Diablo MPValve Universal

Diablo MPValve Universal Software
Reference Manual

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Contents

Introduction

What is MPValve Universal

The Diablo MPValve Universal software consists of two applications: MPValve Controller and MPValve Sequencer. Both applications are designed to interface with Valco (VICI) multi-position/selector valves or two-position/switching valves through either the micro-electric or universal actuator via RS-232 serial communications. The MPValve Controller application allows both interactive and automated control of valve position using command-line parameters, Dynamic Data Exchange (DDE) or ActiveX/COM programming. The MPValve Sequencer is a stand-alone valve sequencing application.

About Diablo Analytical, Inc.

The MPValve software was written by Diablo Analytical, Inc. Diablo Analytical is an analytical application development company located in Antioch, CA. We specialize in the development of custom analytical solutions for a broad range of industries.

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Getting Started

System Requirements

Computer

MPValve requires a computer running Windows 2000, XP, Windows 7-32, or 7-64. The computer must also have one free serial port for each valve to be controlled.

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 and EUT series "Universal" actuators using the RS-232 serial communication interface. Please contact VICI for information about their valves and actuators:

Valco Instruments Company, Inc. (VICI)

http://www.vici.com

Installing the Software

To install the software, simply run the installation program that was downloaded from our web site or provided on the installation CD-ROM. Follow the directions presented by this installation program. The installation program will install MPValve in evaluation mode on new systems, or will update registered systems to the latest version of MPValve.

Important Note: You must be logged in with Administrator rights in order to install the software.

Software License and Registration

This software is distributed as a fully functional 30-day evaluation application. The evaluation version has all of the features of the registered version, but you will be reminded that you are running the evaluation version with a "nag" screen each time you start the application. At the end of the 30-day evaluation period the application will no longer start unless you purchase a license or request an evaluation extension from Diablo Analytical. See the Software License guide for more information.

Technical Support

Technical support for MPValve is available directly through Diablo Analytical, Inc.

Phone

If you want to speak directly with technical support, call us at **(925) 755-1005**.

Fax

Fax a description of your problem or suggestion to us at **(925) 755-1007**.

Support Helpdesk

Use our web-based help desk to submit and track support requests: **http://www.diabloanalytical.com/support.htm**

Uninstalling the Program

From the Windows Control Panel, double-click the **Add/Remove Programs** Icon. Select the **Install/Uninstall** Tab and then select **Diablo MPValve Universal** in the list box. Press the **Add/Remove** button and follow the instructions to remove the application from your system.

Edit Valve Configuration

After starting either the MPValve Controller or Sequencer software for the first time, you will need to create a valve configuration. If no valve configuration exists, the valve configuration window will be displayed automatically. To edit an existing valve configuration, select the "**Valve Configuration...**" option of the "**Edit**" menu of either program.

Note: the MPValve Controller and Sequencer software share the valve configuration, so any changes you make to the configuration from one program will be used the next time you start the other program.
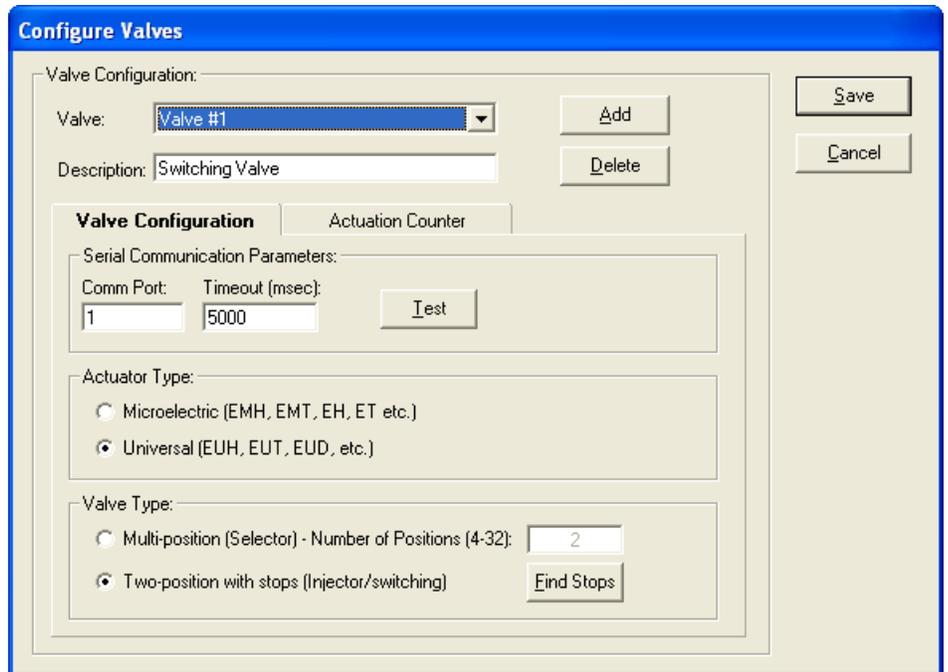
Valve Configuration

MPValve can control multiple valves/actuators on different serial ports. By default, MPValve is configured with a single valve. Pressing the "Add" button will add a new valve to the configuration. Each valve must be controlled through it's own serial 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.

Valve Listbox

MPValve can be configured to communicate with multiple valves, each connected on a separate serial port through an actuator. This list box allows each valve to be selected for configuration.

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.

Add Button

By default, MPValve is configured to control one valve connected on a single serial port. However, MPValve can control multiple valves connected on multiple serial ports. This button allows additional valves to be added to the configuration.

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

Delete Button

Pressing this button will delete the currently selected valve from the configuration. MPValve will not allow *all* valves to be deleted from the configuration.

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

COMM Port

Selects the serial communication port to which the VICI actuator is connected.

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 2000 msec, unless there is a specific problem with your system.

Test Button

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

Actuator and Valve Type

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.

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 status bar of the MPValve Controller or Sequencer software when the number of actuations on a particular valve exceeds a warning level.

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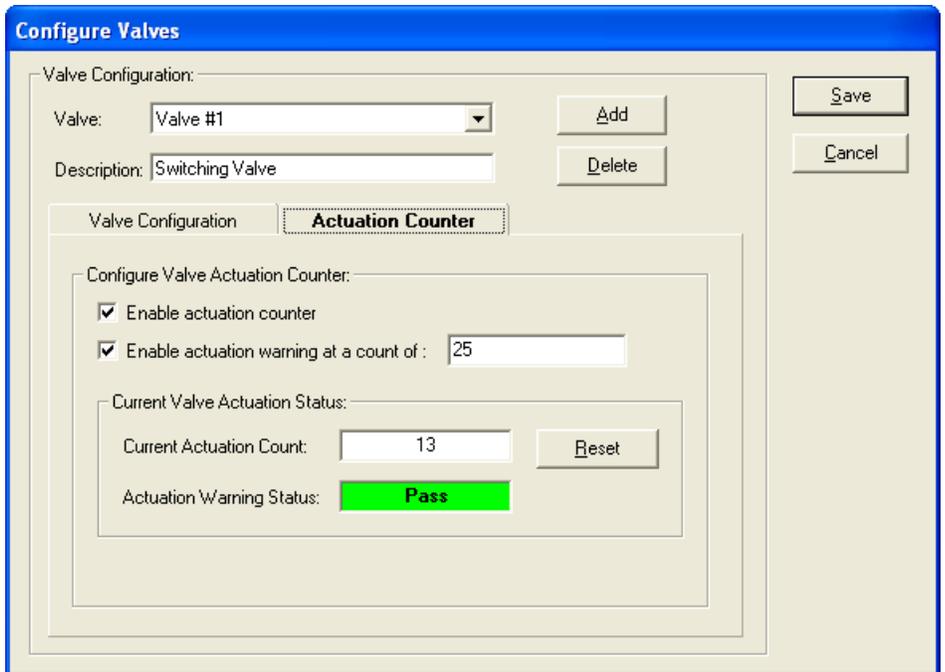
Configure Valve Actuation Counter

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 valveto a new value. You would typically reset the actuation count to 0 after replacing the valve rotor or installing a new valve.
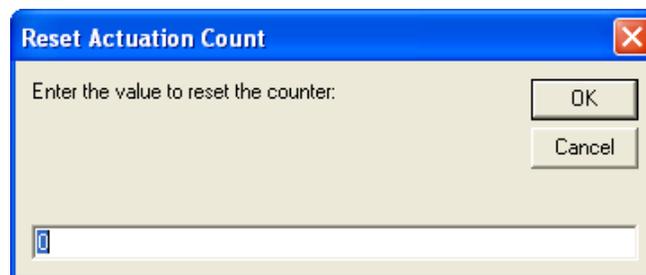
MPValve Controller

Introduction

The MPValve Controller software allows both interactive and automated control of VICI multi-position/selector and two-position/switching valves using command-line parameters, Dynamic Data Exchange (DDE) or ActiveX/COM programming. It is designed to provide a means to control a VICI valve from a third-party sequencer or data system like the Agilent Technologies GC or MSD ChemStation software.

See "MPValve Controller Command Line Options" on page 21 and "MPValve Controller Dynamic Data Exchange" on page 23 in the Appendix for information about how to use the MPValve Controller with other software applications. For more detailed questions about interfacing with the MPValve software, please contact Diablo Analytical.

Main Screen

The main screen of MPValve is shown below. The main screen is used to configure MPValve, and to control the valve interactively.
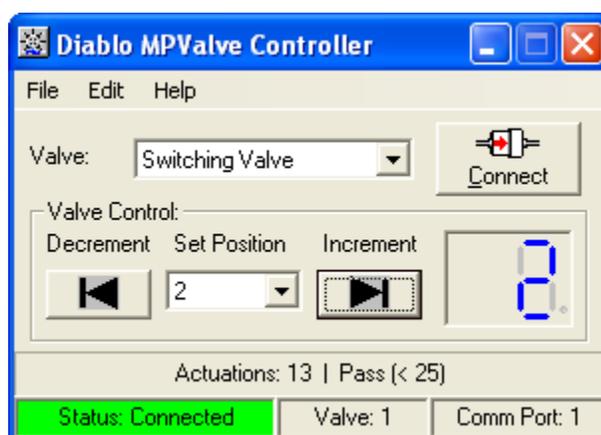
Valve Listbox

If MPValve is configured to control multiple valves on different serial ports, this list box can used to switch the display between each of the valves.

Connect

In order for MPValve to control a valve, it must first initialize RS-232 serial communication with the actuator. MPValve will attempt to connect automatically with the actuator when it is first started. However, if MPValve has not been configured to communicate with an actuator, or if the actuator is not powered, an error message will be displayed in the status panel. If this happens, you will have to connect manually to the actuator after fixing the problem. This can be accomplished by pressing the "Connect" button in the main MPValve window.
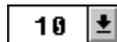
Decrement Valve Position

For multi-position/selector valves, pressing this button causes the valve position to be decremented by 1. Decrementing from position 1 causes the valve to go to the last valve position (e.g. position 16 in a 16-position valve).

For two-position, switching valves, pressing this button causes the valve to switch to position 1 (A).

Goto Specific Valve Position

The valve can be changed to a specific position by using the list box located between the increment and decrement buttons on the main MPValve window. The valve will automatically select the direction (CW or CCW) that is the shortest path to reach the desired position.

Increment Valve Position

For multi-position/selector valves, pressing this button causes the valve position to be incremented by 1. Incrementing from the last valve position (e.g. position 16 in a 16-position valve) causes the valve to go to position 1.

For two-position/switching valves, pressing this button causes the valve to switch to position 2 (B).

Status Bar

The current status of the valve actuator is displayed in this panel. If MPValve is connected to the actuator, then the message "Status: Connected" should be displayed with a green background. If an error occurs, an error message will be displayed with a red background. If the cursor is positioned over the status panel, a "tool tip" will be displayed that may contain additional status information.

If you have enabled the valve actuation counter, an additional status bar will be displayed with the current number of actuations and warning limit/status if you have enabled that option.

Main Menu Options

File

Exit

Exit and terminate MPValve.

Edit

Valve Configuration...

Opens the MPValve valve configuration window.

Help

Contents...

Displays the MPValve Help file contents page.

View Release Notes...

Displays the release notes for the current version of the software. The release notes may contain important information about new features not present in the reference manual or help file.

License…

Displays the MPValve License and Registration dialog box.

About...

Displays the MPValve "About" box. The current program version, license status, and other information are displayed.
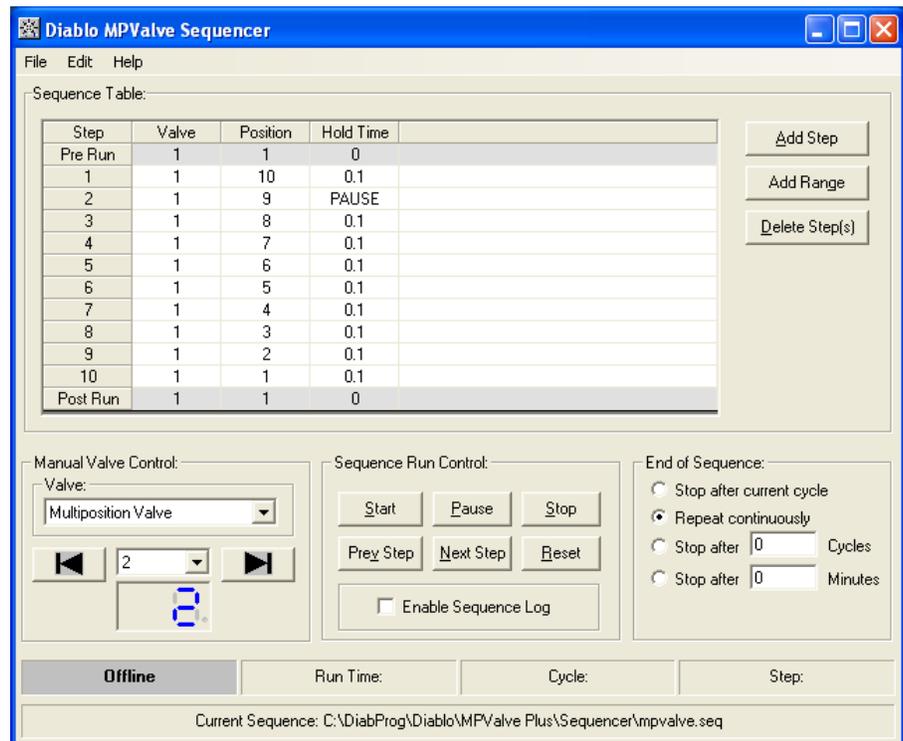
MPValve Sequencer

Introduction

MPValve Sequencer is a stand-alone valve sequencing application designed to be used with both multi-position (selector) and two-position (switching) VICI valves.

Main Screen

MPValve Sequencer is edited and operated through the screen shown below:

MPValve Sequencer Edit and Control Screen

Sequence Table

The sequence table contains a list of all the steps that will be executed sequentially when the sequence is run. Each step is composed of the valve and valve position that will be switched at the start of the step, as well as the length of time the sequencer will hold before proceeding to the next step in the sequence.

Manual Valve Control

The Manual Valve Control panel allows you to change the valve position manually and also view the current position of the selected valve. See the description of the valve controls on the MPValve Controller "Main Screen" on page 8 for more information.

End Of Sequence

These settings define how the sequencer will respond after executing the last line in the sequence – stop, repeat continuously, or repeat for some number of sequence cycles or minutes.

Sequence Run Control

These buttons control execution of the sequence.

Sequence Information Panels

Status information about the current sequence is displayed in these panels.

Main Menu Options

File

New

Clear the current sequence table and sequence file name in preparation for creating a new sequence.

Open Sequence…

Displays a dialog box that allows you to select an existing sequence file to be opened. MPValve Sequence files have a file extension of ".SEQ".

Save Sequence

Saves the current sequence to the current sequence file.

Save Sequence As…

Displays a dialog box that allows you to select a directory and file name to which the current sequence will be saved. MPValve Sequence files have a file extension of ".SEQ".

Exit

Exit and terminate the MPValve Sequencer. You will need to stop the sequence if it is running before you can exit the application.

Edit

Valve Configuration...

Opens the MPValve configuration window.

Help

Contents...

Displays the MPValve Help file contents page.

View Release Notes...

Displays the release notes for the current version of the software. The release notes may contain important information about new features not present in the reference manual or help file.
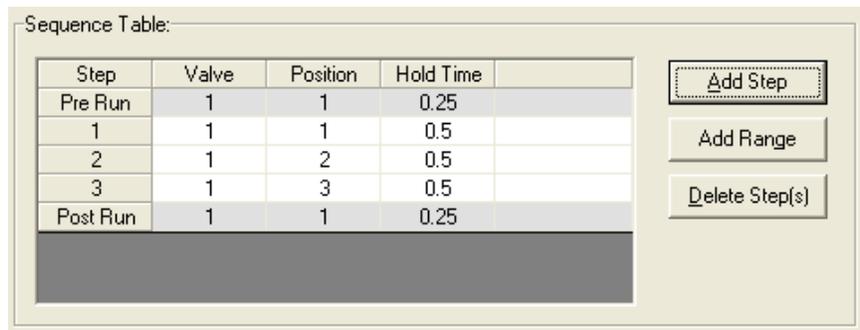
License…

Displays the MPValve License and Registration dialog box.

About...

Displays the MPValve "About" box. The current program version, license status, and other information are displayed.

Creating and Editing a Sequence

A sequence is created by adding steps (lines) to the sequence table. Single steps can be added using the "Add Step" button, while a range of steps can be added using the "Add Range" button.

Sequence Table:

| Step	Valve	Position	Hold Time		
Pre Run	1	1	0.25		Add Step
1	1	1	0.5		Add Range
2	1	2	0.5		
3	1	3	0.5		Delete Step(s)
Post Run	1	1	0.25		

Add a Step to a Sequence

To add a single step to the sequence press the "Add Step" button. A new sequence step will be appended to the table, and the "Edit Sequence Step" dialog box will be displayed.

Add a Range of Steps to a Sequence

The "Add Range" button can be used to append multiple steps to the sequence table.
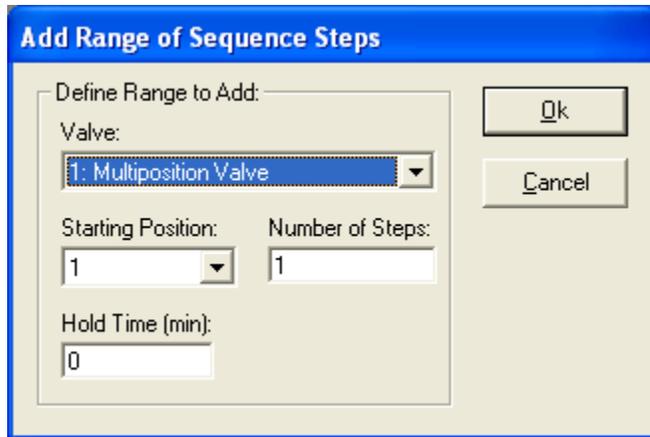
Add Range of Sequence Steps Dialog Box

Valve:

Select the valve that will used for the range of sequence steps.

Starting Position:

Select the first valve position you want to add to the sequence table.

Number of Steps:

Enter the number of steps that should be added to the sequence table. A positive number will result in the valve position being incremented in each step. A negative number will result in the valve position being decremented in each step. The valve position will "wrap" if the starting position and number of steps exceed the maximum number of positions available on the valve.

Hold Time:

Enter the hold time to enter for each step in the range.
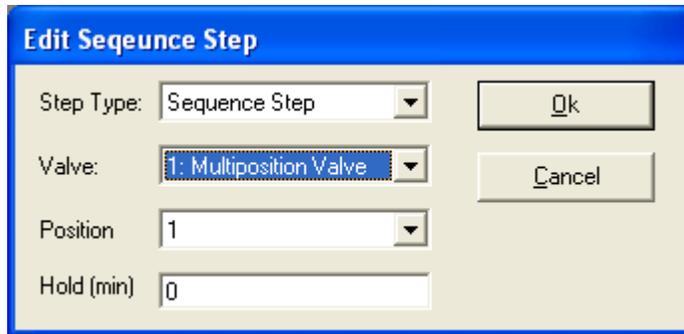
Ok:

Press the OK button to append the specified range of steps to the current sequence table.

Cancel:

Press the cancel button to exit with adding any new steps to the sequence table.

Edit a Sequence Step

Individual sequence steps can be edited by double-clicking the appropriate line in the sequence table. The "Edit Sequence Step" dialog box is then displayed.

Edit Sequence Step Dialog Box

Step Type

Pre Run: Pre Run steps are executed before the sequence reaches Ready status, and are not part of the normal sequence cycle.

Sequence Step: These are the steps that are executed while the sequence is running. They are executed in the order that is displayed in the sequence table.

Post Run: Post Run steps are executed after a run has been stopped and are not part of the normal sequence cycle.

Valve

The valve that will be controlled during the sequence step.

Position

The position to which the valve will be switched at the start of the sequence step.

Hold Time

The length of time, in minutes, that the sequence will wait before proceeding to the next step in the sequence. Entering a negative hold time will cause the sequence to pause at that step.

Delete Step(s)

Pressing the "Delete Steps" button will cause all steps that are currently selected in the sequence table to be deleted.

End of Sequence Action

These settings determine what happens after executing the last line in the sequence table.

Stop After Current Cycle

The sequence will stop and execute any post-run steps after executing the last line in the sequence table.

Repeat Continuously

The sequence will repeat continuously until stopped by the user.

Stop After "N" Cycles

The sequence will stop and execute any post-run steps after repeating the sequence the specified number of cycles.

Stop After "N" Minutes

The sequence will stop immediately and execute any post-run steps after running for the specified number of minutes.

Running a Sequence

Sequence Run Control

Start

Starts the current sequence run. If the sequence status is "Offline", "Online", "Finished", or "Error", then the sequence will first be reset, all pre-run steps will be executed, and the run will automatically start. If the sequence status is "Ready", then the run will simply start.

Pause

Pauses the sequence at the current step and hold time. To resume a paused sequence, press the "Pause" button again. The Status Panel will display the Paused status, and the Message Panel will display when the sequence was paused.

Important Note: The run timer continues while the sequence is paused. If you have specified "Repeat for 'N' Minutes" as the End of Sequence action, then the run will still end at the designated run time even though the sequence is paused.

Stop

Stops the current run immediately and executes any post-run sequence steps.

Prev Step

Moves the sequence immediately to the previous step in the sequence table.

Next Step

Moves the sequence immediately to the next step in the sequence table.

Reset

Immediately resets the sequence as follows:

1. Disconnects from all valve controllers
2. Re-connects and brings all valve controllers back online
3. Executes any pre-run steps
4. Holds at "Ready" status

Sequence Log

The sequence log contains the date+time of the sequence start/stop, and the date+time, valve, and port of each valve switch. The log is saved in the MPValve installation directory and is named based on the date+time that the sequence is started: 'sequence-yyyymmdd-hhmmss.log".

To enable/disable logging, simply check/uncheck the "Enable Sequence Log" box in the sequence run control section of MPValve Sequencer.

Sequence Table

The step that is currently executing during a run is displayed with a blue background in the sequence table. In addition, the corresponding hold-time cell displays a progress bar that indicates the elapsed hold time.

Step	Valve	Position	Hold Time
Pre Run	1	1	0.25
1	1	1	0.5
2	1	2	0.5
3	1	3	0.5
Post Run	1	1	0.25

Sequence Information Panels

The sequence information panels located at the bottom of the main screen provide real-time information about the current sequence.

Running	Run Time: 1.03	Cycle: 1	Step: 3
Sequence started: 2/20/2009 4:52:39 PM			

MPValve Sequence Information Panels

Sequence Status Panel

The top left panel is the sequence status panel, which uses the keywords and colors described in the following table to communicate the status of the current sequence:

Status	Color	Description
Offline	Gray	The MPValve Sequencer application has been started, but communication has not yet been established with the valve controller(s).
Online	Black	Communication has been established successfully with the valve controller(s).
Pre Run	Yellow	The Sequencer is executing any pre-run sequence steps.
Ready	Green	All pre-run sequence steps have been executed, and the Sequencer is waiting for the run to be started.
Running	Blue	The sequence is running.
Paused	White	The sequence has been paused.
Post Run	Yellow	The sequence has been stopped, and the Sequencer is executing any post-run steps.
Finished	Black	All post-run steps have been executed, and the run is finished.
Error	Red	An error has occurred. Check the message panel for details.

Run Time Panel

The Run Time panel displays the elapsed time in minutes since the run was started. The run-timer is not active during any pre-run or post-run steps.

Sequence Cycle Panel

The value displayed in the Cycle Panel indicates how many times the sequence has been repeated.

Sequence Step Panel

The sequence step that is currently executing is displayed in this panel.

Status Message Panel

System status and error messages are displayed in this panel.

Appendix

MPValve Controller Command Line Options

MPValve Controller can be automated through the use of command line parameters. If one of the following parameters is specified on the command line when MPValve is started, MPValve will perform the specified action and then close immediately if the action was successful. If MPValve was not able to complete the action successfully, it will display an error dialog box and remain open so that the user can troubleshoot the problem.

Command Line Parameters

The following command line parameters can be specified when starting the MPValve Controller software.

VALVE=

This optional parameter can be included on the command line along with one of the following control commands to select the valve that will receive the command. By default the command-line parameters operate on the valve 1.

SETPOS=

The SETPOS parameter instructs MPValve to switch immediately to the specified position.

GOTO=

This command-line parameter performs the same function as the SETPOS parameter described above.

INCREMENT

For multi-position/selector valves, the increment parameter instructs MPValve to increment the valve position by 1. Incrementing from the last valve position (e.g. position 16 in a 16-position valve) causes the valve to go to position 1.

For two-position/switching valves, the increment parameter switches the valve to position 2/B

DECREMENT

For multi-position/selector valves, the decrement parameter instructs MPValve to decrement the valve position by 1. Decrementing from position 1 causes the valve to go to the last valve position (e.g. position 16 in a 16-position valve).

For two-position/switching valves, the increment parameter switches the valve to position 1/A

EXAMPLE

The following example command line will cause valve 1 to switch to position 2:

```
"c:\program files\diablo mpvalve
3.0\mpvalvecontroller.exe valve=1 setpos=2"
```

Simple Sequence Command

The "Simple Sequence" command allows you to send a set of valve positions and hold times to the controller software to execute as a sequence.

Command: SEQUENCE= {Sequence Parameters}

The Sequence Parameters are a comma delimited string of valve positions and hold times that will be run in order from left to right. The format of the sequence string is:

HX.Y, P[V:]N, ... where

H=Hold for X.Y minutes

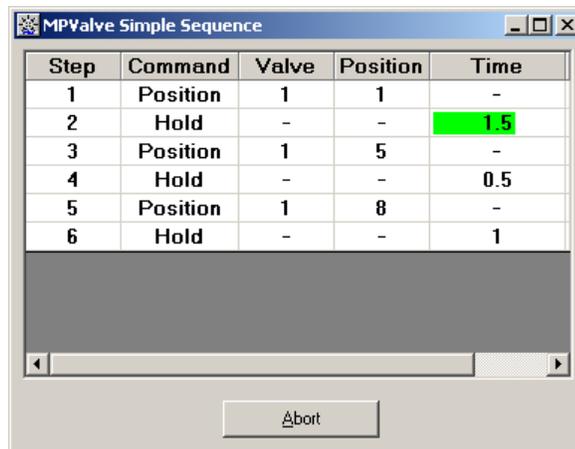P=Goto valve V, position N, V is optional, if omitted valve 1 is assumed

Example Syntax:

```
"c:\program files\diablo mpvalve
3.0\mpvalvecontroller.exe SEQUENCE=P1, H1.0, P2, H1.5"
```

(Goto Valve 1, Position 1, Hold for 1.0 minutes, goto Valve 1, Position 2, Hold for 1.5 minutes)

Simple Sequence Table:

When a simple sequence is running, the following dialog box will be displayed on the screen. Press the "Abort" button to stop any sequence that is running.

Step	Command	Valve	Position	Time
1	Position	1	1	–
2	Hold	–	–	1.5
3	Position	1	5	–
4	Hold	–	–	0.5
5	Position	1	8	–
6	Hold	–	–	1

MPValve Controller Dynamic Data Exchange

In addition to the command-line interface described above, MPValve Controller also allows valve control from a Client application via Dynamic Data Exchange (DDE). A thorough description of Dynamic Data Exchange is beyond the scope of this document. However, the application, topic, and item names supported by MPValve are documented below along with programming examples for Visual Basic and Agilent Technologies ChemStation Macro Languages. Other DDE implementations should use syntax similar to these examples.

Dynamic Data Exchange Commands

The following commands and syntax can be used to program MPValve Controller using dynamic data exchange (DDE).

Open DDE Conversation

Application: *MPValveController*

Topic: *Control*

Example Syntax for Visual Basic (VB) and Agilent ChemStation Macro Language (CS)

VB:

Text1.LinkTopic = "MPValveController|Control"
Text1.LinkMode=2

CS:

gnID = DDEInitiate("MPValveController","Control")

Set Valve Number and Valve Position for GOTO/SETPOS

Item: ValveNumber

Item: ValvePosition

Example Syntax for Visual Basic (VB) and Agilent ChemStation Macro Language (CS)

VB:

Text1.LinkItem = "ValveNumber"
Text1.Text= "1"
Text1.LinkPoke

Text1.LinkItem = "ValvePosition"
Text1.Text = "5"
Text1.LinkPoke

CS:

DDEPoke gnID, "ValveNumber", "1"
DDEPoke gnID, "ValvePosition", "5"

Send GOTO/SETPOS Command

Command: GOTO, SETPOS

Example Syntax for Visual Basic (VB) and Agilent ChemStation Macro Language (CS)

VB:

Text1.LinkExecute "GOTO"

CS:

DDEExecute gnID, "GOTO"

Send INCREMENT/DECREMENT Command

Command: INCREMENT

Command: DECREMENT

Example Syntax for Visual Basic (VB) and Agilent ChemStation Macro Language (CS)

VB:

Text1.LinkExecute "INCREMENT"
Text1.LinkExecute "DECREMENT"

CS:

DDEExecute gnID, "INCREMENT"
DDEExecute gnID, "DECREMENT"

Simple Sequence Command

The "Simple Sequence" command allows you to send a set of valve positions and hold times to the controller software to execute as a sequence.

Command: SEQWAIT {Sequence Parameters}

Command: SEQNOWAIT {Sequence Parameters}

The SEQWAIT command will not return control until the sequence has completed. The SEQNOWAIT command will return control immediately and the valve sequence will run asynchronously.

The Sequence Parameters are a comma delimited string of valve positions and hold times that will be run in order from left to right. The format of the sequence string is:

HX.Y, P[V:]N, ... where

H=Hold for X.Y minutes

P=Goto valve V, position N, V is optional, if omitted valve 1 is assumed

Example Syntax for Visual Basic (VB) and Agilent ChemStation Macro Language (CS)

VB:

Text1.LinkExecute "SEQNOWAIT P1:2, H1.5, P1:3, H0.25"

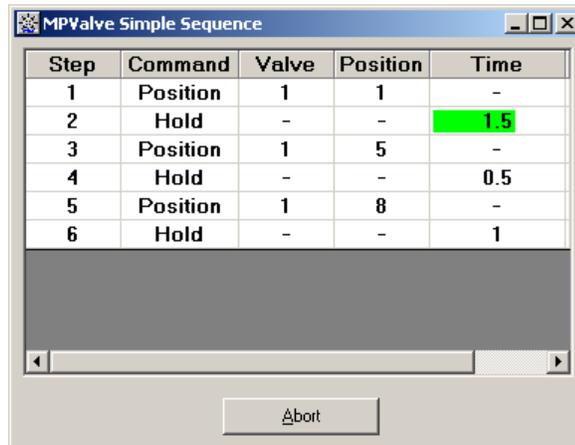(Goto Valve 1, Position 2, Hold for 1.5 minutes, Goto Valve 1, Position 3, Hold for 0.25 min)

CS:

DDEExecute gnID, "SEQWAIT P1, H1.0, P2, H2.0

(Goto Valve 1, Position 1, Hold for 1.0 minutes, Goto Valve 1, Position 2, Hold for 2.0 min)

Simple Sequence Table:

When a simple sequence is running, the following dialog box will be displayed on the screen. Press the "Abort" button to stop any sequence that is running.

Step	Command	Valve	Position	Time
1	Position	1	1	-
2	Hold	-	-	1.5
3	Position	1	5	-
4	Hold	-	-	0.5
5	Position	1	8	-
6	Hold	-	-	1

Abort

Demonstration Code

The "Demo Code" subdirectory of the main MPValve installation directory contains examples of macros that add MPValve control to specific data systems. At this time, demonstration macros have been written for the following data systems:

- The Agilent Technologies GC and LC ChemStation
- The Agilent Technologies MSD ChemStation

IMPORTANT: The demonstration code included with MPValve is distributed "As Is" with no guarantee of performance or additional support from Diablo Analytical, Inc. These macros are intended for experienced users as a starting point for writing their own control macros. Brief instructions on the installation and use of each macro are provided in the "README.TXT" file located in the same directory as the macro file.

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