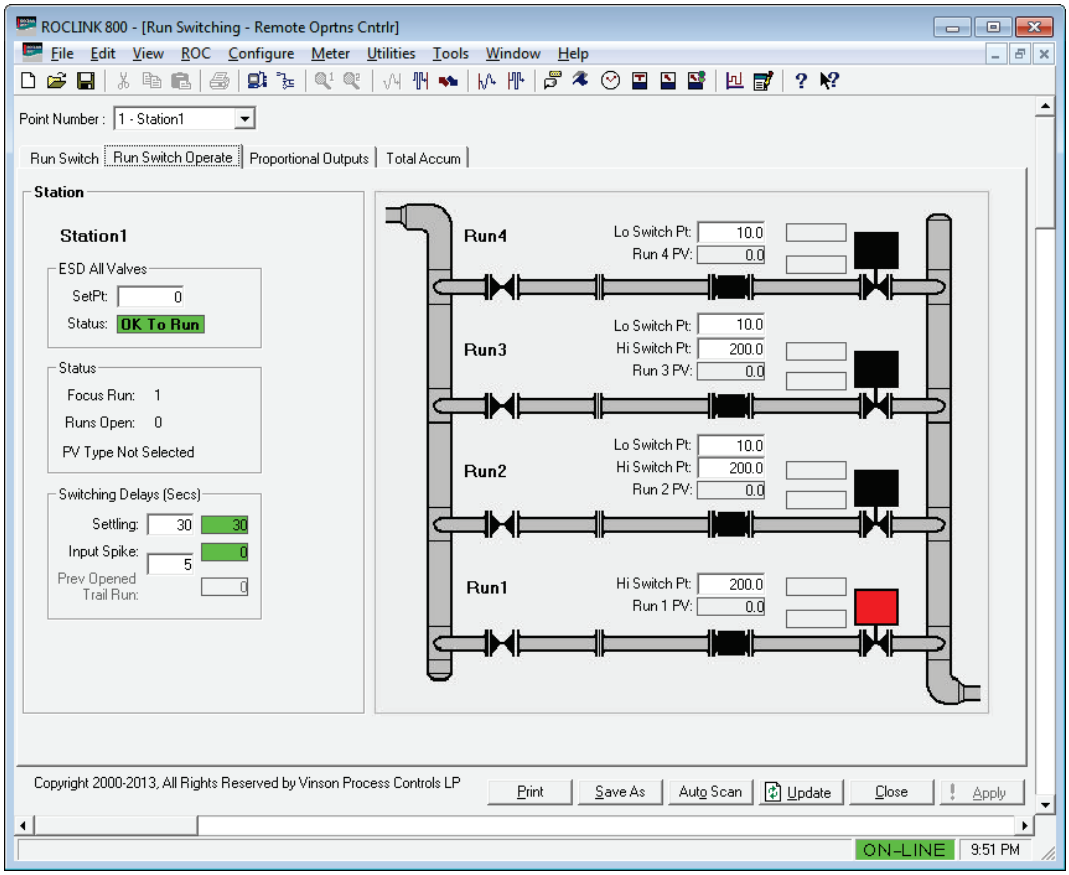


Figure 13. Run Switching screen – Run Switch Operate tab

1. Review the values in the following fields:

Field	Description
ESD SetPt	Establishes the set point which triggers the ESD. When the setpoint matches the TLP defined, an ESD occurs, shutting all available runs configured in Run Switching.
ESD Status	Provides information for the run switching conditions. The code number is available in Run Switching parameter 81.
Status	This **read-only** section shows the status of the *Focus Run* and *Runs Open*.
Settling	Sets Settling Run Switch Delay. Values are shown in seconds.
Input Spike	Sets Spike Delay for all inputs. Values are shown in seconds.

Field	Description
Prev Opened Trail Run	Indicates the setting time (in seconds) that both valves are open during the transition period between tubes. This feature applies **only** if you have disabled the **Leave Open After Opening Next Tube** option on the Run Switch tab.
Lo Switch Pt	Indicates the low value that the program compares to the value of the Input TLP for each run. **Note:** The units of this field are actual Engineering Units (not percentages).
Hi Switch Pt	Indicates the high value that the program compares to the value of the Input TLP for each run. **Note:** The units of this field are actual Engineering Units (not percentages).

2. Click **Apply** to save your changes.
3. Proceed to *Section 3.1.4, Run Switching – Proportional Output Tab*.

3.1.4. Run Switching – Proportional Output Tab

Sixteen proportional outputs are available that send selected inputs points to analog outputs. Each Station includes four Outputs, that is, Station 1 contains the 1st to 4th Output, Station 2 contains the 5th to 8th output, and so on.

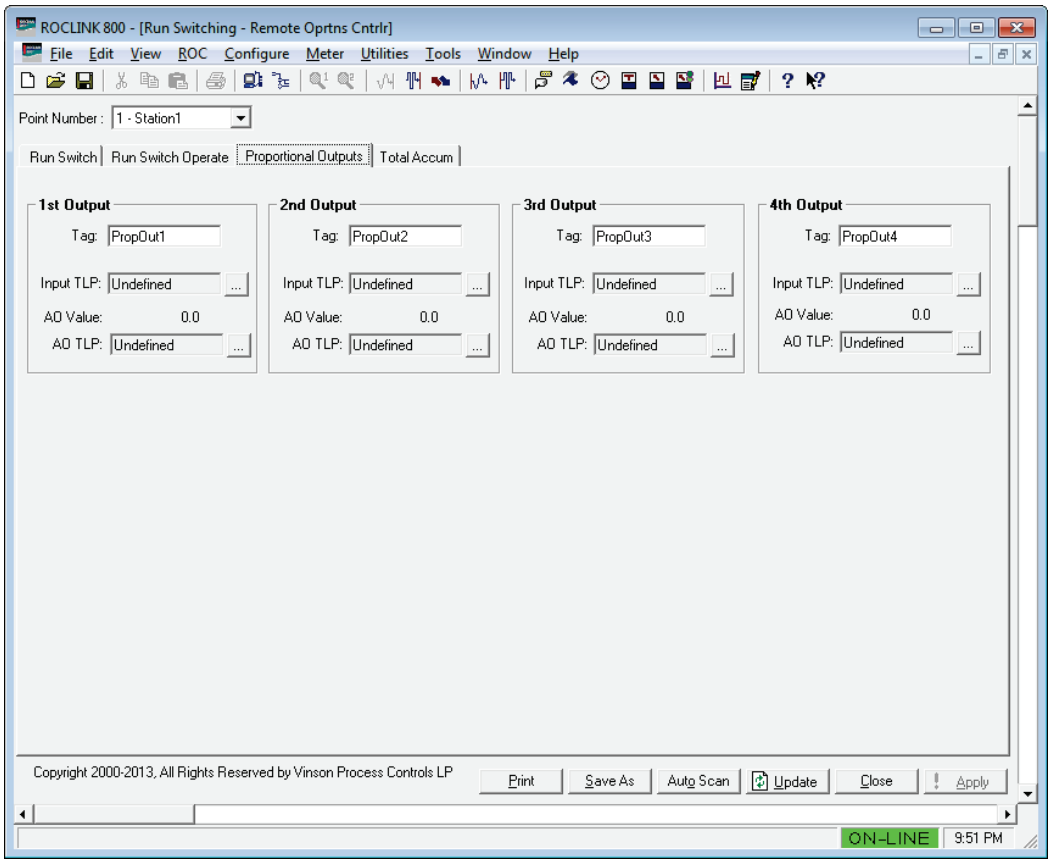


Figure 14. Run Switching screen – Proportional Outputs tab

1. Review the values in the following fields:

Field	Description
Tag	Use this field to name your output.
Input TLP	Select the Input from available points on the ROC.
AO Value	This shows the AO Value for the selected Output.
AO TLP	Select the AO from available points on the ROC.

2. Click **Apply** to save your changes.
3. Proceed to *Section 3.1.5, Run Switching – Total Accum Tab*.

3.1.5. Run Switching – Total Accum Tab

The program provides four sets of resettable total accumulators for each meters volume and energy. Unlike the total accumulator points in the base ROC800 (that roll over at a value of 1,000,000), this accumulator is based on a huge data type that practically never rolls over unless manually reset. All resets log to the event log.

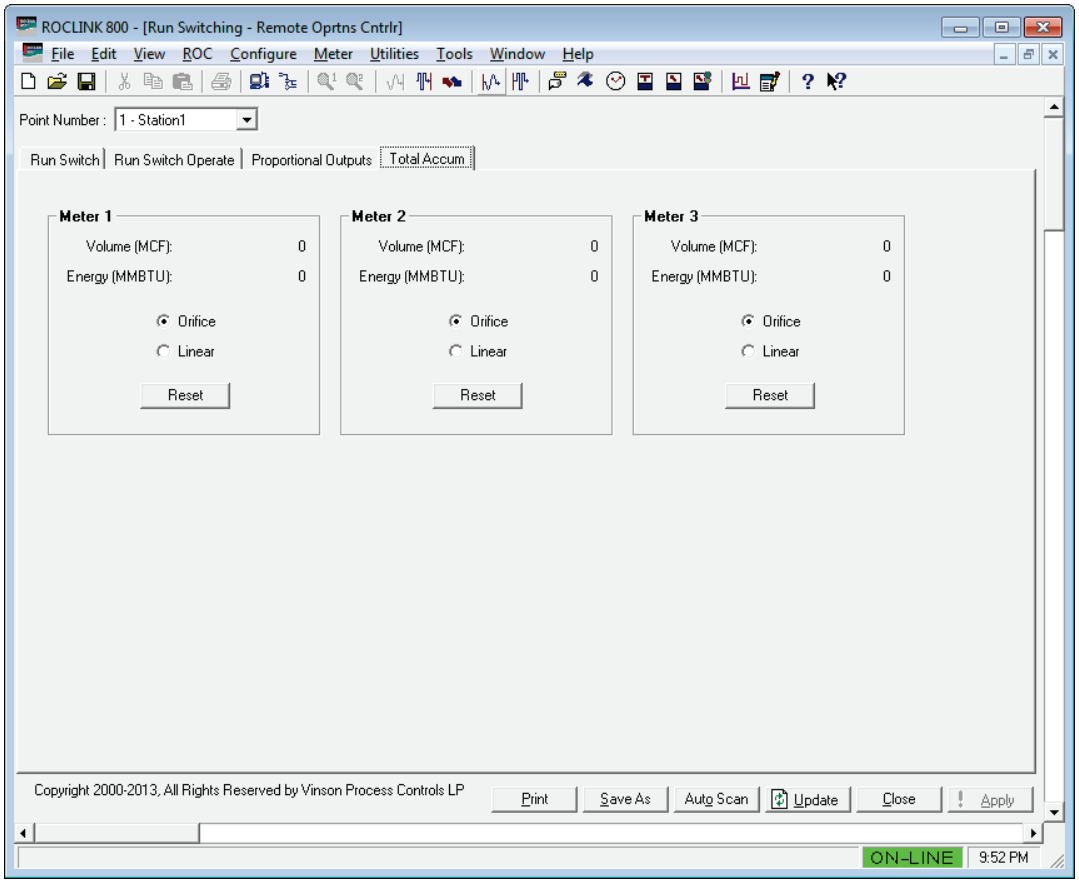


Figure 15. Run Switching screen – Total Accum tab

1. Review the values in the following fields:

Field	Description
Volume (MCF)	This read-only field shows the Run Total Volume Accum for the selected meter.
Energy (MMBTU)	This read-only field shows the Run Total Volume Energy for the selected meter.
Reset	Click to reset the value of the selected meter.

2. Click **Apply** to save your changes.
3. Proceed to *Section 3.1.6, About Open and Close DO*.

3.1.6. About Open and Close DO

The selected Solenoid Mode determines the DO parameter, so correct selection of Status or Mode is not important. For testing purposes without any physical I/O, FST MISC 1 to 4 Parameters are legitimate selections.

When using the Solenoid Mode Dual Solenoid Momentary, you configure the pulse DO Time On delay in seconds using the ROCLINK I/O Discrete Output screen's General tab:

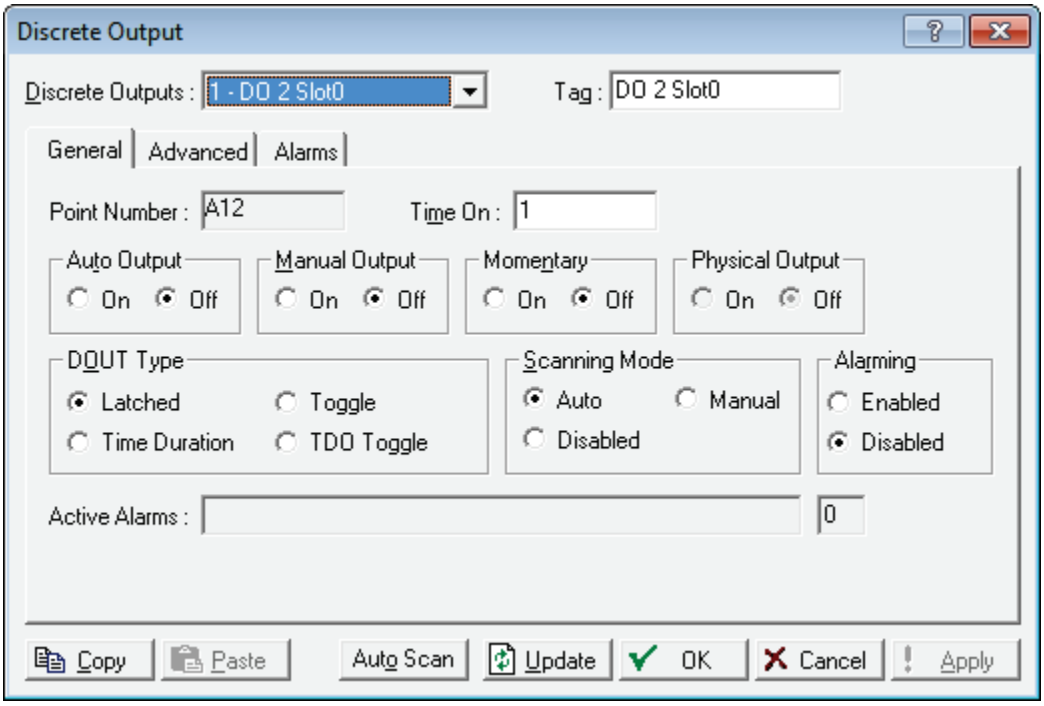


Figure 16. Discrete Output window

3.2. Cause and Effect

Before you begin configuring causes and effects, a little planning is helpful. You may have up to eight effects triggered by one or more of the sixteen causes. For this reason, it is best to plan your effects first, and then decide what triggers those effects.

You may wish to use a chart such as the one pictured below as a handy way to organize your information. The effects are located across the top of

the table in columns, and the causes are listed down the left side of the table for easy reference:

Injection Well Skid 00-RSK-18 Cause & Effect Matrix	Output Description		Injection Meter Skid Shutdown	General Alarm Beacon	Annunciation in DCS	Annunciation in Local Display	Run 1 SD Valve Open Command	Run 2 SD Valve Open Command	Run 3 SD Valve Open Command	Run 4 SD Valve Open Command
Input Description	**Tag**		USD-1901	UA-1901	--	--	ESDV-1901	ESDV-1902	ESDV-1903	ESDV-1904
Remote Shutdown	EXS-1901		X	X		X	O	O	O	O
Utility Gas ESD Valve Closed Limit Switch	EZSC-1905			X	X	X				
Local ESD Hand Station	EHS-1906		X	X	X	X	O	O	O	O
Reset Hand Switch	EHS-1907		O	O	O	O				
Gas Level Hi-Hi Alarm	AAHH-1901		X	X	X	X				
Fire Level Hi-Hi Alarm	AAHH-1902		X	X	X	X				
Gas Level Hi Alarm	AAH-1901				X	X				
Gas Detector Fault	AH-1902			X	X	X				

Figure 17. Cause and Effect sample matrix

Appendix A provides a full sample matrix. Use the sample or make your own design.

To start the Cause and Effect Program:

1. Double-click a ROC800 or click the **Direct Connect** icon in the toolbar.
2. The device window opens. Click **User Program** > **Gas Control Mgr** in the ROCLINK configuration tree.
3. Double-click **Display #22, Effect Configuration**.
4. A display appears for each effect point. Double-click a station to see the *Effect Configuration* window for that effect point.

Each effect represents a particular action that occurs when the causes that are linked to it are tripped or cleared. The Value When Active is the value the program applies to the selected PtDef when the effect is active (1 = Yes). The Value When Inactive is the value that the program applies to the selected PtDef when the effect is not active (0 = No). The output state is written either one time only or continuously based on the Assert Effect

Continuously selection. Writing one time to the output can be useful for operations such as setting a discrete output momentary parameter for a resettable output.

The Effect Configuration screen displays for the effect you have chosen. The screen has three main sections:

- **Effect Configuration**. Use this area to name your effect, define the point and define the active and inactive states that will be applied.
- **Effect Usage**. Use this area to define an effect to be a normal output or hardware/software input reset point.
- **Effect Status**. This area is informational.

3.2.1. Effect Configuration Settings

Use this screen to configure the Effect Configuration settings..

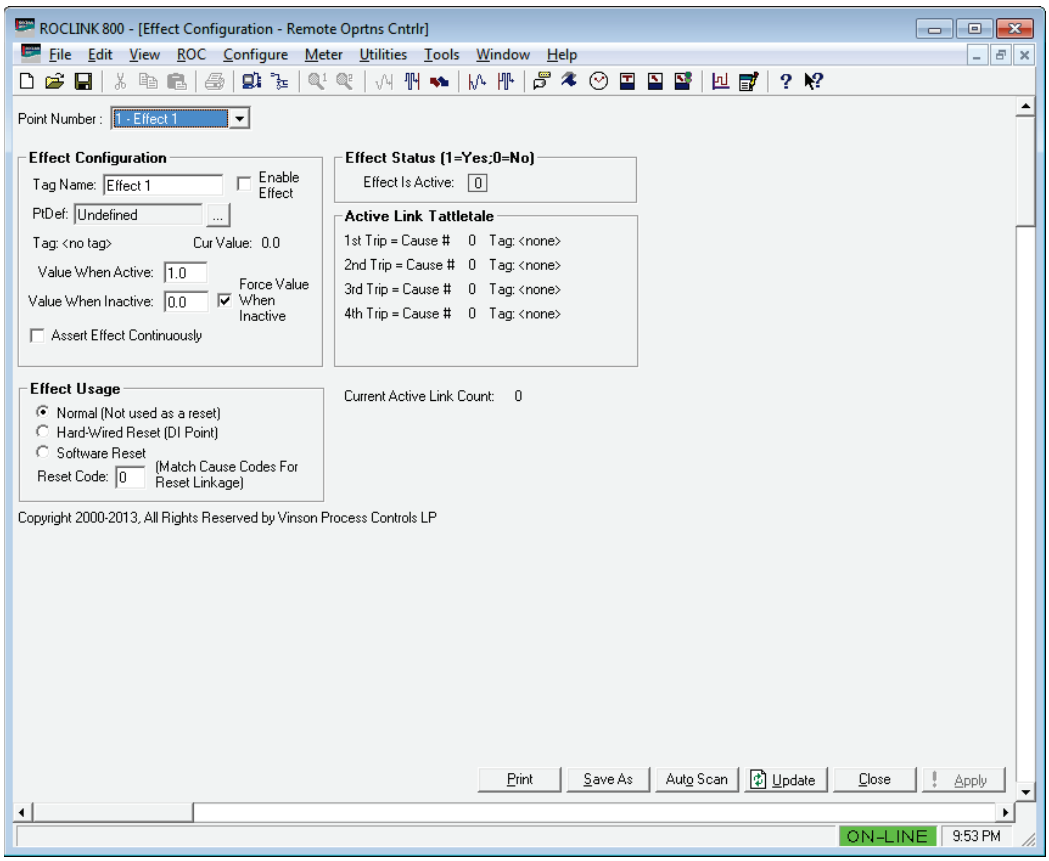


Figure 18. Effects Configuration screen

1. Review the values in the following fields:

Field	Description
Tag Name	Use this field to name your effect with up to 10 characters. The default value is **Effect 1**.
Enable Effect	Select this checkbox to process the effect. If you leave this checkbox blank, the program ignores the effect, even when a cause should activate it (that is, one or more causes that list the effect are true).

PtDef	Indicates the controlled ROC800 data point (TLP).	
Tag and CurValue	These fields show the current name “PtDef” field whenever the effect is activated by one or more true causes.	
Value When Active	The user-specified (or dynamic) value that is sent to the TLP defined in the “PtDef” field whenever the effect is actuated by one or more true causes.	
Value When Inactive	The user-specified (or dynamic) value that is sent to the TLP defined in the Effect PtDef field whenever the effect is un-activated as a result of no true cause. If the Force Value When Inactive is unchecked, the TLP defined in the Effect PtDef field is not controlled when the effect is un-activated.	
Force Value When Inactive	Select this checkbox to write the value in the Value When Inactive field to the TLP defined in the PtDef field whenever the effect is un-activated (that is, none of the causes that list the effect are true). If you leave this checkbox blank, the program does not write any values to the PtDef field when the effect is un-activated.	
Assert Effect Continuously	Select this checkbox to have the program continuously write active or inactive values to the PtDef TLP. This may be desirable to assure that the output is re-asserted to the expected state (for example, when a DO point is taken out of manual mode). If you leave this checkbox blank, the program sets the state one time. This may be useful for a DO point in momentary mode which resets itself.	
Effect Usage	This section allows effects to be defined as reset points. Reset points are monitored by causes that require a reset before clearing from the tripped condition.	
	Normal (Not used as a reset)	Select if the effect is handled like any other normal effect (this is the default).
	Hard-Wired Reset (DI Point)	Select if the effect is handled as a reset point requiring a manual action, such as pressing a reset pushbutton.
	Software Reset	Select if the effect is handled as a reset point that can be reset through a variable. This variable could then be assigned to the LCD display or set by SCADA. The program automatically reset the field back to the Inactive Value. The program now allows the selection of other data types besides unsigned interger (UINT8).
Reset Code	Defines a code that, if matched to a Cause Reset Code, reset those causes when the program detects a software or hard-wired reset point.	

Effect Status	Shows whether the effect has been tripped (activated).
Active Link Tattletale	This area shows the first four causes that currently hold this effect active, and the order in which they occurred.
Current Active Link Count	Shows how many causes currently activate this effect.

2. Click **Apply** to save your changes.
3. Proceed to *Section 3.2.2, Cause Configuration Settings.*

A reset point is normally a digital input point, such as a status point. For example, you may have the "PtDef" configured to be a DI status and the "Actuated Value" would be the value of the digital input when the reset button is pushed. All causes that require resets ("Require Reset?" Is checked) would examine this effect (reset effect) for the activated value. Causes reset when program detects the activated value.

3.2.2. Cause Configuration Settings

To access the Cause Configuration window:

1. Double-click a ROC800 or click the **Direct Connect** icon in the toolbar.
2. The device window opens. Click **User Program** > **Gas Control Mgr** in the ROCLINK configuration tree.
3. Double-click **Display #21, Cause Configuration**.
4. A display for each cause point appears. Double-click a cause point to see the *Cause Configuration* window for that station.

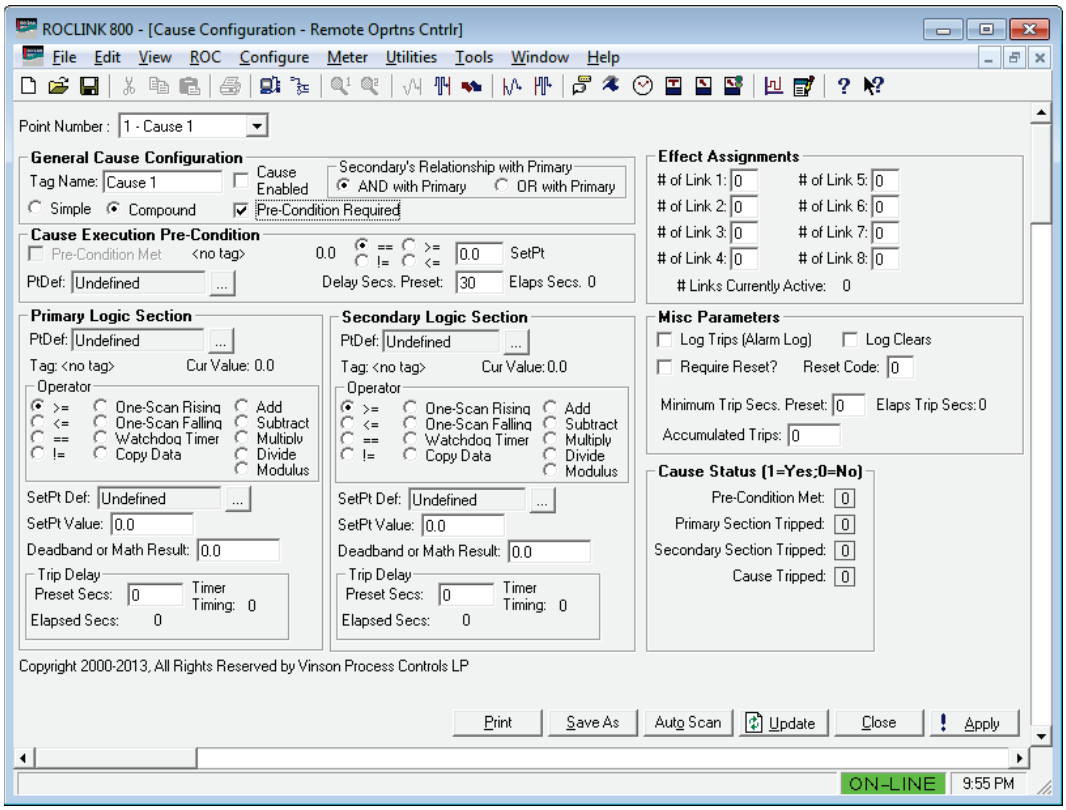


Figure 19. Cause Configuration screen

The Cause Configuration window has seven main sections:

- **General Cause Configuration**. Use this section to assign a name to your cause, define it as simple or compound, indicate the requirement for a pre- condition, and enable the cause.
- **Cause Execution Pre-Condition**. This section displays **only** if you select **Pre-Condition Required** in the General Cause Configuration section. Use this section to define the pre-condition.
- **Primary Logic Section**. Use this section to define the primary logic of your cause.
- **Secondary Logic Section**. This section displays **only** if you select **Compound** in the General Cause Configuration section. Use this section to define the secondary logic of your cause.
- **Effect Assignments**. Use this section to link your cause to one or more effects.
- **Misc Parameters**. Use this section to write logs or alerts, or to have this cause require a reset.
- **Cause Status**. This informational section shows the status of the cause. Red indicates tripped, and green indicates not tripped.

Causes can be configured to perform multiple functions, including true/false logical comparisons, math functions, copying data, state

changes, and watchdog timer. Causes can be linked to eight effects, which will activate when the cause comparison is true.

1. Review the values in the following fields:

Field	Description	
General Cause Configuration	**Cause Tag**	A 10- character field for the tag from the cause & effect matrix or a user-selected tag.
	Cause Enabled	Select this checkbox to process the cause. Leave the checkbox blank to ignore the cause. **Note**: Ensure all portions of the cause screen are correctly configured before enabling the cause.
	Simple/ Compound	Choose **Simple** if you want to use one logic section in this cause. Choose **Compound** to use two logic sections, primary and secondary.
	Secondary's Relationship with Primary	Use this selection to set the relationship between the primary and secondary logic sections. **Note**: This section displays **only** if you chose **Compound** for this cause. The relationship can be "AND" or "OR".
	Pre-Condition Required	Select this checkbox to activate this cause only when the pre-condition has been met. The Cause Execution Pre-Condition section displays when you select this option.
Cause Execution Pre-Condition	**Pre-Condition Met**	When the pre-condition goes true, this box is checked.
	PtDef	Indicates the data point (TLP) value used as a pre-condition. If the set point is not reached for this TLP, this cause does not activate.
	Operators	Choose how you want the value of this point to be evaluated – equal (==), greater than or equal to (>=), not equal (!=), or less than or equal to (<=).
	SetPt	Identifies the point at which the cause is activated.
	Delay Secs. Preset	Identifies how long the program waits after the condition is met before activating the cause.
Primary Logic Section	"Primary" refers to the fact that this field is in "Part 1" of the two possible comparisons for each cause.	

Field	Description	
	PtDef	The data point (TLP) value that displays in the Cur Value field. This item can be any numerical point including values from other causes. Click the "…" button to the right of the field to browse through the list of available parameters. You must configure this field for all cause function types.
	Tag	The name given to the soft point in the soft point configuration screen. **Note:** The system reads the tag when you configure the point definition. If you change the tag after it has been read, you will not see the updated tag name until you reconfigure the point definition. To force an update, set the PtDef to "Undefined" then reset it to the desired point. The tag name will then be read and updated. If a particular point type selected does not have a tag as the first parameter, this field may not display properly.
	Cur Value	Displays the current value of the ROC point (TLP) specified in the "PtDef" field.
	Operator	Specifies the function (operator) of the cause. The possible functions are shown in *Table 1*.
	SetPt Def	The ROC data point (TLP) that becomes a dynamic source of the set point value ("SetPt Value" field). When this field is left "Undefined," you may enter a static value in the "SetPt Val" field.
	SetPt Value	Holds the value that is used for comparisons and math functions. This field is not used for the One-Scan or Watchdog Timer functions. If the "SetPt Def" field is configured (other than "Undefined"), this field gets its value from the TLP specified in "SetPt Def".
	Deadband or Math Result	This field serves three purposes. When using comparison operators (>=, <=, ==, !=), it specifies a deadband value that must be exceeded before an existing true comparison can go false. For math functions (Add, Subtract, Multiply, Divide), this field holds the result of the math operation. For the Copy Data function, this field defines how many fields or parameters to copy. Deadband is not used with One-Scan or Watchdog Timer functions.
Trip Delay	**Preset Secs**	The number of user-defined seconds for which the comparison must be true before the cause goes true.

Field	Description	
	Elapsed Secs	Displays the delay count in seconds up to the user-defined preset. When the comparison becomes true, the count (seconds) increments until it reaches the "Preset Secs" and the cause becomes true. If at anytime the comparison turns false, the count resets to zero and the cause becomes false.
	Timer Timing	This field's value is 1 or 0. It serves as an indication that the timer has been activated.
Secondary Logic Section	The Secondary Logic section has the same fields and logic as the Primary Logic section.	
Effect Assignments	These are the links to the effects for this cause. The link labels indicate there are 8 possible links that can be used. The Link fields will be the 1 to 8 number referenced to one or more effects where 0 indicates no link. For example, If you wanted the first effect activated to be effect #4, you would enter 4 in the "# of Link 1" field. Any number of effects can be listed here, from zero to eight. If all eight fields are set to zero (defaults), no effects are connected to the cause.	
	# Links Currently Active	This shows the number of effects that are currently tripped for this cause.
Misc Parameters	**Log Trips**	Determines if an alarm generated by the cause will be written to the ROC's alarm log. If this field is checked, every time the cause goes true an alarm will be logged. The log consists of the cause's 10-character tag and the value of "Cur Value" along with the date and time.
	Log Clears	Determines whether an entry will be written to the ROC's alarm log when this cause is cleared. If this field is checked, every time the cause is cleared an entry will be logged. The log consists of the cause's 10-character tag and the value of "Cur Value" along with the date and time. **Note:** Log entries that begin with a "Z" as the first digit are cause entries. Alarms not generated by Cause & Effect are not prefixed with a Z.
	Require Reset?	Check this box if the logic requires that a reset button needs to be pushed before the cause is set back to false. For example: when the cause goes true, it actuates effects that cause a shutdown, and it is desired that the shutdown be maintained until a reset is done.

Field	Description	
	Reset Code	A numeric value that must be associated with the Effect Reset Code that will provide the reset through a DI point or software point.
	Minimum Trip Secs. Preset	Holds the trip state for a minimum time so a short duration trip can be detected.
	Elaps Trip Secs	Shows how long the cause has been tripped. This is also the counter for the Minimum Trip Secs. Preset.
	Accumulated Trips	Shows how many times the cause has been tripped.
Cause Status	**Pre-Condition Met**	Shows whether the Pre-Condition section has been tripped (1 for Yes, 0 for No).
	Primary Section Tripped	Shows whether the Primary section has been tripped (1 for Yes, 0 for No).
	Secondary Section Tripped	Shows whether the Secondary section has been tripped (1 for Yes, 0 for No).
	Cause Tripped	Shows whether the cause has been tripped (1 for Yes, 0 for No). If this is a compound cause and the relationship between primary and secondary was set to AND, the cause will only be tripped if both the Primary Section and Secondary Sections are tripped.

2. Click **Apply** to save your changes.
3. Proceed to *Section 3.2.3, Cause and Effect Operate Display.*

3.2.3. Cause and Effect Operate Display

The Cause & Effect Operate display is a read-only summary screen showing all conditions, statistics and linkages for the 16 causes and 8 effects. Red indicates an active or tripped state where green indicates an inactive or normal state.

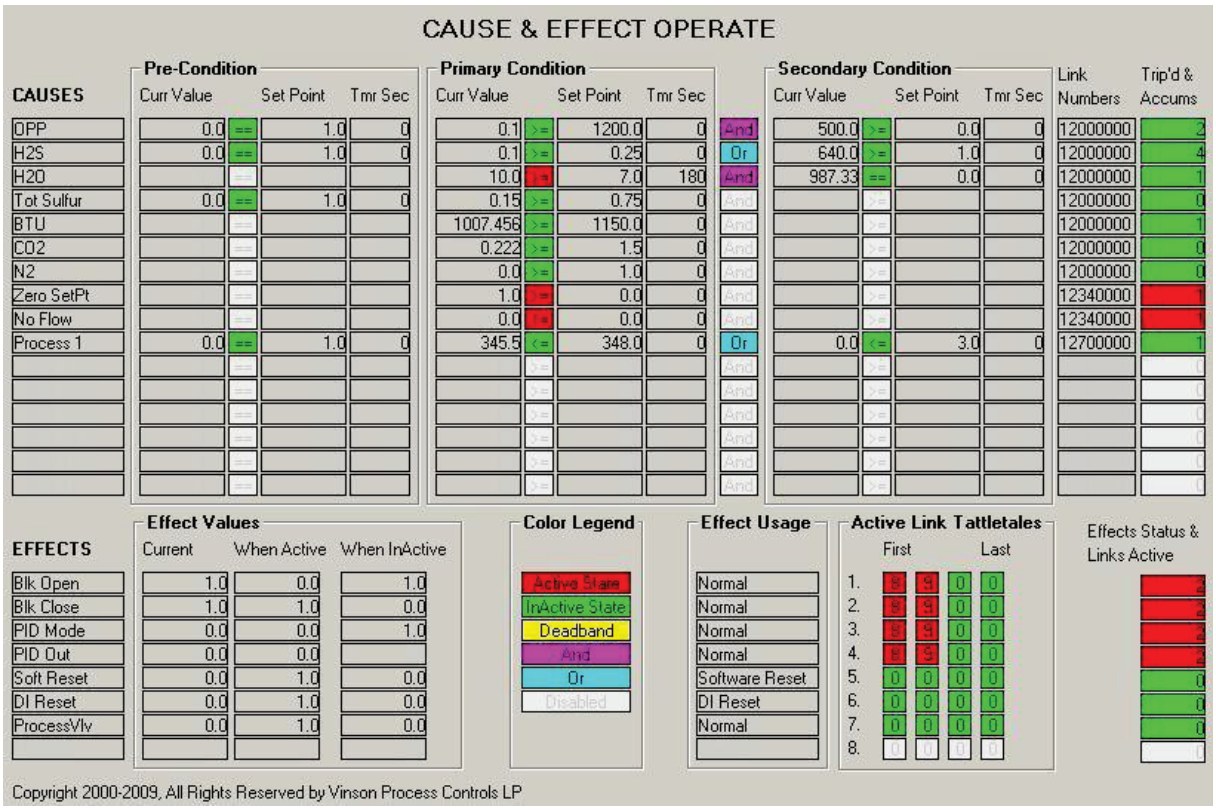


Figure 20. Cause and Effect Operate Display screen

3.2.4. Configuration Examples

The possible functions are shown in the table below. All comparisons are between "Cur Value" and "SetPt Value."

Table 1. List of Functions

Function	Function Description
>=	True If (compare) Greater Than (or equal to)
<=	True If (compare) Less Than (or equal to)
==	True If (compare) Equal To
!=	True If (compare) Not Equal To
One-Scan Rising	One-Scan Rising (Cur Value, 0 to 1 transition = true)
One-Scan Falling	One-Scan Falling (Cur Value, 1 to 0 transition = true)
Watchdog Timer	Watchdog Timer (resets on changing value of Cur Value)
Copy Data	Copies from Cur Value to SetPt Value (see full explanation
Add	Addition, Cur Value plus SetPt Value
Subtract	Subtraction, CurValue minus SetPt Value
Multiply	Multiplication, Cur Value times SetPt Value
Divide	Division, Cur Value divided by SetPt Value
Modulus	Modulus. Remainder of Integers: Cur Value / SetPt Value

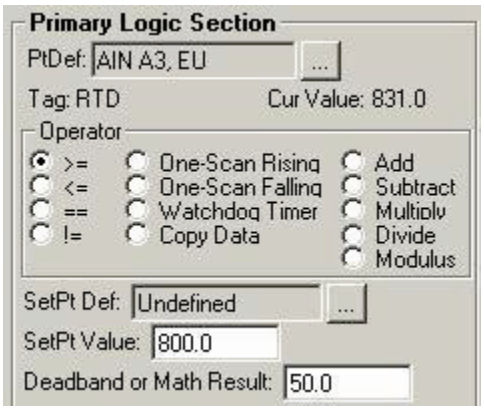


Figure 21. Operator area in the Primary Logic Section

The following examples show how to do configurations with each of the available functions (operators). These examples do not show compound logic (AND, OR) or examples utilizing enablers.

Greater Than (> =)

The cause goes true when the value at "Cur Value" is greater than or equal to the value at "SetPt Val".

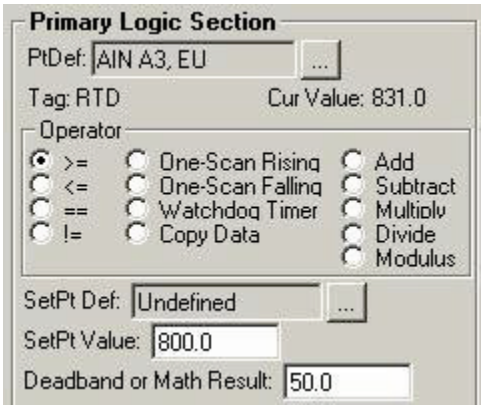


Figure 22. Greater Than Operator example

This cause is true because "Cur Value" (831) is greater than "SetPt Val" (800).

Note: Because of the deadband of 50, the cause will remain true until the value of analog input A3 falls below 750.

Less Than (< =)

The cause goes true when the value at "Cur Value" is less than or equal to the value at "SetPt Value".

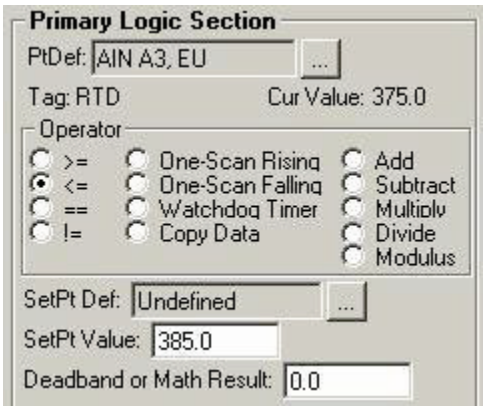


Figure 23. Less Than Operator example

This cause is true because "Cur Value" (375) is less than or equal to "SetPt Value" (385).

Note: "SetPt Value" is a dynamic value coming from analog input A3.

Equals (= =)

The cause goes true when the value at "Cur Value" is equal to the value at "SetPt Value".

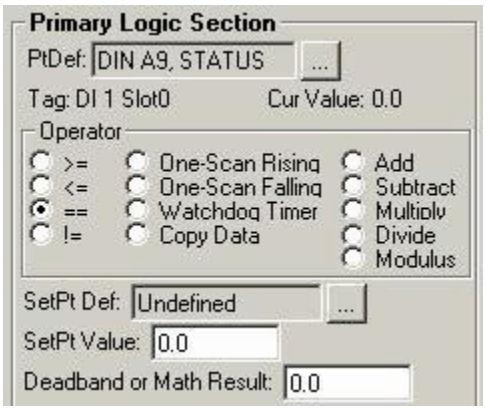


Figure 24. Equals Operator example

This cause is true because digital input A9 is zero.

Note: Even when the level switch (A9) goes to normal (1) the cause remains true until someone pushes the reset button if Reset Required is checked.

Not Equal (! =)

The cause goes true when the value at "Cur Value" is not equal to the value at "SetPt Value".

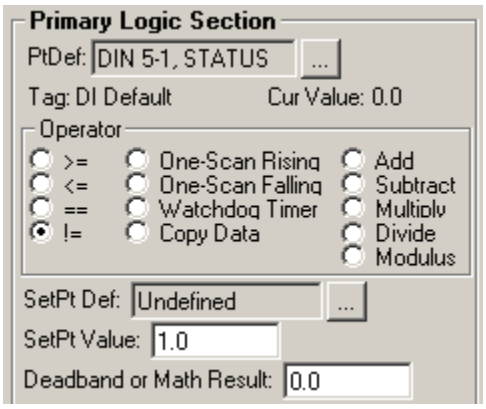


Figure 25. Not Equal Operator example

This cause is true because the statue of digital input A9 (0) does not equal the set point value (1).

One-Scan Rising The cause goes true when the value at "Cur Value" changes from zero to one. The cause will be true for one scan (1 second) only.

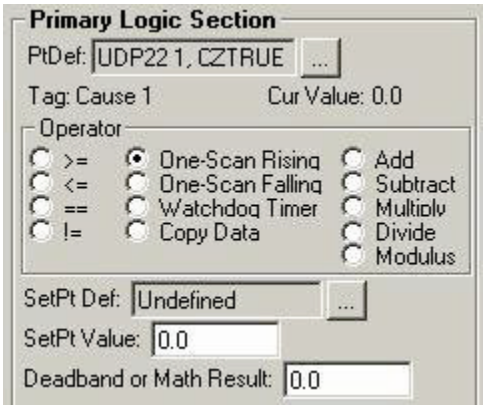


Figure 26. One-Scan Rising Operator example

The input to this cause is the status of cause #1 (true/false). When cause #1 goes true, this cause will go true for one second. The effect for this cause might be the mode of a digital output (versa valve or momentary solenoid).

Inputs for this function should be limited to Boolean types because only a zero to one transition will cause a trip.

One-Scan Falling The cause goes true when the value at "Cur Value" changes from one to zero. The cause will be true for one scan (1 sec) only.

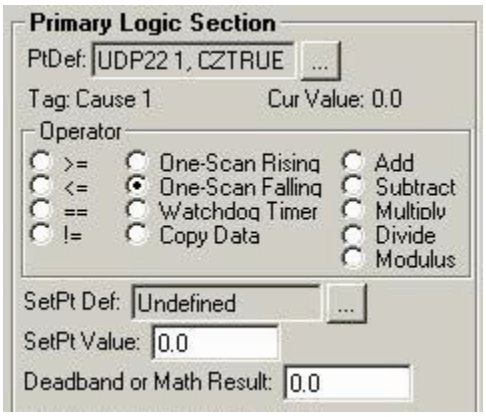


Figure 27. One-Scan Falling Operator example

The input to this cause is the status of cause #1 (true/false). When cause #1 goes false, this cause will go true for one second. Effect #2 might be the mode of a digital output (versa valve or momentary solenoid).

Inputs for this function should be limited to Boolean types because only a one to zero transition will cause a trip.

Watchdog Timer

The cause goes true when the value at "Cur Value" does not change within the time span defined at "True Delay sec". This is an example using the comm. port Valid Receive Counter to detect when communication stops:

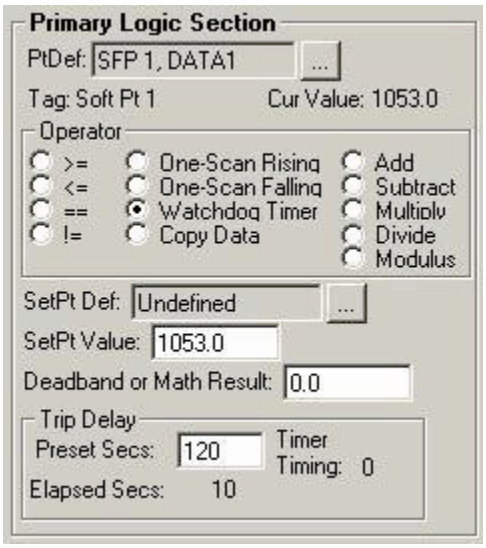


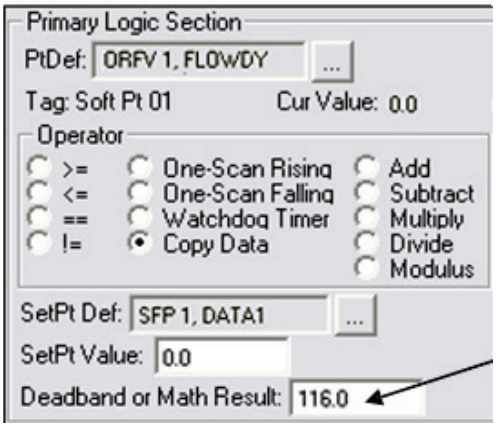
Figure 28. Watchdog Timer Operator example

The value (1053) is from the valid receipt-counter of a remote ROC. It is stored in Soft Point #1 – Data #1.

The intent here is to alarm if there is no valid Modbus communication for a 2-minute period. The effect this cause triggers might be a remote alarm dialer channel.

Copy Data The cause copies from Cur Value to SetPt Value. The numeric value in the "Deadband" field tells the system what type of copy to make and how much data to copy.

This is an example how to copy Orifice meter run parameters to Softpoint data points.



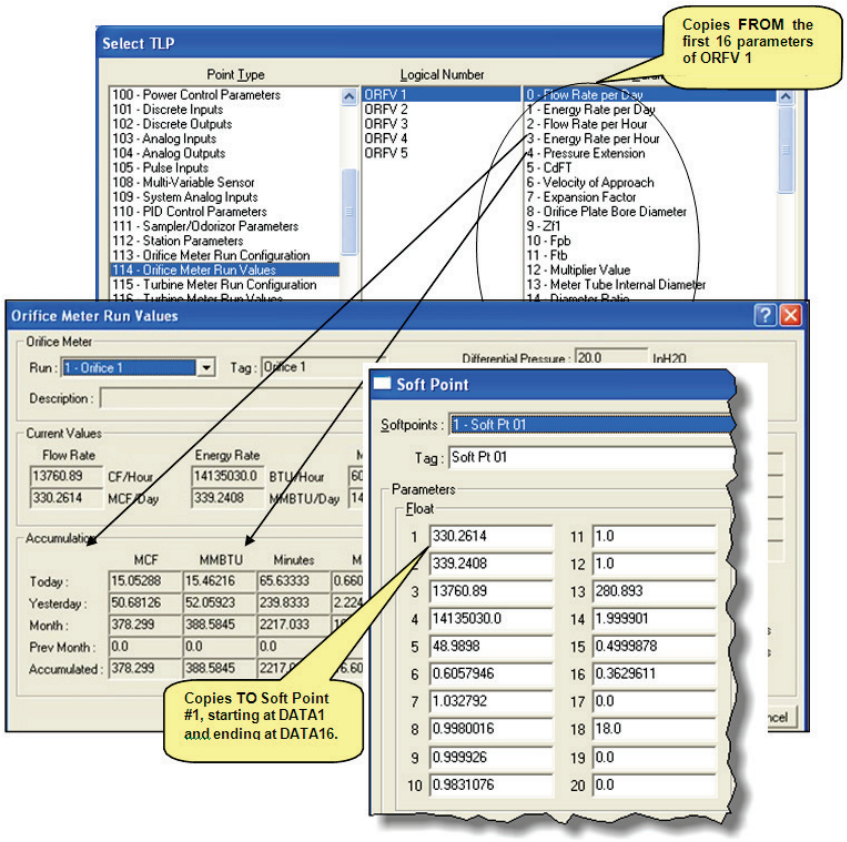


Figure 29. Copy Data Operator example

The 1XX value in the Deadband/Result field commands that the copy is from incremental parameters to incremental parameters, and is configured to copy 16 parameters (by parameter to parameter) starting from Orifice

Meter Run values #1, parameter 0 (flow rate per day). The 16 copied items land in soft point #1, starting at DATA1 and ending at DATA16.

The Copy Data function copies data from "PtDef" to "SetPt Def." There are four different types of copies – by logicals, by parameters, logicals to parameters, parameters to logicals. The numeric value in the "Deadband" field tells the system what type of copy to make and how much data to copy:

Table 2. Types of Copies

Number	Copy Type	Description
XX	Logicals	Source data located in a Logical order will be copied to the Target data location in a Logical order.
1XX	Parameters	Source data located in a Parameter order will be copied to the Target data location in a Parameter order.
2XX	Logicals to Parameters	Source data located in a Logical order will be copied to the Target data location in a Parameter order.
3XX	Parameters to Logicals	Source data located in a Parameter order will be copied to the Target data location in a Logical order.

Example: 105 in the Deadband field means copy parameters 0 through 4 to parameters 1 through 5 on another TLP.

Add The sum of "Cur Value" and "SetPt Value" is placed in the "Deadband/Result" register. If the SetPt Def is undefined, the value entered in SetPt Value will be added as a constant. The cause status is always zero.

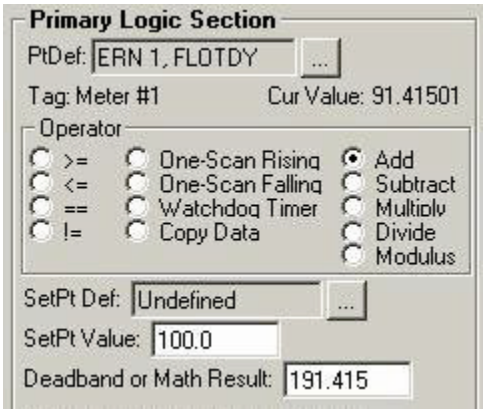


Figure 30. Add Operator example

Note: No effects are used with math operations.

Subtract The difference of "Cur Value" and "SetPt Value" is placed in the

"Deadband/Result" register. The cause status is always zero.

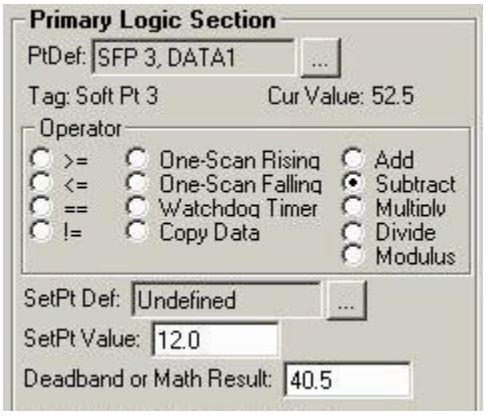


Figure 31. Subtract Operator example

Note: No effects are used with math operations.

Mutiply The product of "Cur Value" and "SetPt Value" is placed in the "Deadband/Result" register. The cause status is always zero.

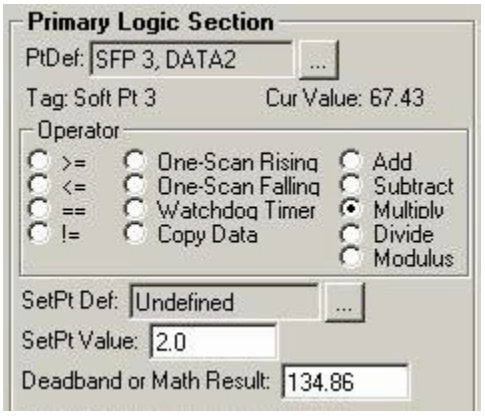


Figure 32. Multiply Operator example

Note: No effects are used with math operations.

Divide The quotient of "Cur Value" divided by "SetPt Value" is placed in the "Deadband/Result" register. The cause status is always zero.

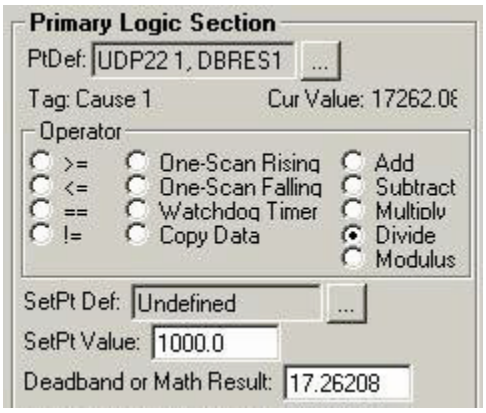


Figure 33. Divide Operator example

The quotient of "Cur Value" divided by "SetPt Value" is placed in the "Deadband/Result" register. The cause status is always zero.

Modulus The remainder of the integer division of "Cur Value" divided by "SetPt Value" is placed in the "Deadband/Result" register. The cause status is always zero. This is an example how to create 5-second execution from ROC clock seconds:

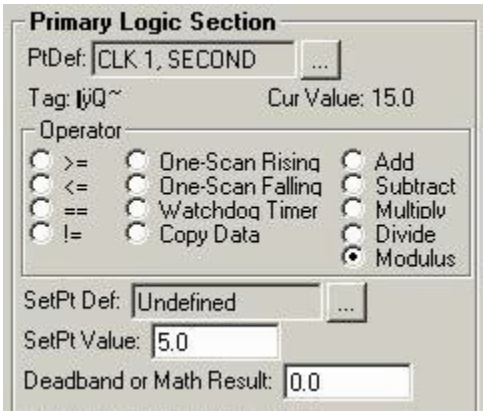


Figure 34. Modulus Operator example

The seconds from the ROC clock are divided by five. Every five seconds the modulus (remainder) is zero. Another cause can look at this cause's result field for a zero as part of condition for taking action. In this way a 5-second execution clock is created.

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Chapter 4 – Reference

This section provides information on the user-defined point type the Gas Control Manager program uses:

- Point Type 73: Run Switching
- Point Type 71: Cause Configuration
- Point Type 72: Effect Configuration

4.1. Point Type 73: Run Switching

Point type 73 applies to Run Switching. There are 4 logicals of this point type.

Point Type 73: Run Switching

Parm	Name	Abbr	Access	System or User Update	DataType	Length	Range	Default	Ver	Description
0	Station Tag	STATAG	R/W	User	String10	10	0x20 -> 0x7E for each ASCII character	Station 1 to Station 4	1.00	Station Tag Name
1	Run1 Tag	RUN1TG	R/W	User	String10	10	0x20 -> 0x7E for each ASCII character	Run1	1.00	Run 1 Tag Name
2	Run2 Tag	RUN2TG	R/W	User	String10	10	0x20 -> 0x7E for each ASCII character	Run2	1.00	Run 2 Tag Name
3	Run3 Tag	RUN3TG	R/W	User	String10	10	0x20 -> 0x7E for each ASCII character	Run3	1.00	Run 3 Tag Name
4	Run4 Tag	RUN4TG	R/W	User	String10	10	0x20 -> 0x7E for each ASCII character	Run4	1.00	Run 4 Tag Name
5	Run1 Enable	RUN1EN	R/W	User	Binary	1	0 -> 1	00000001	1.00	Run 1 Enable: 0 = Disabled 1 = Enabled
6	Run2 Enable	RUN2EN	R/W	User	Binary	1	0 -> 1	00000000	1.00	Run 2 Enable: 0 = Disabled 1 = Enabled
7	Run3 Enable	RUN3EN	R/W	User	Binary	1	0 -> 1	00000000	1.00	Run 3 Enable: 0 = Disabled 1 = Enabled

Point Type 73: Run Switching

Parm	Name	Abbr	Access	System or User Update	DataType	Length	Range	Default	Ver	Description
8	Run4 Enable	RUN4EN	R/W	User	Binary	1	0 -> 1	00000000	1.00	Run 4 Enable: 0 = Disabled 1 = Enabled
9	Run1 Input	R1INPT	R/W	User	TLP	3		0,0,0	1.00	Selected Run 1 Input
10	Run2 Input	R2INPT	R/W	User	TLP	3		0,0,0	1.00	Selected Run 2 Input
11	Run3 Input	R3INPT	R/W	User	TLP	3		0,0,0	1.00	Selected Run 3 Input
12	Run4 Input	R4INPT	R/W	User	TLP	3		0,0,0	1.00	Selected Run 4 Input
13	Run1 Open DO	R1OPDO	R/W	User	TLP	3		0,0,0	1.00	Selected Run 1 Open DO
14	Run2 Open DO	R2OPDO	R/W	User	TLP	3		0,0,0	1.00	Selected Run 2 Open DO
15	Run3 Open DO	R3OPDO	R/W	User	TLP	3		0,0,0	1.00	Selected Run 3 Open DO
16	Run4 Open DO	R4OPDO	R/W	User	TLP	3		0,0,0	1.00	Selected Run 4 Open DO
17	Run1 Close DO	R1CLDO	R/W	User	TLP	3		0,0,0	1.00	Selected Run 1 Close DO
18	Run2 Close DO	R2CLDO	R/W	User	TLP	3		0,0,0	1.00	Selected Run 2 Close DO
19	Run3 Close DO	R3CLDO	R/W	User	TLP	3		0,0,0	1.00	Selected Run 3 Close DO
20	Run4 Close DO	R4CLDO	R/W	User	TLP	3		0,0,0	1.00	Selected Run 4 Close DO
21	Run1 Open State	R1OPST	R/W	System	Binary	1	0 -> 1	00000001	1.00	Run 1 Energize to Open: 0 = No 1 = Yes
22	Run2 Open State	R2OPST	R/W	System	Binary	1	0 -> 1	00000001	1.00	Run 2 Energize to Open: 0 = No 1 = Yes
23	Run3 Open State	R3OPST	R/W	System	Binary	1	0 -> 1	00000001	1.00	Run 3 Energize to Open: 0 = No 1 = Yes
24	Run4 Open State	R4OPST	R/W	System	Binary	1	0 -> 1	00000001	1.00	Run 4 Energize to Open: 0 = No 1 = Yes

Point Type 73: Run Switching

Parm	Name	Abbr	Access	System or User Update	DataType	Length	Range	Default	Ver	Description
25	Run1 Lo SetPt	R1LOSP	R/W	User	Float	4	Any FloatingPoint Number	0.0	1.00	Run 1 Low Set Point
26	Run2 Lo SetPt	R2LOSP	R/W	User	Float	4	Any FloatingPoint Number	10.0	1.00	Run 2 Low Set Point
27	Run3 Lo SetPt	R3LOSP	R/W	User	Float	4	Any FloatingPoint Number	10.0	1.00	Run 3 Low Set Point
28	Run4 Lo SetPt	R4LOSP	R/W	User	Float	4	Any FloatingPoint Number	10.0	1.00	Run 4 Low Set Point
29	Run1 Hi SetPt	R1HISP	R/W	User	Float	4	Any FloatingPoint Number	200.0	1.00	Run 1 High Set Point
30	Run2 Hi SetPt	R2HISP	R/W	User	Float	4	Any FloatingPoint Number	200.0	1.00	Run 2 High Set Point
31	Run3 Hi SetPt	R3HISP	R/W	User	Float	4	Any FloatingPoint Number	200.0	1.00	Run 3 High Set Point
32	Run1 Leave Open	R1LVOP	R/W	User	Binary	1	0 -> 1	00000001	1.00	Run 1 Leave Open AfterOpening Next Tube 0 = No 1 = Yes
33	Run2 Leave Open	R2LVOP	R/W	User	Binary	1	0 -> 1	00000001	1.00	Run 2 Leave Open AfterOpening Next Tube 0 = No 1 = Yes
34	Run3 Leave Open	R3LVOP	R/W	User	Binary	1	0 -> 1	00000001	1.00	Run 3 Leave Open AfterOpening Next Tube 0 = No 1 = Yes
35	Spike Delay	SPKDLY	R/W	User	U8	1	0 -> 255	5	1.00	Spike Delay For All Inputs - Seconds
36	Settling Delay	SETDLY	R/W	User	U8	1	0 -> 255	30	1.00	Settling Run Switch Delay - Seconds
37	Runs Open	RNSOPN	R/O	System	U8	1	1 -> 4	0	1.00	Runs Open Status

Point Type 73: Run Switching

Parm	Name	Abbr	Access	System or User Update	DataType	Length	Range	Default	Ver	Description
38	Control Type	CTLTYP	R/W	User	U8	1	0 -> 1	1	1.00	Switch Mode: 0 = Monitor Last OpenedSwitch Points 1 = Monitor All PassedSwitch Points
39	Prop1 Tag	PR1TAG	R/W	User	String10	10	0x20 -> 0x7E for each ASCII character	PropOut1	1.00	Proportional Output 1 TagName
40	Prop2 Tag	PR2TAG	R/W	User	String10	10	0x20 -> 0x7E for each ASCII character	PropOut2	1.00	Proportional Output 2 TagName
41	Prop3 Tag	PR3TAG	R/W	User	String10	10	0x20 -> 0x7E for each ASCII character	PropOut3	1.00	Proportional Output 3 TagName
42	Prop4 Tag	PR4TAG	R/W	User	String10	10	0x20 -> 0x7E for each ASCII character	PropOut4	1.00	Proportional Output 4 TagName
43	Prop1 Input	PRP1IN	R/W	User	TLP	3		0,0,0	1.00	Selected Input 1
44	Prop2 Input	PRP2IN	R/W	User	TLP	3		0,0,0	1.00	Selected Input 2
45	Prop3 Input	PRP3IN	R/W	User	TLP	3		0,0,0	1.00	Selected Input 3
46	Prop4 Input	PRP4IN	R/W	User	TLP	3		0,0,0	1.00	Selected Input 4
47	Prop1 Output	PRP1OU	R/W	User	TLP	3		0,0,0	1.00	Selected ProportionalOutput 1
48	Prop2 Output	PRP2OU	R/W	User	TLP	3		0,0,0	1.00	Selected ProportionalOutput 2
49	Prop3 Output	PRP3OU	R/W	User	TLP	3		0,0,0	1.00	Selected ProportionalOutput 3
50	Prop4 Output	PRP4OU	R/W	User	TLP	3		0,0,0	1.00	Selected ProportionalOutput 4
51	Run1 Open Close	R1OPCL	R/W	Both	Binary	1	0 -> 1	00000000	1.00	Run 1 Status: 0 = Close 1 = Open
52	Run2 Open Close	R2OPCL	R/W	Both	Binary	1	0 -> 1	00000000	1.00	Run 2 Status: 0 = Close 1 = Open

Point Type 73: Run Switching

Parm	Name	Abbr	Access	System or User Update	DataType	Length	Range	Default	Ver	Description
53	Run3 Open Close	R3OPCL	R/W	Both	Binary	1	0 -> 1	00000000	1.00	Run 3 Status: 0 = Close 1 = Open
54	Run4 Open Close	R4OPCL	R/W	Both	Binary	1	0 -> 1	00000000	1.00	Run 4 Status: 0 = Close 1 = Open
55	Use Flow Sensing	FLWSNS	R/W	User	U8	1	0 -> 2	0	3.00	Focus Run Verification: 0 = Disable 1 = PV Flow Sensing 2 = DI State
56	ESD Pt Def	ESDDEF	R/W	User	TLP	3		0,0,0	1.00	Selected ESD Point(Referenced PointMonitored for ESD)
57	ESD Trip Value	ESDTRP	R/W	User	U8	1	0 -> 255	0	1.00	ESD Trip Set Point
58	ESD Cur Value	ESDCUR	R/O	System	U8	1	0 -> 1	0	1.00	ESD Status: 0 = OK to Run 1 = ESD Active
59	Run1 Input Value	DP1VAL	R/O	System	Float	4	Any FloatingPoint Number	0.0	1.00	Run 1 Value
60	Run2 Input Value	DP2VAL	R/O	System	Float	4	Any FloatingPoint Number	0.0	1.00	Run 2 Value
61	Run3 Input Value	DP3VAL	R/O	System	Float	4	Any FloatingPoint Number	0.0	1.00	Run 3 Value
62	Run4 Input Value	DP4VAL	R/O	System	Float	4	Any FloatingPoint Number	0.0	1.00	Run 4 Value
63	Spike DelaySeconds	SPKSEC	R/O	System	U8	1	0 -> 255	0	1.00	Spike Delay - (Secs)
64	Settling DelaySeconds	STLSEC	R/O	System	U8	1	0 -> 255	0	1.00	Settling Delay - (Secs)
65	Trail Run DelaySeconds	TRLSEC	R/O	System	U8	1	0 -> 255	0	1.00	Trail Run Delay (Secs) (NotUsed)

Point Type 73: Run Switching

Parm	Name	Abbr	Access	System or User Update	DataType	Length	Range	Default	Ver	Description
66	Focus Run Number	FOCRUN	R/O	System	U8	1	0 -> 3	0	1.00	Current Control Run: Run #1 Run #2 Run #3 Run #4
67	Focus Sense PV Cutoff	FPVCUT	R/W	User	FL	4	Any FloatingPoint Number	3.0	1.00	PV Low Cutoff for FlowSensing
68	Run Total VolumeAccum 1	RVOLA1	R/O	System	UINT32	4	0->4294967295	0	3.00	Run Total Volume Accum 1
69	Run Total VolumeAccum 2	RVOLA2	R/O	System	UINT32	4	0->4294967295	0	3.00	Run Total Volume Accum 2
70	Run Total VolumeAccum 3	RVOLA3	R/O	System	UINT32	1	0->4294967295	0	3.00	Run Total Volume Accum 3
71	Run Total EnergyAccum 1	RENEA1	R/O	System	UINT32	4	0->4294967295	0	3.00	Run Total Energy Accum 1
72	Run Total EnergyAccum 2	RENEA2	R/O	System	UINT32	4	0->4294967295	0	3.00	Run Total Energy Accum 2
73	Run Total EnergyAccum 3	RENEA3	R/O	System	UINT32	4	0->4294967295	0	3.00	Run Total Energy Accum 3
74	Run Total AccumReset 1	RARST1	R/W	User	UINT8	1	0->1	0	3.00	Run Total Accum Reset 1: 0 = Normal 1 = Reset (program returnsto normal)
75	Run Total Accum Reset 2	RARST2	R/W	User	UINT8	1	0->1	0	3.00	Run Total Accum Reset 2: 0 = Normal 1 = Reset (program returns to normal)
76	Run Total AccumReset 3	RARST3	R/W	User	UINT8	1	0->1	0	3.00	Run Total Accum Reset 3: 0 = Normal 1 = Reset (program returnsto normal)

Point Type 73: Run Switching

Parm	Name	Abbr	Access	System or User Update	DataType	Length	Range	Default	Ver	Description
77	AGA CalculationSelect 1	AGASL1	R/W	User	UINT8	1	0->1	0	3.00	AGA Calculation Select 1: 0 = AGA3 1 = AGA7
78	AGA CalculationSelect 2	AGASL2	R/W	User	UINT8	1	0->1	0	3.00	AGA Calculation Select 2: 0 = AGA3 1 = AGA7
79	AGA CalculationSelect 3	AGASL3	R/W	User	UINT8	1	0->1	0	3.00	AGA Calculation Select 3: 0 = AGA3 1 = AGA7
80	AO Value 1	AOVAL1	R/O	System	FL	4	Any FloatingPoint Number	0	3.00	AO Value 1
81	AO Value 2	AOVAL2	R/O	System	FL	4	Any FloatingPoint Number	0	3.00	AO Value 2
82	AO Value 3	AOVAL3	R/O	System	FL	4	Any FloatingPoint Number	0	3.00	AO Value 3
83	AO Value 4	AOVAL4	R/O	System	FL	4	Any FloatingPoint Number	0	3.00	AO Value 4

Point Type 73: Run Switching

Parm	Name	Abbr	Access	System or User Update	DataType	Length	Range	Default	Ver	Description
84	Status Code	STATUS	R/O	System	UINT8	1	0->18	0	3.00	Status Code: 0 = Status Ok 1 = Station ESD 2 = PV Type Not Selected 3 = Invalid Open DO Type 4 = Invalid Open DO Param 5 = Invalid Close DO Type 6 = Invalid Close DOParam 7 = Invalid Open DI Type 8 = Invalid Open DI Param 9 = Invalid Close DI Type 10 = Invalid Close DIParam 11 = Illegal Flow Tube 1 12 = Illegal Flow Tube 2 13 = Illegal Flow Tube 3 14 = Illegal Flow Tube 4 15 = Illegal DI Tube 1 16 = Illegal DI Tube 2 17 = Illegal DI Tube 3
85	Failure Type	FAILTY	R/W	User	UINT8	1	0->2	0	3.00	Failure Type: 0 = None 1 = Illegal PV Flow 2 = Illegal DI State
86	Failure Action	FAIACT	R/W	User	UINT8	1	0->2	0	3.00	Failure Action: 0 = Status Only 1 = Alarm Log + Status 2 = Disable Tube + Alarm Log + Status
87	Failure Delay	FAIDLY	R/W	User	UINT8	1	0->255	0	3.00	Failure Delay (Secs)
88	Failure Seconds	FAISEC	R/O	System	UINT8	1	0->255	0	3.00	Failure Seconds

Point Type 73: Run Switching

Parm	Name	Abbr	Access	System or User Update	DataType	Length	Range	Default	Ver	Description
89	Solenoid Mode	SOLMOD	R/W	User	UINT8	1	0->3	0	3.00	Solenoid Mode: 0 = Single Solenoid Latch 1 = Dual Solenoid Latch 2 = Dual Solenoid Latch - DI Reset 3 = Dual Solenoid Momentary
90	Run 1 Open Reset DI	R1OPDI	R/W	User	TLP	3		0,0,0	3.00	Run 1 Open Reset DI
91	Run 2 Open Reset DI	R2OPDI	R/W	User	TLP	3		0,0,0	3.00	Run 2 Open Reset DI
92	Run 3 Open Reset DI	R3OPDI	R/W	User	TLP	3		0,0,0	3.00	Run 3 Open Reset DI
93	Run 4 Open Reset DI	R4OPDI	R/W	User	TLP	3		0,0,0	3.00	Run 4 Open Reset DI
94	Run 1 Close Reset DI	R1CLDI	R/W	User	TLP	3		0,0,0	3.00	Run 1 Close Reset DI
95	Run 2 Close Reset DI	R2CLDI	R/W	User	TLP	3		0,0,0	3.00	Run 2 Close Reset DI
96	Run 3 Close Reset DI	R3CLDI	R/W	User	TLP	3		0,0,0	3.00	Run 3 Close Reset DI
97	Run 4 Close ResetDI	R4CLDI	R/W	User	TLP	3		0,0,0	3.00	Run 4 Close Reset DI
98	Run 1 Open DI Value	DIOPV1	R/O	System	UINT8	1	0->1	0	3.00	Run 1 Open DI Value: 0 = Reset 1 = Open
99	Run 2 Open DI Value	DIOPV2	R/O	System	UINT8	1	0->1	0	3.00	Run 2 Open DI Value: 0 = Reset 1 = Open
100	Run 3 Open DI Value	DIOPV3	R/O	System	UINT8	1	0->1	0	3.00	Run 3 Open DI Value: 0 = Reset 1 = Open
101	Run 4 Open DI Value	DIOPV4	R/O	System	UINT8	1	0->1	0	3.00	Run 4 Open DI Value: 0 = Reset 1 = Open

Point Type 73: Run Switching

Parm	Name	Abbr	Access	System or User Update	DataType	Length	Range	Default	Ver	Description
102	Run 1 Close DI Value	DICLV1	R/O	System	UINT8	1	0->1	0	3.00	Run 1 Close DI Value: 0 = Reset 1 = Close
103	Run 2 Close DI Value	DICLV2	R/O	System	UINT8	1	0->1	0	3.00	Run 2 Close DI Value: 0 = Reset 1 = Close
104	Run 3 Close DI Value	DICLV3	R/O	System	UINT8	1	0->1	0	3.00	Run 3 Close DI Value: 0 = Reset 1 = Close
105	Run 4 Close DI Value	DICLV4	R/O	System	UINT8	1	0->1	0	3.00	Run 4 Close DI Value: 0 = Reset 1 = Close

4.2. Point Type 71: Cause Configuration

Point type 71 applies to Cause Configuration. There are up to 16 logicals of this point type.

Point Type 71: Cause Configuration

Parm	Name	Abbr	Access	System or User Update	DataType	Length	Range	Default	Ver	Description
0	Cause Tag	PTTAG	R/W	User	String10	10	0x20 -> 0x7E for each ASCIIcharacter	Cause 1 toCause 16	1.04	Cause Tag Name
1	Enable Cause	ENABLE	R/W	User	U8	1	0 -> 1	0	1.04	Cause Enabled: 0 = Disable 1 = Enable
2	Input1 Definition	INDEF1	R/W	User	TLP	3		98,0,1	1.04	Primary Logic Point Selection
3	Input1 Tag	INTAG1	R/O	System	String10	10	0x20 -> 0x7E for each ASCIIcharacter	<none>	1.04	Selected Primary Logic PointTag ID
4	Cur Value	CUVAL1	R/O	System	Float	4	Any Floating Point Number	0	1.04	Primary Logic Current Value:
5	Function1 Type	RELAT1	R/W	User	U8	1	1, 2, 3, 4, 5, 7, 8, 10, 11, 12,13, 14, 18	1	1.04	Primary Logic Operator: 1) >= 2) <= 3) == 4) != 5) Watch Dog Timer 7) One Scan Rising 8) One Scan Falling 10) Add 11) Subtract 12) Multiply 13) Divide 14) Modulus 18) Copy Data
6	SetPt1 Definition	SETDF1	R/W	User	TLP	3		0,0,0	1.04	Primary Logic Set PointSelection

Point Type 71: Cause Configuration

Parm	Name	Abbr	Access	System or User Update	DataType	Length	Range	Default	Ver	Description
7	SetPt1 Value	SETPT1	R/W	User	Float	4	Any Floating Point Number	0	1.04	Primary Logic Setpoint Value
8	Deadband orResult1	DBRES1	R/W	Both	Float	4	Any Floating Point Number	0	1.04	Primary Logic Deadband orMath Result
9	Part2 Enable	USEPT2	R/W	User	U8	1	0 -> 1	0	1.04	Secondary Enable: 0 = Simple 1 = Compound
10	Input2 Definition	INDEF2	R/W	User	TLP	3		0,0,0	1.04	Secondary Logic PointSelection
11	Input2 Tag	INTAG2	R/O	System	String10	10	0x20 -> 0x7E for each ASCIIcharacter	<none>	1.04	Selected Secondary Logic PointTag ID
12	Cur Value2	CUVAL2	R/O	System	Float	4	Any Floating Point Number	0	1.04	Secondary Logic Current Value
13	Function2 Type	RELAT2	R/W	User	U8	1	1, 2, 3, 4, 5, 7, 8, 10, 11, 12,13, 14, 18	1	1.04	Secondary Logic Operator: 1) >= 2) <= 3) == 4) != 5) Watch Dog Timer 7) One Scan Rising 8) One Scan Falling 10) Add 11) Subtract 12) Multiply 13) Divide 14) Modulus 18) Copy Data
14	SetPt2 Definition	SETDF2	R/W	User	TLP	3		0,0,0	1.04	Secondary Logic Set PointSelection
15	SetPt2 Value	SETPT2	R/W	User	Float	4	Any Floating Point Number	0.0	1.04	Secondary Logic Setpoint Value

Point Type 71: Cause Configuration

Parm	Name	Abbr	Access	System or User Update	DataType	Length	Range	Default	Ver	Description
16	Deadband orResult2	DBRES2	R/W	Both	Float	4	Any Floating Point Number	0.0	1.04	Secondary Logic Deadband orMath Result
17	And/Or Mode	ANDOR	R/W	User	U8	1	15 -> 16	15	1.04	Secondary Relationship withPrimary: 15 = And with Primary 16 = Or with Primary
18	Cause Trip/Clear	CZTRUE	R/O	System	U8	1	0 -> 1	0	1.04	Cause Tripped Status: 0 = No 1 = Yes
19	Part1 Trip/Clear	P1TRUE	R/O	System	U8	1	0 -> 1	0	1.04	Primary Section Tripped Status: 0 = No 1 = Yes
20	Part2 Trip/Clear	P2TRUE	R/O	System	U8	1	0 -> 1	0	1.04	Secondary Section TrippedStatus: 0 = No 1 = Yes
21	Use DigitalEnabler	ENABRQ	R/W	User	U8	1	0 -> 1	0	1.04	Pre-Condition Required: 0 = Disable 1 = Enable
22	Digi EnabDefinition	ENADEF	R/W	User	TLP	3		0,0,0	1.04	Pre-Condition Point Selection
23	Digi Enab Tag	ENATAG	R/O	System	String10	10	0x20 -> 0x7E for each ASCIIcharacter	<none>	1.04	Selected Pre-Condition PointTag ID
24	Digi EnabProcess Value	ENAPV	R/O	System	Float	4	Any Floating Point Number	0.0	1.04	Pre-Condition Selected PointValue
25	Digi EnablerType	ENAREL	R/W	User	U8	1	0 -> 3	0	1.04	Pre-Condition Operator: 0) == 1) != 2) >= 3) <=
26	Digi Enab StPtValue	ENSTPT	R/W	User	Float	4	Any Floating Point Number	0.0	1.04	Pre-Condition Setpoint

Point Type 71: Cause Configuration

Parm	Name	Abbr	Access	System or User Update	DataType	Length	Range	Default	Ver	Description
27	Digi Enab ResultValue	ENARLT	R/O	System	U8	1	0 -> 1	0	1.04	Pre-Condition Met: 0 = No 1 = Yes
28	Enab Delay SecsPreset	ENAPRE	R/W	User	U16	2	0 -> 65535	30	1.04	Pre-Condition Timer Preset(Secs)
29	Enab Delay SecsElapsed	ENACNT	R/O	System	U16	2	0 -> 65535	0	1.04	Pre-Condition Timer (Secs)
30	Pri Trip DelaySecs Preset	TRPPR1	R/W	User	U16	2	0 -> 65535	0	1.04	Primary Logic Trip Preset(Secs)
31	Pri Trip Delay	TRPCT1	R/O	System	U16	2	0 -> 65535	0	1.04	Primary Logic Trip Elapsed
	Secs Elapsed									(Secs)
32	Scan Interval	SCANIV	R/W	User	U8	1	0 -> 5	3	1.04	Scan Interval: (Not Used) 0 = 100 mSec 1 = 200 mSec 2 = 500 mSec 3 = 1 Sec 4 = 2 Sec 5 = 5 Sec
33	Log Alarms	LOGALM	R/W	User	U8	1	0 -> 1	0	1.04	Log Trips to Alarm Log: 0 = No 1 = Yes
34	Require Reset	RSTREQ	R/W	User	U8	1	0 -> 1	0	1.04	Trip Requires Reset: 0 = No 1 = Yes
35	Effect 1	EFFT1	R/W	User	U8	1	1 -> 8	0	1.04	Effect Assignment Link 1
36	Effect 2	EFFT2	R/W	User	U8	1	1 -> 8	0	1.04	Effect Assignment Link 2
37	Effect 3	EFFT3	R/W	User	U8	1	1 -> 8	0	1.04	Effect Assignment Link 3
38	Effect 4	EFFT4	R/W	User	U8	1	1 -> 8	0	1.04	Effect Assignment Link 4
39	Effect 5	EFFT5	R/W	User	U8	1	1 -> 8	0	1.04	Effect Assignment Link 5

Point Type 71: Cause Configuration

Parm	Name	Abbr	Access	System or User Update	DataType	Length	Range	Default	Ver	Description
40	Effect 6	EFFT6	R/W	User	U8	1	1 -> 8	0	1.04	Effect Assignment Link 6
41	Effect 7	EFFT7	R/W	User	U8	1	1 -> 8	0	1.04	Effect Assignment Link 7
42	Effect 8	EFFT8	R/W	User	U8	1	1 -> 8	0	1.04	Effect Assignment Link 8
43	Links Energized	LNKENR	R/O	System	U8	1	1 -> 8	0	1.04	Effect Assignment LinksCurrently Active
44	Min Trip SecsPresets	MNTPRE	R/W	User	U16	2	0 -> 65535	0	1.04	Minimum Trip Seconds Preset
45	Min Trip SecsElapsed	MNTCNT	R/O	System	U16	2	0 -> 65535	0	1.04	Minimum Trip Seconds Elapsed
46	Log Clears	LOGCLR	R/W	User	U8	1	0 -> 1	0	1.04	Log Clears To Alarm Log: 0 = No 1 = Yes
47	Reset Code	RSTCOD	R/W	User	U8	1	0 -> 255	0	1.04	Reset Code Matched to EffectReset Code
48	Sec Trip DelaySecs Preset	TRPPR2	R/W	User	U16	2	0 -> 65535	0	1.04	Secondary Logic Trip Preset(Secs)
49	Sec Trip DelaySecs Elapsed	TRPCT2	R/O	System	U16	2	0 -> 65535	0	1.04	Secondary Logic Trip Elapsed(Secs)
50	Pri Trip DelayTimer Timing	TMRTT1	R/O	System	U8	1	0 -> 1	0	1.04	Primary Logic Trip TimerTiming: 0 = Timer Expired 1 = Timing
51	Sec Trip DelayTimer Timing	TMRTT2	R/O	System	U8	1	0 -> 1	0	1.04	Secondary Logic Trip TimerTiming: 0 = Timer Expired 1 = Timing
52	AccumulatedTrips	TRPACM	R/W	Both	U16	2	0 -> 65535	0	1.04	Accumulated Trips
53	Watchdog Timer	WATDOG	R/O	SYSTEM	UINT16	2	0 -> 65535	0	3.05	Provides an incrementing counter, to validate the program's running status. Only updated for the first logical instance.

4.3. Point Type 72: Effect Configuration

Point type 72 applies to Effect Configuration. There are 8 logicals of this point type.

Point Type 72: Effect Configuration

Parm	Name	Abbr	Access	System or User Update	Data Type	Length	Range	Default	Ver	Description
0	Effect Tag	EFFTAG	R/W	User	String10	10	0x20 -> 0x7E for each ASCIIcharacter	Effect 1 to Effect 16	1.04	Effect Tag Name
1	Effect Enable	EFFENB	R/W	User	U8	1	0 -> 1	0	1.04	Effect Enable: 0 = Disabled 1 = Enabled
2	Effect Definition	EFFDEF	R/W	User	TLP	3		0,0,0	1.04	Point Selection
3	Definition Tag	DEFTAG	R/O	System	String10	10	0x20 -> 0x7E for each ASCIIcharacter	<none>	1.04	Selected Point Tag ID
4	Now Active	CURENG	R/O	System	U8	1	0 -> 1	0	1.04	Effect Status Is Active: 0 = No 1 = Yes
5	Cur Val	CURVAL	R/O	System	Float	4	Any Floating Point Number	0.0	1.04	Effect Current Value
6	Value When Active	ENGVAL	R/W	User	Float	4	Any Floating Point Number	1.0	1.04	Value When Active
7	Value When Not Active	UENVAL	R/W	User	Float	4	Any Floating Point Number	0.0	1.04	Value When Inactive
8	Apply When Not Active	WRITEU	R/W	User	U8	1	0 -> 1	1	1.04	Force Value When Inactive: 0 = No 1 = Yes
9	Is Reset Pt?	RESTPT	R/W	User	U	1	0 -> 2	0	1.04	Reset Type: 0 = This Point is Not a Reset Point 1 = This Point is a Hard-Wired Reset 2 = This Point is a Software Reset

Point Type 72: Effect Configuration

Parm	Name	Abbr	Access	System or User Update	Data Type	Length	Range	Default	Ver	Description
10	1st Out Cause	1OUTCZ	R/O	System	U8	1	0 -> 1	0	1.04	1st Trip Cause NumberTattletale: 0 = None 1 = Active
11	2nd Out Cause	2OUTCZ	R/O	System	U8	1	0 -> 1	0	1.04	2nd Trip Cause NumberTattletale: 0 = None 1 = Active
12	3rd Out Cause	3OUTCZ	R/O	System	U8	1	0 -> 1	0	1.04	3rd Trip Cause NumberTattletale: 0 = None 1 = Active
13	4th Out Cause	4OUTCZ	R/O	System	U8	1	0 -> 1	0	1.04	4th Trip Cause NumberTattletale: 0 = None 1 = Active
14	1st Out Tag	1OTTAG	R/O	System	String10	10	0x20 -> 0x7E for each ASCII character	<none>	1.04	1st Trip Cause Tag
15	2nd Out Tag	2OTTAG	R/O	System	String10	10	0x20 -> 0x7E for each ASCII character	<none>	1.04	2nd Trip Cause Tag
16	3rd Out Tag	3OTTAG	R/O	System	String10	10	0x20 -> 0x7E for each ASCII character	<none>	1.04	3rd Trip Cause Tag
17	4th Out Tag	4OTTAG	R/O	System	String10	10	0x20 -> 0x7E for each ASCII character	<none>	1.04	4th Trip Cause Tag
18	Reset Code	RSTCOD	R/W	User	U8	1	0 -> 255	0	1.04	Match Reset Code withCause Reset Code
19	Active Link Count	LNKCNT	R/O	System	U8	1	1 -> 16	0	1.04	Current Active Link Count

Point Type 72: Effect Configuration

Parm	Name	Abbr	Access	System or User Update	Data Type	Length	Range	Default	Ver	Description
20	Assert EffectContinuously	EFMODE	R/W	User	U8	1	0 -> 1	0	3.03	Assert Effect Continuously: 0 = Once 1 = Continuous 2 = This Point is a SoftwareReset
10	1st Out Cause	1OUTCZ	R/O	System	U8	1	0 -> 1	0	1.04	1st Trip Cause NumberTattletale: 0 = None 1 = Active
11	2nd Out Cause	2OUTCZ	R/O	System	U8	1	0 -> 1	0	1.04	2nd Trip Cause NumberTattletale: 0 = None 1 = Active
12	3rd Out Cause	3OUTCZ	R/O	System	U8	1	0 -> 1	0	1.04	3rd Trip Cause NumberTattletale: 0 = None 1 = Active
13	4th Out Cause	4OUTCZ	R/O	System	U8	1	0 -> 1	0	1.04	4th Trip Cause NumberTattletale: 0 = None 1 = Active
14	1st Out Tag	1OTTAG	R/O	System	String10	10	0x20 -> 0x7E for each ASCII character	<none>	1.04	1st Trip Cause Tag
15	2nd Out Tag	2OTTAG	R/O	System	String10	10	0x20 -> 0x7E for each ASCII character	<none>	1.04	2nd Trip Cause Tag
16	3rd Out Tag	3OTTAG	R/O	System	String10	10	0x20 -> 0x7E for each ASCII character	<none>	1.04	3rd Trip Cause Tag

Point Type 72: Effect Configuration

Parm	Name	Abbr	Access	System or User Update	Data Type	Length	Range	Default	Ver	Description
17	4th Out Tag	4OTTAG	R/O	System	String10	10	0x20 -> 0x7E for each ASCII character	<none>	1.04	4th Trip Cause Tag
18	Reset Code	RSTCOD	R/W	User	U8	1	0 -> 255	0	1.04	Match Reset Code withCause Reset Code
19	Active Link Count	LNKCNT	R/O	System	U8	1	1 -> 16	0	1.04	Current Active Link Count
20	Assert EffectContinuously	EFMODE	R/W	User	U8	1	0 -> 1	0	3.03	Assert Effect Continuously: 0 = Once 1 = Continuous

Appendix A – Sample Cause and Effect Diagram

This appendix presents a full Cause and Effect Diagram sample matrix. You can use the sample or make your own design.

Injection Well Skid 00-RSK-18 Cause & Effect Matrix	Output Description	Injection Meter Skid Shutdown	General Alarm Beacon	Annunciation in DCS	Annunciation in Local Display	Run 1 SD Valve Open Command	Run 2 SD Valve Open Command	Run 3 SD Valve Open Command	Run 4 SD Valve Open Command	Utility Gas SD Valve Open Cmd	Run 1 SD Valve Close Command	Run 2 SD Valve Close Command	Run 3 SD Valve Close Command	Run 4 SD Valve Close Command	Utility Gas SD Valve Close Cmd			
Input Description	**Tag**	USD-1901	UA-1901	--	--	ESDV-1901	ESDV-1902	ESDV-1903	ESDV-1904	ESDV-1905	ESDV-1901	ESDV-1902	ESDV-1903	ESDV-1904	ESDV-1905			
Remote Shutdown	EXS-1901	X	X		X	O	O	O	O	O	X	X	X	X	X			
Utility Gas ESD Valve Closed Limit Switch	EZSC-1905		X	X	X													
Local ESD Hand Station	EHS-1906	X	X	X	X	O	O	O	O	O	X	X	X	X	X			
Reset Hand Switch	EHS-1907	O	O	O	O						O	O	O	O	O			
Gas Level Hi-Hi Alarm	AAHH-1901	X	X	X	X						X	X	X	X	X			
Fire Level Hi-Hi Alarm	AAHH-1902	X	X	X	X						X	X	X	X	X			
Gas Level Hi Alarm	AAH-1901			X	X													
Gas Detector Fault	AAL-1901		X	X	X													
Fire Detector Fault	AAL-1902		X	X	X													
Gate Intrusion Limit Switch	ZSO-1901		X	X	X													
Panel Intrusion Limit Switch	ZSO-1902		X	X	X													
Power Supply Low Voltage Switch	ESL-1908			X	X													
Power Supply Low-Low Voltage Switch	ESLL-1909	X	X	X	X	O	O	O	O	O	X	X	X	X	X			
Run 1 Pressure Lo-Lo Alarm	PALL-1901A		X	X	X	R					X							
Run 2 Pressure Lo-Lo Alarm	PALL-1902A		X	X	X		R					X						
Run 3 Pressure Lo-Lo Alarm	PALL-1903A		X	X	X			R					X					
Run 4 Pressure Lo-Lo Alarm	PALL-1904A		X	X	X				R					X				
Run 1 Strainer Diff Press Hi-Hi Limit	PDHH-1901		X	X	X													
Run 2 Strainer Diff Press Hi-Hi Limit	PDHH-1902		X	X	X													
Run 3 Strainer Diff Press Hi-Hi Limit	PDHH-1903		X	X	X													
Run 4 Strainer Diff Press Hi-Hi Limit	PDHH-1904		X	X	X													
Run 1 Flow High Alarm	FAH-1901		X	X	X													
Run 2 Flow High Alarm	FAH-1902		X	X	X													
Run 3 Flow High Alarm	FAH-1903		X	X	X													
Run 4 Flow High Alarm	FAH-1904		X	X	X													

X = condition present to cause effect

O = condition resets effect, unless causes are still present

R = effect must be reset by clearing condition, namely, re-pressurizing the run for the PALL

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