

Sequencing and Control of VICI Valves

Diablo MPValve 5.0

The screenshot displays the Diablo MPValve 5.0 software interface. At the top, there is a menu bar with 'File', 'Tools', and 'Help'. Below the menu bar, there are two dropdown menus: 'Valve:' set to '[1] Stream Selection' and 'Current Position:' set to '[1] Port 1'. The main area is divided into three tabs: 'Valves', 'Sequence', and 'Event Log'. The 'Sequence' tab is active, showing a 'Sequence Table' with the following data:

Step	Step Type	Valve	Position	Hold Time (min.)
1	GotoPosition	[1] Stream Selection	[1] Port 1	-
2	GotoPosition	[2] Injection	[1] Load	-
3	HoldPosition	-	-	0.50
4	GotoPosition	[2] Injection	[2] Inject	-
5	HoldPosition	-	-	5.00
6	Increment	[1] Stream Selection	-	-
7	GotoStepRunTime	-	-	Goto Step: 1, Repeat until Run Time > 30.00 min.

To the right of the table is a vertical stack of buttons: 'New', 'Add Step', 'Edit Step', 'Delete Step', 'Save', 'Load', and 'Help'. Below the table is a 'Sequence Control' panel with 'Start', 'Advance', and 'Stop' buttons, and a checked 'Export Sequence Events' checkbox. To the right of the control panel is a 'Sequence Status' panel showing 'Sequence Running - Hold Time (m): 2.81' with a green progress bar, and three sub-panels for 'Run Time (m): 3.34', 'Step: 5', and 'Cycle: 1'.

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Diablo MPValve 5.0
Reference Manual

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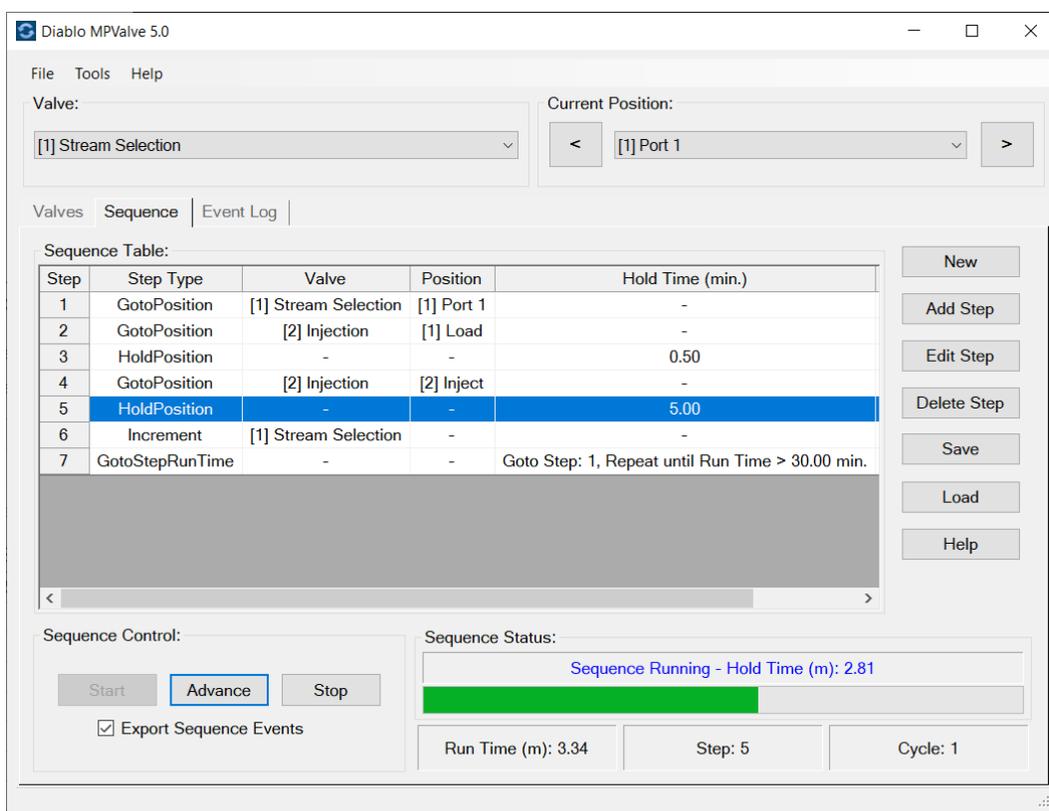
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Introduction

About MPValve 5.0



The Diablo MPValve software interfaces with Valco Instruments (VICI) multi-position/selector valves and two-position/switching valves through either the micro-electric or universal actuator via RS-232 or USB serial communications. MPValve 5.0 allows both interactive and automated control of valve position using command-line parameters and programmed valve sequences.

MPValve 5.0 combines the features of the MPValve Universal Controller and Sequencer programs into a single application and adds increased sequencing capabilities. For more information about the differences between MPValve 5.0 and earlier versions, see [“Considerations when Upgrading from Earlier Versions of MPValve”](#) on page 28

About Diablo Analytical, Inc.

Diablo Analytical is an analytical application development company located in Antioch, CA. We specialize in gas-phase chemical measurement solutions using gas chromatography, mass spectrometry, infrared detection, pyrolysis, and software development.

Our company is named after Mount Diablo, a nearby 3849' peak in the San Francisco Bay Area.

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Getting Started

System Requirements

Software Requirements

The MPValve 5.0 software is compatible with Windows 7 SP1, Windows 8/8.1, and Windows 10.

The .NET Framework 4.5.2 must be installed before trying to run MPValve 5.0. The .NET Framework will be installed automatically, if necessary, when you install the software from the distribution media, or if you use the single-file installer. If you use the web-based installer the .NET Framework 4.5.2 will be downloaded automatically if necessary. You can also download and install the .NET Framework 4.5.2 from Microsoft using the following link:

<https://www.microsoft.com/en-us/download/details.aspx?id=42642>

Note: The .NET Framework 4.5.2 is included with all versions of the Windows 10 operating system.

Valco/VICI Valve Actuator

The MPValve software is designed to interface to Valco/VICI valves using either the EMH /EMT and EH/ET series micro-electric actuators or the EUH, EUD and EUT series “Universal” actuators using the RS-232 or USB serial communication interface. Please contact VICI for information about their valves and actuators.

Important: MPValve does *not* support the “multidrop” cable.

Valco Instruments Company, Inc. (VICI)

<http://www.vici.com>

Install the USB Driver

If you have the version of the Universal actuator with the USB interface, you will need to download and install the USB Driver from the VICI web site. The driver allows the MPValve software to communicate with the actuator controller over the USB interface as if it is a serial interface. Here is a link to the “Universal Actuator USB Driver Tutorials” on the VICI website:

https://www.vici.com/act/usb_tutorials.php

Installing the Software

The MPValve 5.0 software is installed by running the setup program on the distribution USB flash drive/CD, or the installation program downloaded from our web site.

Important: You must be logged on with Administrator permissions when you install the software (but you can run the software thereafter as a standard user)

There are two different versions of the installation program that can be downloaded from our web site:

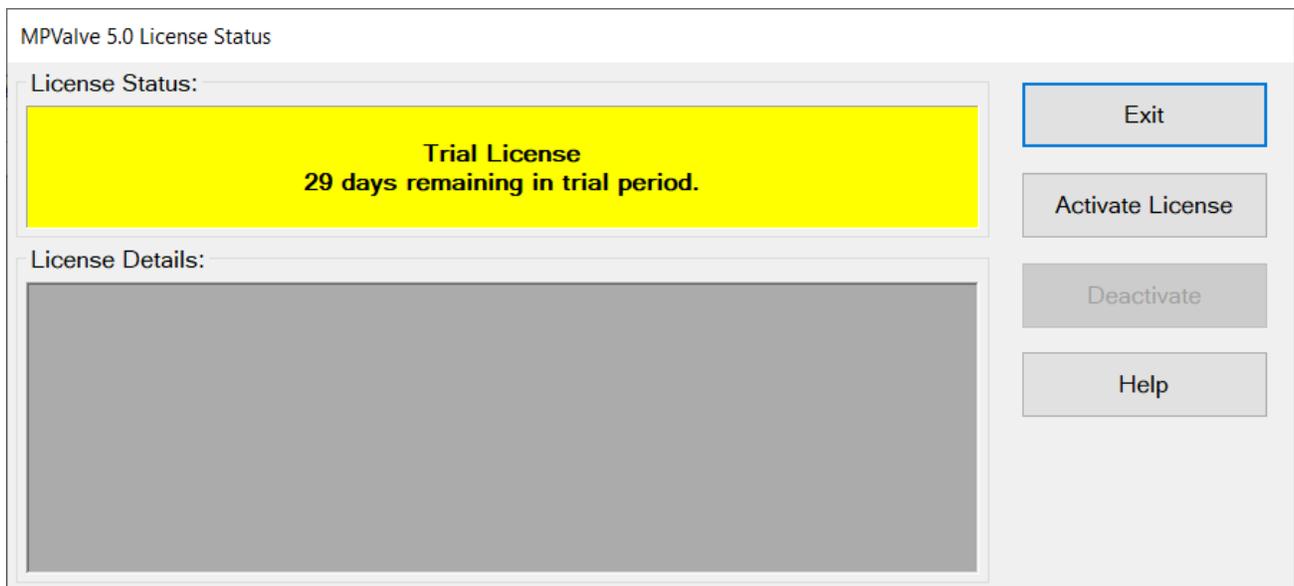
1. A web-based installer that can be used to update an existing installation of the software or to install the software on a computer that has Internet access. This version of the installer will download the required .NET Framework 4.5.2 and other run-time files automatically over the Internet if required.
2. A single-file installer that should be used to install the software on a computer with no access to the Internet. This version of the installer includes the .NET Framework 4.5.2 and other run-time libraries and is consequently much larger in size.

Note: The .NET Framework 4.5.2 is included with all versions of the Windows 10 operating system.

Software Licensing and Activation

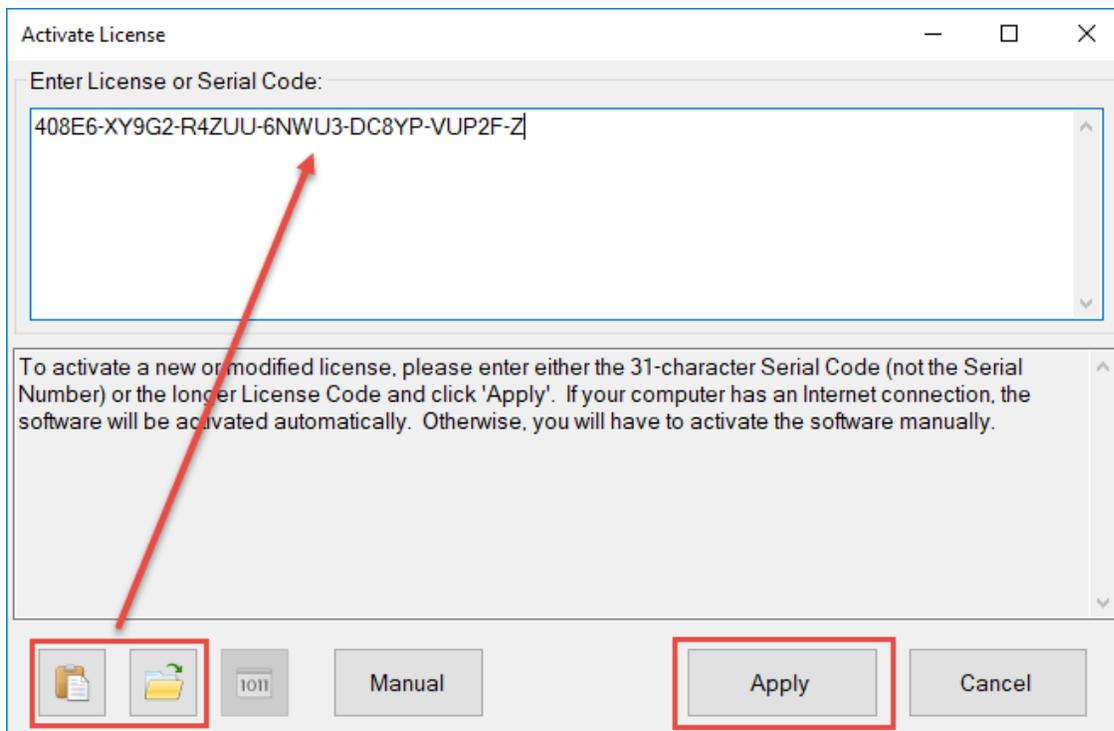
When you run the software for the first time, you will have a trial license that allows you to use and evaluate the program for up to 30 days. The program is fully functional during the trial period. To continue using the software after the 30-day trial period, you must purchase a license and then activate the software.

To activate your license, click the “Activate License” button on the License Status window that is displayed when you start the software or when you click the menu option, “Help > License Status...”.



When you purchase your software license, you will receive a 31-character Serial License Code (this is different than the shorter Serial Number). To activate the software, you must enter that License Code into the text box on the “Activate License” window. If you copy the Serial License Code to the Windows Clipboard from an email message, you can paste into the text box using the “Paste” button. Alternatively, if you received a text file containing the Serial License Code, you can load it using the “File Open” button.

Note: If you received a distribution USB flash drive, a text file containing your serial license code may be saved on the flash drive.



After entering the Serial License Code, click the “Apply” button. If your computer is connected to the Internet, the software will contact the License Server and automatically activate the software.

If your computer is not connected to the Internet, or if there is a problem contacting the License Server, then you will need to activate the software manually by clicking the “Manual” button and following the instructions.

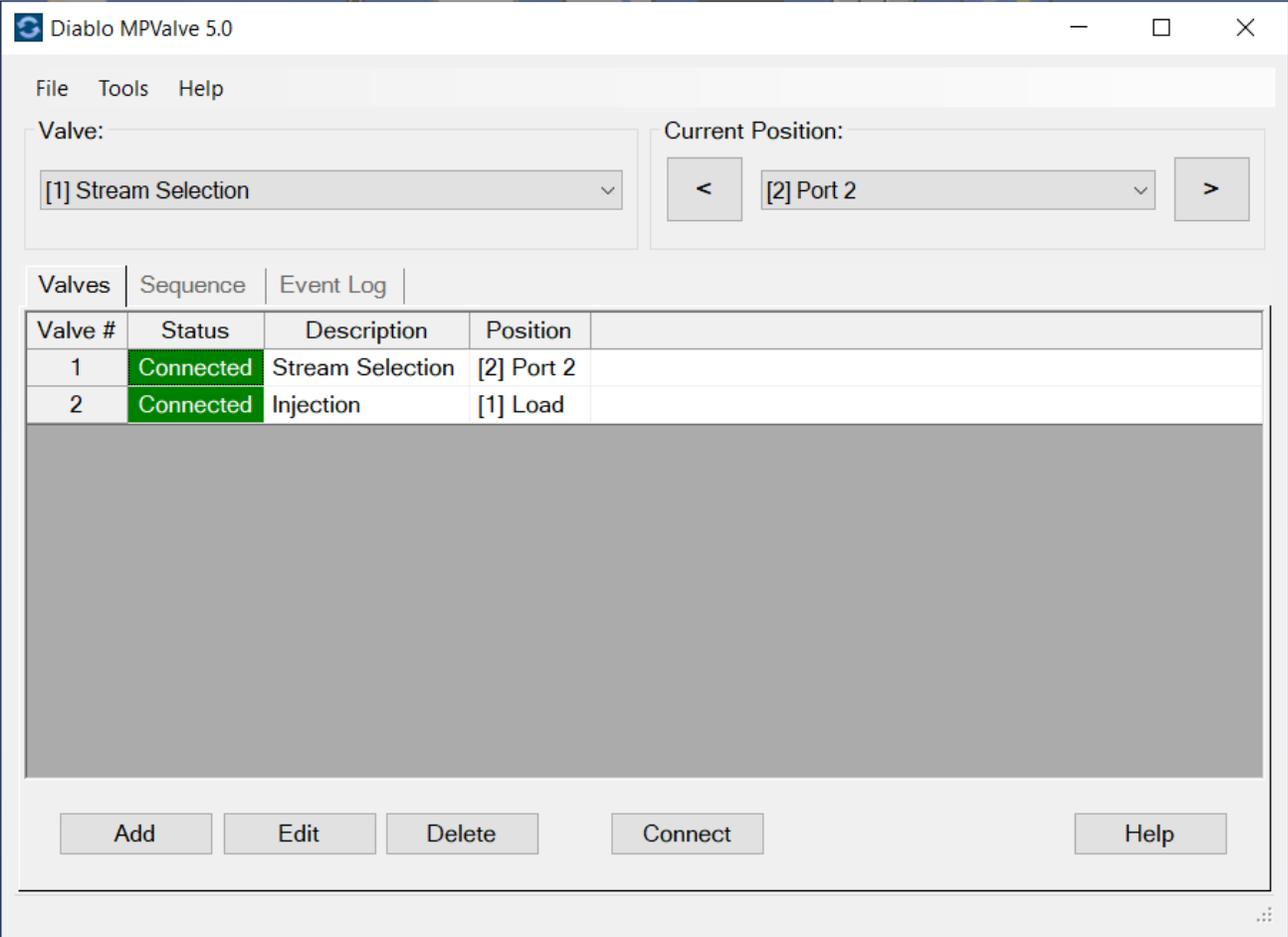
Refer to the Software License Guide for more information about licensing and activation.

Note: An Internet connection is only required when applying an activation code or deactivating the software. No Internet connection is required during normal operation of the software.

Running the Software

The Main Window

The MPValve software is configured and controlled through a single window. Manual control of valves is possible using the “Valve” and “Current Position” controls at the top of the window. Valve configuration, sequencing, and logging are handled in the “Valves”, “Sequence”, and “Log” tabs.



Valve Configuration

After starting the MPValve software for the first time, you will need to create a valve configuration. If no valve configuration exists, you will be prompted to create one.

Valves	Sequence	Log	
Valve #	Status	Description	Position
1	Connected	Valve 1	[1] Port 1

Editing the Valve Table

MPValve can control multiple valves/actuators on different serial ports. Each valve must be controlled through its own serial or USB port connected to the corresponding actuator. Since most computers are provided with only a single serial port, this feature might require the use of a multi-port RS-232 expansion card or USB adapter.

Important: MPValve does *not* support the Valco “multi-drop” cable.

Add a Valve

Click the “Add” button to add a new valve to the configuration.

Important Note: Make sure that each valve/actuator is connected to a unique serial or USB port on the computer.

Edit a Valve

Click the “Edit” button to edit the selected valve configuration. You can also double-click the valve entry in the Valves table to edit that valve’s configuration.

Delete a Valve

Pressing the “Delete” button will delete the currently selected valve from the configuration.

Configuring the Valves

Whenever you add or edit a valve, the valve configuration window will be displayed, allowing you to set up the valve and actuator type along with the serial communication settings.

Configure Valves [X]

Valve Configuration:

Valve:

Description:

Configuration | Actuation Counter

Serial Communication Settings:

Serial Port: Timeout (msec):

Actuator Type:

Microelectric (EMH, EMT, EH, ET, Etc.)

Universal (EUH, EUT, EUD, Etc.)

Valve Type:

Multi-position: Number of Positions (4-32)

Two-position with Stops (injector/switching)

Port Labels:

Port	Label
1	Port 1
2	Port 2
3	Port 3
4	Port 4
5	Port 5
6	Port 6
7	Port 7

Description

The text entered in this box will appear in the valve-selection list box on the main MPValve window. This allows valves to be identified with a more meaningful name than Valve #1 or Valve #2.

Save Button

Pressing the “Save” button writes the current communication and valve settings to the configuration file and makes them the default values.

Cancel Button

Pressing the “Cancel” button closes the configuration window without making any changes.

Serial Communication Parameters

The only communication parameter that needs to be set is the serial communication port to which the actuator is connected.

Note: the actuator is configured to use the following fixed serial communication parameters:

- Baud Rate: 9600
- Parity: None
- Word Length: 8
- Stop Bits: 1

Serial Port

Selects the serial communication port to which the VICI actuator is connected. The list box will display the serial or USB ports that are currently installed on the computer.

Timeout

Sets the serial communication timeout period in milliseconds. When sending commands to the actuator control module, MPValve will wait this period of time for a valid response before generating a timeout error. It is recommended that this value be kept at 4000 ms unless there is a specific problem with your system.

Note: some high-torque valves may move slowly and may generate a timeout error with the default setting when moving between positions that are far apart. If you encounter this, increase the timeout setting until the error no longer occurs.

Test Button

The test button allows the RS-232 serial communication interface to the specified port to be tested. If the application successfully communicates with the actuator, the firmware ID of the actuator will be displayed in a window. If the application is unable to establish a communication link, then an error message will be displayed.

Important: Make sure you have selected the correct valve and actuator type before testing communication.

Actuator Type

Select whether you are using a VICI “micro-electric” or “universal” actuator with this valve.

Micro-electric actuator part numbers will generally start with “EMH” or “EMT” for multi-position/selector valves, and “EH” or “ET” for two-position/switching valves.

Universal actuators can control either multi-position/selector valves or a two-position/switching valves. Part numbers for the universal actuator generally start with “EUH” or “EUT”

Please contact VICI if you are unsure what kind of actuator you are using.

Valve Type

Select whether the valve is a multi-position/selector valve, or a two-position/switching valve.

Important: The MPValve software currently only supports two-position/switching valves with stops. This is the most common type of VICI two-position valve used in typical applications. However, please contact VICI if you are unsure what kind of valve you are using.

Positions

For multi-position/selector valves, the actuator needs to know the number of positions there are in a full rotation of the installed valve. Enter the number of positions into the text box. The exit port on a multi-position valve should not be included in this count.

Find Stops

If you are using a two-position valve with stops and the universal actuator, the “Find Stops” button will be enabled. When you click this button, MPValve will attempt to connect to the actuator, and if successful will instruct the valve to find the valve stops automatically.

Important: Make sure that you are connected to a two-position valve with stops before using this command.

Port Labels

The “Port Labels” table allows you to enter descriptive names for each port on the valve. These descriptive labels are displayed in the “Position” display on the main window and when referencing the port/position in the sequence table and event log.

Actuation Counter

You can enable an actuation counter independently for each valve in the configuration. When enabled the actuation count is incremented each time the valve is switched to a new position. This allows you to track rotor wear as part of a preventative maintenance program, for example. In addition, you can enable an actuation status warning that will notify you in the valve table and event log when the number of actuations on a particular valve exceeds a warning level.

Valves	Sequence	Log			
Valve #	Status	Description	Position	Actuation Counter	
1	Connected	Valve 1	[1] Port 1	Actuations: 4 Pass (<5000)	

Add Edit Delete Connect

Note: The actuation counter is only incremented once for each actuation regardless of the number of positions the valve is rotated through.

Configuration Actuation Counter

Configure Valve Actuation Counter:

Enable Actuation Counter

Enable Actuation Warning at a Count of:

Current Actuation Status:

Current Actuation Count:

Actuation Warning Status:

Check “Enable actuation counter” to enable the actuation counter. If you also want to be warned when the actuation count exceeds a warning limit, check “Enable actuation warning” and enter the desired warning limit count.

Current Valve Actuation Status

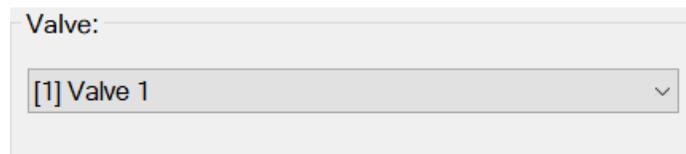
The current actuation count and warning status (if enabled) for the selected valve are displayed in this section of the configuration dialog.

Press the “Reset” button to reset the current actuation count for the valve to a new value. You would typically reset the actuation count to 0 after replacing the valve rotor or installing a new valve.

Manual Valve Control

Manual control of valves is possible using the “Valve” and “Current Position” controls at the top of the main window.

Valve Selection Control

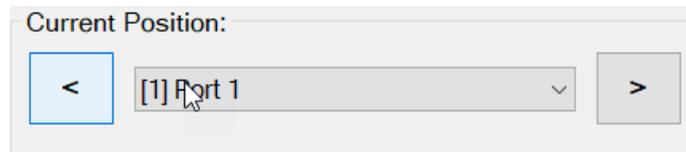


If you have multiple valves in your configuration, the “Valve” list can be used to select which valve will be controlled by the Valve Position controls. When you select a valve, the Valve Position list will be updated automatically with the positions/ports available for the selected valve.

Note: When a valve command is received from the command line or when a sequence is being executed, the valve that is selected for the command or sequence step will automatically be selected in the “Valve” list.

Valve Position Control

The Valve Position controls can be used to switch the selected valve manually to a new position.



Increment: You can increment to the next valve position by clicking the increment button: [>]. If you increment from the last position, the valve will be switched back to the first position.

Decrement: You can decrement to the previous valve position by clicking the decrement button: [<]. If you decrement from the first position, the valve will be switched to the first last position.

Select Position: You can switch to a specific position by selecting it from the “Current Position” list. The actuator controller typically selects the shortest rotation when switching to a new position. So, the valve could rotate forward or backward depending on the current position and new position.

Note: When a valve command is received from the command line or when a sequence is being executed, the position that is selected for the command or sequence step will automatically be selected in the “Current Position” list.

Valve Table

The Valve Table displayed on the “Valves” tab of the main window displays all the valves that have been configured. Each line in the table corresponds to one of the valves. See “[Valve Configuration](#)” on page 8 for information on adding and configuring valves.

Valve #	Status	Description	Position	Actuation Counter
1	Connected	Valve 1	[1] Port 1	Actuations: 4 Pass (<5000)

Valve Number: The valve number is displayed in brackets along with the valve description in the sequence table and event log.

Valve Status: The current status of the valve:

Valve Status	Description
Offline	The valve is not currently connected to the controller. Click the “Connect” button below the valve table to connect to the valve.
Connected	The valve is connected to the controller and is ready to receive valve commands.
Error	An error has occurred. Check the event log or the debug log for more information.

Description: The valve description entered when the valve was configured. Edit the configuration to change the description.

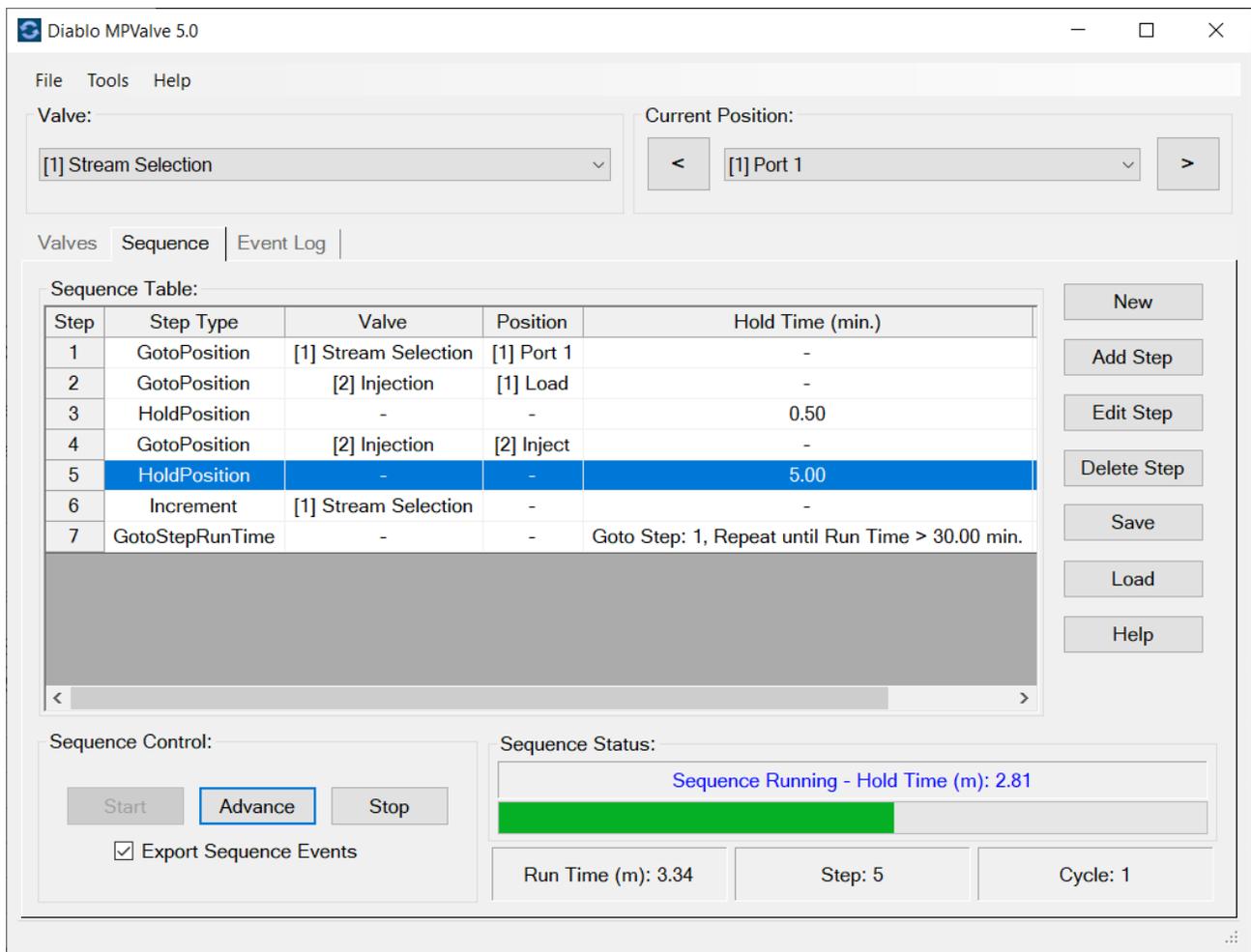
Position: The valve’s current position. The position will be updated whenever it is change by manual control, by a command-line command, or when executing a sequence.

Actuation Counter: If you have enabled the actuation counter in the valve configuration, then actuation information and warnings are displayed here. See “[Actuation Counter](#)” on page 11.

Valve Sequencing

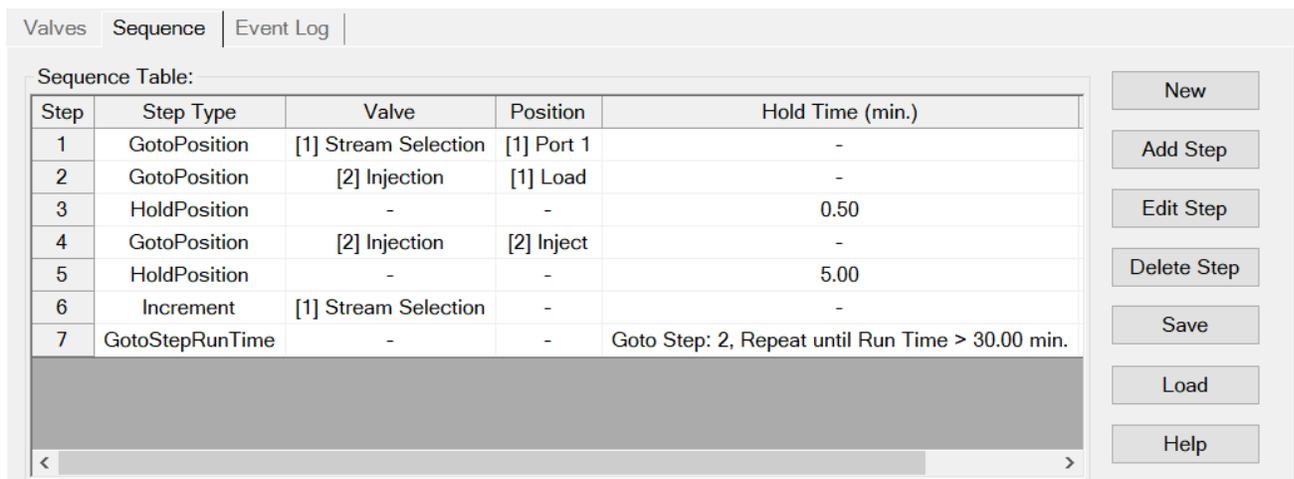
A valve sequence is a programmed sequencing of valve positions. The sequence is defined by a series of “steps” that allow you to switch the position of one or more valves, hold a position for a specified period of time, and repeat portions of the sequence for a specified number of cycles or run time. You create a valve sequence by adding each step in the order you want it executed: See “[Editing the Sequence](#)” on page 15

MPValve 5 also allows a full sequence to be created and run from the command line: See “[Command-Line Control](#)” on page 18



Sequence Table

The sequence table displays the current sequence steps in the order they will be executed.



Step Types

The following sequence step types are supported and can be selected when adding a step to the sequence table:

Step Type	Description
SelectValve	Selects the valve that will be used for subsequent valve positioning commands. Valve #1 is assumed at the start of the sequence.
GotoPosition	Change the current valve to the specified position.
HoldPosition	Holds the sequence for the specified time in minutes. A hold time of 0 will cause the sequence to hold indefinitely until the “Advance” button is clicked or an “Advance” command is received from the command line.
Increment	Increment the valve by one position. If the valve is currently at the last position, it will be incremented to the first position.
Decrement	Decrement the valve by one position. If the valve is currently at the first position, it will be decremented to the last position.
GotoStep	Sends the sequence to the specified step and repeats continuously until the sequence is stopped.
GotoStepCycles	Sends the sequence to the specified step and repeats for the specified number of cycles. If the number of cycles is set to 0, then this is equivalent to “GotoStep”.
GotoStepRunTime	Sends the sequence to the specified step and repeats until the specified run-time has been exceeded. If the run time is set to 0, then this is equivalent to “GotoStep”.

Editing the Sequence

You can edit a sequence using the buttons located to the right of the sequence table:

Sequence Table:

Step	Step Type	Valve	Position	Hold Time (min.)
1	GotoPosition	[1] Stream Selection	[1] Port 1	-
2	GotoPosition	[2] Injection	[1] Load	-
3	HoldPosition	-	-	0.50
4	GotoPosition	[2] Injection	[2] Inject	-
5	HoldPosition	-	-	5.00
6	GotoStepRunTime	-	-	Goto Step: 1, Repeat until Run Time > 30.00 min.

Buttons: New, Add Step, Edit Step, Delete Step, Save, Load, Help

New

Click the “New” button to create a new sequence. This will clear any existing sequence steps, so make sure you have saved the current sequence if you want it preserved before creating a new sequence.

Add Step

Click the “Add Step” button to append a new step to the sequence table. The Edit Sequence Step window will be displayed, allowing you to select the step type and any additional parameters like valve number, valve position, hold time, etc.

Edit Sequence Step

Step Type: GotoPosition

Valve Number: [1] Valve 1

Valve Position: Port 1

Buttons: Save, Cancel

Edit Step

Click the “Edit Step” button to edit the selected step. You can also double-click the step in the sequence table. The “Edit Sequence Step” window will be displayed, allowing you to edit the step.

Delete Step

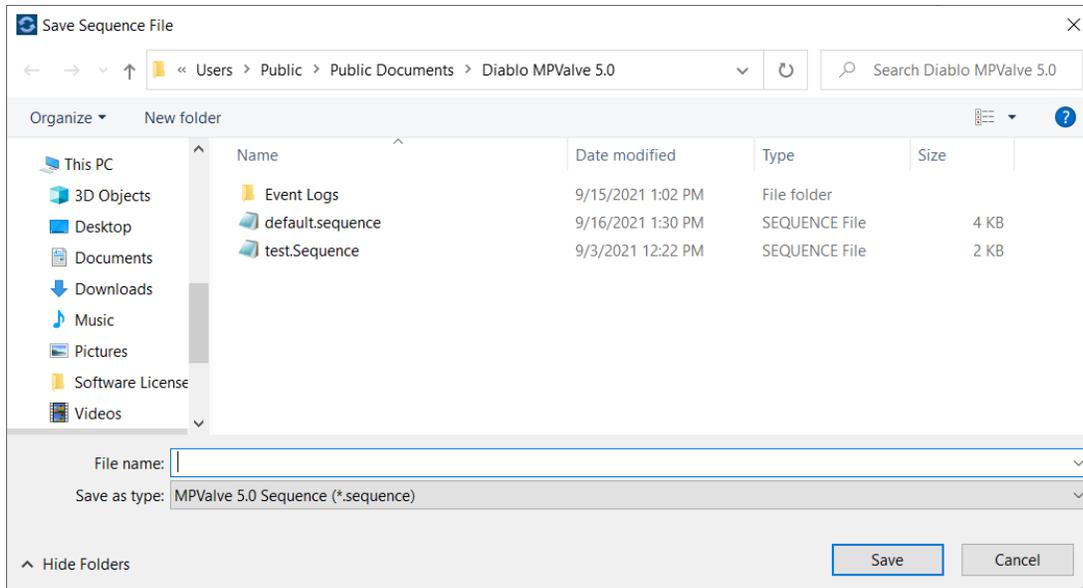
Click the “Delete Step” button to delete the selected step.

Re-order Sequence Steps

To re-order sequence steps, left-click the step number in the first column of a row in the sequence table and drag it up or down to the desired new position. The steps will be renumbered automatically.

Save

Click the Save button to save the current sequence file to a sequence file. You will be prompted to enter the desired sequence file name:



By default, sequence files are saved in the MPValve “Public Documents” folder:

C:\Users\Public\Documents\Diablo MPValve 5.0

You can access this folder quickly using the menu option, “Tools > Browse System Folders > Common Documents Folder”

MPValve sequence files are “XML” files that have a file extension of, “.sequence”.

Note: When the MPValve program is closed, the current sequence is automatically saved to the sequence file, “default.sequence”. When the program is re-started, it automatically restores that sequence.

Load

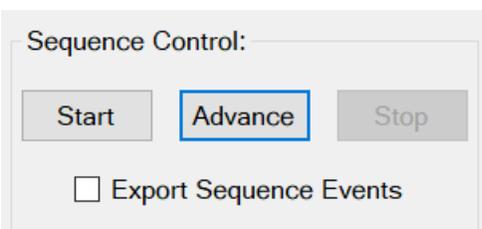
Click the “Load” button to load a sequence file that you have saved previously.

Help

Display the sequencing section of the MPValve help file.

Sequence Control

You control the execution of a sequence using the Sequence Controls:



Start

Click the “Start” button to start the current sequence.

Advance

Click the “Advance” button to advance the sequence to the next step. The sequence must be running and be executing a “HoldPosition” step. Otherwise, this command is ignored.

Stop

Stops the current sequence upon completion of the current step.

Export Sequence Events

If this checkbox is checked upon successfully completion of a sequence, then any events written to the event log during the sequence run will be exported to a comma-delimited (CSV) text file. The sequence log files are saved to the folder:

C:\Users\Public\Documents\Diablo MPValve 5.0\Event Logs

The log files are named with a date- time prefix. For example:

20210915-115235.mpvalve.sequence.events.csv

You can access this folder quickly using the menu option, “Tools > Browse System Folders > Sequence Event Log Folder”

Note: the state of the “Export Sequence Events” checkbox is saved to the MPValve configuration file whenever the program is closed and restored whenever the program is re-started.

Sequence Status

The sequence status is displayed in the “Sequence Status” section of the sequence tab:



When a sequence is running, the run time, step number being executed, and the current cycle are displayed. In addition, if a HoldPosition step is being executed, a hold-time progress bar will be displayed.

Command-Line Control

The MPValve software can be controlled by another program by calling the MPValve executable (.exe) file with command-line parameters that instruct MPValve to switch valve positions, run a sequence, stop a sequence, or advance a sequence that is on hold. The following commands are supported:

Command-Line Format

The command line typically begins with the full path to the MPValve executable file. Since the file path contains spaces, you will need to enclose the path in quotation marks:

```
"C:\Program Files (x86)\Diablo MPValve 5.0\MPValve.exe"
```

Next, add the desired commands. Each command must be separated by a space. So, for example, the following command will switch valve 1 to position 5:

```
"C:\Program Files (x86)\Diablo MPValve 5.0\MPValve.exe" v1 p5
```

Supported Commands

The following commands can be executed from the command line:

Command	Description
vn	<p>Select the valve that subsequent valve positioning commands will act upon. Where, “n” is the valve number as displayed in the valve table.</p> <p>For example, “v1” would specify valve #1.</p> <p>This command can be included in the same command line with any of the valve positioning commands. For example, “v1 p2” would switch valve 1 to position 2.</p>
pn	<p>Switches the current valve to the specified position, “n”. For example, “p5” would switch the currently selected valve to position 5. You can combine this with the valve command to ensure you are acting on the desired valve. For example, “v2 p5” would switch valve 2 to position 5.</p>
Increment inc +	<p>Any of these commands will increment the position of the currently selected valve to the next position. If the valve is currently at the last position, it will be incremented to the first position.</p> <p>You can combine this command with the valve command to ensure you are acting on the desired valve. For example, “v2 +” would increment valve 2 to the next position.</p>
decrement dec -	<p>Any of these commands will decrement the position of the currently selected valve to the previous position. If the valve is currently at the first position, it will be decremented to the last position.</p> <p>You can combine this command with the valve command to ensure you are acting on the desired valve. For example, “v2 -” would decrement valve 2 to the previous position.</p>
start	Starts the current sequence displayed in the MPValve Sequence Table
stop	Stops the current sequence displayed in the MPValve Sequence Table if it is running.
advance adv a	Advances the current sequence displayed in the MPValve Sequence table to the next sequence step. The sequence must be running and be executing a “HoldPosition” step. Otherwise this command is ignored.

**Sequence
seq**

Executes a command-line sequence. See “[Sequence Commands](#)” on page 20 for the list of sequence commands.

You can also create and test a sequence in the MPValve Sequence Editor and then right-click the sequence table and select, “Show Sequence Command” from the pop-up menu to display the correct command line for that sequence.

Sequence Commands

MPValve allows full sequences to be created and executed from the command line. A command-line sequence must start with either the “sequence” or “seq” command followed by a space-separated list of sequence commands. The following sequence commands are supported.

Note: the brackets shown below indicate an optional item. Don’t include the brackets in your command if you are adding the optional item.

Sequence Command	Description
vn[,pm]	<p>This command creates a SelectValve step:</p> <p>Select the valve that subsequent valve positioning commands will act upon. Where, “n” is the valve number as displayed in the valve table.</p> <p>For example, “v1” would specify valve #1.</p> <p>You can also optionally specify a position “m” in the SelectValve command. For example, v1,p5 would switch valve 1 to position 5.</p> <p>Note: If you include a position in the SelectValve command it is converted to a “GotoPosition” command in the sequence table.</p> <p>Important: make sure there are no spaces in the command.</p>
pm[,vn]	<p>This sequence command creates a GotoPosition step:</p> <p>Switches the current valve to the specified position, “m”. For example, “p5” would switch the currently selected valve to position 5.</p> <p>You can also optionally specify a valve “n” in the GotoPosition command. For example, p5,v1 would switch valve 1 to position 5.</p> <p>Important: make sure there are no spaces in the command.</p>
+ [n]	<p>This sequence command creates an Increment step:</p> <p>Increments the position of the currently selected valve to the next position. If the valve is currently at the last position, it will be incremented to the first position.</p> <p>You can also optionally specify a valve “n” in the Increment command. For example, +2 would increment valve 2.</p>
- [n]	<p>This sequence command creates a Decrement step:</p> <p>Decrements the position of the currently selected valve to the previous position. If the valve is currently at the first position, it will be decremented to the last position.</p>

	You can also optionally specify a valve “n” in the Decrement command. For example, -2 would decrement valve 2.
hx,y	This sequence command creates a HoldPosition step Holds the sequence for the specified time, x.y, in minutes. A hold time of 0 will cause the sequence to hold indefinitely until the “Advance” button is clicked or an “Advance” command is received from the command line.
gs	This sequence command creates a GotoStep step: Sends the sequence to step #s and repeat continuously until the sequence is stopped. For example, g2 will send the sequence back to step 2.
cs,i	This sequence command creates a GotoStepCycles step: Sends the sequence to step #s and repeat for i cycles. For example, g2,5 will send the sequence back to step 2 and repeat for 5 cycles.
rs,x.y	This sequence command creates a GotoStepRunTime step: Sends the sequence to step #s and repeats until the run time, x.y, has been exceeded. For example, g2,10.5 will send the sequence back to step 2 and repeat until the run time has reached 10.5 minutes.
w	By default, when you submit a command line sequence, the sequence will be created and started immediately. If you include the wait command, “w”. The sequence will be created but won’t start until a “start” command is received or the “Start” button is clicked.

So, for example, the sequence:

Sequence Table:

Step	Step Type	Valve	Position	Hold Time (min.)
1	GotoPosition	[1] Stream Selection	[1] Port 1	-
2	GotoPosition	[2] Injection	[1] Load	-
3	HoldPosition	-	-	0.50
4	GotoPosition	[2] Injection	[2] Inject	-
5	HoldPosition	-	-	5.00
6	Increment	[1] Stream Selection	-	-
7	GotoStepRunTime	-	-	Goto Step: 2, Repeat until Run Time > 30.00 min.

Can be created using the following command line:

```
seq p1,v1 p1,v2 h0.50 p2,v2 h5.00 +1 r2,30.00.
```

Note the spaces in between each command.

In order for the sequence to actually run when called from another program, you also need to Include the full path to the MPVvalve executable:

```
"C:\Program Files (x86)\Diablo MPVvalve 5.0\MPVvalve.EXE" seq p1,v1 p1,v2 h0.50 p2,v2 h5.00 +1 r2,30.00
```

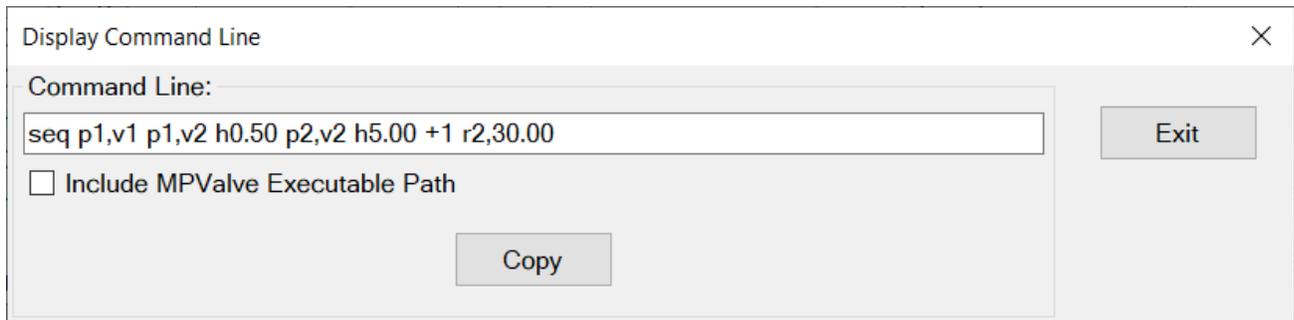
Since there is no wait (w) command in the command line, the sequence will be created and started automatically without any intervention.

Command Line Tools

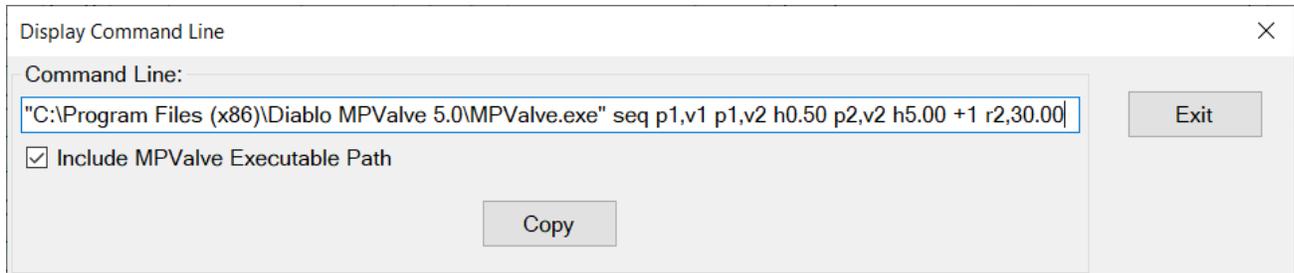
Fortunately, there are additional tools you can use to help you create and test command lines.

Show Sequence Command

You can build and test your sequence in the MPVvalve sequence editor. When the sequence is correct for your application, right-click the sequence table and select, Show Sequence Command” from the pop-up menu. The command line that corresponds to the current sequence table will be created and displayed automatically for you:



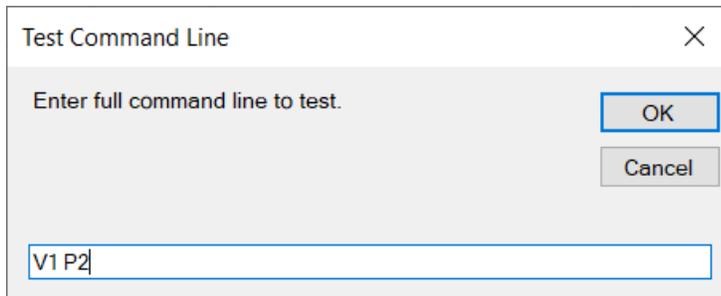
If you check, “Include MPVvalve Executable Path”, then the path will be added to the command line:



Click the “Copy” button to copy the command line as displayed to the Windows clipboard. You can then paste it into whatever program will be calling MPVvalve to run the sequence.

Test Command Line

You can test a command line by clicking the menu option, “Tools > Test Command Line”. Enter the commands you want to test, and click, “OK” the commands will be executed as if they had been called from the command line. For example:



This test will cause MPValve to switch valve #1 to position 2.

Instructions for Specific Programs

The following instructions are provided for implementing MPValve 5.0 with specific programs. Please contact Diablo Analytical for assistance in implementing this kind of automation with the software you are using.

Agilent GC and LC ChemStation Software

A custom macro is provided for the Agilent Technologies GC/LC ChemStation software that enables the valve position to be set to the position specified by the vial setting in the sequence table using a pre-run command/macro. This macro is compatible with all recent versions of the ChemStation software including the OpenLab and “legacy” “A” (16-bit) and “B” (32-bit) versions.

If the installation program detects the ChemStation software is installed on the computer, it will automatically copy the macro file to the correct location in the ChemStation directory structure. If for some reason this doesn’t work, you will need to copy the macro file manually as follows:

1. The macro file, “mpvalve5.mac”, is located the following folder:

```
C:\Users\Public\Documents\Diablo MPValve 5.0\Macros\Agilent OpenLab  
ChemStation
```

2. Copy the macro file to:

```
16-bit "A" Version ChemStations: c:\hpchem\core
```

```
32-bit "B" and some OpenLab versions: c:\chem32\core
```

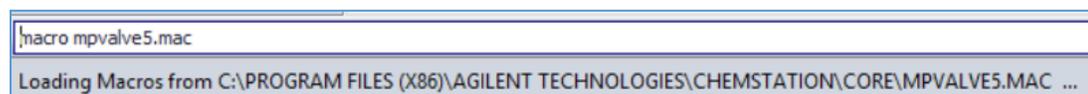
```
Recent OpenLab versions:
```

```
C:\Program Files (x86)\Agilent Technologies\ChemStation\CORE
```

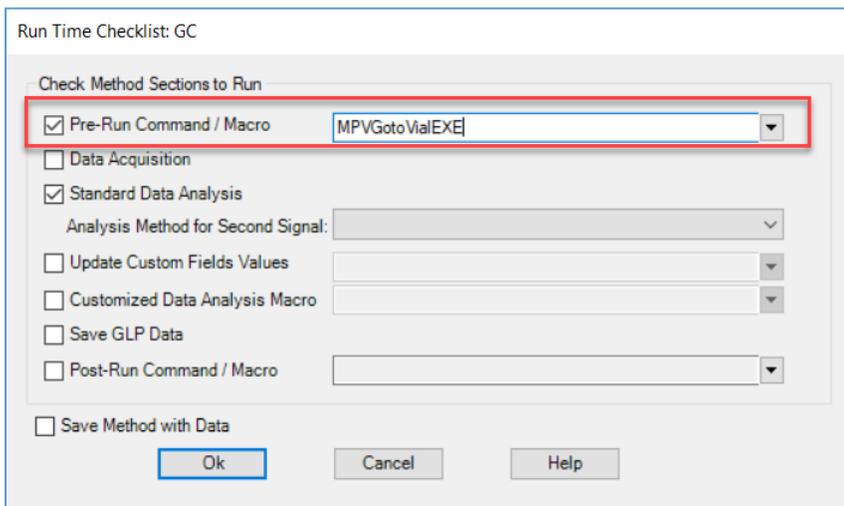
Once the macro file has been copied to the ChemStation “Core” folder, you can load it and add it to your method as follows:

- 1) Load the macro by typing the following command at the ChemStation command line:

```
macro mpvalve5.mac
```



- 2) Load the method that you will be using in your sequence.
- 3) Display the Run Time Checklist by selecting the "Method > Run-time Checklist" menu option. Enable the "Pre-run Command / Macro" and specify the following command: **MPVGotoVialEXE**



- 4) Save the method, and then repeat steps 3 and 4 for any other methods that will be used in the sequence.
- 5) Configure the sequence table, setting the vial number field to the desired valve position for each line in the sequence.
- 6) Start the MPValve 5.0 software and make sure communication is established with the actuator.
- 7) Run the sequence - the pre-run macro will switch the valve to the position specified in the sequence vial number field before each injection is made.

Optional Parameters:

MPVGotoVialEXE [Delay], [Valve]

[DELAY] You can specify a Delay Time in seconds as a parameter to the MPVGotoVialEXE macro if you want the valve/sample lines to purge prior to the injection.

Example: 'MPVGotoVialEXE 10' will result in valve 1 being switched to the vial position, and then delaying 10 seconds before returning control to the method for injection.

[VALVE] You can specify a valve number as an additional parameter after the [Delay] parameter to select the valve that will receive the command.

Note: You must have already configured the specified valve in the MPValve software The default Valve is 1.

Example: 'MPVGotoVialDDE 10,2' will direct the command to valve number 2 with a purge delay of 10 seconds.

Additional Macros

MPVGotoPosEXE Position, [Valve]

This macro allows you to switch the valve to the specified position.

Example: 'MPVGotoPosEXE 5' will result in valve 1 being switched to position 5.

[VALVE] You can specify a valve number as an additional command-line parameter after the Position parameter to select the valve that will receive the command. You must have already configured the specified valve in the MPValve 5.0 software The default Valve is 1.

Example: 'MPVGotoPosEXE 6,2' will result in valve 2 being switched to position 6.

Hint: You can run this macro from the ChemStation command line to confirm that the macro is communicating with MPValve and switching the valve.

Important Notes:

1. The MPValve5.MAC macro must be loaded each time the ChemStation software is restarted. If you would like the macro to be loaded automatically whenever the ChemStation starts, you can add the following line to the file "user.mac" located in the ChemStation "Core" folder:

macro "mpvalve.mac"

If "user.mac" doesn't exist, simply create it using Windows Notepad.

2. The MPValve software must be running and connected to the actuator controller before running a sequence or using either macro.

Agilent MassHunter GC/MS and MSD ChemStation Software

A custom macro is provided for the Agilent Technologies MassHunter GC/MS (Single Quad) and GC MSD ChemStation software that enables the valve position to be set to the position specified by the vial setting in the sequence table using a pre-run command/macro.

If the installation program detects the MSD ChemStation or MassHunter software is installed on the computer, it will automatically copy the macro file to the correct location on the computer. If for some reason this doesn't work, you will need to copy the macro file manually as follows:

1. The macro file, "mpvalve5.mac", is located the following folder:

C:\Users\Public\Documents\Diablo MPValve 5.0\Macros\Agilent MSDChem & MassHunter

2. Copy the macro file to:

MSD ChemStation: C:\MSDChem\Msexec

MassHunter: C:\GCMS\Msexec

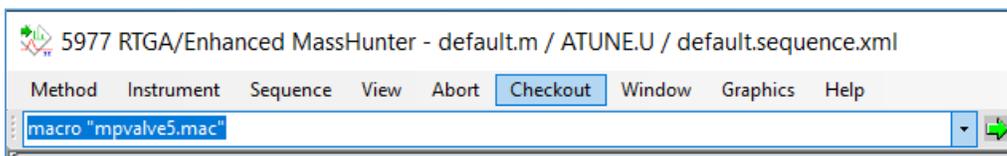
Note: depending on the computer hard drive configuration, the folder may be on the "D:" drive.

Once the macro file has been copied to the "MSEXEC" folder, you can load it and add it to your method as follows:

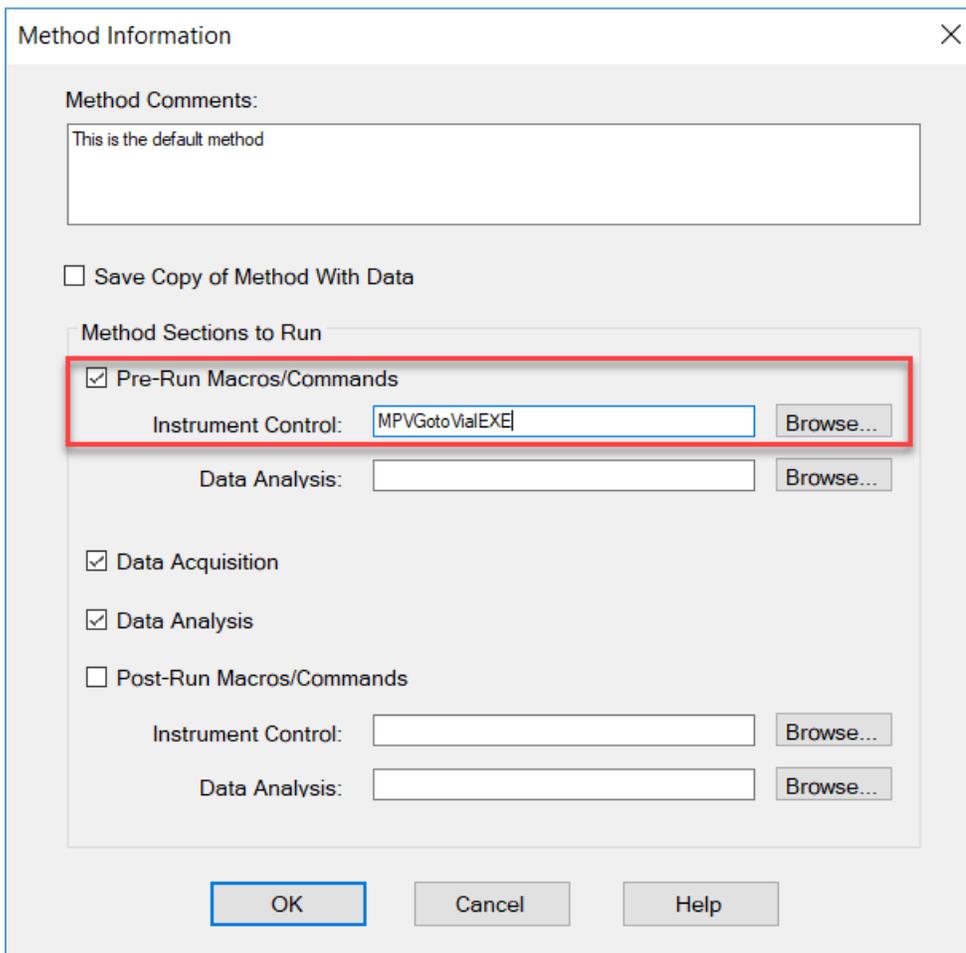
1. Load the macro by typing the following command at the MSD ChemStation or MassHunter command line:

macro "mpvalve5.mac"

Note: the quotation marks are required.



2. Load the method that you will be using in your sequence.
3. Select "Edit Entire Method" from the "Method" menu, and check, "Method Information". Enable the "Pre-run Command / Macro" and specify the following command for "Instrument Control": MPVGotoVialEXE



4. Save the method, and then repeat steps 3 and 4 for any other methods that will be used in the sequence.
5. Configure the sequence table, setting the vial number field to the desired valve position for each line in the sequence.
6. Start the MPValve 5.0 software and make sure communication is established with the actuator.
7. Run the sequence - the pre-run macro will switch the valve to the position specified in the sequence vial number field before each injection is made.

Optional Parameters:

MPVGotoVialEXE [Delay], [Valve]

[DELAY] You can specify a Delay Time in seconds as a parameter to the MPVGotoVialEXE macro if you want the valve/sample lines to purge prior to the injection.

Example: 'MPVGotoVialEXE 10' will result in valve 1 being switched to the vial position, and then delaying 10 seconds before returning control to the method for injection.

[VALVE] You can specify a valve number as an additional parameter after the [Delay] parameter to select the valve that will receive the command.

Note: You must have already configured the specified valve in the MPValve software The default Valve is 1.

Example: 'MPVGotoVialDDE 10,2' will direct the command to valve number 2 with a purge delay of 10 seconds.

Additional Macros

MPVGotoPosEXE Position, [Valve]

This macro allows you to switch the valve to the specified position.

Example: 'MPVGotoPosEXE 5' will result in valve 1 being switched to position 5.

[VALVE] You can specify a valve number as an additional command-line parameter after the Position parameter to select the valve that will receive the command. You must have already configured the specified valve in the MPValve 5.0 software. The default Valve is 1.

Example: 'MPVGotoPosEXE 6,2' will result in valve 2 being switched to position 6.

Hint: You can run this macro from the ChemStation command line to confirm that the macro is communicating with MPValve and switching the valve.

Important Notes:

1. The MPValve5.MAC macro must be loaded each time the MassHunter or MSD ChemStation software is restarted.
2. The MPValve software must be running and connected to the actuator controller before running a sequence or using either macro.

Interfacing with Other Sequencers

There is often a need to synchronize an MPValve sequence with a sequence from another program like a chromatography data system running a sequence of samples. There are many ways this can be accomplished, however the enhanced sequencing capabilities of MPValve 5.0, provide some new options. For example, here is an example of a simple MPValve 5.0 sequence:

Step	Step Type	Valve	Position	Hold Time (min.)
1	GotoPosition	[1] Stream Selection	[1] Port 1	-
2	GotoPosition	[2] Injection	[1] Load	-
3	HoldPosition	-	-	0.00
4	GotoPosition	[2] Injection	[2] Inject	-
5	Increment	[1] Stream Selection	-	-
6	GotoStep	-	-	Goto Step: 2, Repeat until Stopped

1. The sequence is started, either by the user clicking the “Start” button, or the sequencing program sending a “Start” command.
2. MPValve switches the stream selection valve to the first position, places the injection valve in the load position, and then holds in that state (HoldPosition 0)
3. When the sequencing program is ready for the injection, it sends an “Advance” command to MPValve. MPValve switches the injection valve to the inject position.
4. After injecting, MPValve increments the stream selection valve to the next position and returns to step 2. The injection valve is switched back to the load position, and then waits for the next “Advance” command to be sent from the sequencing program.

This approach requires the sequencing program to be able to run an external program during each line in the sequence.

Considerations when Upgrading from Earlier Versions of MPValve

The most obvious difference between MPValve 3.0/4.0 and MPValve 5.0 is that the separate MPValve Controller and MPValve Sequencer programs have been combined into a single program. In addition, there have been changes to automation/interfacing, and Sequencing.

Automation and Interfacing

MPValve 3.0 and 4.0 (Universal) utilized Dynamic Data Exchange (DDE) as one of the primary automation interfaces to enable other programs to control Valco valves through MPValve. Unfortunately, DDE is no longer supported by Windows, and is increasingly impacted by Windows security measures. Consequently, the DDE interface has been removed from MPValve 5.0.

MPValve 5.0 still provides a command line interface that has been enhanced and provides full sequencing and valve control. If you have been using the DDE interface in previous versions of MPValve, you will need to convert to the command-line interface. See “[Command-Line Control](#)” on page 18 for more information about the command-line interface.

If you used the command line interface to automate previous versions of MPValve, you will need to update the commands that are used to make them compatible with the new command line interface. See “[Command-Line Control](#)” on page 18 for more information on the command line interface.

Agilent Data System Macros

The macros provided with earlier versions of MPValve that integrate the Agilent Technologies GC/LC ChemStation, MSD ChemStation, and MassHunter GC/MS Acquisition with MPValve have been rewritten. See “[Agilent GC and LC ChemStation Software](#)” on page 23 and “[Agilent MassHunter GC/MS and MSD ChemStation Software](#)” on page 25 for details.

Note that the macro file has been renamed from “mpvalve.mac” to “mpvalve5.mac”. The macro commands contained within the macro files are named the same. This allows you to simply load “mpvalve5.mac” instead of “mpvalve.mac” when you switch from MPValve 3.0/4.0 to MPValve 5.0.

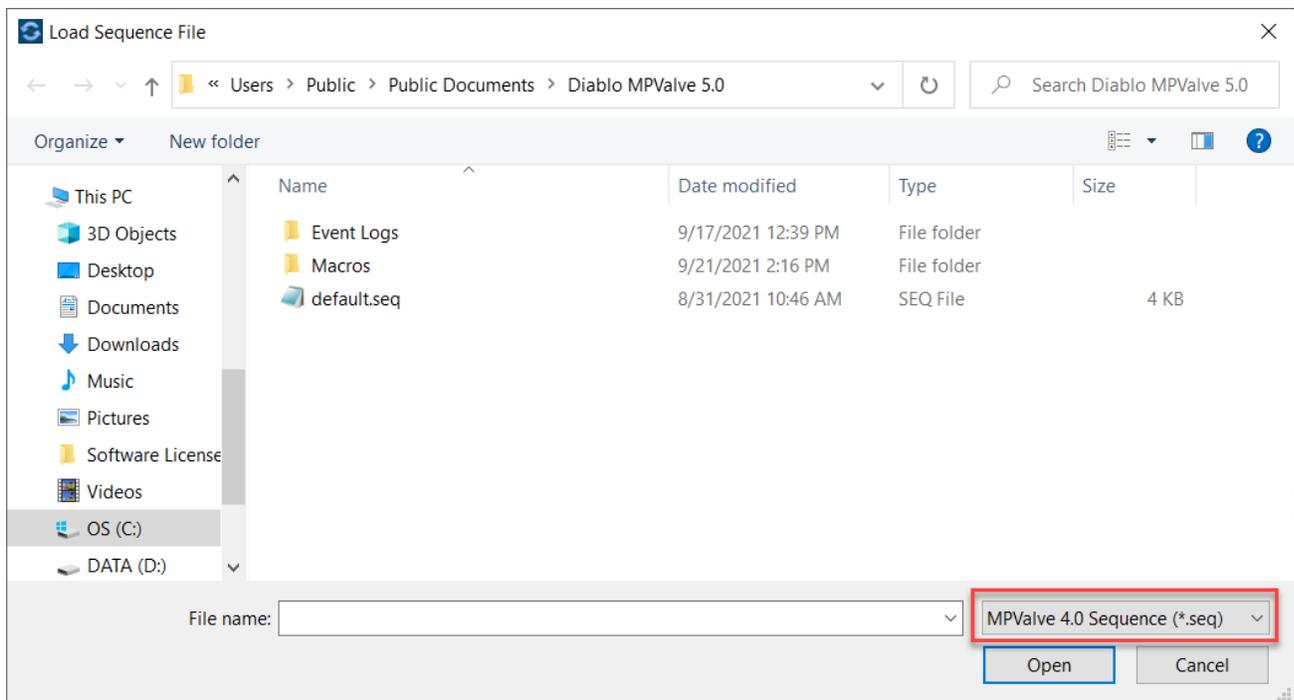
Important: However, if you are using customized versions of these macros, they will likely need to be updated to make them compatible with the new MPValve 5.0 command line interface.

Sequencing

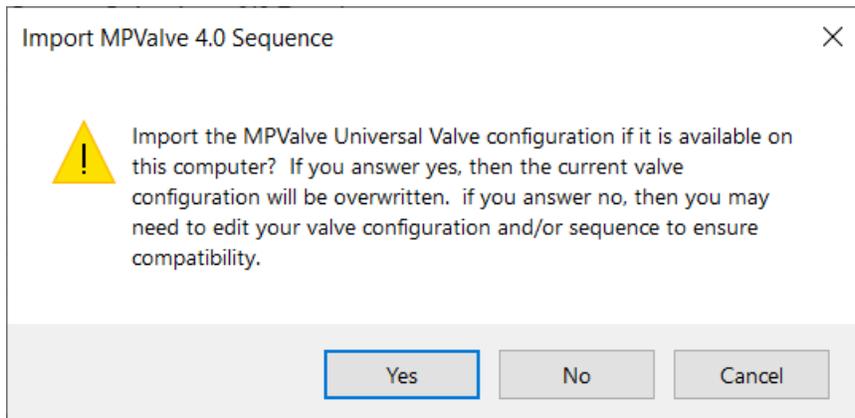
MPValve 5.0 has changed and enhanced sequencing when compared to MPValve 3.0 and 4.0 (Universal). While you can import existing MPValve 3.0 and 4.0 sequences into MPValve 5.0, in most cases we recommend creating new sequences to take advantage of the new sequencing capabilities.

Importing MPValve 3.0 and 4.0 Sequences

To import a MPValve 3.0 or 4.0 sequence into MPValve 5.0, click the “Load” button on the Sequence Tab. Select the “MPValve 4.0 Sequence (*.seq)” option in the file filter list box:



You will be prompted whether you want to import the MPValve 3.0/4.0 (Universal) valve configuration if it is available. If you click, “Yes”, then the current valve configuration will be overwritten. If you click, “No”, then you may need to edit the valve configuration and sequence to ensure they are compatible with each other.



Important: you should carefully review the imported sequence to make sure it accomplishes the desired valve actions.

End of Sequence Action

MPValve 3.0/4.0 had a single “End of Sequence” setting that defined whether the sequence would stop, repeat continuously, repeat for a specified number of cycles, or repeat for a specified run time. MPValve 5.0 has eliminated that setting, but added new “GotoStep”, “GotoStepCycle”, and “GotoStepRunTime” sequence steps that can be placed at the end of the sequence to provide the same functionality. However, these steps can also be placed anywhere within the sequence to provide increased flexibility.

When you import a sequence the appropriate “GotoStep” will be placed at the end of the sequence based on the End of Sequence setting in the MPValve 3.0/4.0 sequence.

Pre-Sequence and Post-Sequence Steps

MPValve no longer has specific Pre-Run and Post-Run steps.

When you import a MPValve 3.0/4.0 sequence, any Pre-Run steps will be placed in order as “GotoPosition” and “HoldPosition” steps at the beginning of the sequence. An additional “HoldPosition” step with a hold time of 0 will be placed between the last Pre-Run step and the first Sequence Step. The sequence will hold indefinitely at this point until you click the “Advance” button to continue the sequence, providing similar functionality to MPValve 3.0/4.0.

Any Post-Run steps will be placed in order as “GotoPostion” and “HoldPosition” steps after the End of Sequence “GotoStep”.

Event Log

The MPValve Event Log window is where system events, errors, and system messages are displayed. The event log is saved in a SQLite database and is automatically loaded when the software is started. Events will remain in the log until the log is cleared.

Valves Sequence Event Log		
Today	All Events: 2309	Errors: 231 Warnings: 146
Event ID	Description	Event
2276	Sequence File Loaded: C:\Users\Public\Documents\Diablo MPValve 5.0\default.sequence	System Me
2277	Trial License Active, 14 days remaining.	System Wa
2278	Valve #1: Offline	Valve Statu
2279	Valve #1: Connected	Valve Statu
2280	Valve 1 [Valve 1] is at Position 1 [Port 1]	Valve Switc
2281	Valve 1 [Valve 1] is at Position 2 [Port 2]	Valve Switc
2282	Valve 1 [Valve 1] is at Position 3 [Port 3]	Valve Switc
2283	Valve 1 [Valve 1] is at Position 2 [Port 2]	Valve Switc
2284	Valve 1 [Valve 1] is at Position 1 [Port 1]	Valve Switc
2285	Sequence Started	Sequence S
2286	Valve 1 [Valve 1] is at Position 3 [Port 3]	Valve Switc
2287	Valve 1 [Valve 1] is at Position 1 [Port 1]	Valve Switc
2288	Sequence Complete	Sequence S

MPValve Event Log

Filter Events

You can filter the events that are displayed in the event log using the filter list box in the toolbar.

Filter	Description
Today	Display only events that were added to the log on the current day.
All Events	Display all events currently in the event log. Note that if a large number of events are present in the log, there may delay in updating event log table.
Warnings	Display only events with “Warning” status.
Errors	Display only events with “Error” status.

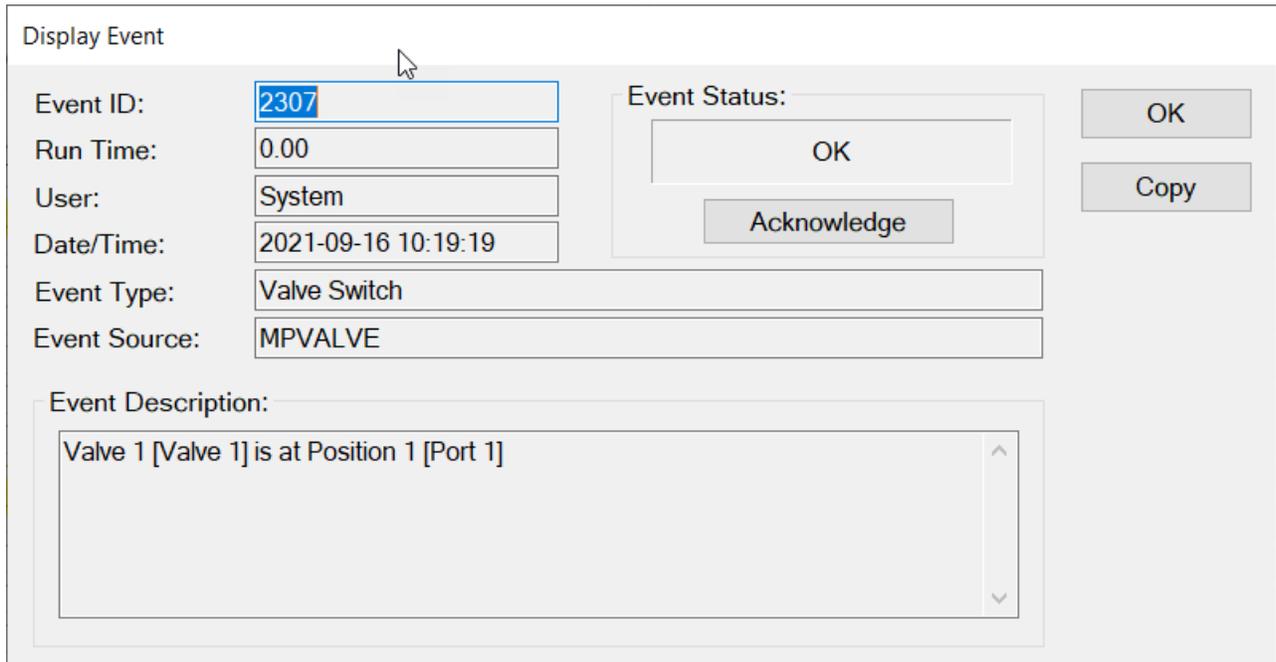
Acknowledge Errors and Warnings

When an error or warning event is received by the event log, that line in the event table will be highlighted with either a red background (error) or yellow background (warning). In addition, the current number of errors and warnings are displayed in the event log toolbar. To acknowledge an individual error or warning, double click the entry in the event table, and an event summary window will be displayed. If the event is an active error or warning, then the "Acknowledge" button is enabled.

All errors or warnings in the event table can be acknowledged by pressing either the "Acknowledge all errors" or "Acknowledge all warnings" toolbar buttons.

Display Event

If you double click on an event in the Event Table, the "Display Event" window will be displayed:



The screenshot shows a window titled "Display Event". On the left, there are several input fields: "Event ID:" with the value "2307", "Run Time:" with "0.00", "User:" with "System", "Date/Time:" with "2021-09-16 10:19:19", "Event Type:" with "Valve Switch", and "Event Source:" with "MPVALVE". Below these is a text area for "Event Description:" containing the text "Valve 1 [Valve 1] is at Position 1 [Port 1]". On the right side, there is an "Event Status:" label above a box containing "OK". Below that is an "Acknowledge" button. To the far right are two buttons: "OK" and "Copy".

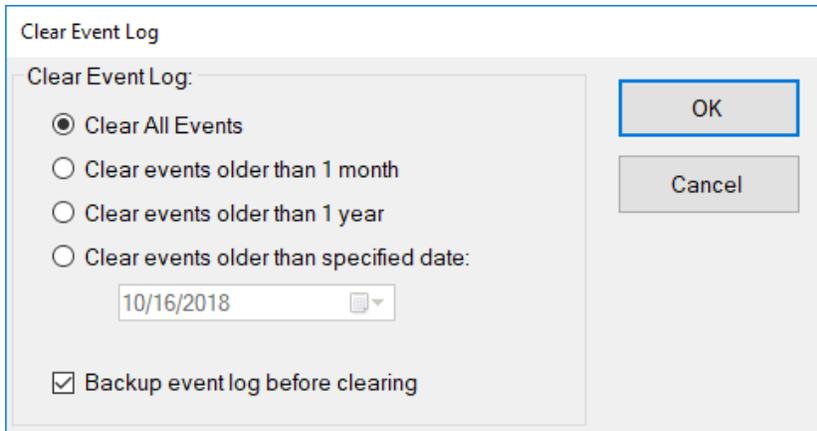
MPValve Display Event Window

If the event is an error or warning, the "Acknowledge" button can be pressed. This will cause the Event Status to change from "Warning" or "Error" to "Ack", and the Warning or Error count on the main Event Log window will be decremented by 1.

Pressing the "Copy" button will cause the current event detail to be copied to the Windows Clipboard.

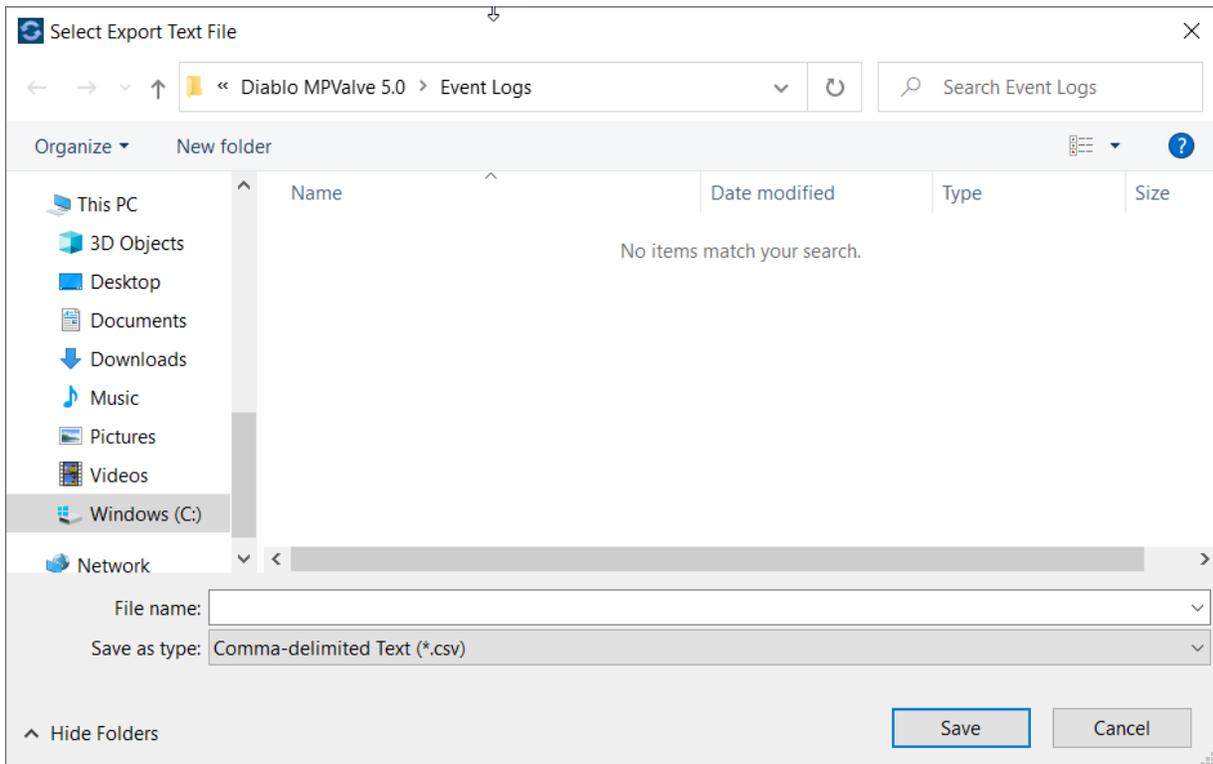
Clear Event Log

The event log can be cleared by clicking the "Clear Events" button on the Event Log toolbar. You have the option to clear all events, clear events older than one month, clear events older than one year, or clear events older than a specified date. You can also backup the event log database before clearing events.



Export Log Entries

You can export entries from the event log to a comma-delimited (CSV) text file by selecting the desired entries and the right-clicking the event log and selecting, “Export Selected Events” from the pop-up menu. You will be prompted for a file name:



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