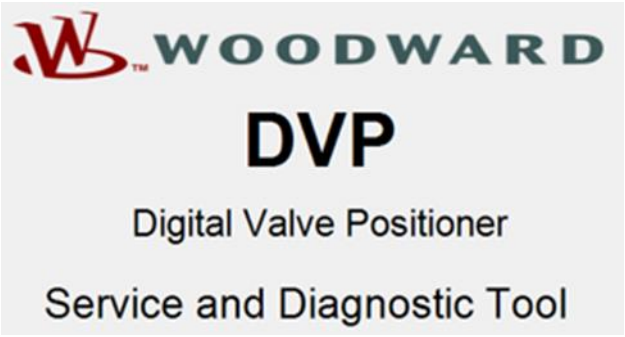
Released

Product Manual 26912
(Revision G, 10/2024)
Original Instructions



Digital Valve Positioner (DVP)
Service Tool Manual

Installation and Operation Manual

General Precautions

Read this entire manual and all other publications pertaining to the work to be performed before installing, operating, or servicing this equipment.

Practice all plant and safety instructions and precautions.

Failure to follow instructions can cause personal injury and/or property damage.

Revisions

This publication may have been revised or updated since this copy was produced. The latest version of most publications is available on the Woodward website.

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If your publication is not there, please contact your customer service representative to get the latest copy.

Proper Use

Any unauthorized modifications to or use of this equipment outside its specified mechanical, electrical, or other operating limits may cause personal injury and/or property damage, including damage to the equipment. Any such unauthorized modifications: (i) constitute "misuse" and/or "negligence" within the meaning of the product warranty thereby excluding warranty coverage for any resulting damage, and (ii) invalidate product certifications or listings.

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If the cover of this publication states "Translation of the Original Instructions" please note:

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Always compare with the original for technical specifications and for proper and safe installation and operation procedures.

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Revisions— A bold, black line alongside the text identifies changes in this publication since the last revision.

Manual 26912

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Important Definitions

This is the safety alert symbol used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

- **DANGER** - Indicates a hazardous situation, which if not avoided, will result in death or serious injury.
- **WARNING** - Indicates a hazardous situation, which if not avoided, could result in death or serious injury.
- **CAUTION** - Indicates a hazardous situation, which if not avoided, could result in minor or moderate injury.
- **NOTICE** - Indicates a hazard that could result in property damage only (including damage to the control).
- **IMPORTANT** - Designates an operating tip or maintenance suggestion.

⚠WARNING

Overspeed / Overtemperature / Overpressure

The engine, turbine, or other type of prime mover should be equipped with an overspeed shutdown device to protect against runaway or damage to the prime mover with possible personal injury, loss of life, or property damage.

The overspeed shutdown device must be totally independent of the prime mover control system. An overtemperature or overpressure shutdown device may also be needed for safety, as appropriate.

⚠WARNING

Personal Protective Equipment

The products described in this publication may present risks that could lead to personal injury, loss of life, or property damage. Always wear the appropriate personal protective equipment (PPE) for the job at hand. Equipment that should be considered includes but is not limited to:

- **Eye Protection**
- **Hearing Protection**
- **Hard Hat**
- **Gloves**
- **Safety Boots**
- **Respirator**

Always read the proper Material Safety Data Sheet (MSDS) for any working fluid(s) and comply with recommended safety equipment.

⚠WARNING

Start-up

Be prepared to make an emergency shutdown when starting the engine, turbine, or other type of prime mover, to protect against runaway or overspeed with possible personal injury, loss of life, or property damage.

Electrostatic Discharge Awareness

NOTICE

Electrostatic Precautions

Electronic controls contain static-sensitive parts. Observe the following precautions to prevent damage to these parts:

- **Discharge body static before handling the control (with power to the control turned off, contact a grounded surface and maintain contact while handling the control).**
- **Avoid all plastic, vinyl, and Styrofoam (except antistatic versions) around printed circuit boards.**
- **Do not touch the components or conductors on a printed circuit board with your hands or with conductive devices.**

To prevent damage to electronic components caused by improper handling, read and observe the precautions in Woodward manual *82715*, *Guide for Handling and Protection of Electronic Controls, Printed Circuit Boards, and Modules*.

Follow these precautions when working with or near the control.

1. Avoid the build-up of static electricity on your body by not wearing clothing made of synthetic materials. Wear cotton or cotton-blend materials as much as possible because these do not store static electric charges as much as synthetics.
2. Do not remove the printed circuit board (PCB) from the control cabinet unless absolutely necessary. If you must remove the PCB from the control cabinet, follow these precautions:
   - Do not touch any part of the PCB except the edges.
   - Do not touch the electrical conductors, the connectors, or the components with conductive devices or with your hands.
   - When replacing a PCB, keep the new PCB in the plastic antistatic protective bag it comes in until you are ready to install it. Immediately after removing the old PCB from the control cabinet, place it in the antistatic protective bag.

Regulatory Compliance

IMPORTANT

Regulatory Compliance and Declarations information are not contained in this manual and may be found in the product manuals. For DVP refer to manual B26329. For DVP5000, DVP10000, and DVP12000 refer to manual B26773. For DVP5000 or DVP10000 with Servo Interface Module refer to manual B35185.

Chapter 1. Introduction

This manual contains information relevant to the Service Tool as it pertains to the Digital Valve Positioner (DVP) and contains information for the entire product line of DVP models from earliest to the latest models. Not all information will apply to each DVP due to variations in hardware and software options. This manual is a complement to 26329 Digital Valve Positioner (DVP), 26773 High Output Digital Valve Positioner DVP5000/DVP10000/DVP12000 (HODVP), and 35185 High Output Digital Valve Positioner DVP5000/DVP10000 with Servo Interface Module (SIM). For additional DVP information, refer to the applicable DVP product manual.

This manual provides an initial setup guide, a description of features and functionality of the Service Tool, and configuration information which explain how to use the DVP Service Tool to configure and customize the DVP for use.

Woodward DVP Service Tool software allows end users to monitor the DVP condition, to reconfigure certain driver parameters and to troubleshoot the DVP operation.

1.1 What's New

An additional demand source was added, Servo Analog Input. This new mode is used in conjunction with an additional module in the DVP (servo interface module) which facilitates field upgrades from hydraulic actuators to electric actuators. It provides a proportional setpoint interface between a customer's closed loop, integrating servo output and the DVP controller. Use of this feature requires the appropriate DVP hardware, see product manual 35185 for servo interface module details.

⚠WARNING

An unsafe condition could occur with improper use of these software tools. Only qualified personnel should use these tools to modify or monitor the DVP functions.

Personal Injury

1.2 Requirements

1.2.1. System Requirements

The minimum system requirements for the DVP Service Tool software are:

- Service Tool 9927-2265 for DVP firmware 6.01 and newer
  - Microsoft Windows® 10, 8.1, 7, Vista (32- & 64-bit) or later
  - Microsoft .NET Framework 4.5.1
  - 1GHz or faster x86 or x64 processor
  - 1GB of RAM
- Service Tool 9927-1736 for DVP firmware version 5.03 and older
  - Microsoft Windows® XP, 2000, NT 4.0 Service Pack 6a
  - Microsoft .NET Framework ver. 2.0 (Can be downloaded from Woodward Software Web-Site)
  - 600 MHz Pentium® CPU
  - 96 MB of RAM
- Minimum 800 by 600 pixel screen with 256 colors
- Recommended screen resolution 1024 by 768 pixel or higher
- Serial Port or USB-to-RS232 adapter and driver
- Serial Extension Cable
- Woodward ToolKit Software

1.2.2. Cabling Requirements

Use a 9-pin **straight through** Serial Cable (not a null modem cable!). For newer PCs or laptops with USB ports, a USB-to-serial converter is required.

Refer to Chapter 3 of the DVP manual (26329 or 26773 or 35185) for more information on the RS-232 serial port.

1.2.3 USB to RS-232 Adapter

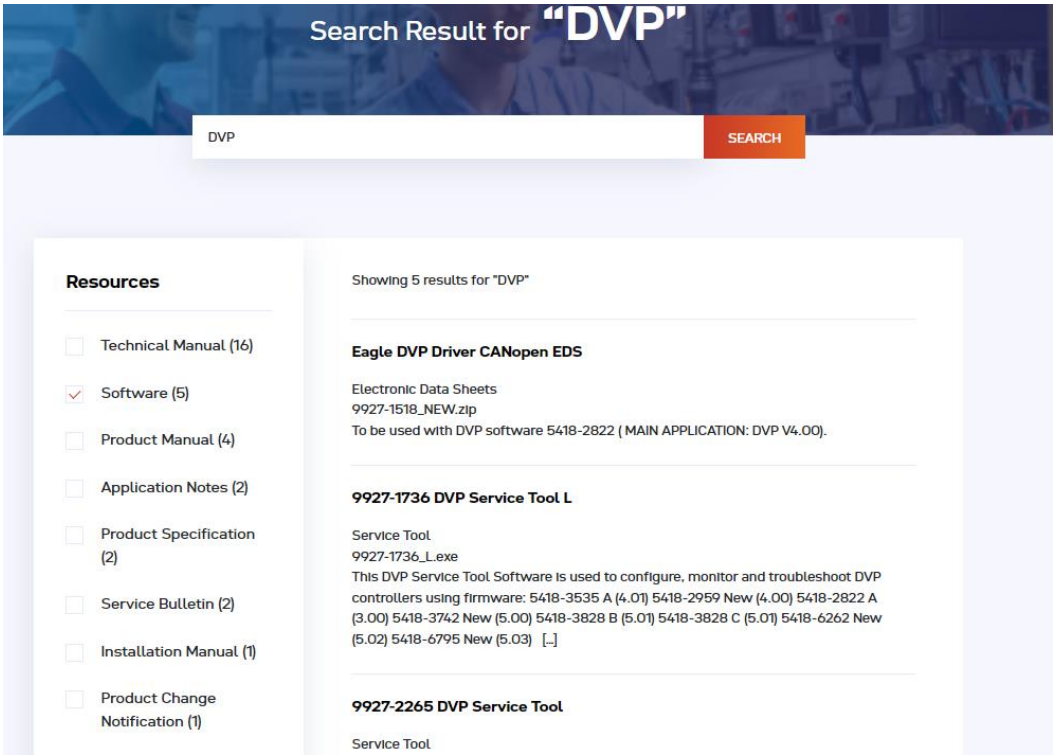
With the widespread adoption of the USB on most modern computers do not have an RS-232 port. Therefore, to connect an RS-232 device to the computer will require a USB to RS-232 adapter.

The USB to RS-232 adapter has some limitations and it is recommended that proper adapter is being selected when use with the DVP. Woodward has some success with off-the-shelf adapter such as Tripp Lite Model U209-000-R USB to RS232 converter cable. An approved converter can be obtained from Woodward P/N 8928-1151.

It is very important that the proper USB to RS-232 device driver get install to the PC to use your USB-RS232 adapter

1.2.4 Obtaining the Service Tool

The DVP Service Tool software is based on the Woodward ToolKit software standard version included with the DVP Service Tool installation software package. Obtain DVP Service Tool and the appropriate settings files for your specific application from Woodward via e-mail or via the Woodward website https://www.woodward.com/?s=DVP
Using DVP as a search term (as seen in the figure below), locate and then download the applicable installation.



9927-1736 for firmware version 5.03 and older
9927-2265 for firmware version 6.01 and newer

Figure 1-1. Searching for Service Tool

1.2.5 Installation Procedure

After obtaining the DVP Service Tool software installation package from Woodward, run the included installation program and follow the instructions on the screen to install the Woodward ToolKit software and the DVP Service Tool.

IMPORTANT

Check all wirings from point to point, all connections, and terminations to insure having proper installation before applying the power to the DVP.

IMPORTANT

Verify that fuel pressure is not present to the actuator that may open due to actuator motion before applying power to the DVP.

1.2.6 General Installation Check Before Applying Power

1. Verify the power source is set to within the input operating voltage range. Always make sure that the power at the driver is within the input power range to insure the operation of the DVP.
2. Verify all DVP and Valve cable connections are properly installed, including earth and motor ground and I/O cable shield grounding termination.
3. Verify that DVP driver is securely installed, and all cover fasteners are tightened.
4. In the case of using Analog input as demand source, verify that the input command is between 4 to 20 mA.

⚠WARNING

Failure to follow general installation check prior to applying the power to the driver could damage the turbine due to overspeed conditions if the actuator shuts down in the wrong direction.

1.3 Getting Started with the DVP Service Tool

The DVP Service Tool communicates with the DVP via RS-232 connection. The PC (personal computer), running the DVP Service Tool is connected to the DVP using a 9-pin straight-through serial cable. Connect the serial cable to the RS-232 Service Port on the backside of the DVP and an unused RS-232 serial port (COM port or USB-to-Serial adapter on the PC side.

Refer to the appropriate DVP Outline drawing for the exact location of the DVP Service port. Also, refer to the section RS-232 Service Port section in Chapter 2 for the technical specifications of the RS-232 Service Port.

IMPORTANT

The serial cable used to connect the DVP to the PC running the DVP Service Tool must be set up as straight-through configuration. Do NOT use a serial cable with Null-Modem configuration to connect the DVP to the PC!

After connecting the DVP and the PC via the serial cable, start the DVP Service Tool from the Windows Start menu or a shortcut on the Desktop (if applicable).

1.3.1 DVP Service Tool Home Page

The home page appears when the Service Tool is ready for use. This title page of the DVP Service Tool contains important information including the Service Tool version and the DVP Firmware for control and monitoring. It also provides contact information for Woodward Technical Support.

NOTICE

Before modifying any settings of the DVP, make sure the device is shut down. Modifying settings with the unit in operation may result in unexpected behavior.

⚠WARNING

The SHUTDOWN button will move the valve to the fail position (0% position, or 100% position for fail-open). This will potentially shut down the Prime Mover!

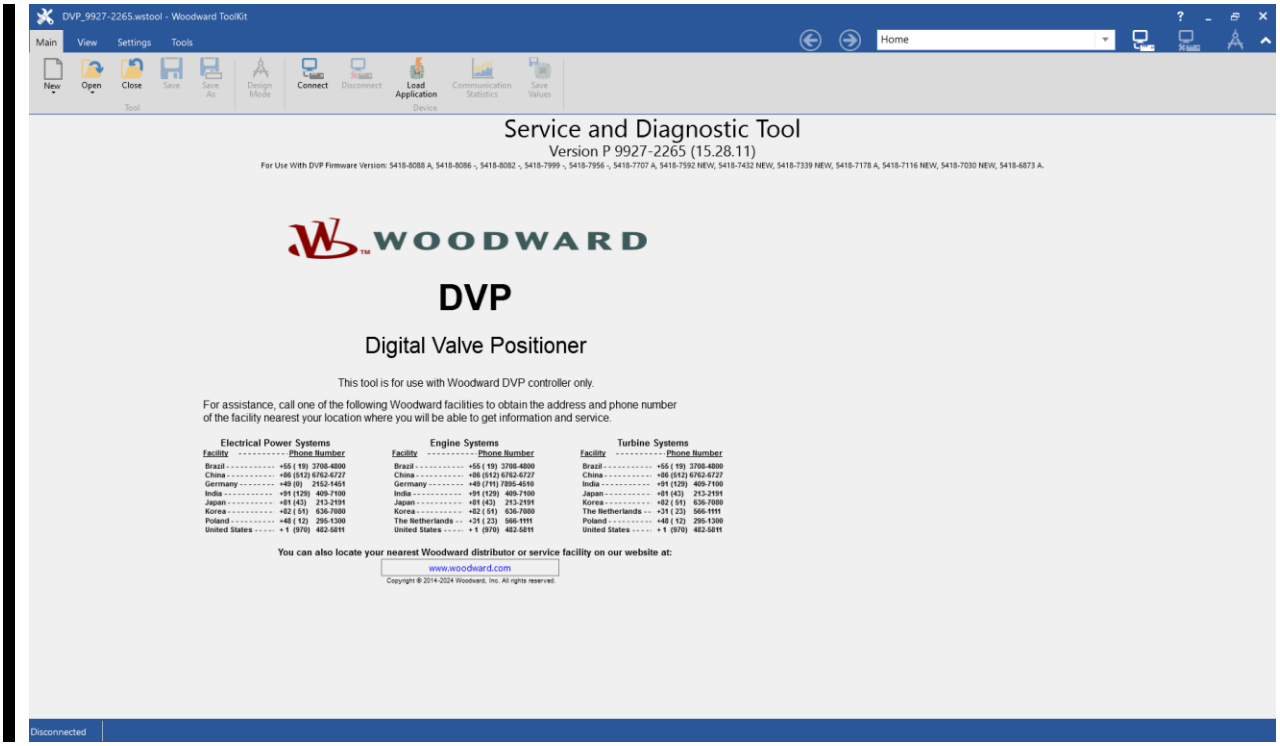


Figure 1-2. DVP Service Tool Home Page

1.3.2 Connecting and Disconnecting the DVP Service Tool

Click the toolbar Connect button or select “Device” then “Connect” from the main tool bar to connect to the DVP.

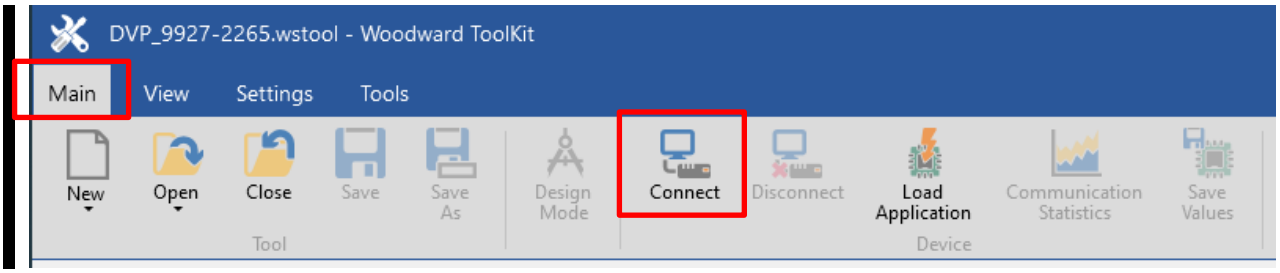


Figure 1-3. Service Tool Connection Options

In the case of the USB to RS-232 adapter is used, the COM port does not normally show as COM1. The COM port will vary depending on the availability of the PC ports at the time of COM port establishment. Disconnect the Service Tool from the DVP by either pressing the disconnect button or selecting “Device” and “Disconnect All Devices” from the main tool bar.

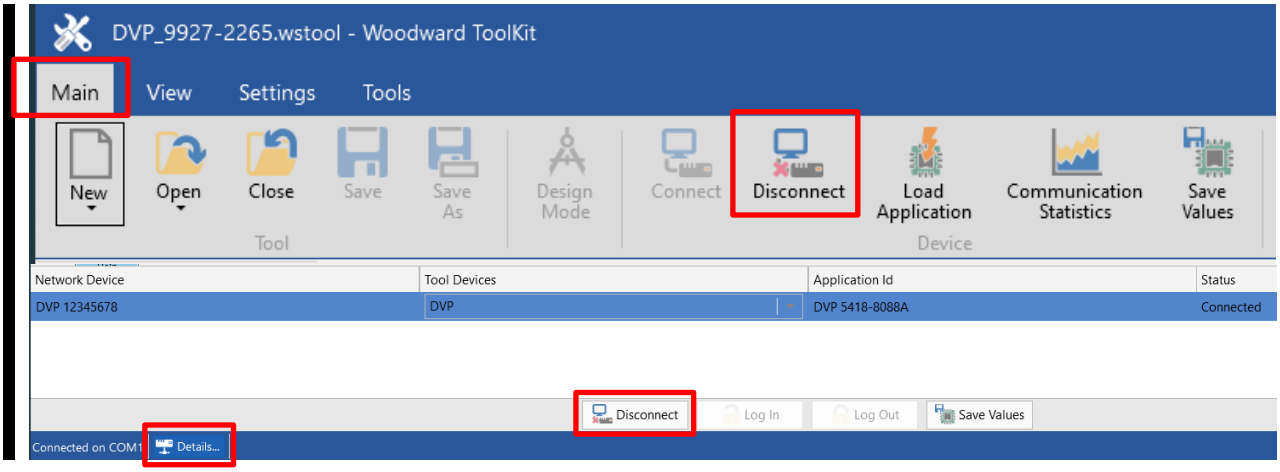


Figure 1-4. Service Tool Disconnect Options

1.3.3 Selecting a Communication Port

When connecting for the first time, the DVP Service Tool shows a dialog box and query to select a suitable communication (COM) port for communication between the PC and the DVP. In most cases, COM 1 is the default choice. Check the checkbox near the bottom of the dialog screen to use the selected port as default in the future.

If a default port is selected the Service Tool will always establish the connection to the DVP immediately after pressing the connect button without asking for a communication port again.

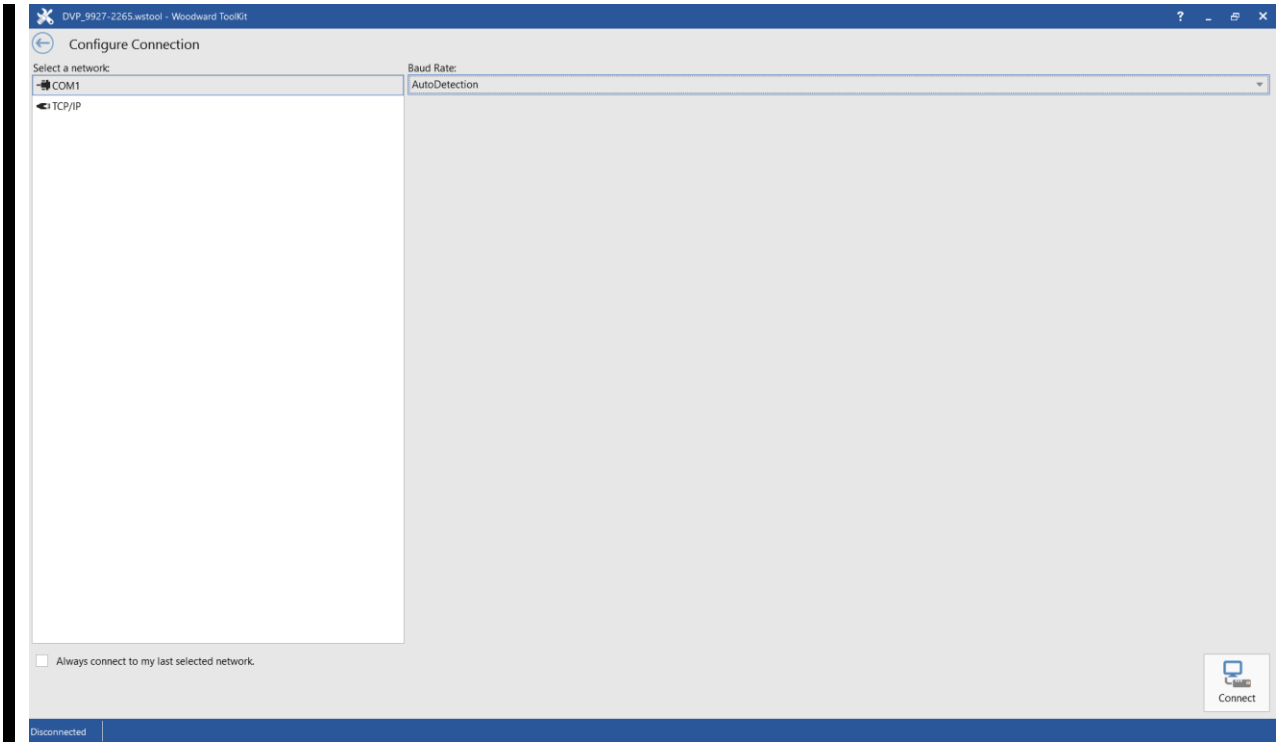


Figure 1-5. Communications Port Selection

The communication port selection can be changed at any time by going to the “Tools” menu in the main tool bar and selecting “Options”. The following dialog box will appear:

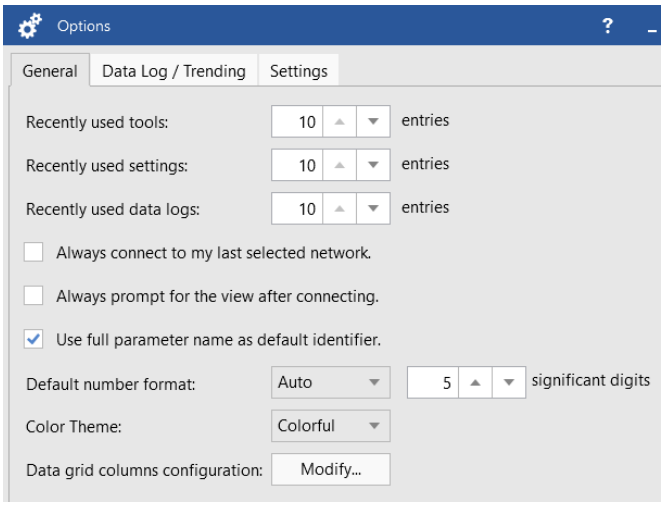


Figure 1-6. Default Communications Port Selection

Select the desired options from checking or unchecking any combination of the three check boxes “Always connect…”, “Always Prompt…”, or “Use Full Parameter…” You may also set the number of entries using the up/down arrows in the “Recently used tools” and “Recently used settings” The tools will display the selected number tools in the bottom window of the file tab on the menu ribbon. The settings will display the selected number of settings up to the number selected on the settings tab on the menu ribbon.

1.3.4 Establishing a Connection

After selecting the desired communication port, the Service Tool will try to connect to the DVP.

Following successful connection to the DVP, the screen will populate with current values and the status bar will display the connection status.

Figure 1-7. Communication Status

If the Service Tool does not establish a successful connection to the DVP after approximately 30 seconds, or the DVP Service Tool annunciates that it cannot find the correct SID file, refer to the next section “Connection Troubleshooting” for further information.

1.4 Connection Troubleshooting

1.4.1 Service Tool Does Not Connect to DVP

If the communication has not been established after approximately 30 seconds, disconnect the Service Tool from the DVP by either selecting the disconnect button or using “Device” and “Disconnect” from the main tool bar.

Check the serial connection between the DVP and the PC and make sure the straight-through serial cable is correctly connected on the PC and DVP side. Also, verify that the serial cable is securely connected to the selected communication port on the DVP and the PC. Check the COM baud rate is compatible. Most of the cases recommend that "Auto Detection" mode is the preferred setting.

1.4.2 Service Tool Cannot Find the Correct SID File

The communication between the DVP Service Tool and the DVP is based on the Service Interface Definition (SID) file that defines the communication variable mapping. If the SID file is missing, communication between the DVP Service Tool and the DVP is not possible. The SID file is included in the Service Tool software installation package and is installed to the directory chosen during the Service Tool install.

If the Service Tool cannot find the correct SID file to communicate with the DVP, a dialog box similar to the figure below will appear when trying to connect.

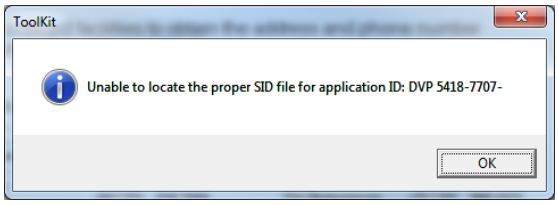


Figure 1-8. Unable to Locate SID File

The supported DVP firmware versions are listed at the top of the Home screen. If this message occurs, typically a newer Service Tool version is required. Follow the instructions in the “Obtaining the Service Tool” section.

Figure 1-9. Supported DVP Firmware Versions

1.4.3 Compatibility of This Service Tool

The software compatible SID files for the version of Service Tool are seen by selecting "View" and then "Tool Properties". This window indicates DVP firmware, SID, and specification versions that this tool is compatible with. A different (likely newer) Service Tool is required if connection is not possible due to an incompatible version.

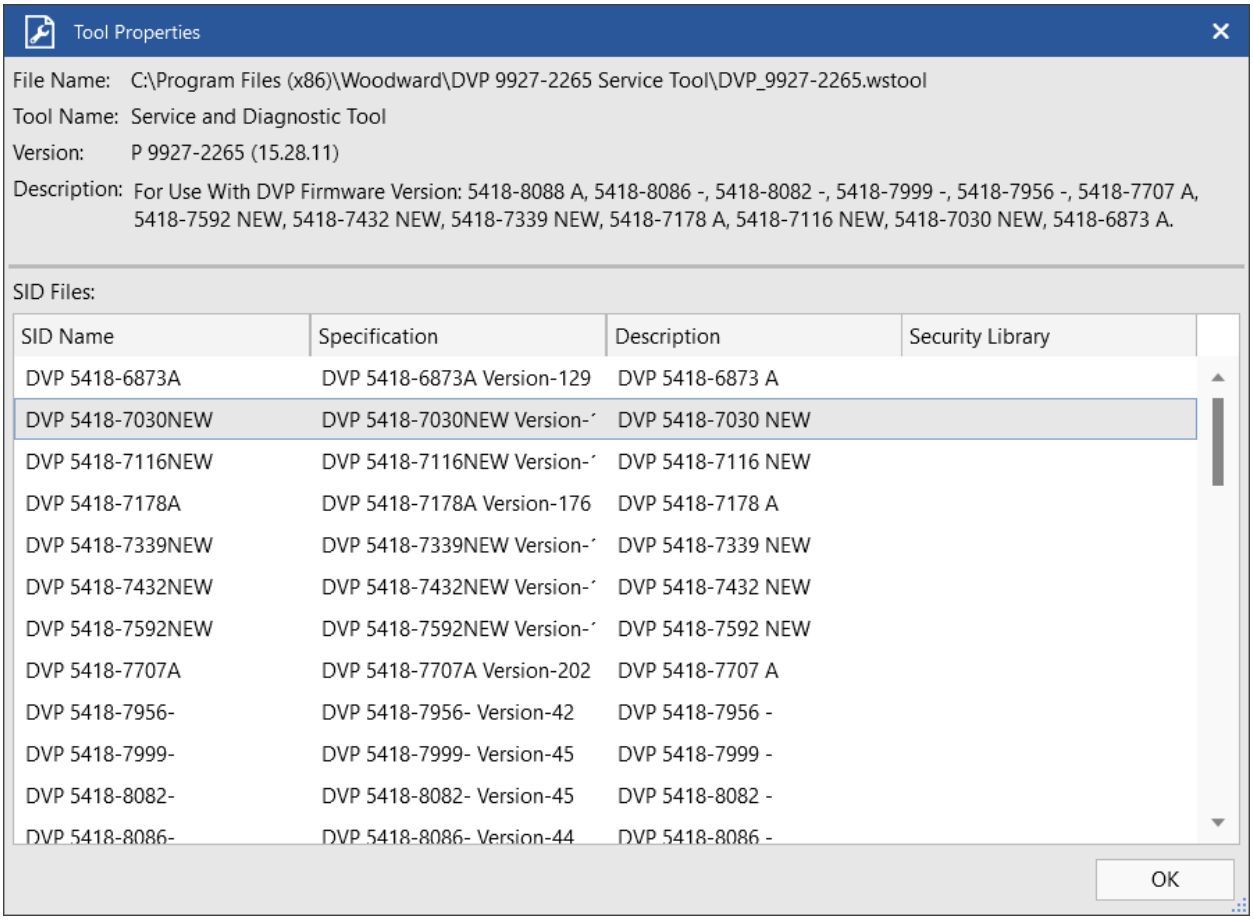


Figure 1-10. Tool Properties Compatibility Display

1.5 Using the Service Tool Introduction and Instructions

The following sections provide information on all Service Tool pages available for monitoring and troubleshooting. Each page is described in detail and additional information on the operation of the DVP is also provided.

1.5.1 Screen Navigation

DVP Service Tool screens can be selected by using a variety of options. A pull-down menu on the tool ribbon at the top-right of the screen or “Navigation Buttons” along the left-side of the screen can be used to select the desired page directly. Additional navigation buttons at the top of the screen provide forward/back and previous/next page selection.

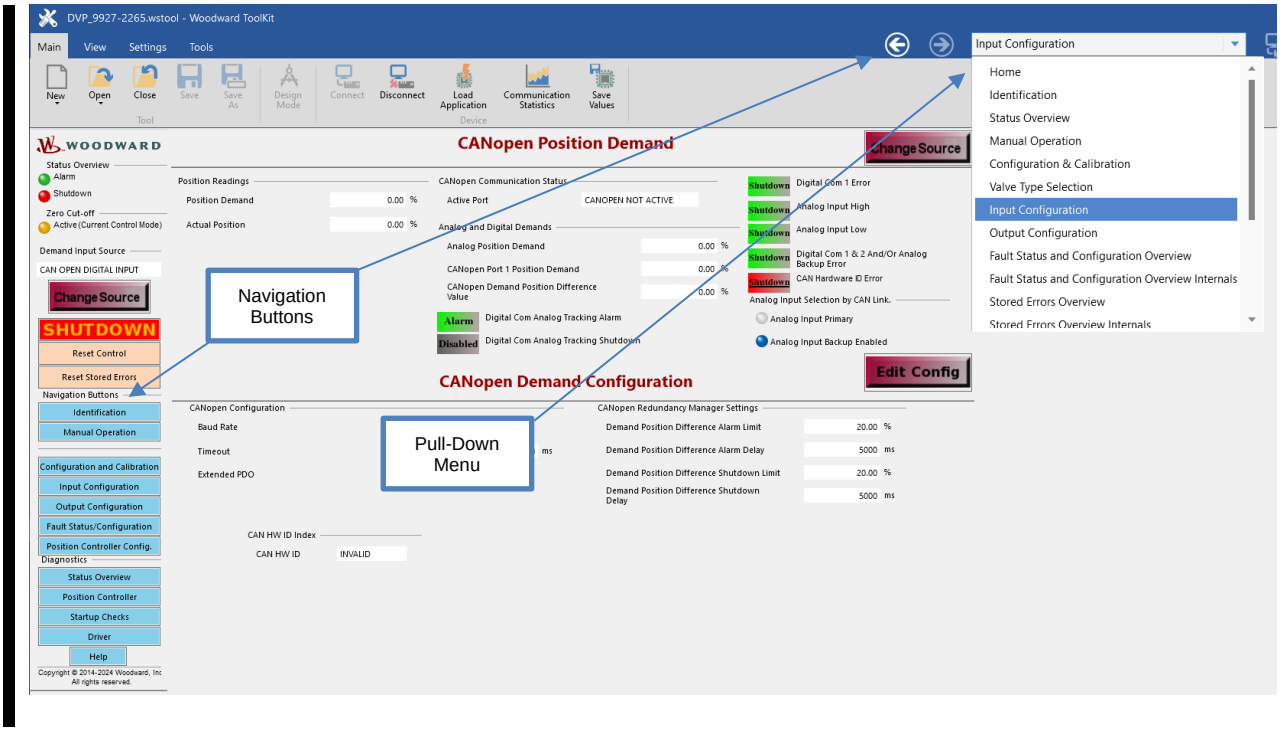


Figure 1-11. Screen Navigation Options

Pages of the DVP Service Tool are grouped based on the device being controlled. On some versions of Service Tool, indented page(s) represent more detailed information of the item above, which is further to the left in the menu.

1.5.2 Dashboard Display

The dashboard section is a common section of information that is displayed on all pages. On the top/left portion is the status overview that depicts the overall status of the DVP. Below this area are the command buttons, used to shut down and reset the control at any time. The lower half contains the page navigation buttons, providing quick access to specified screens.

The summary fault status is displayed at the top/left of each page of the Service Tool by LED indicators. These summary faults indicate an alarm condition or fault condition to alert the user that the DVP has detected a diagnostic condition. The details of an existing alarm or process fault condition are displayed on the corresponding pages of the Service Tool.

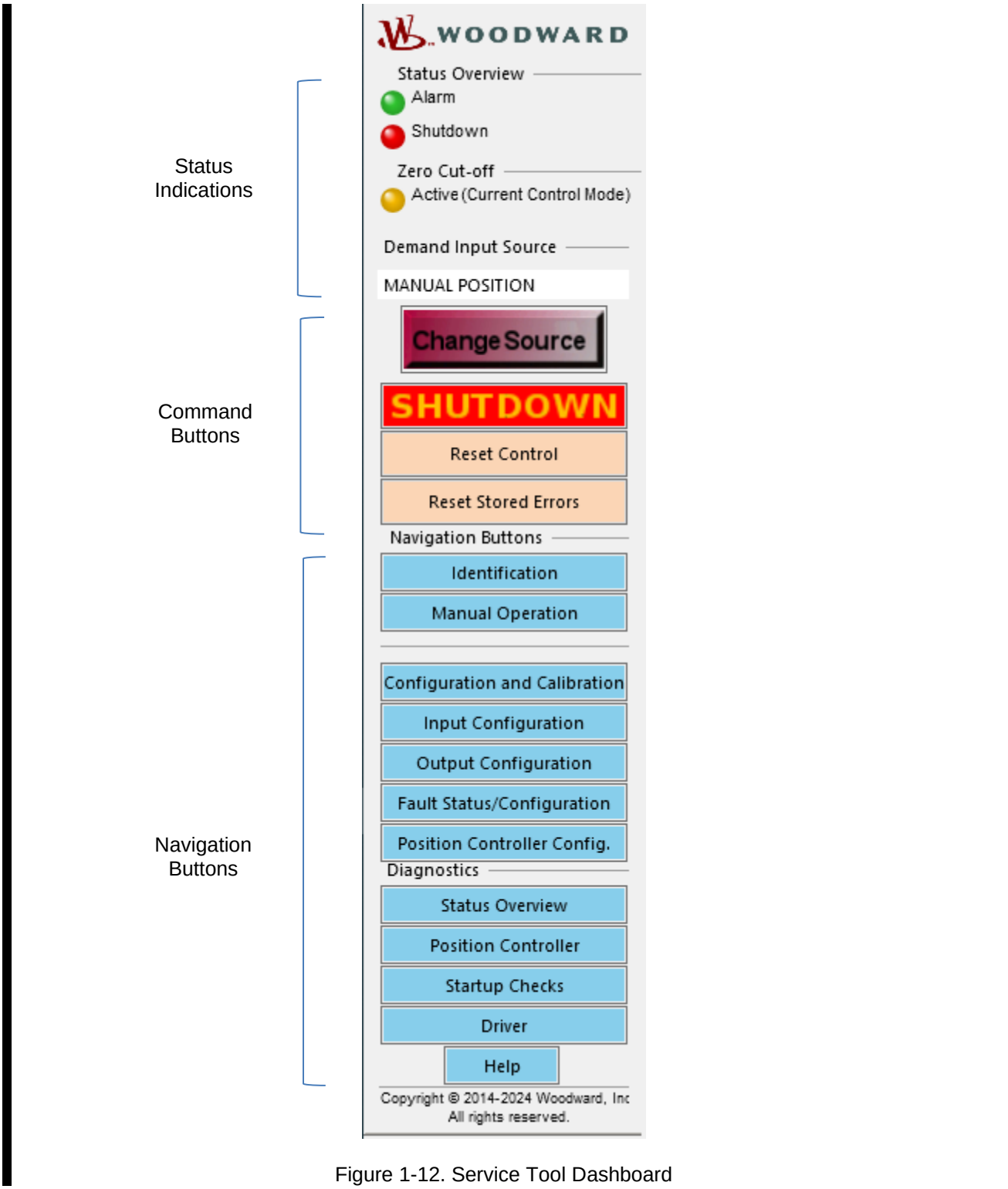


Figure 1-12. Service Tool Dashboard

1.5.3 Status Overview Indications

The following LED indicators are present at the top/left of each Service Tool page:

Alarm

An Alarm allows the DVP to maintain operation in the presence of a detected diagnostic condition.

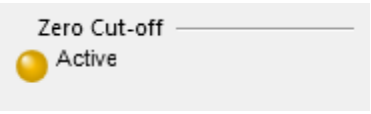
Shutdown

This indicator shows that the DVP is in shutdown mode and errors may exist. The DVP may also initialize in Shutdown mode and may not have errors. When errors do exist, a Reset will not bring the DVP back online if one or more errors are still present. Clear existing errors prior to resetting the shutdown.

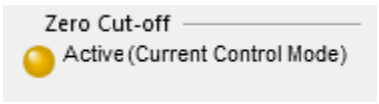
Zero Cut-off Active

This LED indicator illuminates when the Zero Cut-off function is activated. In the case of a 3-phase actuator the valve closes by its return spring (traditional spring-only mode) or return spring assisted by constant current (seating current mode programmed for some newer valve types).

The status text will also indicate whether the Zero Cut-off is the traditional spring-only mode or the current controlled mode.



OR



1.5.4 Demand Source Indications

Demand Input Source

Indicator of the selected source for the position demand as well as a button to select a different source are provided.

Change Source

Clicking this button opens the Demand Input Selection, Demand Input Source menu which provides a variety of source options. These options are Manual Position, Analog Input, EGD Digital Input, PWM Input, Function Generator, CAN Open Digital Input, and Servo Analog Input. These options are explained in detail later in this manual.

1.5.5 Command Buttons

The following command buttons are provided on the dashboard:

Shutdown

Selecting this button will command a shutdown. When commanded, the valve moves to the fail position by the position controller. On most valve types the fail position is 0% position, but some may be configured for fail-open which has a fail position of 100% position. The shutdown LED will be illuminated. A confirmation is provided to prevent inadvertent commands.

WARNING

The SHUTDOWN button will move the valve to the fail position (0% position, or 100% position for fail-open). This will potentially shut down the Prime Mover!

Reset Control

This button will reset the DVP. All diagnostic flags will clear if the diagnostic condition is no longer present. A confirmation is provided to prevent inadvertent commands.

WARNING

The Reset button will reset the DVP if diagnostic condition(s) are no longer present. The valve/actuator system will become active. Ensure system is tagged out or ready to operate before issuing the Reset command. Stay clear of any moving parts WHEN resetting the control.

Reset Stored Errors

This button will reset the stored faults if the diagnostic condition(s) are cleared. The stored faults and active faults are depicted as status block that uses colors and formatting to depict the status. If the process fault is no longer present, resetting the driver will reset this status block. Only pressing the Reset Stored Errors button resets the stored fault(s); a power cycle will not clear the stored fault(s). Stored faults will not affect the operation of the DVP. The stored errors are displayed on the Stored Errors Overview and Stored Errors Overview Internals pages.

1.5.6 Navigation Buttons

Navigation buttons are provided to provide quick access to specified screens.

1.5.7 Help Button

Selecting the Help button will open the Service Tool manual. This manual is provided as a convenience however be aware that newer versions may be available.

NOTICE

For the most up-to-date information, it is recommended that you obtain the latest version of the Service Tool manual 26912 from Woodward.

Chapter 2.
DVP Operation

2.1 Monitoring and Troubleshooting

The chapter describes the operating screens of the DVP Service Tool. The DVP Service Tool software configures, monitors, and troubleshoots the DVP Control. Chapter 3 provides detailed information for configuration and setup of the DVP for customer-specific applications.

⚠WARNING

An unsafe condition could occur with improper use of these software tools. Only qualified personnel should use these tools to modify or monitor the DVP functions.

The following sections provide information on all Service Tool pages available for monitoring and troubleshooting. Each page is described in detail and additional information on the operation of the DVP is provided.

Refer to Chapter 1 for general information on the tool such as connection, navigation, and dashboard section details.

2.2 Identification

The Service Tool Identification page has valuable information on the Controller and Valve Identification, a quick start “Configuration & Calibration” button, Woodward contact information, and some important warnings.

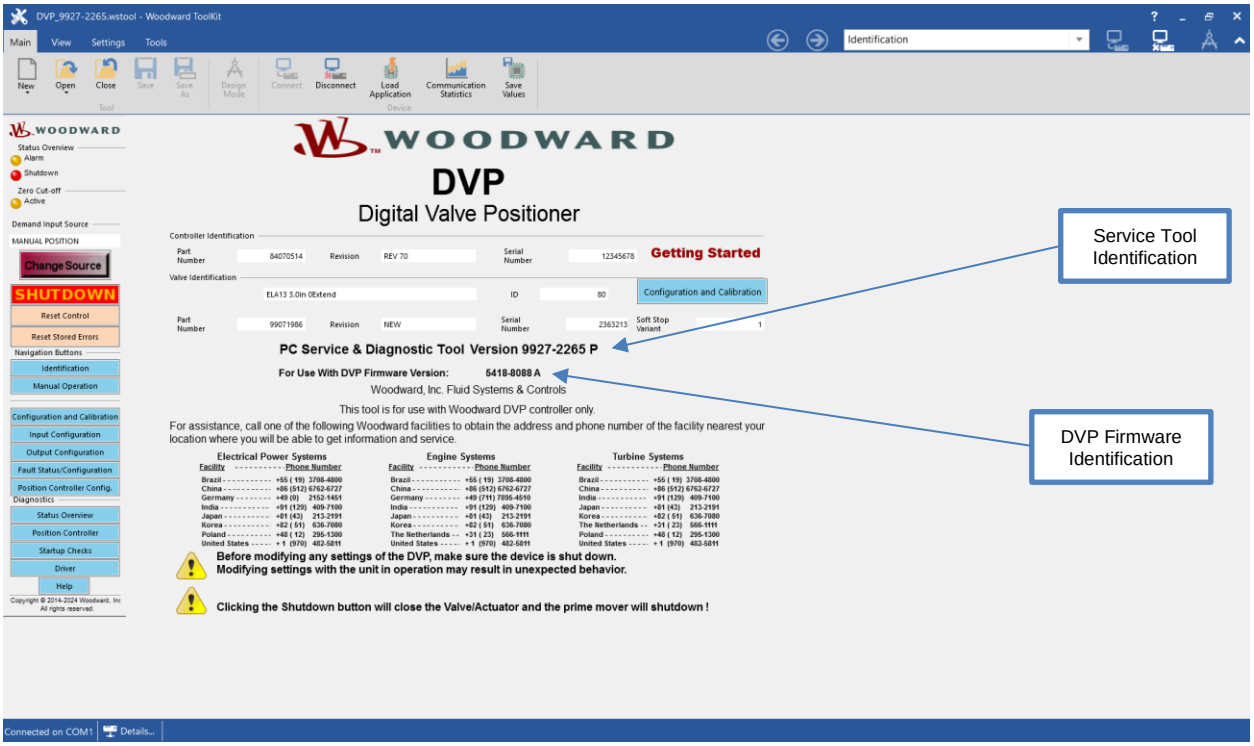


Figure 2-1. Service Tool Identification Page

2.2.1 Controller Information
Displays DVP Part Number, Revision, and Serial Number.

2.2.2 Valve Identification
Displays Valve Type, Valve Part Number, Revision, and Serial Number.

2.2.3 Service Tool Identification
The PC Service and Diagnostic Tool field provides the DVP Service Tool version.

2.2.4 Firmware Identification
The “For Use with DVP firmware version” field displays the DVP firmware version. This is the actual value of the connected device. Another option to view the firmware identification is to select the “Details” button on the lower left corner of the tool window. This opens information on the connected device. The “Application Id” displays the firmware identifier. Press the Details button again to close this information window.

See also Table G-1 for a cross-reference between part number and version number of the DVP firmware.

2.2.5 Getting Started
By left clicking the blue “Configuration & Calibration” button, the “Configuration & Calibration” page will open, and you can verify the default settings and/or adjust the settings to your requirements.

Note: If default settings are present, they will be displayed on the “Configuration & Calibration” page. If no default settings are present, nothing will be displayed.

2.3 Editing Settings Using the Service Tool

There are select screens where you can edit data for the Service Tool, which are described in detail later in this section. Prior to selecting either of the two buttons illustrated below, read and apply the notice and warning below.

NOTICE

Before modifying any settings of the DVP, make sure the device is shut down. Modifying settings with the unit in operation may result in unexpected behavior.

⚠WARNING

The SHUTDOWN button will move the valve to the fail position (0% position, or 100% position for fail-open). This will potentially shut down the Prime Mover!

There are two ways you can edit data on the Service Tool. You may edit the mode in which you are operating (Change Source) or edit the configuration of the mode in which you are operating (Edit Config). The operation of these features is described in detail in the descriptions of the applicable screens below and in Chapter 3.

Figure 2-2. Change Source and Edit Configuration Buttons

When enabling an edit mode, a configuration edit window is opened.

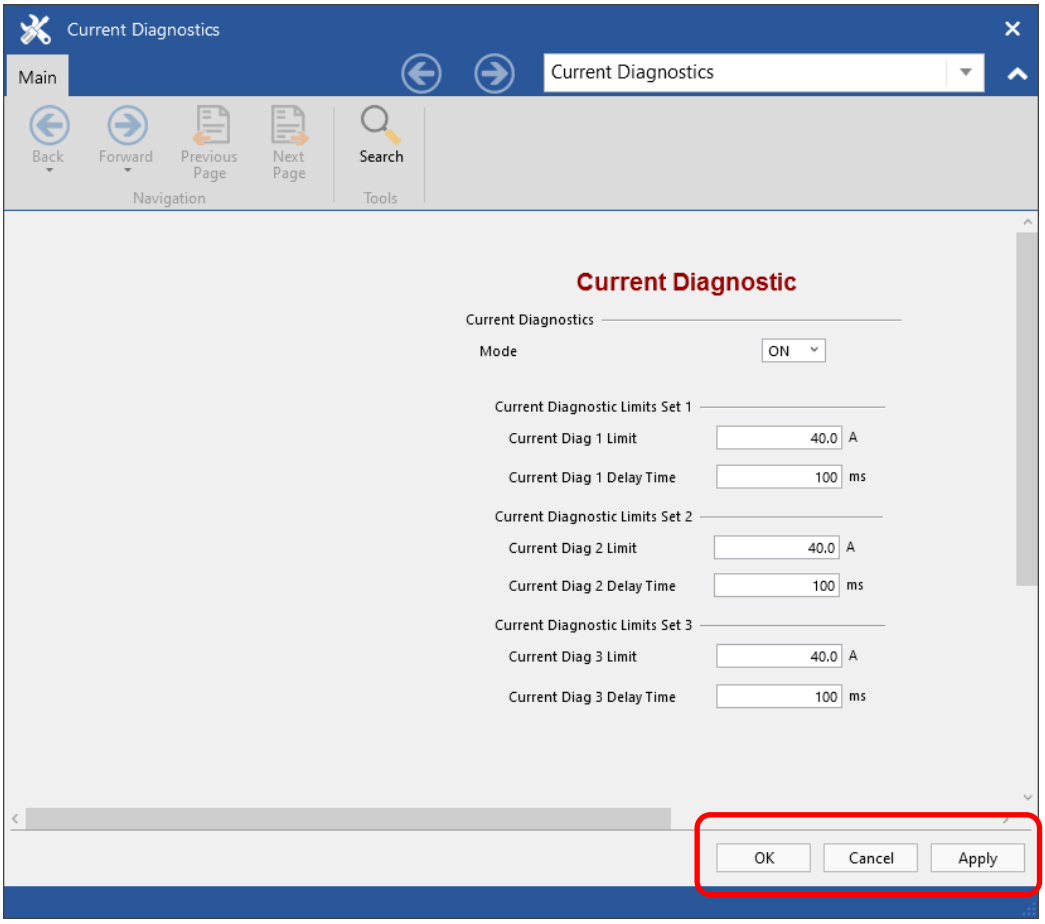


Figure 2-3. Edit Window Options

The edit window has three options for selected changes, OK, Cancel or Apply. Selecting Cancel closes the window and ignores any changes. Selecting OK saves the changes to the device and closes the window. Selecting Apply saves the changes to the device but keeps the window open.

2.4 Status Overview

This page contains a summary of valuable information showing Position Readings, Discrete Input and Output Status, Analog Values, Motor Control Parameters, and a Trend Chart. See below for an overview of each of these areas.

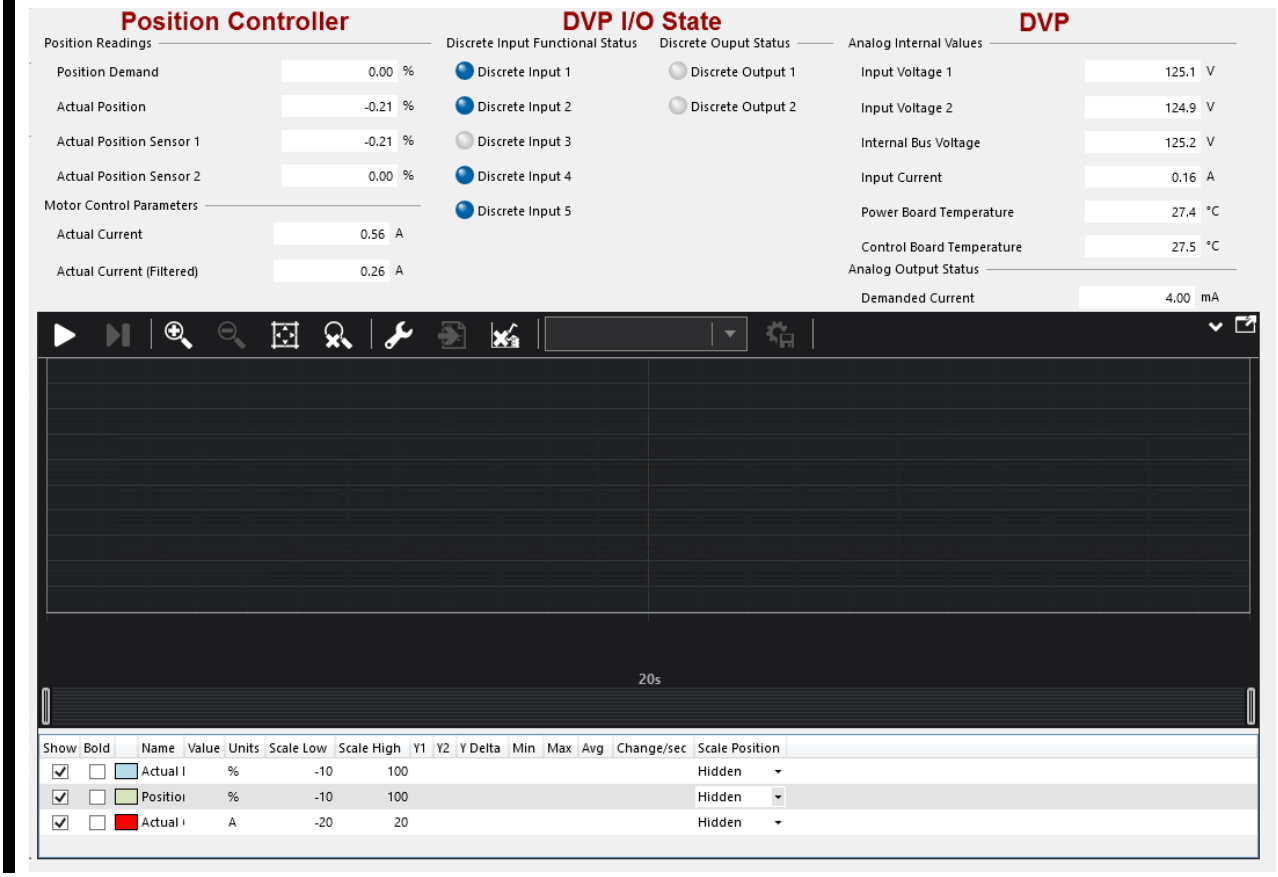


Figure 2-4. Status Overview

2.4.1 Position Readings

The control setpoint, actual position feedback as well as the position feedback readings from both position resolver values are displayed in this group as a percentage (%) of valve position. Under normal operating conditions, the actual position will match the setpoint with minimal steady state error. These values should range between 0% and 100% during normal operation.

This section shows you four readings at a glance—Position Demand, Actual Position, and Actual Position for Sensors 1 and 2. The Actual Position represents the reported position of the valve or actuator as seen by the DVP.

2.4.2 Discrete Input Functional Status

With the colored indicator display, you can see the real time status of Discrete Input 1-5. Blue is active and gray is not active. The Shutdown/Reset inputs will shut down in active state. The Reset and Shutdown/Reset inputs all perform a reset when the input goes to the inactive state (edge triggered).

2.4.3 Discrete Output Status

The colored indicator display the Discrete Output 1 and Discrete Output 2 are easily visible. Blue represents selected and gray represents not selected.

2.4.4 Analog Internal Values

This section shows you the real time status of the DVP current, voltages, and temperatures.

2.4.5 Analog Output Status

This section displays the commanded value of the analog output current.

2.4.6 Motor Control Parameters

The Actual Current and filtered Actual Current are displayed for easy viewing. Actual Current represents the current that drives the torque in the motor. Actual Current Filtered has a low-pass filter applied.

2.4.7 Trend Chart

A 20-second time slice that displays the following in the window below the chart: time varying position set point, actual position, and filtered motor drive current. Adjust these by clicking on the Properties link on the upper right-hand border immediately above the trend chart. See Trend Chart section for additional details on this component.

2.5 Manual Operation

The Manual Control screen is used during initial commissioning or when troubleshooting to confirm the operation of the DVP/actuator system. The ability of the system to respond to a change in position setpoint, the actual position of the valve, and motor drive current levels can be confirmed using this screen.

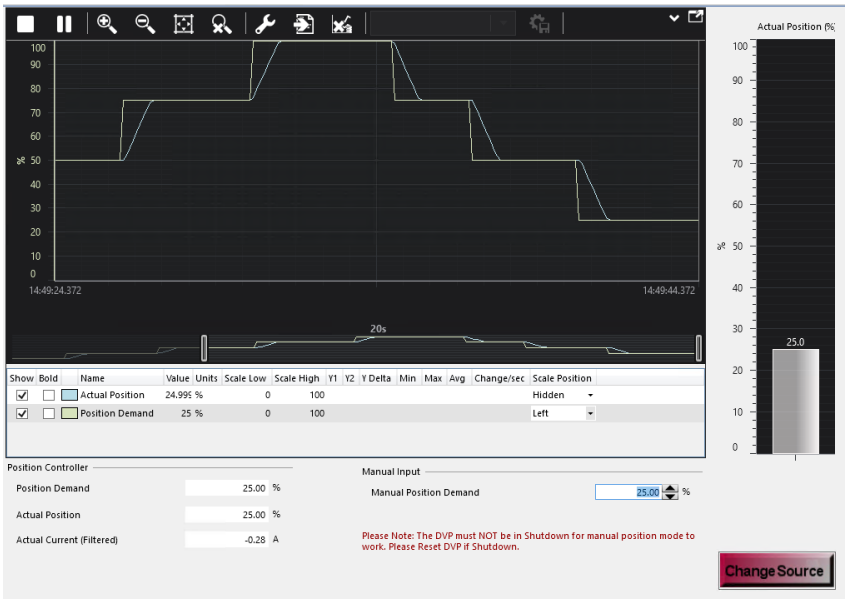


Figure 2-5. Manual Control

2.5.1 Demand Input Selection

The DVP can be configured to position the actuator/valve based on a setpoint generated from the Service Tool. To configure the DVP for this operation, the input source must be set to Manual Input using the Service Tool Change Source button. Once in this mode, the setpoint can be changed using the up/down arrows or typed into the Manual Position Demand input field. The Position Demand to the DVP position controller, Actual Position of the Valve/actuator system as reported by the position feedback system and the filtered Actual Current are also displayed in this section.

2.5.2 Demand Input Source

The Mode indicator displays the currently active setpoint source to the DVP. Possible modes for the setpoint source include Manual Position mode, Analog Input mode, EGD Digital Input mode, PWM Input mode, Function Generator mode, CAN Open Digital Input mode and Servo Analog Input mode. The setpoint source can be changed using dropdown menu in the figure below or by using the DVP Service Tool settings editor. See Chapters 3 and 4 for more information on editing of DVP settings.

⚠WARNING

If there are no diagnostic conditions causing a shutdown, the valve/actuator system will become active. Ensure the system is tagged out and safe to operate before operating in manual mode. Stay clear of any moving parts WHEN using the manual control.

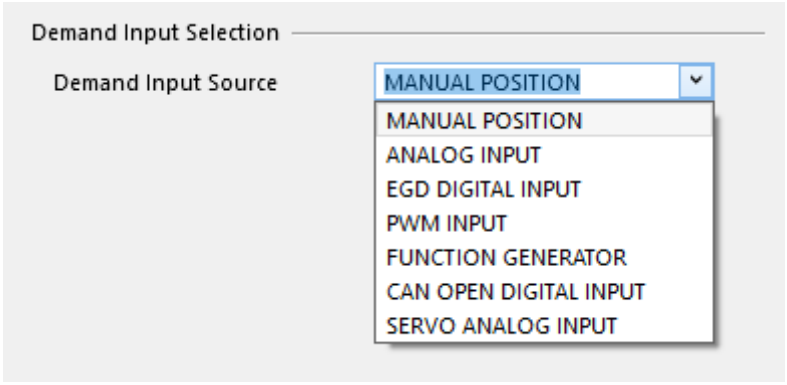


Figure 2-6. Demand Input Selection Dropdown Menu

After you have selected the appropriate mode, for example Manual Position, the screen below appears. You may adjust the Manual Position Demand by selecting the up/down arrows which will increase/decrease in increments of hundredths of a percentage. Position Demand, Actual Position, and Actual Current (Filtered) are display fields only and are not user configurable.

An Actual Position in the range of ~0% to ~100% represents where the valve or actuator is presently located. An Actual Position value of ~ -100% indicates that the control model is not running so the actual position is not known.

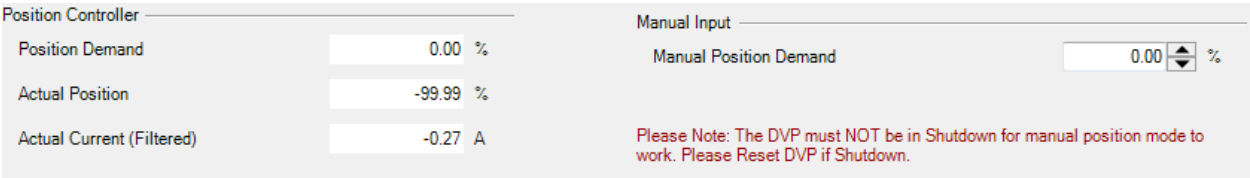


Figure 2-7. Manual Position Controller and Manual Input Page

2.5.3 Trend Chart

A trend chart displays the time-varying position set point, actual position, and filtered motor drive current.

Pressing the Start button (left/upper corner of chart) starts the trending process. Pressing the Stop button freezes the currently displayed values. Pressing the Start button again erases the last traces and restarts the trending process.

Pressing the properties button opens the Trending Properties window. From this window trend screen properties such as trending time span, sample rate and Y-axis scaling can be modified.

Pressing the Export button during or after the trending process allows to export the data collected during the trending process to a file of Comma Separated Values (*.csv). This file can be opened in a spreadsheet or math analysis software package for post-processing of the data and further analysis.

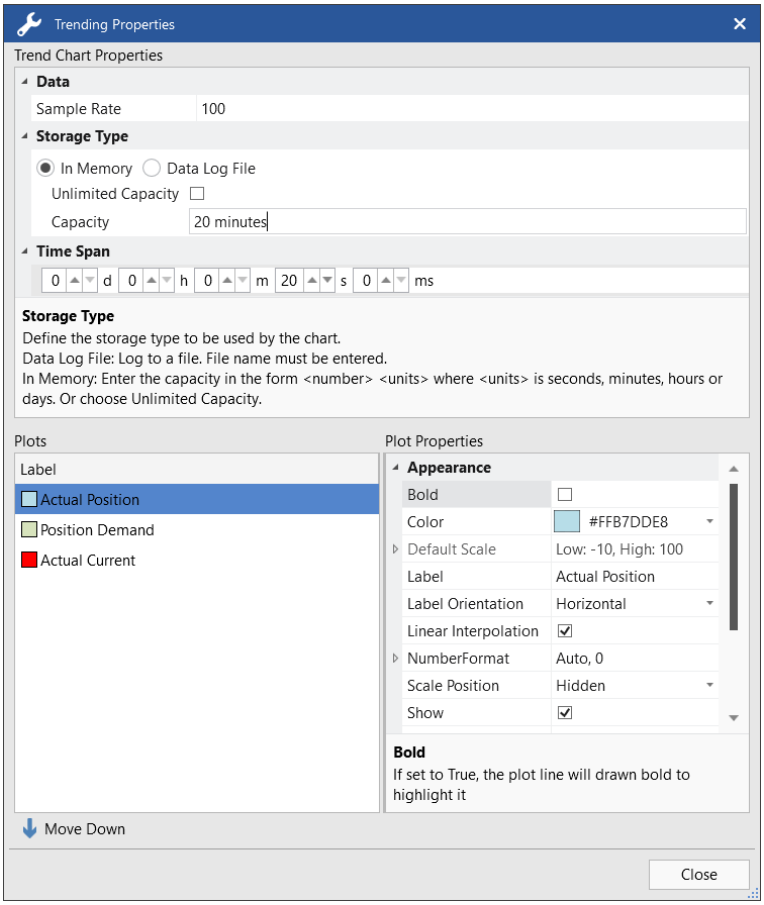


Figure 2-8. Trend Chart Properties Window

For advanced monitoring purposes, the DVP Service Tool can create custom trend charts from any control parameter available in the Service Tool. In addition, the Service Tool also can export data to a file.

2.5.4 Creating a Custom Trend Chart

A trend can be created using any value displayed on the Service Tool. Use this feature by right clicking on the control parameter to be monitored and selecting “Add to trend”.

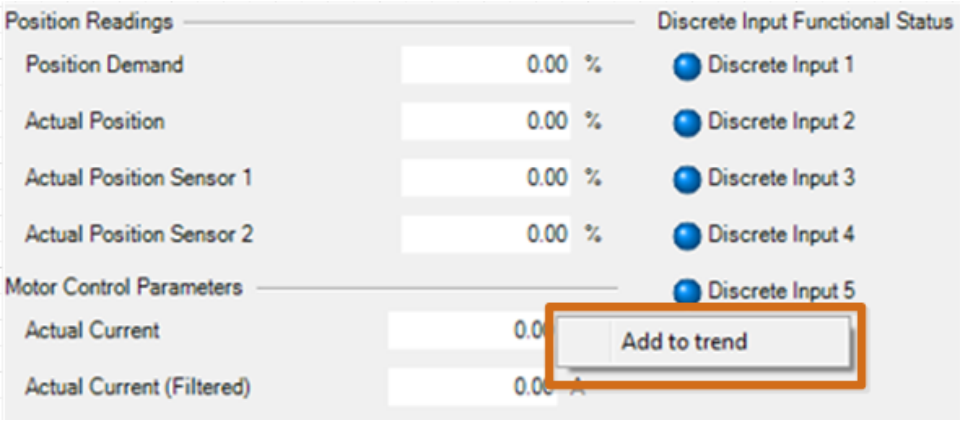


Figure 2-9. Custom Trend Tool “Add to Trend

A new trending window will open showing a trending chart for the selected control variable. Additional values can be added to this same trend in the same manner.

Pressing the Start button starts the trending process for the selected variables. Pressing the Stop button freezes the currently displayed values. Pressing the Start button again erases the last traces and restarts the trending process. Freeze and zoom options are also available.

Pressing the properties button opens the Trending Properties window. From this window trend screen properties such as trending time span, sample rate and Y-axis scaling can be modified.

Pressing the Export button during or after the trending process allows to export the data collected during the trending process to a file of Comma Separated Values (*.csv). This file can be opened in a spreadsheet or math analysis software package for post-processing of the data and further analysis.

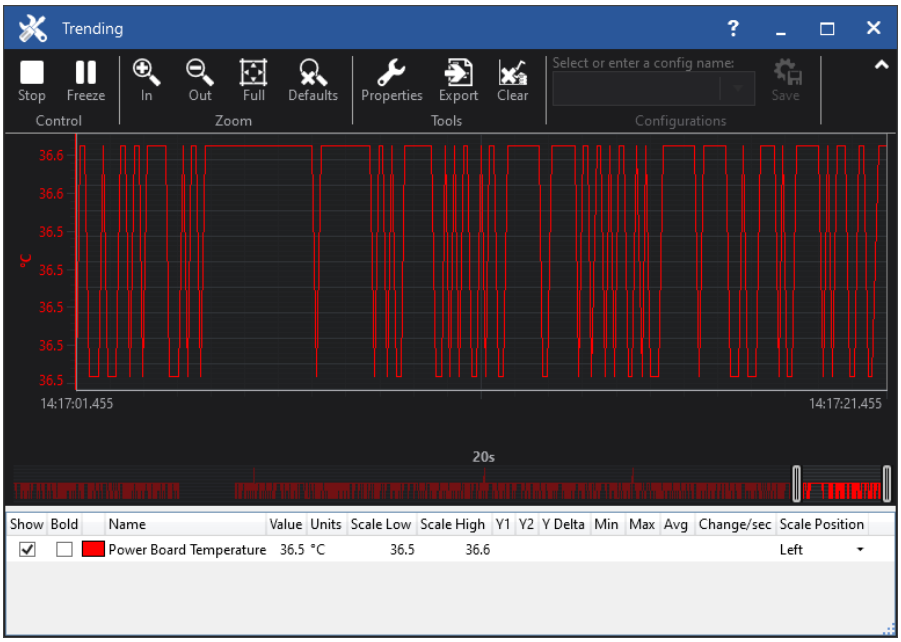


Figure 2-10. Trending Process Display

2.5.5 Modifying Trend Chart Properties

As default, the scaling for variables in the trend chart is set automatically. The default trending time span is set to 20 seconds. The trending parameters can be modified in the trending properties window.

Pressing the properties button opens the Trending Properties window. From this window, trend screen properties such as trending time span, sample rate, and variable scaling can be modified.

To change the plot properties of single variables, e.g., label name and color, select the variable from the “Plots” list and modify the settings populated on the right side of the dialog box.

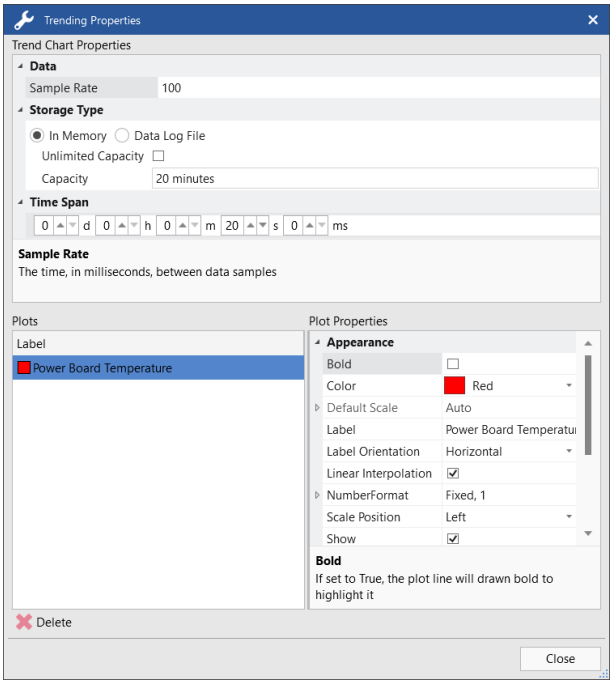


Figure 2-11. Modifying Trend Chart Properties

Uncheck the “Automatic” checkbox in the “Scaling” section to manually select the display range for the trended variables.

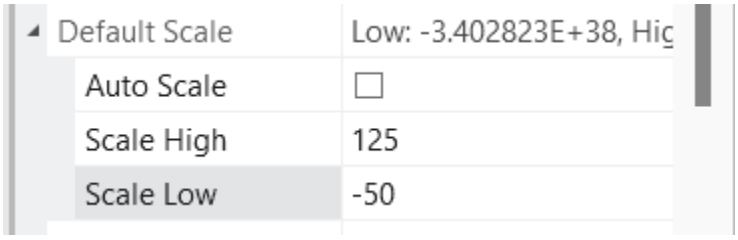


Figure 2-12. Manual Display Range Selection

2.5.6 Exporting and Saving Trend Values

Custom trend values can be exported and saved to a file of Comma Separated Values (*.csv file) by pressing the export button. This file can be opened in a spreadsheet or math analysis software package for post-processing of the data and further analysis.

2.6 Configuration and Calibration

This screen displays valve configuration and calibration and information displayed will vary based on the valve type. Some valves do not require any setup and will indicate this. Several ELA actuators will report their configured settings on a read-only screen. For those valves that have setup options, refer to the appropriate Appendix for details. A subsection is provided detailing calibration for applicable valve types.

Valve types supporting configuration and calibration include: 3103/3171/EM35MR, 3151 EML100, EVA EIGVA, and LQ25/LQ25T/LQ25BP.

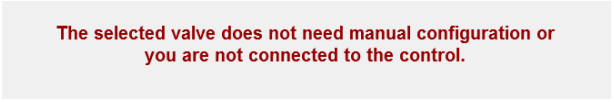


Figure 2-13a. Configuration & Calibration Page – No Calibration

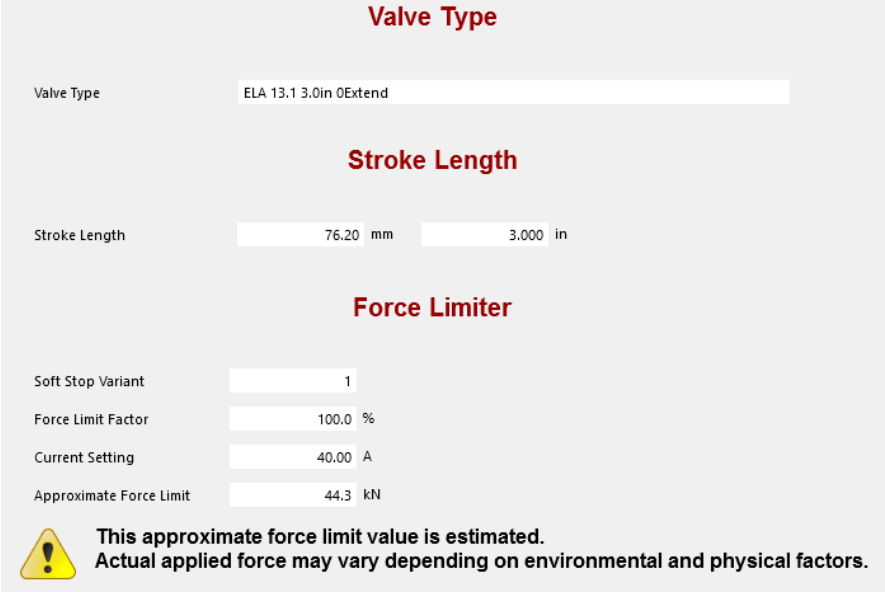


Figure 2-13b. Configuration & Calibration Page – ELA Settings (Read Only)

2.7 Valve Type Selection

This screen displays the selected valve type information and diagnostics relating to valve type selection.

The DVP can run different valve and actuator types. When invoked, the control will perform a self-configuration process using data acquired from the valve's Identity (ID) module. When so equipped, the ID module is physically attached to the valve and connected to the driver. This indicator group gives an overview of the real-time status of the Valve Type Selection Process. The progress of the auto-detection process is displayed as a percent value.

> **Note:** When delivered from the factory, the DVP will perform an auto configuration on initial power up. After each subsequent power up, follow the steps below.

The DVP requests information about the connected valve from the ID module during its self-configuration process.

To start the self-configuration process, the DVP must be in the proper state and the Auto Detect Request button used to initiate the action. The DVP then configures itself correctly according to the configuration data acquired from the valve's ID module. This is the Valve Type Selection Process. Please refer to "Initiating the DVP to Auto-Detection Mode" in Chapter 3.

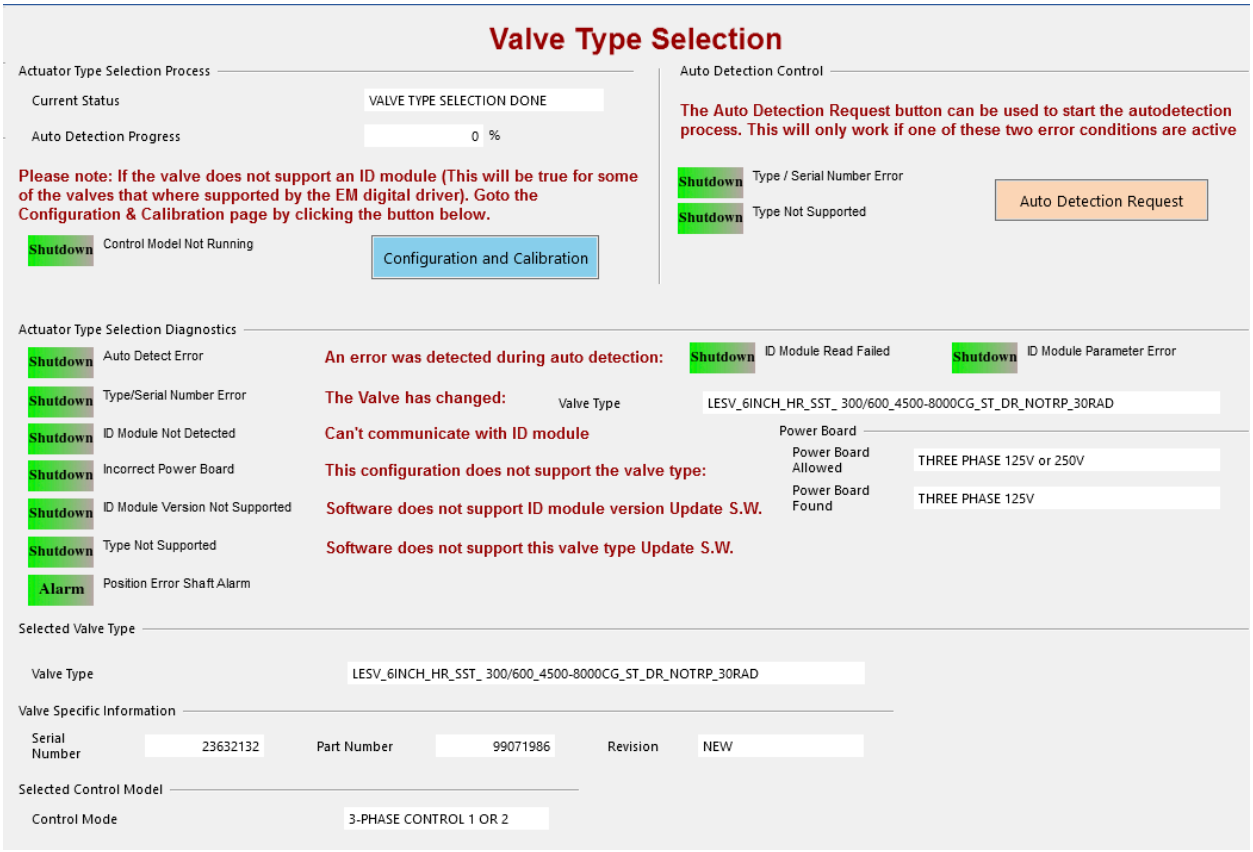


Figure 2-14. Service Tool Valve Type Selection

2.7.1 Actuator Type Selection Process

This indicator group gives an overview of the real-time status of the Valve Type Selection Process. The progress of the auto-detection process is displayed as a percent value.

When the Control Model Not Running indicator is red, the DVP is not able to run and further investigation of the active diagnostics is required to determine the cause.

By clicking the blue Configuration and Calibration button, the Configuration & Calibration page will open, and you can verify the default settings and/or adjust the settings to your requirements.

> **Note:** If default settings are present, they will be displayed on the Configuration & Calibration page. If no default settings are present, nothing will be displayed.

2.7.2 Auto Detection Control

The Auto Detection Request button is used to initiate the DVP Auto-Detection self-configuration process. The DVP will then acquire the configuration information from the ID module and configure itself accordingly. The functionality associated with this button **only** works if the DVP has determined that the valve/actuator system connected does not match the DVP's current configuration.

The "Type/Serial Number Error" status flag shows if the type of equipment and the serial number do not match. The "Type Not Supported" status flag shows if the type of equipment connected to the DVP is not supported by the DVP.

IMPORTANT **In the case of using DVP with a valve that does not have the Identity (ID) module, the DVP will require a manual valve configuration and calibration.**

Manual Configuration of Valve Calibration

In the case of using valves without Identity (ID) module, valve parameters are required to be manually set and calibrated. Each of the valves has unique parameters that contain information necessary for valve operation. It is important that these parameters are properly loaded and calibrated to achieve the maximum valve performance.

Manual Configuration of the valve applies mainly to field retrofits using the 24 Vdc DVP driver. Most valves used with the +125 Vdc DVP are supplied with an Identity (ID) module and will not require manual valve configuration/calibration.

IMPORTANT

Refer to the Quick Start Guide Appendix on the back of this manual for your 3151, 3103 and LQ25 Valves calibration.

Manual Valve Calibration

Refer to Appendix D: 3151A EML100 Quick Start Guide
Refer to Appendix E: 3103/3171/EM35MR Quick Start Guide
Refer to Appendix F: LQ25/LQ25T/LQ25BP Quick Start Guide

2.7.3 Actuator Type Selection Diagnostics

In case of a fault during the Valve Type Selection Process this group shows the appropriate fault flags. The illuminated status text for each diagnostic indicates the action taken when the condition is active (e.g., alarm or shutdown). When the condition is not active the status is green. When the condition is active the status text is underlined and the indicator changes color, red for shutdown or yellow for alarm.

IMPORTANT

Please refer to the Troubleshooting chapter of the DVP manual for information on detection and resolution of diagnostic faults.

2.7.4 Selected Valve Type

The currently active Valve is shown in the window.

2.7.5 Valve Specific Information

Identification information specific to the connected valve is displayed in this section. This includes the valve serial number, the product code, and the revision. This information is specific to the valve and stored on the ID module.

2.7.6 Selected Control Model

This section shows active controller used for the selected valve.

2.8 Input Configuration

This page displays information relating to the position demand and facilitates modifications to the demand. The values displayed vary with the selected demand source.

NOTICE

Before modifying any settings of the DVP, make sure the device is shut down. Modifying settings with the unit in operation may result in unexpected behavior.

⚠WARNING

The SHUTDOWN button will move the valve to the fail position (0% position, or 100% position for fail-open). This will potentially shut down the Prime Mover!

This page displays the currently active setpoint source to the DVP. Possible modes for the setpoint source include Manual Position mode, Analog Input mode, EGD Digital Input mode, PWM Input mode, Function Generator mode, CANopen mode and Servo Analog Input mode. The setpoint source can be by selecting the Change Source button on the upper right-hand corner of the screen. Select the “Edit Config” button to modify the input demand configuration settings like scaling and diagnostic thresholds. For details on configuration see Chapter 3.

2.8.1 Analog Input

The Analog Demand Configuration section on the Input Configuration screen shows the configuration and scaling settings of the analog input to the DVP. The DVP’s analog input can be turned off or configured to accept either a current signal in the range of 4–20 mA or a voltage signal in the range of 0–5 V.

These indicators show the analog input mode and the actual set position in percent of position (%) resulting from the currently active analog input configuration. The origin of this percent value can be either a current (4–20 mA) or a voltage (0–5 V) depending on the input configuration.

Additionally, the Analog Position Demand section includes High and Low Input warnings with the indication of function shutdown as operational (green) or inoperable (red).

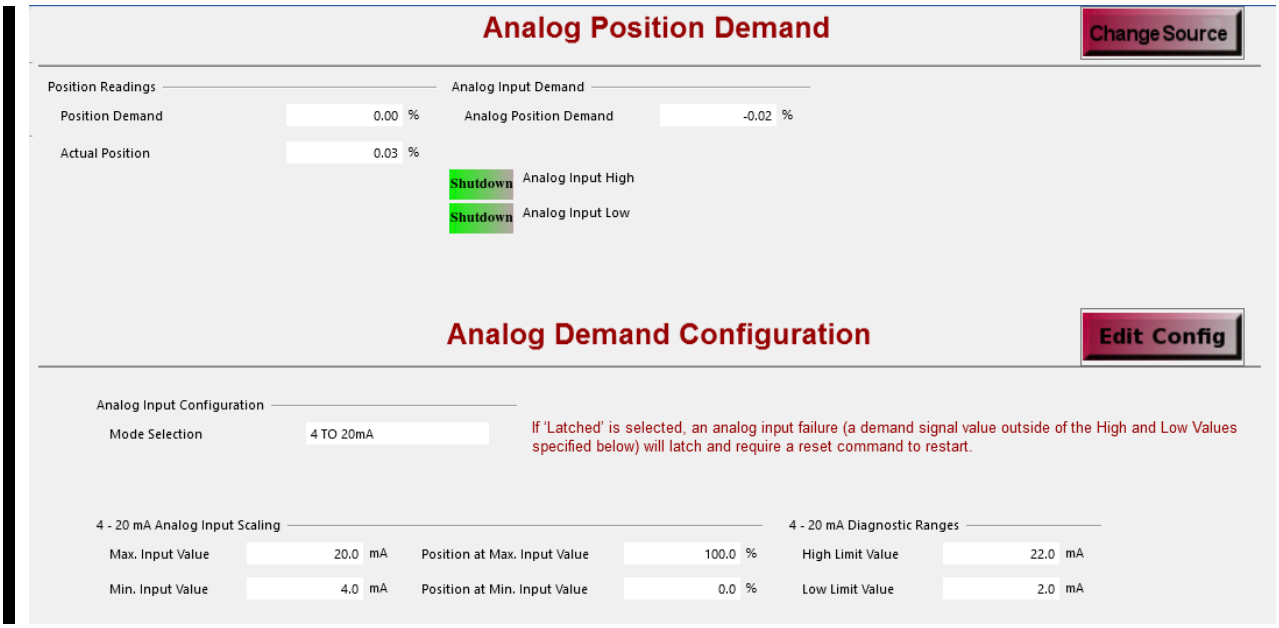


Figure 2-15. Input Configuration – Analog Input

2.8.2 Manual Position

Internally generated setpoint, (user-configurable from the Manual Operation page). No configuration options are available in Manual and the quick button on the lower right hand corner when pressed will redirect you to the Manual Operation page of the Service Tool. Position Demand and Actual Position readings are available on this page.

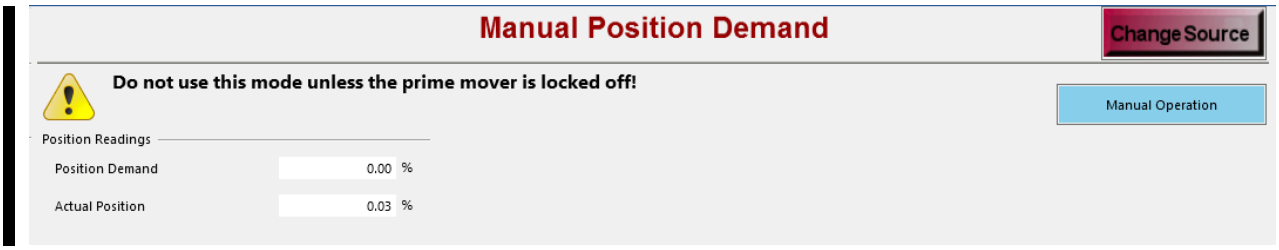


Figure 2-16. Input Configuration – Manual Demand

2.8.3 PWM Input

The PWM input frequency and the PWM input duty cycle are shown in hertz (Hz) and percent (%) respectively. Additionally, diagnostics for duty cycle and frequency are displayed. Red indicates active and green indicates inactive.

The Configuration section displays the configuration settings for this input. For details on these settings refer to Chapter 3.

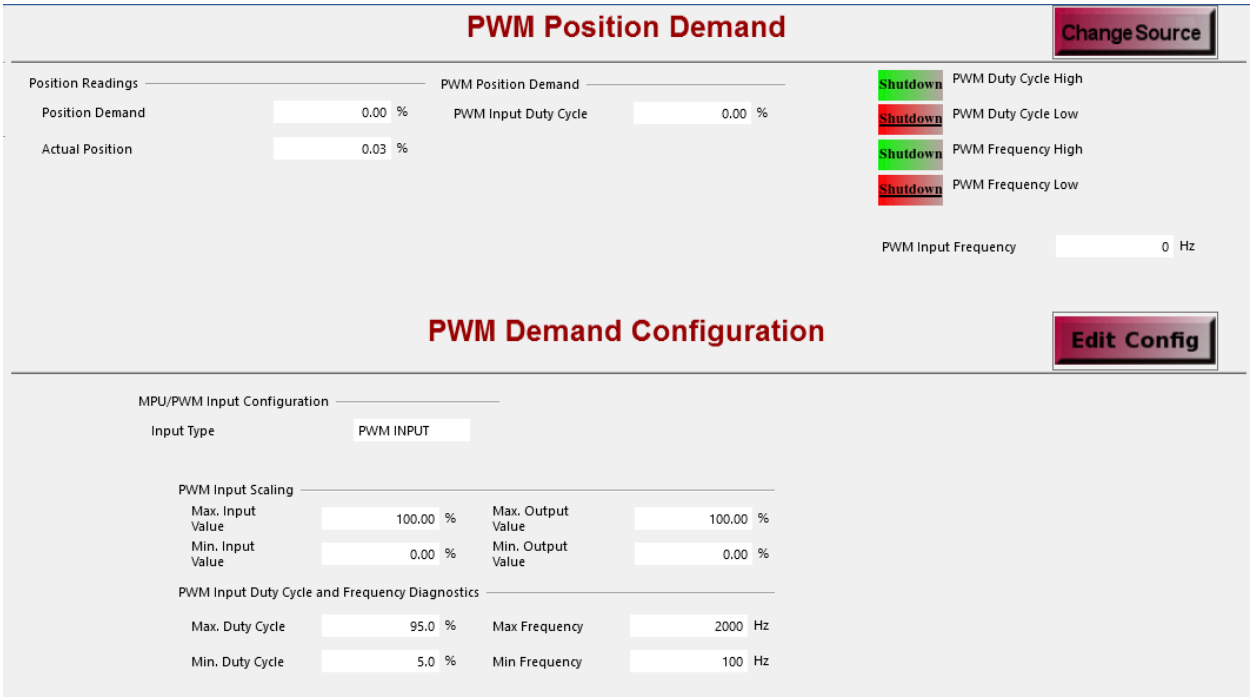


Figure 2-17. Input Configuration – PWM Input

2.8.3.1 CANopen Input

CANopen is a non-proprietary CAN-based command protocol (CAN = “Controller Area Networking”). These protocol controllers are referred to as “NMT” devices, controlled devices, and DVP units. CANopen, then, conforms to a traditional Master/Slave hierarchy.

The NMT devices send a variety of message types, including:

- **Command Requests**—Execute shutdown, change a parameter’s settings
- **SYNCs**—Execute the last received command
- **Informational Requests**—Request current operational values (e.g., position)
- **Metadata Requests**—Request DVP device characteristics (e.g., serial#)

Every DVP device must have assigned a set of CANopen “node IDs”, one for the primary CAN port (CAN Port #1) and another for the secondary CAN port (CAN Port #2). Traditionally, primary ports are assigned odd values (1, 3, 5, 7...), while secondary ports are set to even values (2, 4, 6, 8...). However, any numbering assignment methodology is valid.

DVP node IDs can be set for the specific unit, or the CAN HW ID mode can be used to select a pre-configured CANopen mode and node IDs based on the Discrete Input values captured upon DVP power-up. More details on the settings are described in CANopen section of Chapter 3.

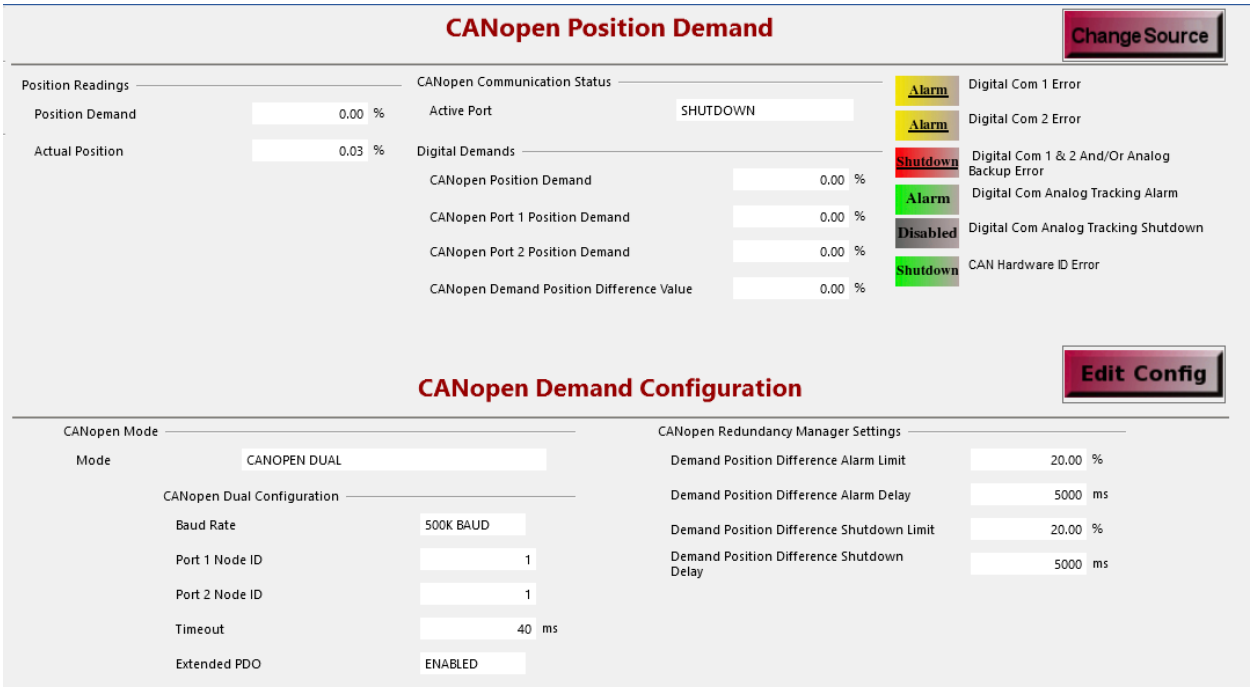


Figure 2-18a. Input Configuration - CANopen Input, Node Address by Unit

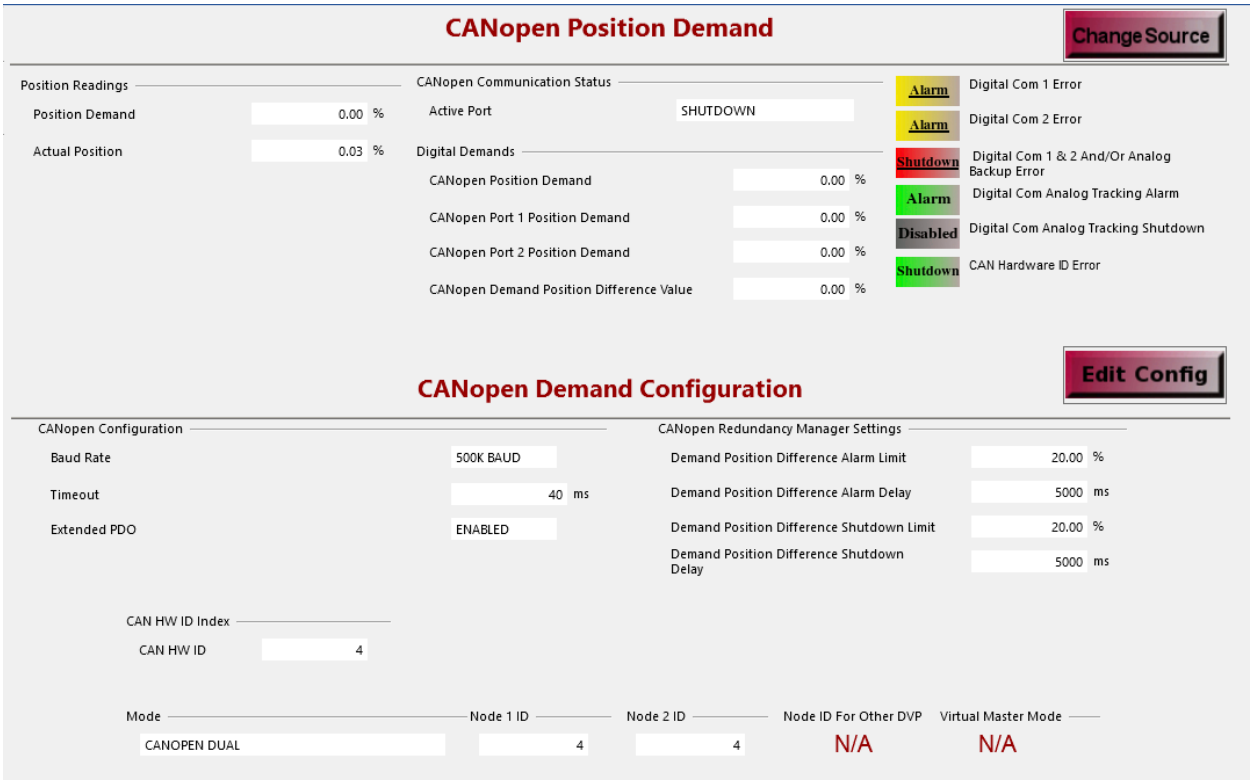


Figure 2-18b. Input Configuration - CANopen Input, Node Address by CAN HW ID

Redundancy: In the “Single CANopen with Analog Backup”, the DVP performs in the normal fashion: Demand position is specified by a single CANopen NMT controller source, and an analog input is optional as a backup.

The DVP (Digital Valve Positioner) is capable of operating with two separate CANopen NMT controller sources simultaneously (i.e., one attached to primary CAN Port #1 and the other to secondary CAN Port

#2). This is referred to as the “Dual” redundancy mode. The most common wiring arrangement is to wire separate CANbus networks. One CANbus can be attached to CAN Port #1 and the other to Port #2. This provides redundant control paths and redundant controllers.

In addition, there will be different CAN ID (node) numbers for each port. A typical operator assignment would be an odd number for the primary CAN port (Port #1) and an even value for the secondary CAN port (Port #2).

Dual redundancy mode operates in one of the following three scenarios:

Scenario 1: CAN Port #1 Operational:

In this default (“start-up”) scenario, the DVP’s demand position is acquired from the Fast Message Requests of the primary CANbus network (i.e., from the NMT controller attached to CAN Port #1). CAN messages are still being processed on the secondary CANbus as well but in a “read only” mode (demand positions and all other specified operating values are ignored).

IMPORTANT

It is possible for CAN Port #2 (secondary) operations to fail and remain in this scenario. A “CANopen Digital Communication Alarm” signals the failure of the “backup” CAN path for Port #2.

Scenario 2: CAN Port #1 Fails, CAN Port #2 Operational:

If messages are not seen within an operator-specified timeout, the Dual redundancy algorithm in the DVP switches its attention to the secondary CANbus and then will subsequently accept new demand positions from this “backup” CANopen network. No operator intervention is required for this command source failover.

Failover to this scenario would be caused by primary NMT controller failure or a primary wiring infrastructure failure.

IMPORTANT

If CANopen communications is once again viable later in this scenario, the DVP will <u>not</u> automatically fall back to Scenario 1. The operator must clear the “CANopen Digital Communication Alarm” for Port #1 before re-entering Scenario #1.

Scenario 3: Both CAN Port #1 and #2 Fail

If both CANopen communication paths have been lost, the failure is flagged with a communication shutdown. If, subsequently, the digital communication shutdown can be cleared via a reset command (messages are once again available on CAN Port #1 or #2), the DVP may enter either Scenario 1 or 2, depending on the available CAN paths.

The CANopen Input Configuration of the Setpoint Source selection details screen shows the configuration settings for the CANopen Digital Input of the DVP. The DVP’s CANopen Input can be turned off or configured in either single (non-redundant) CANopen or redundant CANopen mode (with an optional backup from the DVP Analog Input).

These indicators indicate the CANopen Mode (Single CANopen with or without Analog Backup, Dual CANopen or CANopen Virtual), the active port, and Set Position value shown in percent position (%). There are also colored indicators showing status and error messages as applicable.

2.8.3.2 CANopen Redundancy Manager Settings/Status

CANopen Redundancy Manager Settings

This section shows the parameter settings of the CANopen Redundancy Manager. The CANopen Redundancy Manager compares the two CANopen Position Demands on the two available CAN channels and checks the difference between them. If the difference between those two position demands is bigger than the specified limit, an alarm or shutdown command will be issued. The difference must be presented for longer than the time specified in the parameter settings for the fault condition to be detected by the

Redundancy Manager. The Redundancy Manager is used in CANopen single mode between CAN port 1 and Analog.

CANopen Redundancy Manager Status

This section shows the status of the CANopen Redundancy Manager. The real-time difference value between the two CAN position demands is shown as well as any annunciated alarm and/or shutdown condition.

2.8.3.3 CANopen Demand Configuration

The settings for CANopen are displayed in this section. The CANopen settings can be modified using the “Edit Config”. Details on the settings are described in CANopen section of Chapter 3.

2.8.4 Function Generator

This page contains a trend chart which may be adjusted by clicking the Properties hyperlink and the configuration panel which may be adjusted by selecting the “Edit Config” button. The function buttons at the top/left of the chart control the trend chart operation.

The Function Generator feature is an internal method for generating Set Position values to operate the system. This can be useful for exercising the system or for troubleshooting, and it allows controlling the unit without the need for an external Position Demand source.

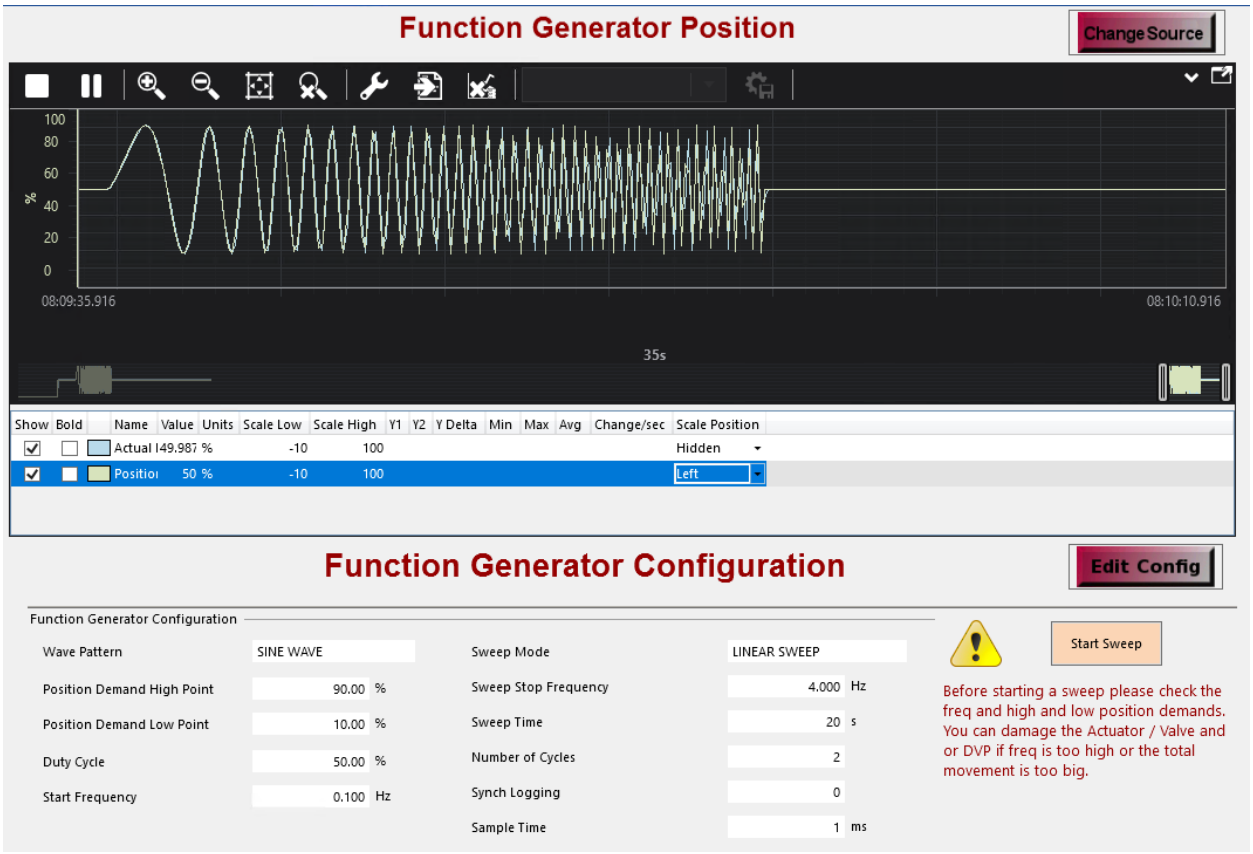


Figure 2-19. Input Configuration Function Generator

NOTICE

DUTY CYCLE

The DVP is rated for full capability as stated in the specifications for 30 seconds and a cooling duration of 120 seconds. This cycle can be repeated if necessary. Although Woodward sizes the actuation system (valve/actuator/DVP) to ensure there is enough margin for the most critical application requirement, in a lab setting, the DVP can be over-driven if care is not taken to observe the operational duty cycle limits. Please refer to the DVP hardware manual for further information on duty cycle limits.

2.8.4.1 Function Generator Trending Properties

After clicking on the Properties hyperlink, the Trending Properties window opens with several ways to modify the information displayed on the trend chart.

- Time Span may be overwritten, and the time increments may be selected from the drop-down menu.
- Sample Rate may be overwritten by the desired number of milliseconds.
- Plotting Style may be either Strip Chart or Oscilloscope by selecting the button to the left of the selection.
- Plot properties contains:
  - A list of plots with a color code that correlates with the plot lines displayed on the trend chart.
  - The Name of the plot
  - The name of the Label
  - Linear Interpolation, Show, and Show Samples options which are selected/deselected by checking and unchecking the box next to the item.
  - Color gives you the ability to change the color of the selected plot.
  - Scale can be automatic when the Auto Scale box is checked, or the values overwritten when unchecked.
  - Data Logging allows you to name the file which you are recording for future review and disposition.
  - Clear button deselects the highlighted plot and removes any text from the File name window.

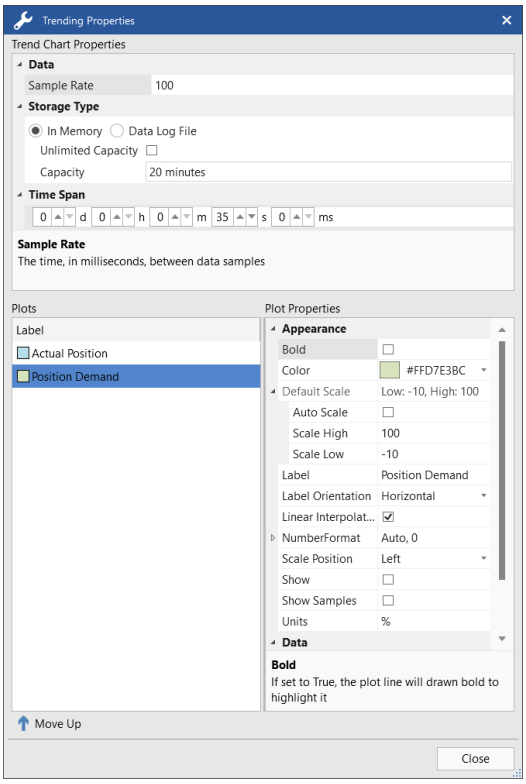


Figure 2-20. Function Generator Trending Properties

2.8.4 2 Function Generator Configuration

The function generator settings can be modified by selecting the Edit Config button. Details on the settings are described in Function Generator section of Chapter 3.

2.8.5 EGD Digital Input

These indicators display the EGD Input configuration. Depending on the EGD configuration (single channel, dual redundant or triple redundant), the Channel #In Control indicator will display the EGD channel currently serving as the source of the input signal. For triple redundant systems, the median value is used and a value of four is displayed. For dual redundant systems, the actual channel in control will be displayed. The actual set position value resulting from the digital EGD input is shown in percent position (%).

Note: If you have a requirement for this mode, contact Woodward for instructions. This information is not contained within this manual.

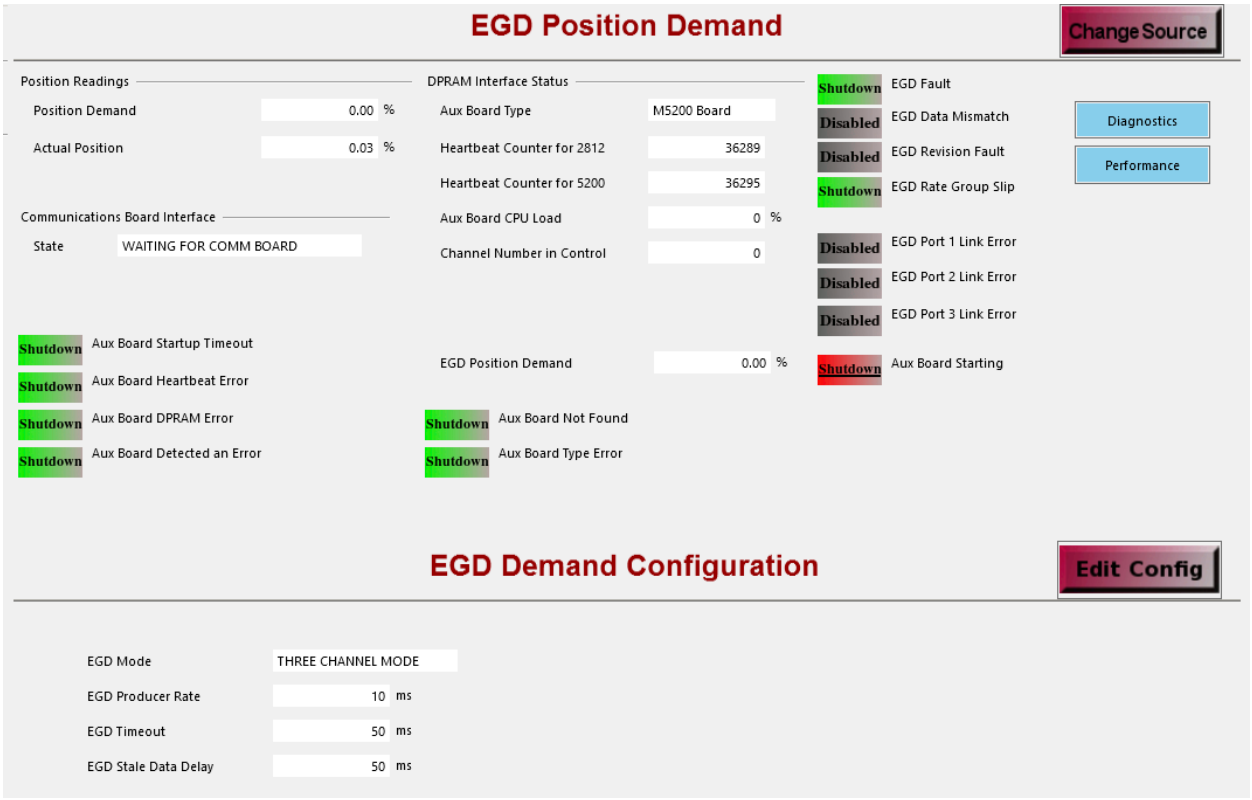


Figure 2-21. Input Configuration – EGD Input

Part of the DVP's board stack is an auxiliary board (communication Board Interface) mainly used to provide an additional setpoint source over Ethernet in the form of the EGD (Ethernet Global Data) protocol. The Communication board interface Configuration of the Setpoint Source selection details screen shows the configuration status for the communication board.

Communication Board Interface

The current state of the Auxiliary Board is shown in this group. If the DVP is configured to use EGD Digital Input as the setpoint source, this indicator will show when the communication board has started VxWorks operating system and the application is running. It may take up to 2 minutes for the operating system to start up.

DP RAM Interface Status

The auxiliary board type and heartbeat values passed between the DVP communication and control board are displayed. If an incompatible auxiliary board is detected a diagnostic fault will be annunciated. The heartbeat is used to ensure that the control processor and the communication processor are in synch

with each other. If the heartbeat values do not continue to increment, a diagnostic fault will be annunciated.

Aux Board Errors

This group of diagnostics is associated with the auxiliary board The LED faults indicate communication or synchronization problems between the auxiliary board and the control modules within the DVP. The presence of any of these faults indicates a serious problem within the DVP. Refer to the trouble shooting section of the manual for more information on any of these faults and appropriate action.

2.8.6 Servo Analog Input

Servo module input signals, output signals, status indications, and diagnostic indications are displayed on the upper portion of the screen. The lower section displays the configuration setting values for this mode.

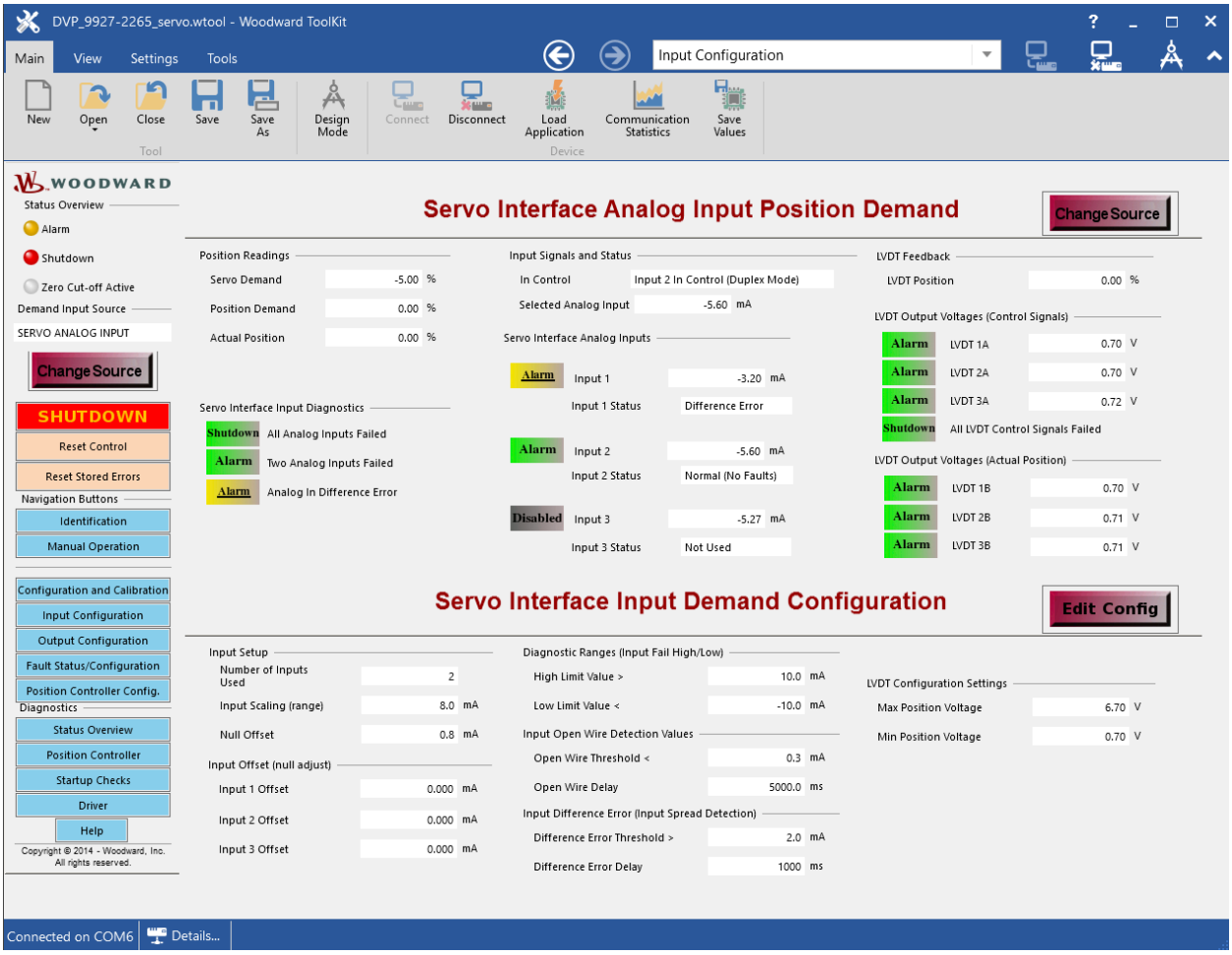


Figure 2-22. Input Configuration – Servo Analog Input

Position Readings
Servo Demand – set position generated by the servo analog inputs, in percent.
Position Demand – final set position to the valve after filtering, in percent.
Actual Position – indicates actual position of the valve, in percent.

Input Signals and Status
In Control – signal selection indicator that provides number of inputs used, mode (triplex, duplex, simplex), and selected input. An input is considered not good if it is failed high, failed low, failed open, or not used.

Table 2-1. Servo Demand In Control Indications

All Inputs Failed	
Input 1 in control (triplex mode)	indicates 3 good inputs, #1 is in control
Input 2 in control (triplex mode)	indicates 3 good inputs, #2 is in control
Input 3 in control (triplex mode)	indicates 3 good inputs, #3 is in control
Input 1 in control (duplex mode)	indicates 2 good inputs, #1 is in control
Input 2 in control (duplex mode)	indicates 2 good inputs, #2 is in control
Input 3 in control (duplex mode)	indicates 2 good inputs, #3 is in control
Input 1 in control (simplex mode)	indicates input #1 is the only good input
Input 2 in control (simplex mode)	indicates input #2 is the only good input
Input 3 in control (simplex mode)	indicates input #3 is the only good input

Selected Analog Input – indicates the mA value of the selected analog input. In triplex mode the median signal is used. In duplex mode the highest absolute value is selected (magnitude). In simplex mode the only remaining good signal is used. When all inputs are failed a value of zero mA is used and the "all inputs failed" diagnostic flag is set.

Servo Interface Analog Inputs
Input 1/2/3 – indicates the mA value of each input.
Input 1/2/3 Status – status indication for each input.

Indications include:
Normal (No Faults) – indicates no faults detected.
Not Used – indicates not configured for use based on Input Mode setting.
Failed High – indicates high threshold exceeded.
Failed Low – indicates low threshold exceeded.
Failed Open – indicates open circuit, zero mA and not moving.
Difference Error – indicates inputs not tracking each other within threshold setpt.

Diagnostic indication - displays "Disabled" when the input is not used, "Alarm" (green) when no faults are detected, "Alarm" (yellow) when a fault is detected on the input (high, low, open, or difference error).

Servo Interface Input Diagnostics
All Inputs Failed – provides an indication that there are no valid input signals (all failed).
Two Inputs Failed – provides an indication that two of three inputs are failed. Only valid when three inputs are used.
Input Difference Error – provides an indication that the inputs are not tracking each other within the configured limits.

LVDT Feedback
LVDT Position – position indication, in percent, used to generate the LVDT control signal outputs.

LVDT Output Voltages (Control Signals)
LVDT 1/2/3 A – indicates voltage of each control signal output, in Vrms. The commanded signal is "LVDT Position" value and scaling is determined by the Min and Max Position Voltage configuration settings.

LVDT Output Voltages (Actual Position)
LVDT 1/2/3 B – indicates voltage of each actual position output, in Vrms. The commanded signal is "Actual Position", and scaling is determined by the Min and Max Position Voltage configuration settings.

LVDT Output Diagnostic indication - displays "Alarm" (green) when no faults are detected or "Alarm" (yellow) when a fault is detected on the output (measured voltage not tracking commanded voltage).

All LVDT Control Signals Failed indication - displays "Alarm" (green) when no faults are detected or "Shutdown" (red) when all used control LVDT outputs are failed. For instance, if the number of inputs used is set to 2, then this fault is set if LVDT 1A and 2A are both failed.

Edit Config
The settings can be modified using the "Edit Config". Details on the settings are described in the Setpoint Source Configuration section of Chapter 3.

Servo Feedback Calibration mode

A warning is indicated on the dashboard if the servo feedback calibration mode is enabled. See figure 2-23. For instructions on use of this calibration mode see “Feedback Calibration” in Chapter 3.

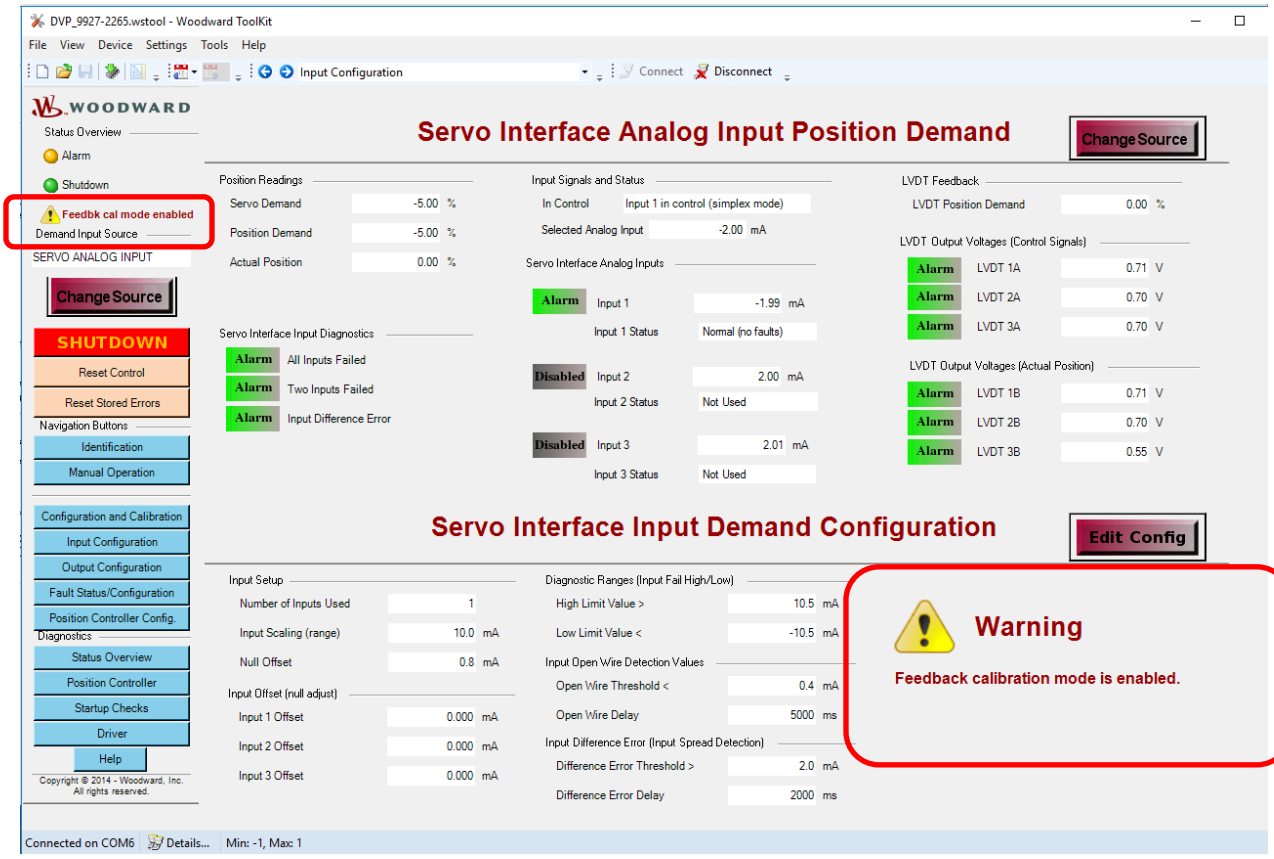


Figure 2-23. Servo Feedback Calibration Mode Indications

2.9 EGD Diagnostics

This page is only displayed when EGD position demand is configured. The EGD Digital Input receives its setpoint over up to three simultaneous Ethernet connections. These connections are physically connected to the EGD Layer 2 (L2) Switch on the Auxiliary Board of the DVP. Each of the three connections has its dedicated Ethernet port on the switch. The status and performance metrics of these Ethernet connections can be monitored using the EGD Diagnostics screen.

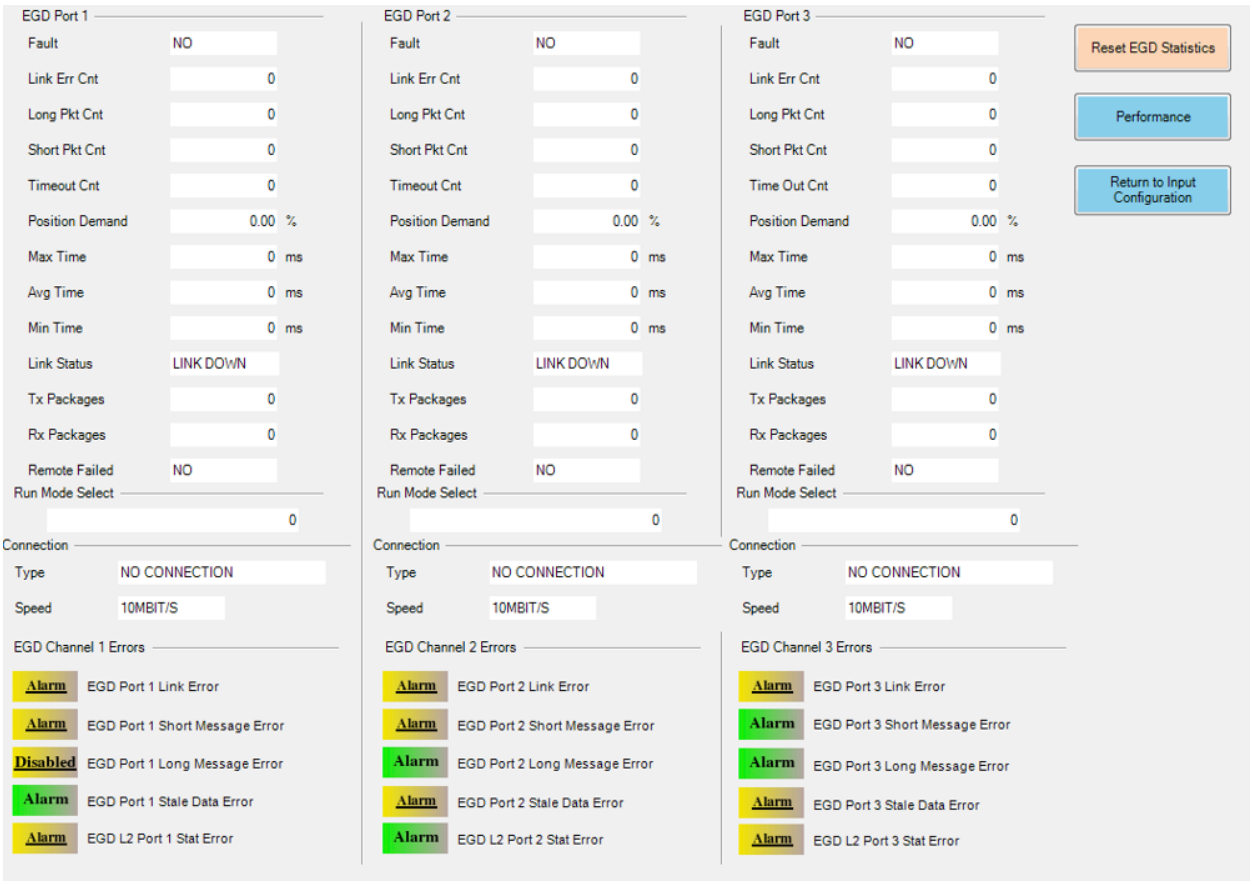


Figure 2-24. EGD Diagnostics

The status and performance metrics for each channel include for example connection type, connection speed or the number of received packages (Rx Packages) and transmitted packages (Tx Packages). Faults on the EGD L2 Switch Ports are annunciated for each individual port by LED indicators at the bottom of each settings group.

Refer to DVP manual (26329 or 26773) Chapter 2, Ethernet Communication Ports, for more detailed information and technical specifications.

EGD Port 1/2/3

This section shows summary statistics regarding the time interval between received messages in milliseconds (ms), the number of long or short EGD messages received, the current position setpoint from each link in percent position (%), and the run/shutdown mode from each link.

Port 1/2/3 Fault Indicators

A group of diagnostic LED indicators monitoring the EGD link status are displayed in the lower half of each port section. Error case for each individual channel is explained in the following table:

Table 2-2. EGD Errors

Error Case	Description
Link Error	A link error is detected when the time between valid incoming EGD packets exceeds the link error timeout setting for that specific channel. This check verifies that the individual EGD channels are receiving packets.
Short Message Error	A short message is detected when the length (measured in bytes) of the data in the incoming EGD packet is less than what is expected by the EGD consumer. This error indicates that there is either a data transmission problem or more commonly an error in the EGD data definition between the consumer and the producer.
Long Message Error	A long message is detected when the length (measured in bytes) of the data in the incoming EGD packet is more than what is expected by the EGD consumer. This error indicates that there is either a data transmission problem or more commonly an error in the EGD data definition between the consumer and the producer.
Stale Data Error	A stale data error is detected when the application level heart beat variable has not changed in a time period greater than the stale data delay time. This error indicates that the data from the producer is not being updated (stale) in the EGD packet.

Reset EGD Statistics

Use this button to reset the EGD statistics displayed on this screen.

2.10 EGD Performance

This page is only displayed when EGD position demand is configured, providing histogram buckets of channel spread data for monitoring purposes. Additional information is displayed including elapsed time, CPU load, channel number in control, and interface revisions.

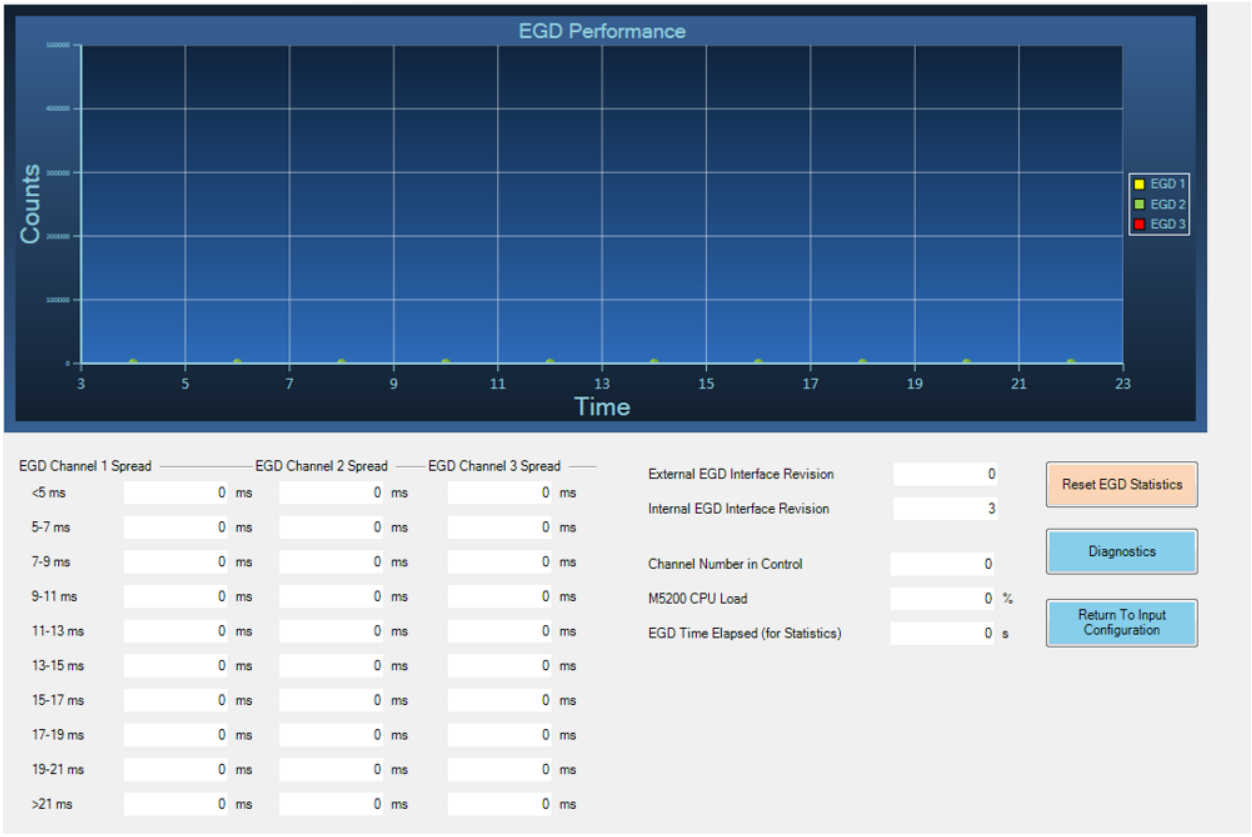


Figure 2-25. EGD Performance

Reset EGD Statistics

Use this button to reset the EGD statistics displayed on this screen.

2.11 Output Configuration

Status information on the DVP's analog and digital output section can be derived from the Output Configuration screen. Three text indicators show the currently active outputs and to which mode they have been configured. For details on the configuration settings refer to Chapter 3.

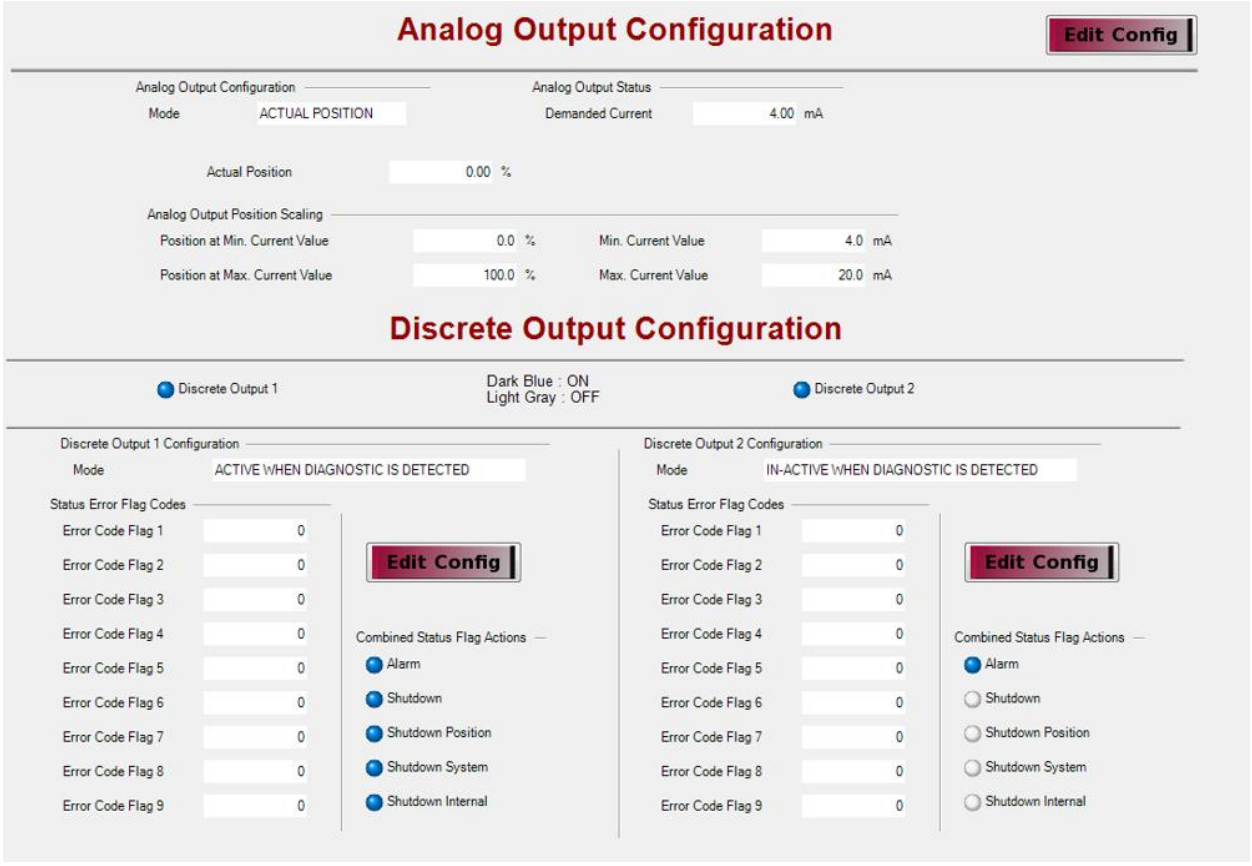


Figure 2-26. Service Tool Output Configuration

2.11.1 Analog Output

Analog output mode configuration displays the mode which produces the output and the amount of demand current in analog output status. A position, current or speed value can be configured to result in a 4–20 mA current signal on the Analog Output. The DVP's analog output can be either turned off or configured to one of the following output modes:

Table 2-3. Analog Output Modes

Analog Output Mode	Function
Turned Off	None
Actual Position	Convert Actual Position to Output current signal.
Echo Setpoint	Convert Position Setpoint to Output current signal.
Motor Current	Convert Motor Current to Output current signal.

Analog Output Configuration / Analog Output Status

The Mode Selection displays the active mode of operation for the analog output. The Current Reading indicator displays the output current derived from the output signal source depending on the configuration setting of the analog output mode.

Analog Output Position Scaling

This group displays the scaling settings used to convert the position feedback values to a current on the analog output. The position scaling values are displayed in percent of position (%), the output current in milliamps (mA).

Analog Output Motor Current Scaling

This group displays the scaling settings used to convert the position feedback values to a proportional current on the analog output. The motor current values are displayed in Amps (A), the output current in milliamps (mA).

2.11.2 Discrete Output 1 Configuration

The configuration settings of the DVP's two discrete outputs are shown on the Discrete Outputs Configuration screen.

2.11.3 Discrete Output 1 and 2 Configuration

This indicator shows the configuration for discrete output mode for discrete output 1 and 2 respectively. The discrete outputs can be either turned off or set to two different modes of operation: active when diagnostic is detected or inactive when diagnostic is detected.

Discrete output 1 and 2 mode configuration has an indicator light which shows the on/off status in addition to the Mode window with the status spelled out. You may change the configuration by selecting the Edit Config button.

Status Error Flag Codes

This group shows which process fault and status flags are configured to trigger the discrete outputs. The error code represents which bits have to be set in the status flag word to trigger the discrete output according to its configuration (active or inactive).

Combined Status Flag Actions

This group of LED indicators shows the combined status flag actions for the discrete outputs. This indicates whether the discrete outputs will be triggered from a combined status flag action. For example, if Alarm is selected in the discrete output will be triggered whenever the DVP reports an Alarm. The flags configuration as well as the combined flag actions can be modified using the DVP Settings Editor.

Refer to Chapter 3, DVP Configuration, for more information.

2.12 Fault Status & Configuration Overview

The Process Fault Status screen gives an overview of the entire range of process fault and status flags and their individual status. If a process fault or status flag is active, the red indicator next to the flag descriptor is illuminated. If the indicator is not illuminated, the process fault or status flag is not active.

> **Note**: The collection of indicators can change depending on what is appropriate for that specific valve/actuator.

Figure 2-27. Process Fault & Status Overview

2.12.1 Diagnostic Indicators

The diagnostic flags are grouped according to their function. Detailed descriptions of the detection methodology and recommended actions can be found in the Troubleshooting Section of the appropriate DVP manual (26773 or 26329 or 35185). The indicators displayed will vary with application, valve/actuator, and configuration settings.

Diagnostic faults have different actions depending on the application and configuration. The illuminated status text for each diagnostic indicates the action taken when the condition is active (e.g., alarm or shutdown). When the condition is not active the status is green. When the condition is active the status text is underlined and the indicator changes color, red for shutdown or yellow for alarm. The table below summarizes these indicators.

Table 2-4. Diagnostic Status Indicators

	Inactive	Active	Description of active state
Alarm Diagnostic	Alarm	Alarm	Enunciated but no affect on control behavior
Shutdown Diagnostic	Shutdown	Shutdown	Enunciated with shutdown of device
Disabled	Disabled	Disabled	No enunciation, no affect on control behavior

IMPORTANT

Refer to the Troubleshooting chapter of the DVP hardware manual 26329 or 26773 or 35185 as applicable for information on detection and resolution of diagnostic faults.

2.12.2 Buttons

Selecting the blue “Internal DVP Fault Status” button will open the Fault Status and Configuration Overview Internals page.

Selecting the “Edit Config” button will open the “Process Fault and Status Flag Configuration” window. Refer to “Fault Status and Configuration Overview” section in Chapter 3 for details on this window.

⚠WARNING

Modification of these settings could affect operation and plant diagnostics annunciation.

Disabling diagnostic flags or changing their function from Shutdown to Alarm could result in a dangerous condition.

It is recommended that you make an appropriate review of the settings PRIOR to making these modifications.

The configuration of the user-configurable flags is done with the DVP Service Tool settings editor. See Chapter 3, DVP Configuration, for more information on this topic.

2.13 Fault Status & Configuration Overview Internals

This Process Fault Status screen gives an overview of the internal process fault and status flags and their individual status. If a process fault or status flag is active, the red indicator next to the flag descriptor is illuminated. If the green next to the flag descriptor is illuminated, the process fault or status flag is not active. If the green indicator titled ”Alarm” is illuminated, then the condition is nominal. If the red indicator titled “Alarm” is illuminated, then the condition is outside of nominal operations and some action may be warranted.

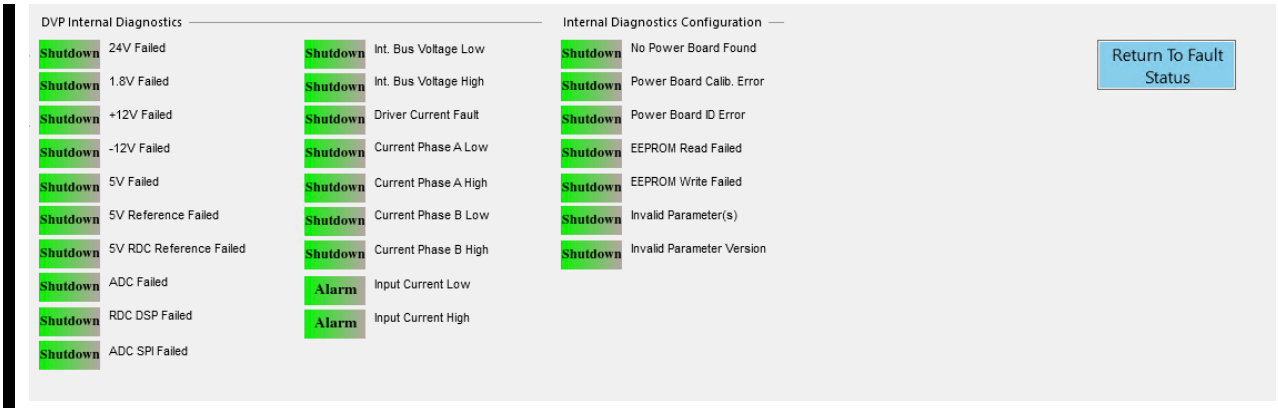


Figure 2-28. Fault Status & Configuration Overview Internals

The blue “Return To Fault Status" button opens the Fault Status and Configuration Overview’ page.

2.14 Stored Errors Overview

This Stored Errors Overview screen provides an indication of diagnostics that have occurred since the last “Reset Stored Errors” command. If a diagnostic was logged, the indicator next to the flag descriptor is illuminated as blue. The indicator is grey if no occurrences have been detected. A “Reset Stored Errors” command will clear all stored faults that are no longer active.

Figure 2-29. Stored Errors Overview

2.15 Stored Errors Overview Internals

This Stored Errors Overview Internals screen provides an indication of internal diagnostics that have occurred since the last “Reset Stored Errors” command. If a diagnostic was logged, the indicator next to the flag descriptor is illuminated as blue. The indicator is grey if no occurrences have been detected. A “Reset Stored Errors” command will clear all stored faults that are no longer active.

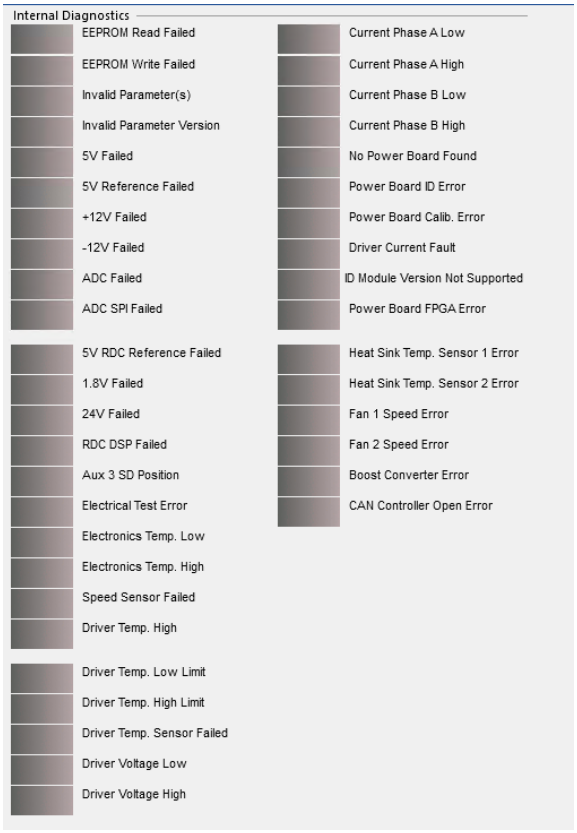


Figure 2-30. Stored Errors Overview Internals

2.16 Position Controller Configuration

The Position Controller Configuration page indicates the general operational setup. The configuration edit options are described in Chapter 3. For actual operation data, refer to the “Position Controller” page later in this section.

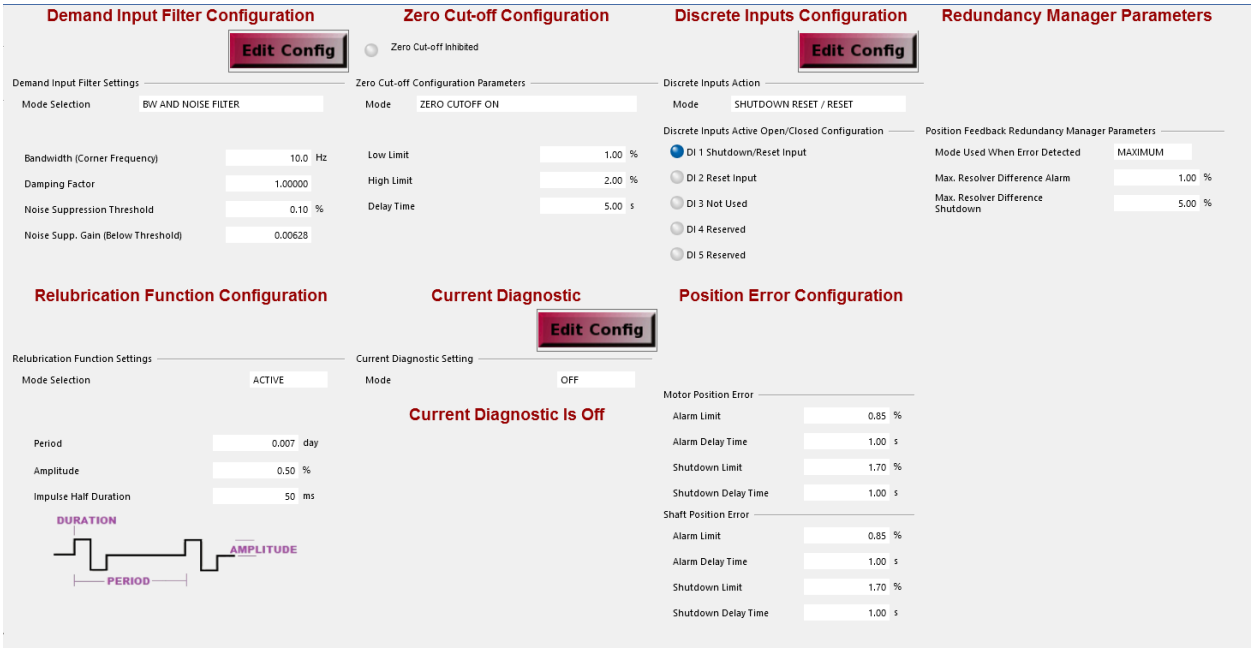


Figure 2-31. Position Controller Configuration

2.16.1 Demand Input Filter Settings

Mode Selection

The mode selection dropdown allows multiple options for input filter configurations. The selected configuration is then displayed in the Mode Selection window of the Position Controller Configuration page.

These input settings allow the user to tune the response of the system to the Position Demand signal, and the Slew Rate allows limiting the maximum rate of travel of the valve or actuator. Each feature is described below.

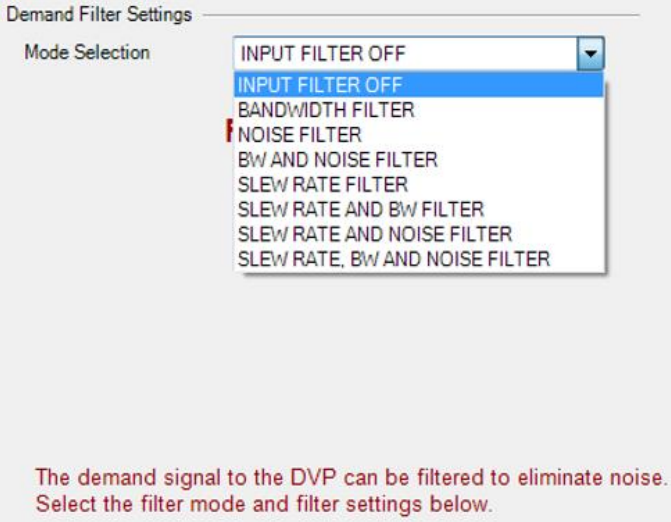


Figure 2-32. Demand Input Filter Configuration

Bandwidth Filter

The bandwidth filter consists of a corner frequency setting and a damping factor. The unit for the bandwidth of the filter is hertz (Hz). Note: This will not affect the bandwidth of the controller but will change the bandwidth of the input signal. Damping factor is a unit-less value but may be adjusted as needed.

Noise Filter

The filter can be set to reduce input signal noise, i.e., from the magnetic pick-up signal variation. The Noise Suppression Threshold is shown in percent of position (%) and noise suppression gain is displayed unit-less values but may be adjusted as needed.

Slew Rate Filter

The filter is displayed in percentage per second and user adjusted filter which limits the maximum rate of change.

> **Note:** The Slew Rate parameter controls the slew rate for Dual DVP in the “slow” operation mode independent of the mode being active.

Edit Config

The settings can be modified using the “Edit Config”. Details on the settings are described in Setpoint Source Modifications section of Chapter 3.

2.16.2 Zero Cut-off Configuration

The Zero Cut-off Function disables position control of the motor, and closing of the valve is achieved by the return spring (traditional spring-only mode) or the return spring assisted by constant motor current (seating current mode programmed for some newer valve types). The DVP and valve remain active and functional, but removing position control to the motor prevents high frequency noise from wearing the motor gear teeth. This important feature reduces premature wear of the motor gear set when the valve is

idle in one position for extended periods. Typically, this mode of operation would be active when the engine is in a shutdown condition in standby. This mode is recommended for "peaking power" or "peak shaving" applications.

When the Zero Cut-off function is enabled, position control is disabled when the demand setpoint drops below the Low Limit setting and remains below this value for the indicated Zero Cut-off Time Delay. While in zero cut-off mode, the return spring (and possibly constant motor current, if enabled) applies the required force on the valve closure element to minimize seat leakage. When this mode is active, the Zero Cut-off Active LED found along the left panel of the screen is illuminated. With this proper closing force applied, there is virtually no variation of seat leakage over temperature. When the demand setpoint exceeds the Zero Cut-off High Limit setting, the valve resumes normal position control. There is no time delay when switching out of the Zero Cut-off mode.

Note: This feature is not user configurable for most factory-configured valves. This functionality is valve type specific.

IMPORTANT

The Zero Cut-off function is only intended to be used with spring returned valves with a hard seat.

IMPORTANT

In DVP firmware version 5418-8082/rev 6.11 and later the Zero Cut-off Inhibited status is added. When shown as active it indicates that Zero Cut-off is not supported for the valve type and will be treated as if the mode is disabled.

IMPORTANT

If the Zero Cut-off function is disabled on a spring returned valve, there may be noticeable variation in valve leakage at the 0% setpoint. This is a result of thermal expansion effects, which change effective loading on the seat when the device is in closed-loop position control at or near 0% setpoint.

The available settings are:

- **Mode (ZERO CUTOFF ON, ZERO CUTOFF OFF)** - The mode enables or disables the function.
  - A new mode has been added (**ZERO CUTOFF ON CURRENT CONTROLLED**) for use with some actuators. It is not recommended to enable this mode for manually configured valves.
- **Low Limit (units are in % Position)** - This limit sets the lower threshold to determine the activation of the function.
- **High Limit (units are in % Position)** - This limit sets the upper threshold to determine the deactivation of the function.
- **Delay Time (seconds)** - This setting determines the number in seconds required to elapse (after the Low Limit Crossing) before the function activates.

NOTE: The position demand and actual position feedback were both used to determine activation/deactivation of Zero Cut-off starting in DVP firmware version 5418-7030/rev 6.02. Currently, only position demand is being used beginning with DVP firmware version 5418-8082/rev 6.11 and later.

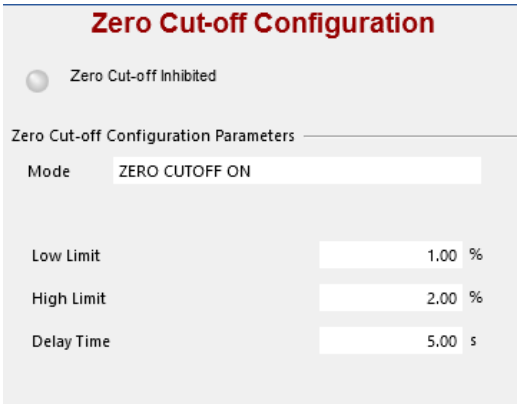


Figure 2-33a. Zero Cut-off Configuration Parameters, Traditional (Spring-only) Mode

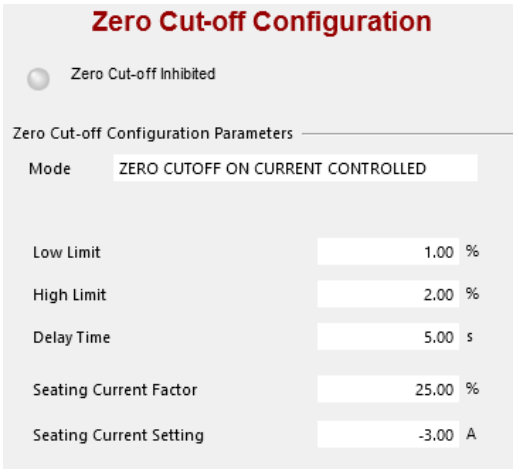


Figure 2-33b. Zero Cut-off Configuration Parameters, Current Controlled Mode

NOTICE

It is always highly recommended to keep the zero cut-off function active for spring returned valves to avoid motor gear wear issues. Excessive gear wear can result when the valve is actively controlling in one fixed position for long durations.

NOTICE

Woodward has provided default values that will likely meet most customer needs. It is recommended not to alter these values. If altering them is necessary, be sure that the operator understands the impact of the values entered to avoid unexpected operational characteristics.

When active, the Zero Cut-off Function illuminates the yellow “Zero Cut-off Active” LED.

Figure 2-34. Zero Cut-off Active/Inactive Indicators

The diagram below explains the criteria for activating the Zero Cut-off Function.

- The valve demand must be below the Low Limit Threshold for the duration of the delay time.
- The Zero Cut-off function will remain active until the demand crosses the upper limit.

- The orange dashed line “Valve Position Feedback” in the figure below represents the actual position of the valve.
- The valve will respond with zero delay when the cut-off deactivates.

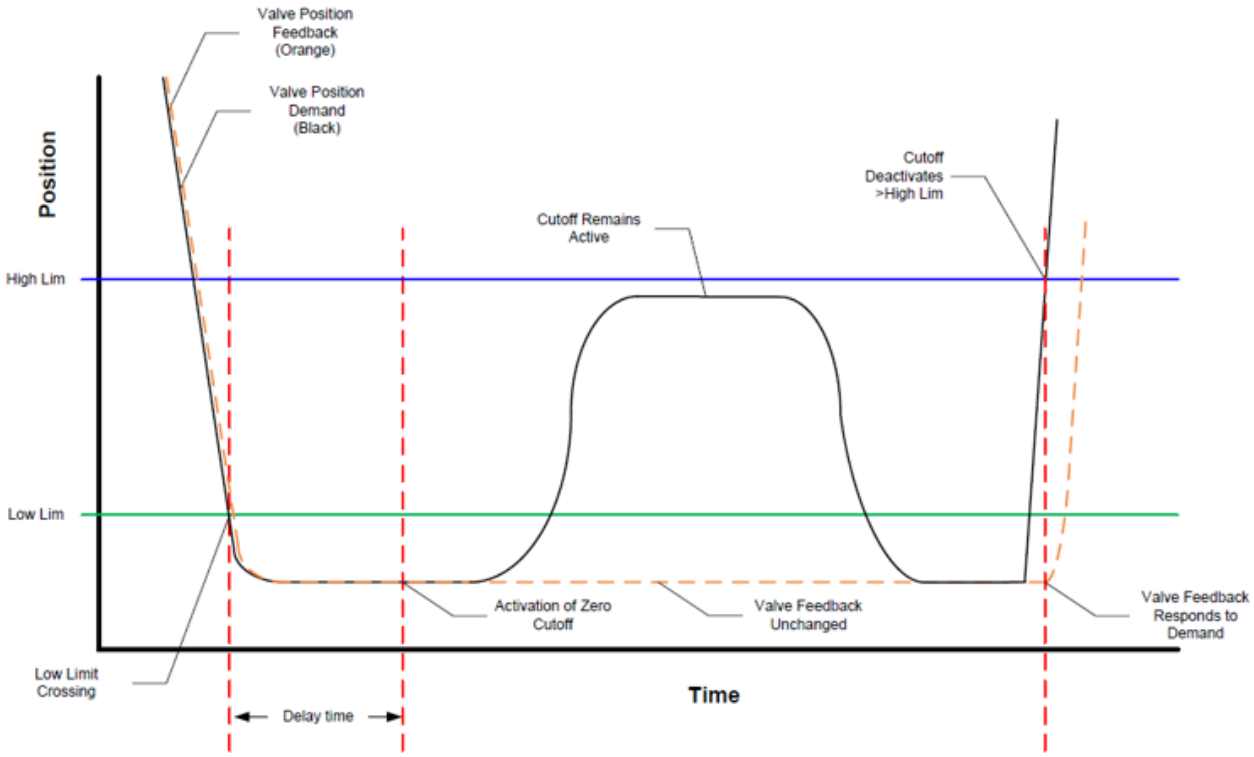


Figure 2-35. Zero Cut-off Timing Chart

**Timing chart is not to scale*

2.16.3 Discrete Inputs Configuration

This section displays the configuration of the discrete inputs.

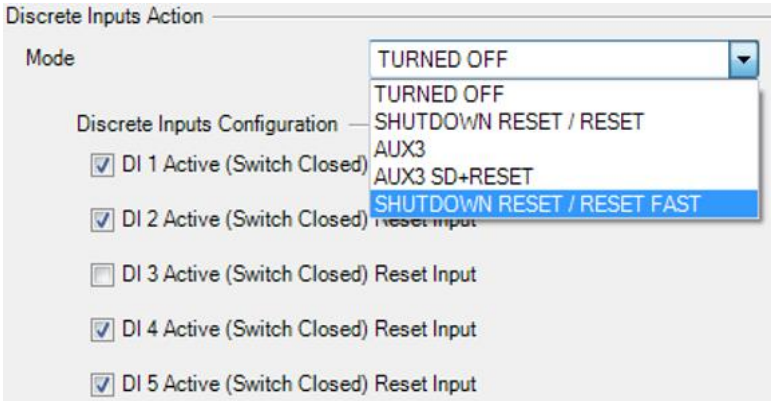


Figure 2-36. Discrete Inputs Configuration

2.16.3.1 Discrete Input (DI) Action Mode (inputs 1-3).

The functionality assigned to the discrete input is based on the configured action mode.

Table 2-5. Discrete Input (DI) Action Mode (Inputs 1-3)

Action	Discrete Input 1 Function	Discrete Input 2 Function	Discrete Input 3 Function
TURNED OFF	*(not used)*	*(not used)*	*(not used)*
SHUTDOWN RESET/RESET	Shutdown/Reset	Reset	*(not used)*
AUX3	*(not used)*	*(not used)*	Shutdown/Reset
AUX3 SD+RESET	Shutdown/Reset	Reset	Shutdown/Reset
SHUTDOWN RESET/RESET FAST	Shutdown/Reset	Reset	*(not used)*

2.16.3.2 Discrete Inputs Configuration (active open/closed)

The configured selection of active open (gray) or active closed (blue) is displayed for each discrete input.

Edit Config

The settings can be modified using the “Edit Config”. Details on the settings are described in Discrete Input Configuration section of Chapter 3.

2.16.4 Redundancy Manager Parameters

The position feedback redundancy manager provides full resolver redundancy in a dual resolver configuration with two valve stem resolvers. It manages the operation of the two valve stem resolvers and prevents a shutdown of the DVP in case of a fault on one of the resolvers by automatically switching to the second resolver. The state indicator in the Position Feedback Redundancy Manager group shows the current state of the Redundancy Manager.

One process fault scenario shows a difference between the position feedbacks of the two valve stem resolvers. In this case the redundancy manager can be set to either automatically use the maximum of these two available resolver feedback values, the minimum or the average of these values. As soon as the resolver difference value exceeds the alarm or shutdown limit, the appropriate action is taken by the control. The parameter settings of the redundancy manager for the difference error case are shown in the Pos. Feedback Redundancy Manager Parameters group.

Position Feedback Redundancy Manager Parameters are displays only and not configurable. They consist of Mode Used When Error Detected (a non-value display), Maximum Resolver Difference Alarm, and Maximum Resolver Difference Shutdown, the latter two displayed in percentages.

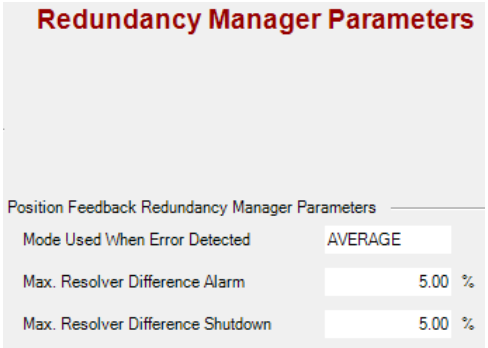


Figure 2-37. Position Feedback Redundancy Manager Parameters

Note: This feature is not user configurable. This functionality is valve type specific.

2.16.5 Relubrication Function Configuration

The Relubrication Function Mode is an advanced feature of the DVP that triggers a fast, small amplitude, symmetrically opposed position pulse which occurs a few times per day. The impulse is designed to redistribute the lubrication within the actuator, while the opposing symmetry of the pulse ensures there is

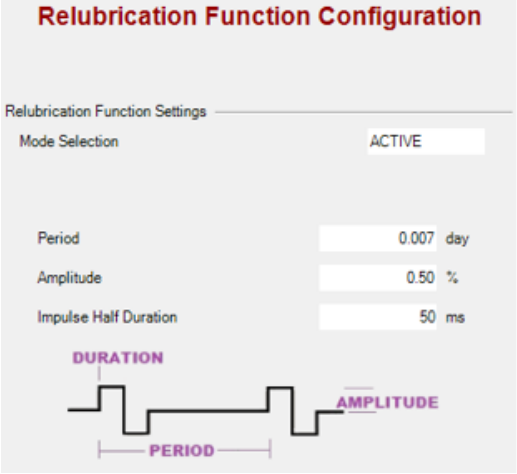
no net change in flow delivery to the machine. Redistribution of lubricant provided by the periodic pulse prevents fretting wear at various points within the actuator.

2.16.5.1 Non-ID Module Units

On first generation products such as the EM35/3103, EM35/3171, EML100/3151, and LQ25, the relubrication function is disabled as a default setting. Should the user want to utilize this re-lubrication function, the Position Impulse Amplitude, Impulse Half Duration, and Delay Period are configurable parameters. These can be modified using the DVP Service Tool settings editor and creation of a custom .wset file. If the function is activated by downloading the modified .wset file, the selected settings will be displayed on the Position Controller Configuration screen. Please contact Woodward for recommended settings for the products listed above.

2.16.5.2 ID Module Equipped Units

For products equipped with the ID module, the Relubrication Function configuration is read by the DVP when the actuator is first connected and powered up. The settings are defaulted to the factory recommended values appropriate for the controlled unit. If the relubrication function settings are modified by downloading the modified .wset file, it is important to note that if a new valve/actuator is installed, the DVP will revert to the default factory settings. Important: Please contact Woodward if more information is needed on the function, behavior, or potential impact of changing these product settings.



Period = (1/number of times per day) or fractions of a day.
Amplitude displayed in percentage of zero to 100%.
Impulse Half Duration displayed in milliseconds.

Figure 2-38. Relubrication Function Configuration

2.16.6 Current Diagnostic

When used, displays the limit and delay time for each diagnostic phase detection.

Mode – Off

With the current diagnostic drop down selected in the “OFF” position, there are no additional options available.

Mode – On

With the current diagnostic dropdown selected in the “ON” position, you may adjust the three limit settings of Limit and Delay Time to customize the results to your specific needs.

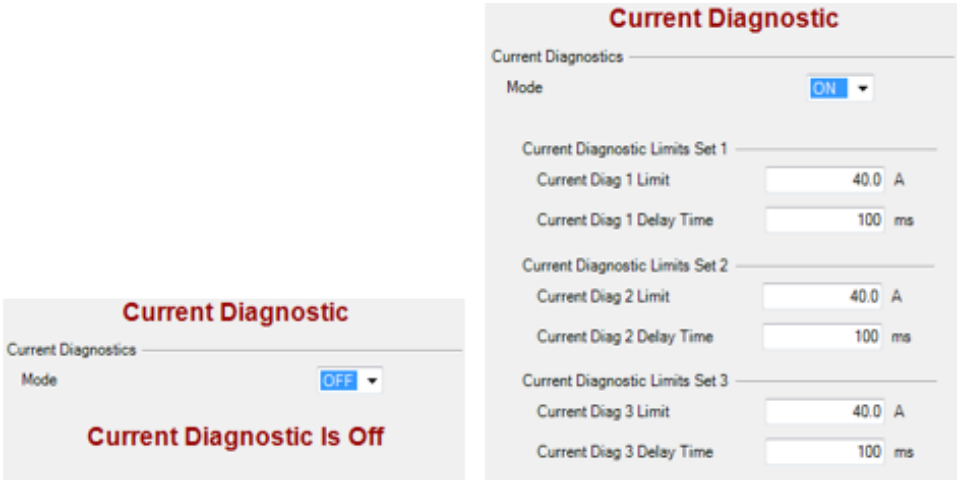


Figure 2-39. Current Diagnostic Configuration

Edit Config

The settings can be modified using the “Edit Config”. Details on the settings are described in Current Diagnostics section of Chapter 3.

2.16.7 Position Error Configuration

This functionality has two displays—Motor Position Error and Shaft Position Error.

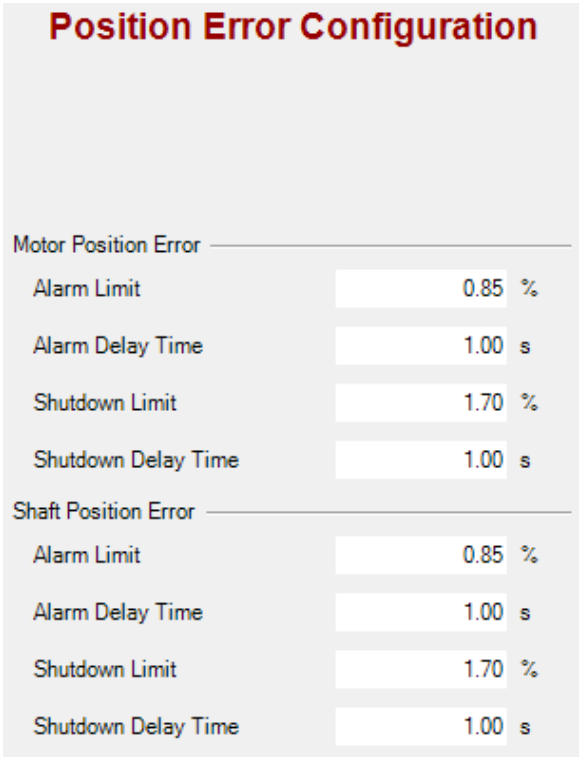


Figure 2-40. Position Error Configuration

Motor Position Error consists of the following:
- Alarm Limit displayed in percent
- Alarm Delay Time displayed in seconds
- Shutdown Limit displayed in percent
- Shutdown Delay Time displayed in seconds

Shaft Position Error consists of the following:
- Alarm Limit displayed in percent
- Alarm Delay Time displayed in seconds
- Shutdown Limit displayed in percent
- Shutdown Delay Time displayed in seconds

Note: These settings are not user configurable. This functionality is valve type specific.

2.17 Position Controller

The DVP Position Controller provides Motor and Actuator/Valve Position Readings, Position Sensor Diagnostics, and Position Error Diagnostics. Additionally, Motor Resolver Difference Diagnostics and Motor Position Control State are provided. The collection of indicators can change depending on what is appropriate for that specific valve/actuator. Use this screen to troubleshoot problems associated with operation of the motor control. The data displayed varies with the motor controller required for the valve/actuator.

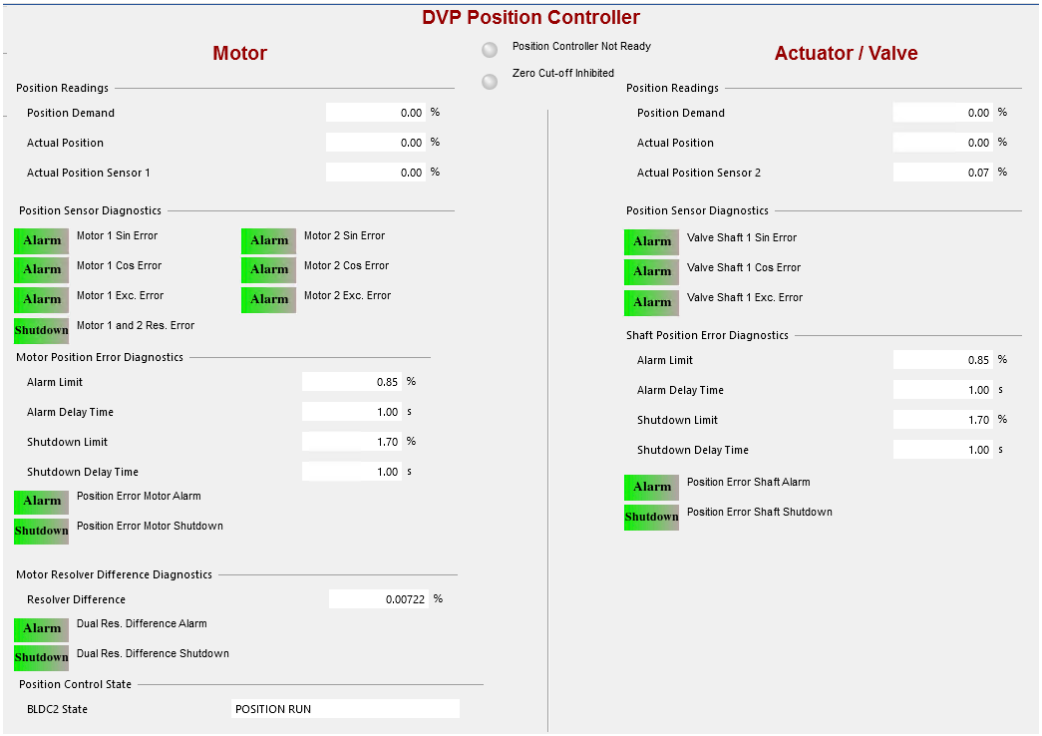


Figure 2-41. Position Controller 3-Phase

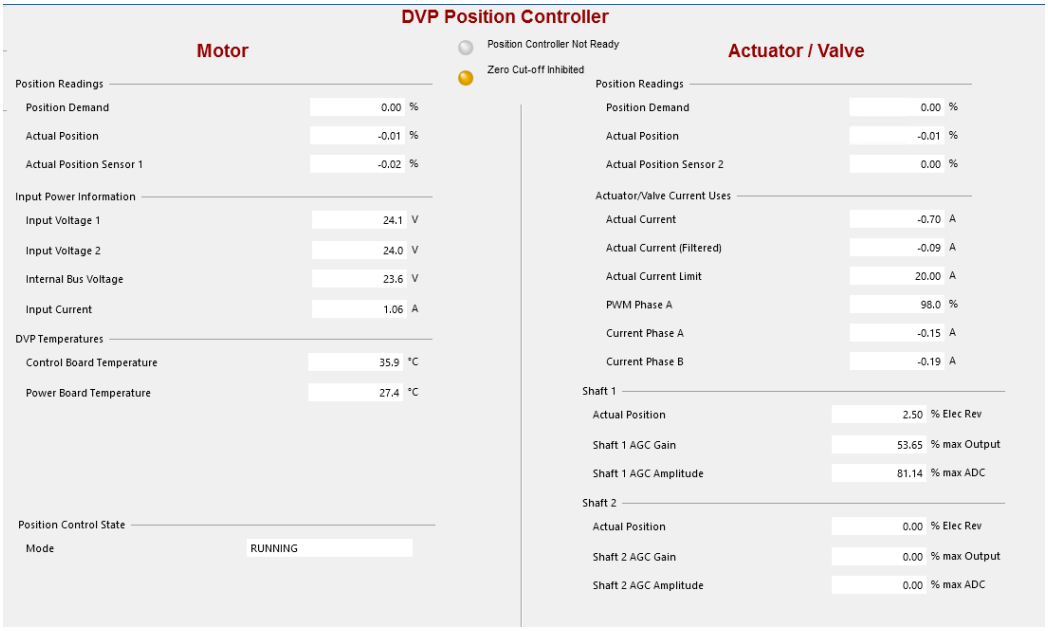


Figure 2-42. Position Controller LAT

2.17.1 Motor and Actuator/Valve Position Readings

Display readings for each independent position feedback system. This includes the unscaled, raw readings for each feedback device, the Automatic Gain Control (AGC) values (Gain and Amplitude) as well as the position after scaling on the right of the respective sections.

Each position readings provide immediate feedback on Position Demand, Actual Position, and Actual Position Sensor, 1 for Motor and 2 for Actuator/Valve.

2.17.2 Position Sensor Diagnostics

Error displays are easily readable with a colored indication showing if there is an error or the motors and valve shafts are operating nominally.

2.17.3 Motor and Actuator/Valve Position Sensor Diagnostics

These diagnostics include Alarm Limit, Alarm Delay Time, Shutdown Limit, and Shutdown Delay Time. Limits are displayed in percentages and times are displayed in seconds.

2.17.4 Motor Resolver Difference Diagnostics

Resolver Difference is displayed in percentages and color-coded status indicator represents the Dual Resolver Difference Alarm and Dual Resolver Difference Shutdown statuses. The difference in position between the valve stem resolver 1 and the valve stem resolver in a dual resolver configuration is shown as the dual resolver difference error value. The difference error has an alarm and a shutdown case. In case the difference error value exceeds the defined limit, the appropriate LED indicator annunciates the failure. The parameters for difference error detection are shown in the Pos. Feedback Redundancy Manager Parameters group.

2.17.5 Motor Position Control State

The state of the position controller is displayed here. This indicator displays the various states of control operation. In case the position controller is not selected, this indicator will display NOT RUNNING.

The following tables identify possible states of the position controller, depending on the controller.

Table 2-6. Position Control State 3-Phase

3-Phase Position State	Description
NOT RUNNING	3-Phase Position controller is inactive.
CHECK MIN DIRECTION	The DVP will check the resolver position in closing direction during start-up.
CHECK MAX DIRECTION	The DVP will check the resolver position in opening direction during start-up.
CHECK MOTOR DIRECTION	The DVP will check the direction the motor turns in during start-up.
START-UP FAILED	One or more start-up checks have failed.
ZERO POSITION CUT-OFF	The DVP is in Zero-Cut off mode.
POSITION RUN	Normal mode of operation.
POSITION SHUTDOWN	The 3-Phase Position controller is shut down.
MANUAL CONTROL	DVP is set to manual control.

Table 2-7. Position Control State LAT

LAT Position State	Description
NOT RUNNING	Position controller is inactive.
STARTUP CLOSING	The DVP will check the resolver position in closing direction during start-up.
STARTUP CHECK RESOLVER	The DVP will check the resolver position to ensure it reads the correct closed position before running.
CLOSING PWM	Position controller is shut down using position control.
CLOSING CURRENT	Position controller is shut down using current control.
RUNNING	Normal mode of operation.
MANUAL CONTROL	DVP is set to manual control.

2.18 Startup Checks

Whenever the DVP is reset from a power up or any critical diagnostics shutdown, a series of automatic start-up checks is performed and must be successfully completed before the DVP enters the running state. The purpose of the start-up checks is to ensure that correct feedback readings are verified, that the valve or actuator is at the required start-up or “home” position (and confirmed by more than one sensor), and that the actuator moves in the correct direction when commanded before resuming operation.

Since many actuators use multi-turn reduction gear trains with multi-turn feedback systems, it is important that the starting point or “zero turn” of the system be confirmed during the start-up process. This is particularly important for normally closed control valves, to ensure that the valve is not open at the indicated 0% position, and to prevent a potentially dangerous high flow starting condition. For other actuators controlling externally connected equipment or linkage, verifying the correct zero point during startup can prevent potential collision against the actuator’s internal end-stops, or against a hard stop within the driven linkage. This is important to prevent damage of the actuator, driven equipment, or both. The start-up checks are a critical function designed to help ensure a safe transition of the DVP to the normal operation mode.

The DVP Valve/Actuator Startup Check sequence includes a Minimum Direction Startup Check, Maximum Direction Startup Check, and Motor Direction Check. Each of these are explained in detail below. The displayed indications can sometimes change depending on the specific valve/actuator connected. The figure shown below is used as a general explanation of the start-up sequence.

The DVP is shipped in a factory set, auto-detect mode. When connected to a valve or actuator equipped with an integrated “ID module”, the DVP automatically detects the type of valve to which it is connected and performs a self-configuration process. The content of the ID module is automatically uploaded into the DVP which is then configured with appropriate configuration settings, including the factory set start-up limits. The objective of the startup checks is that all start up limits are passed prior to entering the normal operating mode.

Note: Not all checks apply to all controller variants.

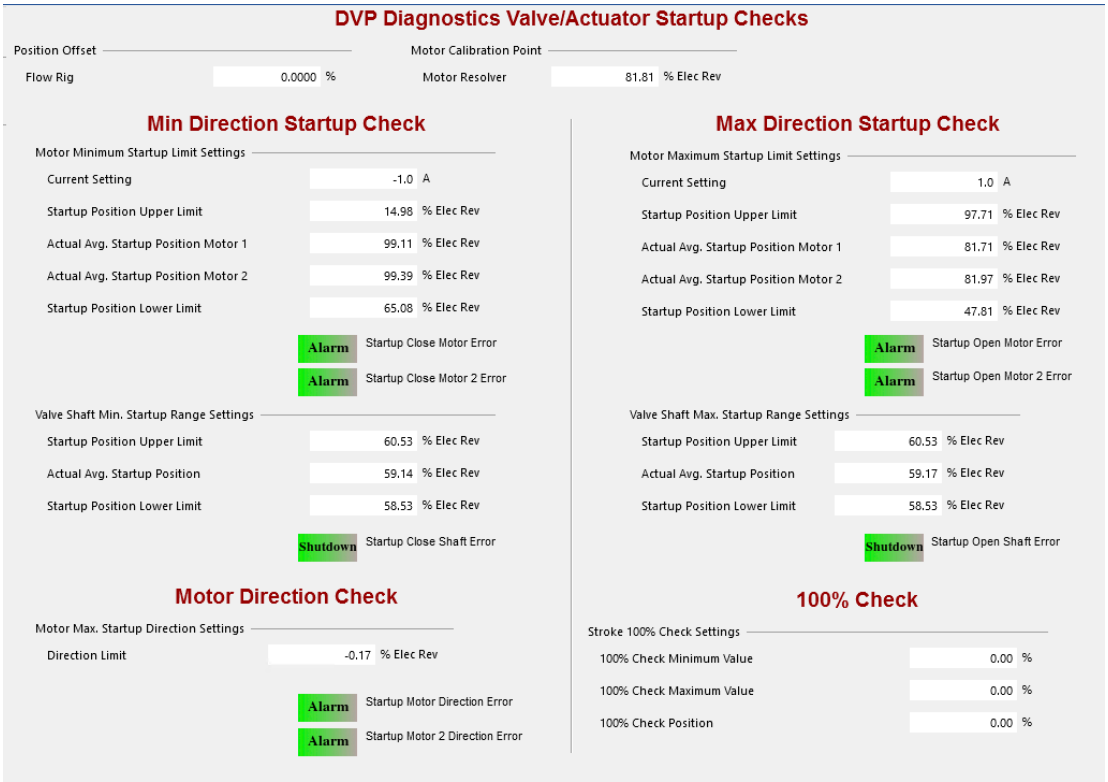


Figure 2-43a. Startup Checks - 3 Phase

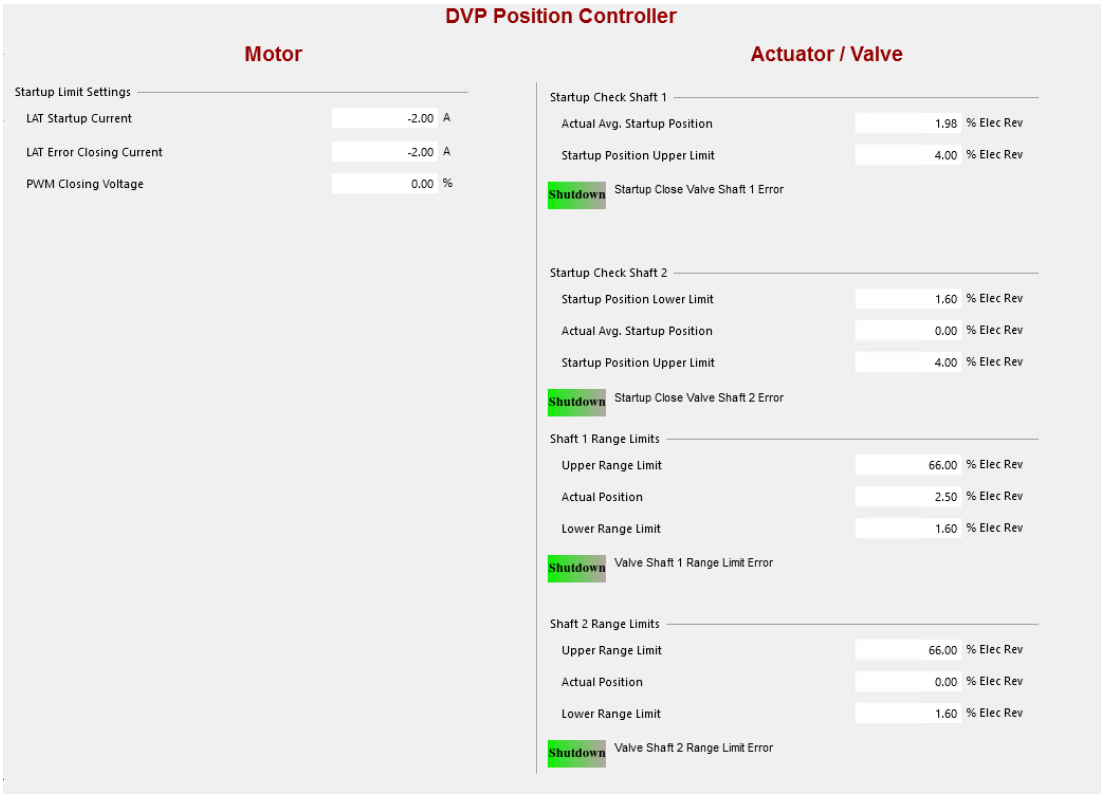


Figure 2-43b. Startup Checks - LAT

During the start-up checks, the positioner performs a sequence of automated functions to ensure that the valve or actuator is at the correct starting or “home” position. For example: for a control valve, the starting position must be at the desired fully closed, or fully open position. For a non-return spring actuator, it is possible that the DVP can be started up with the actuator in mid-range and the detected zero range of the motor sensors is found in mid-travel. To prevent a misdetection of the zero position, the startup check sequence drives the unit to the appropriate end position to perform the Motor Minimum check and for some actuators, confirms that the full operating stroke is verified before attempting to go on-line. The startup sequence verifies four important aspects of the system critical to safe and reliable operation. These include the correct resolver electrical readings, verification of the zero or “home” position at the reference end-stop position, the direction of rotation, and confirmation of the above by more than one signal.

The start-up sequence is initiated by a reset command received from the connected control system, or from the Service Tool. After receipt of the reset command, a controlled current level is applied to the actuator to control motion at a controlled force. Motor current/force is applied first in the minimum direction (typically closing), then in the maximum direction (typically opening). The amount of motor current applied during the opening/closing sequence is displayed at the top of each panel. The level of current applied in the closing direction is determined specifically for each product. The amount is enough to overcome normal expected loads and friction. The amount of motor current applied in the opening direction is generally enough to overcome the actuator’s backlash and internal friction, or in some cases a pre-defined external load. However, for control valves, the opening current is not enough to overcome the return spring, ensuring that the valve remains seated throughout the start-up sequence. In each direction, the “Actual Start-up Positions” are checked against the factory Upper and lower limit values. For completion of the startup check, the Actual Start-up Position values must be within the limits upper and lower limits. To protect the system from potentially unsafe operation, the positioner will not come on-line if the startup positions are outside the factory set upper or lower limits.

If all other diagnostic shutdowns are cleared, when the position controller is powered up and reset, the start-up sequence is initiated. Note: If there are other active shutdowns, other than power up reset, these must be cleared before the shutdown sequence will function. The startup checks require that *all checks are successfully completed*.

2.18.1 Position Offset (Flow Rig)

Flow Rig is displayed by percentage of offset. Flow testing is conducted on valves prior to shipment. Results from this testing determine the effective area characteristics of the valve. This value corrects for unit-to-unit variation in flow performance (particularly low flow positions). This value is automatically set to the correct value when uploading information from the ID module or the settings file for the appropriate serial number.

Example: An EGMV 0.6 in² valve is flow rigged at a reference Effective area of 0.02108 in². The nominal map indicates that this should occur at 3% stroke. During flow testing, this effective area is found at 3.12% travel. The difference is +0.12. Therefore, the Flow Rig Offset value for this particular serial number is +0.12%.

2.18.2 Position Offset (Motor Resolver)

Each valve/actuator has a unique motor resolver reading at the zero percent (0%) position. This value is determined and recorded for each valve/actuator system during production testing. For multi-turn actuators, the number of turns associated with full stroke is determined by counting the number of turns from this reference position.

2.18.3 Motor Calibration Point

Motor Resolver is displayed by percentage of Electric Revolution.

2.18.4 Motor Min. and Max. Start-up Limit Checks

The values associated with the Motor Min. and Max Startup checks are as follows:

Table 2-8. Motor Minimum and Maximum Startup Check Values

Motor Current Setting	Displayed in Amps
Startup Position Upper Limit Actual Average Startup Position Motor 1 Actual Average Startup Position Motor 2 Startup Position Lower Limit	Shown as percentage of Electrical Revolutions.

The colored square indicators at the bottom of each panel display the status of each check performed during the start-up sequence. These include the following:

For each status flag, green indicates successful completion of the start-up checks.

A Red flag indicates a failed step of the start-up check*

The text within each block displays the behavioral configuration of this diagnostic (The flag shown to the right is configured to result in an Alarm vs Shutdown above).

*Typically, the start-up checks are set for shutdown behavior to ensure system safety.

During the Min Direction Startup Check, the indicated motor current drives the valve/actuator in the minimum direction (toward 0%). When the positioner detects that the system is no longer moving, the motor position(s) is sampled and averaged. The average value at the stopped position is then compared against the indicated upper and lower limits determined during factory calibration. The normal situation is that the average value is verified between the two limits. At this point, the ***Startup Close Error*** check is cleared (annunciated by a green status), and the startup process will commence to the Max Direction start-up check. For actuators with redundant motor feedback, both positions must be between limits.

If the motor positions are not within the required limits, the startup checks will pause at this point. The ***Startup Close Motor Error*** status will be displayed as a red status flag. A failed startup check can indicate a wiring problem, or blocked valve or actuator (see the troubleshooting section of the DVP hardware manual 26329 or 26773 or 35185 as applicable).

Once the Min Direction startup check is complete, the startup sequence commences to the Max Direction Startup Check. The indicated motor current drives the valve/actuator in the maximum direction (toward 100%) at a predetermined force level. When the positioner detects that the system is no longer moving, the motor position(s) is sampled and averaged. The average value at the stopped position is then compared against the indicated upper and lower limits determined during factory calibration. The normal situation is that the average value is verified between the two limits. At this point the ***Startup Open Motor Error*** check is cleared (annunciated by a green status). For actuators with redundant motor feedback, both positions must be between limits.

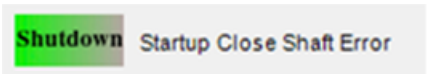
If the motor positions are not within the required limits, the startup checks will pause at this point. The ***Startup Open Motor Error*** status will be displayed as a red status. The start-up process will not commence, if the startup check is not within limits, this could indicate a wiring problem, or excessive load on the actuator.

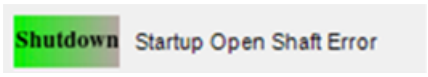
2.18.5 Valve Stem Min. and Valve Stem Max Start-Up Range Settings

Start-up checks are also simultaneously performed using the final element feedback device where provided (examples are the valve shaft resolvers or output shaft LVDTs provided on some linear actuators). The final element feedback devices are typically not a multi-turn device and can ensure that the system is within the appropriate end position range during the start-up checks.

The limit checks are the same as described for the Motor Min and Max Startup checks. The average start-up position values relative to the upper and lower limits are displayed in the panels below the motor checks.

The ***Startup Close/Open Shaft Error*** enunciations behave in the same fashion as those for the Startup Close/Open Motor Error. Green indicates successful completion of the check. Red indicates a failure of the check.



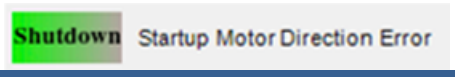


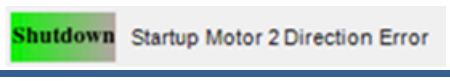
2.18.6 Motor Maximum Startup Direction Settings

As the last step of the startup sequence, the values measured during the closing and opening checks are compared against the factory limits to confirm that the minimum amount of movement was observed and in the proper direction. This confirms the Motor Direction is correct. The normal situation is that the direction value is confirmed above the minimum movement threshold and, the Startup Motor Direction Error check will be cleared (annunciated by a green status)

The minimum Direction Limit value is displayed as a percentage of Electric Revolution.

The ***Motor Direction Check Error*** enunciations behave in the same fashion as those for the Startup Close/Open Motor Error. Green indicates successful completion of the check. Red indicates a failure of the check.





By applying different amounts of motor current during the start-up check, correct wiring of the motor is verified. If a single phase of a 3-phase motor is switched, the motor will rotate in the incorrect direction. If there is a wiring fault, or open lead, the motor may not rotate at all. By ensuring that a minimum amount of motor rotation is confirmed, and in the correct direction, this critical aspect of the system is also verified before the system is brought on-line.

2.18.7 100% Check

For some valve types, an additional check is performed: 100% check. During the 100% check, the setpoint is ramped up in the maximum direction until the valve/actuator stops moving indicating it is at the max mechanical stop. When the positioner detects that the system is no longer moving, the position is sampled and compared against the indicated upper and lower limits determined during factory calibration. A failure will set the Check 100 Percent Error.

Upon successful completion of the startup checks, the positioner will progress to the normal operating state and the position will begin tracking the setpoint received from the controller, or from the manual entry of the Service Tool.

2.19 Driver

The Driver page displays I/O State Discrete Input and Output status and Driver Input and Output Data in real time.

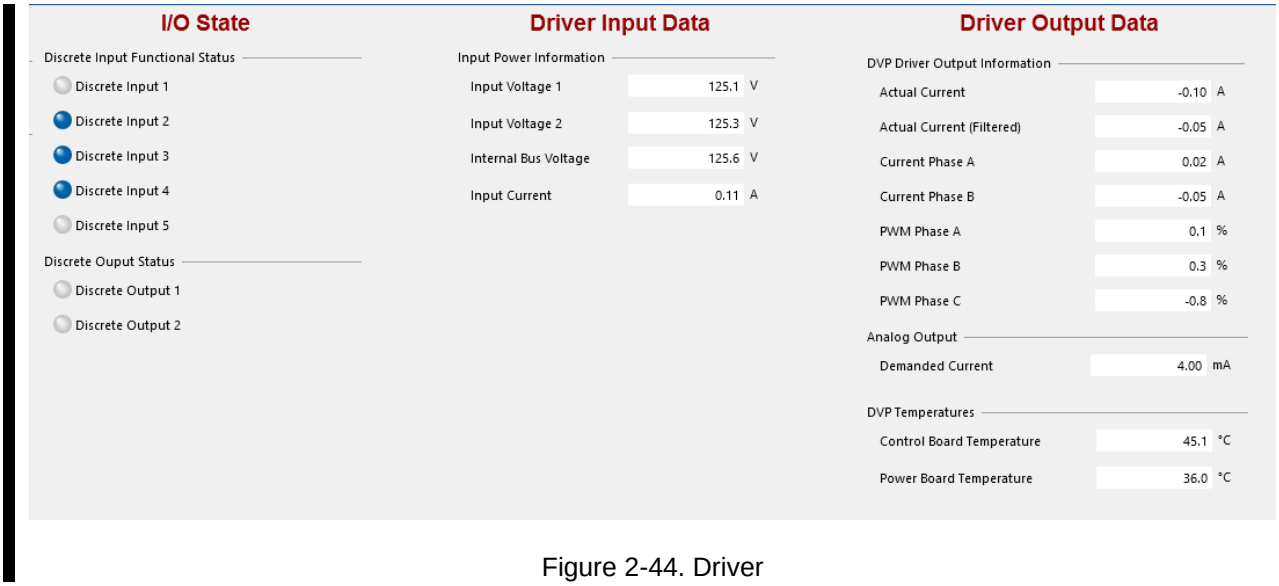


Figure 2-44. Driver

2.19.1 Discrete Input Functional Status

Discrete status for inputs one through five is displayed by a blue indicator for on and a gray indicator for off.

2.19.2 Discrete Output Status

A blue indicator for on and a gray indicator for off display discrete status for outputs one and two.

2.19.3 Input Power Information

Input Voltage 1, Input Voltage 2, and Internal Bus Voltage are displayed in units of Volts. Input Current is displayed in units of Amps. This information is shown under the Driver Input Data section.

2.19.4 DVP Driver Output Information

Actual Current, Actual Current (Filtered), Current Phase A and B are displayed in real-time in Amps. PWM Phases A, B, and C are displayed in real-time in percentages.

2.19.5 Analog Output

Demanded Current is displayed in milliamps.

2.19.6 DVP Temperatures

Two indicators display the temperatures of the control board and power board of the DVP in Degrees Celsius (°C). The ambient temperature, the magnitude and duration of the motor drive current, affects the temperature within the DVP.

2.20 Resolver Diagnostics

A general overview of the status and configuration settings of the different resolver providing the position feedback of the DVP is shown on the Resolver Diagnostics screen. This screen is used to troubleshoot any problems with the position feedback.

This page displays Resolver, Motor, and Valve diagnostics and displays setting information. There are also Motor and Valve fault indicators that show errors in the diagnostic process. The collection of indicators can change depending on what is appropriate for that specific valve/actuator.

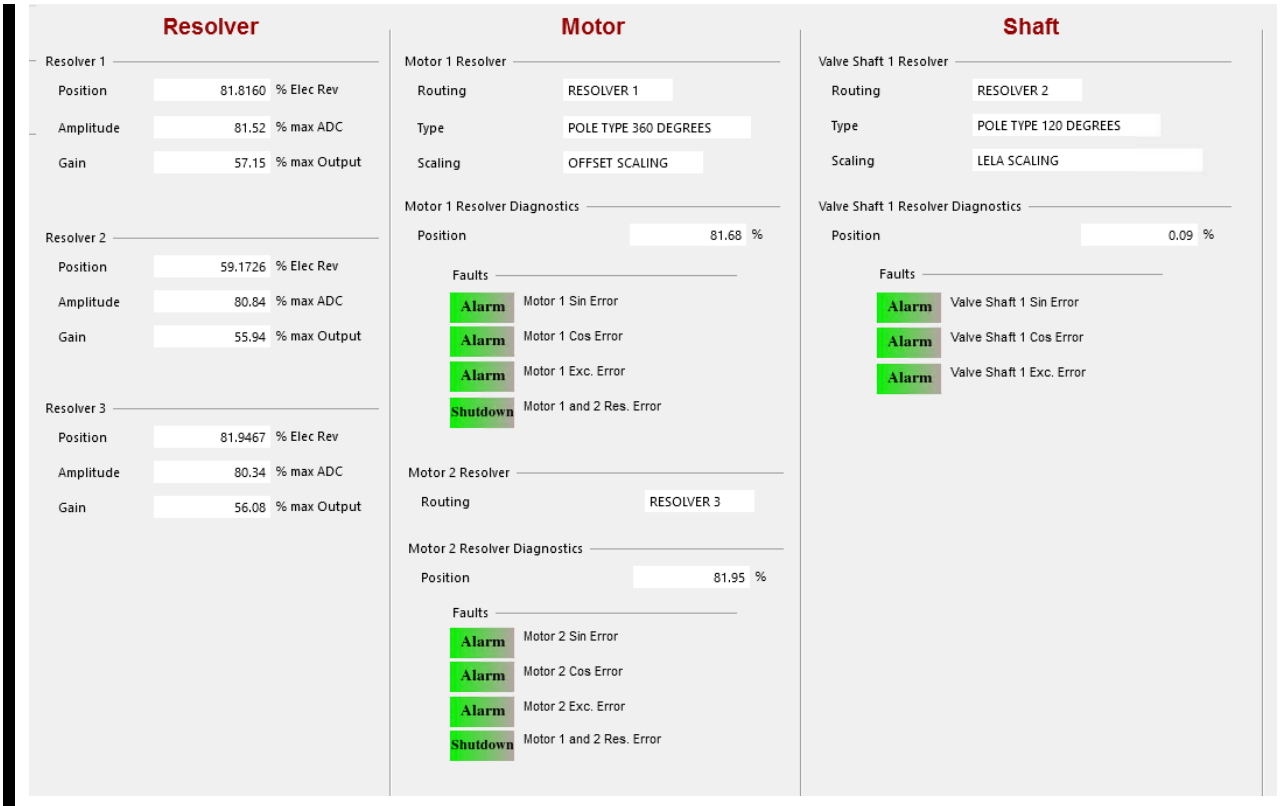


Figure 2-45. Resolver Diagnostics

2.20.1 Resolver

This indicator group shows the raw and unscaled position feedback, amplitude, and gain values for each resolver. The position is displayed in percent of electrical revolution of the resolver (% Elec Rev). The amplitude is displayed as percent of maximum ADC converter input (% max. ADC). The gain is displayed as percent maximum ADC output (% max Output).

2.20.2 LVDT Position Sensor 1

The position is displayed in percentage of Electric Revolution. Amplitude is displayed in percentage of maximum ADC. Gain is displayed in percentage of maximum output.

2.20.3 LVDT Position Sensor 2

The position is displayed in percentage of Electric Revolution. Amplitude is displayed in percentage of maximum ADC. Gain is displayed in percentage of maximum output.

2.20.4 Motor 1 and 2 /Valve Shaft 1 Resolver

Here, text indicators annunciate how the raw and unscaled resolver signals are routed to the motor and valve stem resolvers, which type of resolver is used and which type of scaling is applied to the signals.

2.20.5 Motor 1 and 2 Resolver Diagnostics

The Position indicator shows the actual position values for each resolver after the respective scaling has been applied. The unit is percent of position (%). The group of Flag indicators annunciates wiring faults on any signal line of the resolvers. Actual Position Sensor 1 is displayed in percentage. The Motor 1 Sine Error, Motor 1 Cosine Error, Motor 1 Exciter Error, and the Motor 1 and 2 Resolver Errors have colored indicator lights that display faults or nominal operations.

2.20.6 Valve Shaft 1 Resolver Diagnostics

The Position indicator shows the actual position values for each resolver after the respective scaling has been applied. The unit is percent of position (%). The group of Flag indicators annunciates wiring faults on any signal line of the resolvers. Actual Position Sensor 2 is displayed in percentage. The Valve Shaft 1 Sine Error, Valve Shaft 1 Cosine Error, and Valve Shaft 1 Exciter Error have colored indicator lights that display faults or nominal operations.

IMPORTANT

For additional information regarding potential causes for faults and resolutions to clear the faults, it is recommended that you consult the DVP Troubleshooting Guide in manual 26773, 26329, or 35185.

2.21 Dual DVP Status

The DVP has an option to operate in a dual redundant mode where two actuators are controlled by DVPs connected in a dual redundant configuration. Connection to the actuator is shown in the specific actuator manual. This page displays CANopen Mode, Dual DVP Diagnostics, and Dual DVP Configuration. The status information will only display if the connected valve/actuator is a Dual DVP valve type.

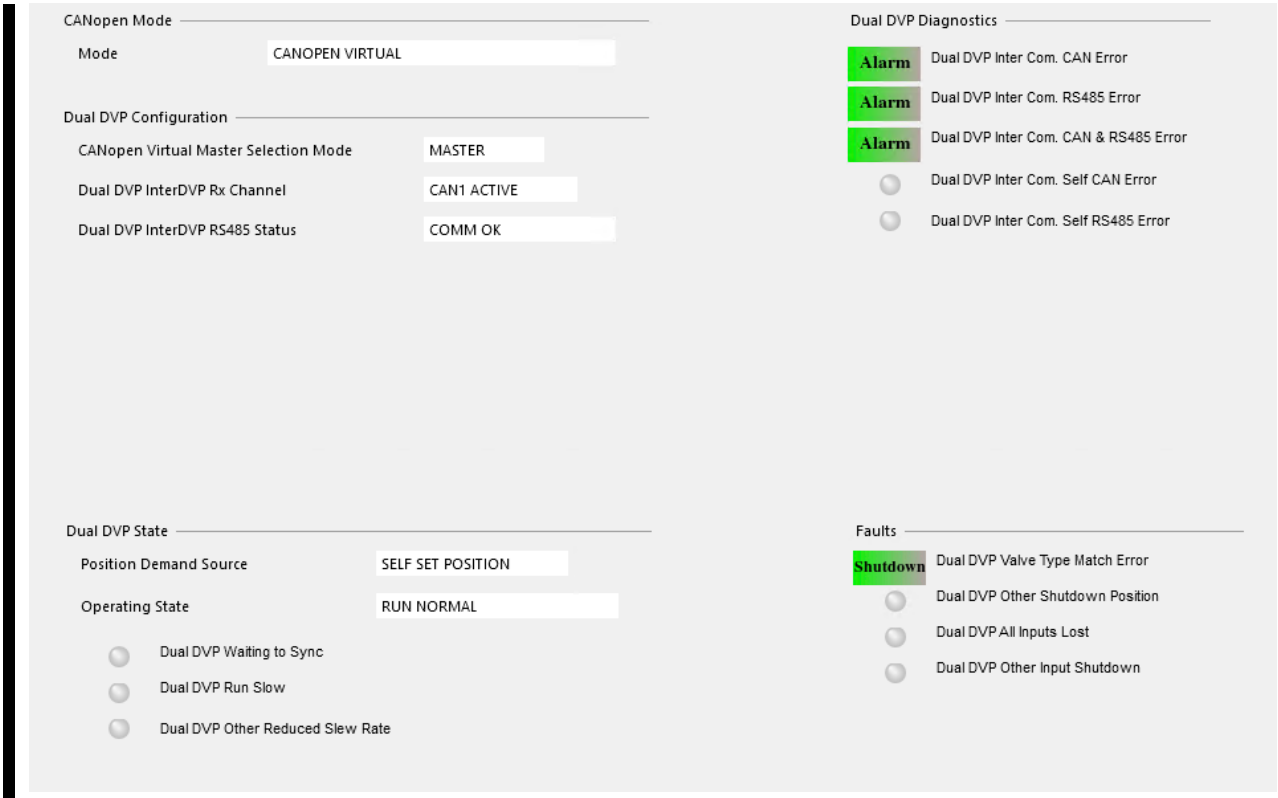


Figure 2-46. Dual DVP Status

2.21.1 CANopen Mode

The CANopen Mode is displayed in the corresponding window.

2.21.2 Dual DVP Diagnostics

Dual DVP Inter Communications individual CAN, individual RS485 and combined CAN & RS485 error statuses are displayed by colored indicator lights.

2.21.3 Dual DVP Configuration

CANopen Virtual Master Selection Mode, Dual DVP InterDVP Rx Channel, and Dual DVP InterDVP RS485 Status are displayed in the corresponding windows.

2.22 Linearization

This page provides the linearization settings. When enabled the 11-point position curve is used, allowing for a non-linear relationship between the position command and actual position.

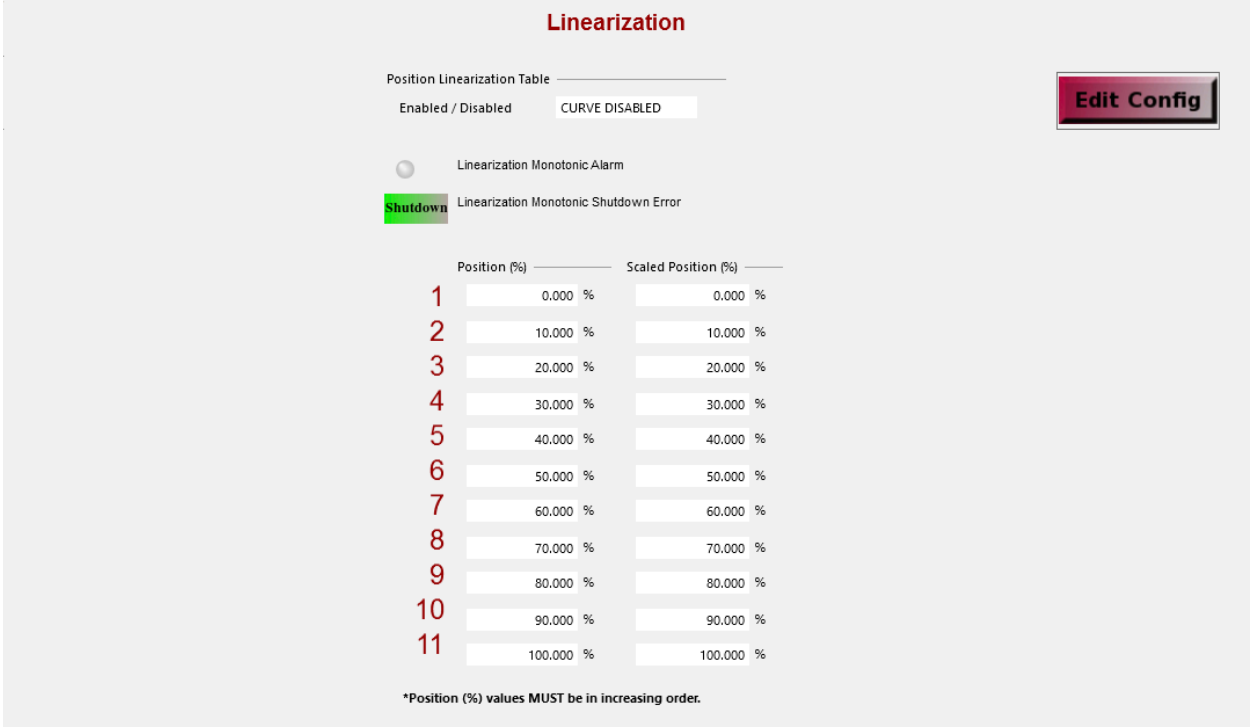


Figure 2-47. Linearization Page

Position Linearization Table

The configuration settings are displayed, enabled/disabled and the 11 points of the two-dimensional linearization table are displayed. The “Position (%)” values represent input breakpoints and the “Scaled Position (%)” values represent the output at the breakpoint. Between breakpoints the values are interpolated.

The Position (%) values represent input breakpoints and must be continuously increasing in value. Each input breakpoint value must be larger than the previous and less than the next value. If not, a Linearization Monotonic diagnostic is annunciated. The diagnostic is a shutdown error if detected on power-up and an alarm if detected afterwards. The linearization table is not applied if this diagnostic is active.

Edit Config

The settings can be modified using the “Edit Config”. Details on the settings are described in the Linearization section of Chapter 3.

Chapter 3.
DVP Configuration

3.1 Introduction

The DVP is a highly customizable positioner, which provides significant application flexibility to the user. The configuration of the device is performed using the settings editor wizard, which is a feature of the PC Service Tool. The settings wizard presents a set of parameters similar to what is displayed in the monitoring function of the Service Tool, but allows certain parameters to be changed, and then reloaded into the control.

⚠WARNING **The SHUTDOWN button will move the valve to the fail position (0% position, or 100% position for fail-open). This will potentially shut down the prime mover!**

Since sudden on-line modification of key operating parameters could result in unexpected behavior, the control settings are modified in an off-line mode, and then reloaded into the DVP while it is shut down. This ensures that the system changes will have no adverse effect on the valve(s) which are being controlled by the DVP. This process also allows the user to review the settings after they are uploaded to the control, thus ensuring that the settings are as intended, prior to bringing the system on-line.

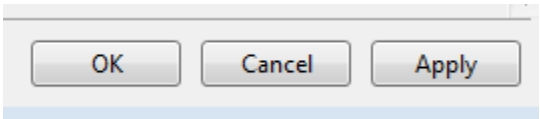
The DVP configuration process generally begins by navigating to the screen(s) provided and adjusting the settings on those screens. Creating a settings file using the setting editor is still available, but in practice using the screens provided is much more efficient and user friendly.

If a pre-configured settings file exists, it can be loaded directly to the DVP. If this is the scenario you are using, skip the next section and go straight to the “Loading a DVP Settings File to the DVP” section.

⚠WARNING **An unsafe condition could occur with improper use of these software tools. Only qualified personnel should use these tools to configure the DVP.**

Configuration Window Options

Each on-line configuration window has three options for selected changes, Ok, Cancel or Apply. Selecting Cancel closes the window and ignores any changes. Selecting Ok saves the changes to the device and closes the window. Selecting Apply saves the changes to the device but keeps the window open.



Configuration Data Range

The allowed range for an analog setting is displayed on the lower-left of the main Service Tool screen window. Moving the settings screen window may be required to view this range.

3.2 Valve Type Selection

This indicator group gives an overview of the status of the Valve Type Selection Process. The progress of the auto-detection process is displayed as a percent value.

There are two ways to adjust DVP configuration, manipulating WSET files and using the online toolset. We will begin with instructions on how the online toolset is used and WSET manipulation will be explained in detail in Chapter 4.

3.2.1 Initiating the DVP to Auto-Detection Mode

The DVP is shipped by factory default in auto-detect mode. As soon as a valve, which has an integrated ID module, is connected to the DVP for the first time, the DVP will auto-detect the type of valve and perform a self-configuration procedure. The content of the ID module is automatically imported into the DVP, and the control is configured with the valve specific settings (valve serial number, the product code, and the revision). After the auto-detection process is completed successfully, the DVP is configured specifically for this valve.

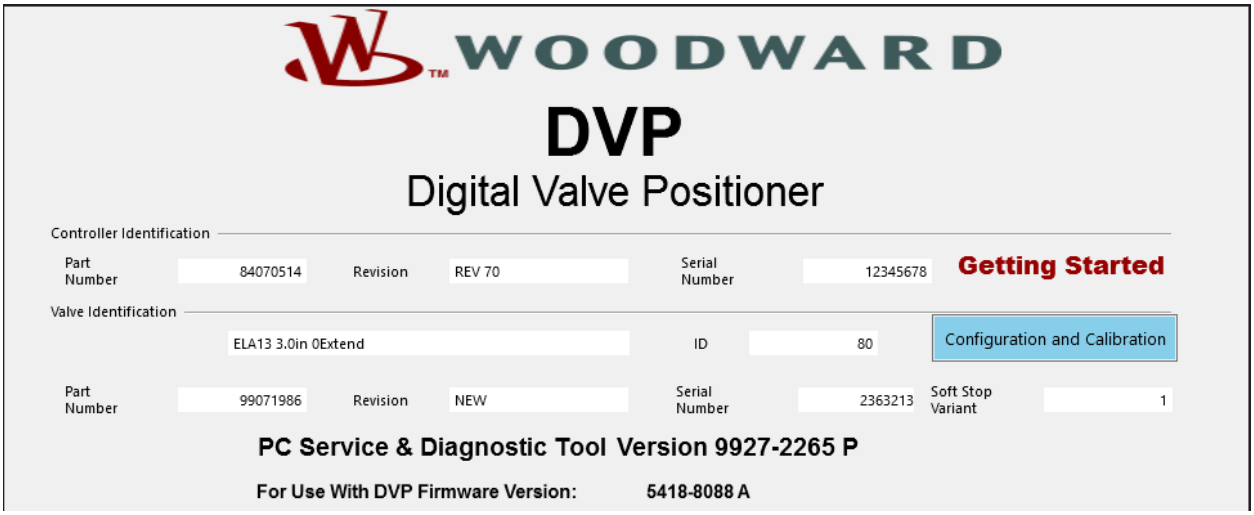


Figure 3-1. Identification Page

The following screenshots shows the status of the Valve Type Selection Process after connecting a new valve to an already configured DVP.

If a new valve is connected to the DVP, on power up the DVP will annunciate a process type or serial number error to show that the DVP has never been configured to run with the new valve. If the DVP firmware recognizes the new valve's ID module, clicking the Auto Detection Request button will restore the flag to the green nominal state.

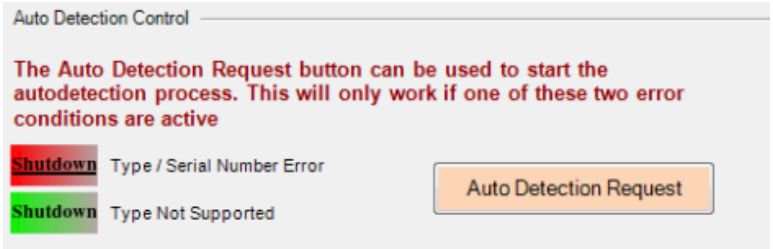


Figure 3-2. Valve Type/Serial Number Error

When a new valve is connected to the DVP and the existing firmware does not match the new valve type, the Type Not Supported error flag will illuminate red. To restore the flag to the green nominal state you may:

1. Contact Woodward for a new firmware upload or
2. Obtain a new Wset file from Woodward and refer to the “Managing DVP Settings Files” process in Chapter 4 on how to configure the DVP manually.

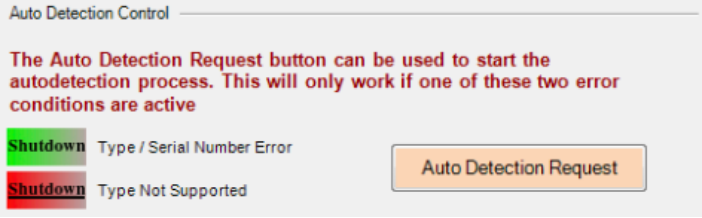


Figure 3-3. Valve Type Not Supported Error

3.2.2 Valve Type Selection

The currently active Valve Type and the DVP Control Mode are shown in this group as soon as the Valve Type Selection Process is completed. The control mode indicates whether a 3-Phase or LAT controller is controlling the connected valve/actuator system.

These sections are zoomed and the areas within the sections are described below. This information is used to support troubleshooting or to initiate an auto detection request. This page is only truly needed if synchronizing with a new ID module is required or if additional troubleshooting information is needed.

> **Note:** For additional information regarding potential causes for faults and resolutions to clear the faults, it is recommended that you consult the DVP Troubleshooting Guide in manual B26773 or B26329 or 35185.

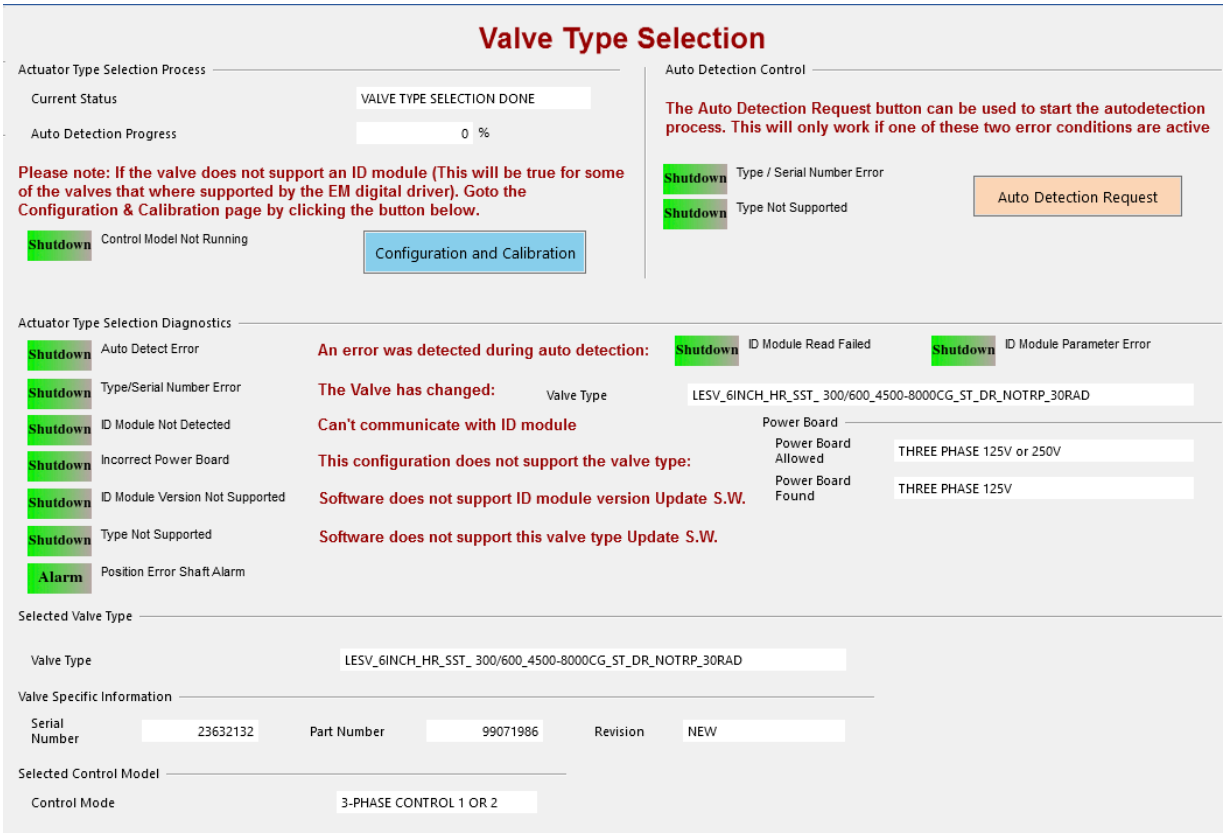


Figure 3-4. Valve Type Selection Page

3.2.2.1 Actuator Type Selection Process

The Current Status displays progress in words that correlates to the Auto Detection Progress. The Auto-Detection Progress indicator shows the percentage of progress in the Actuator Type Selection Process. The indicator flag displays a color-coded indicator for at-a-glance recognition and the text adjacent to the flag adds a description. The blue Configuration & Calibration provides quick access to the Configuration & Calibration page when selected.

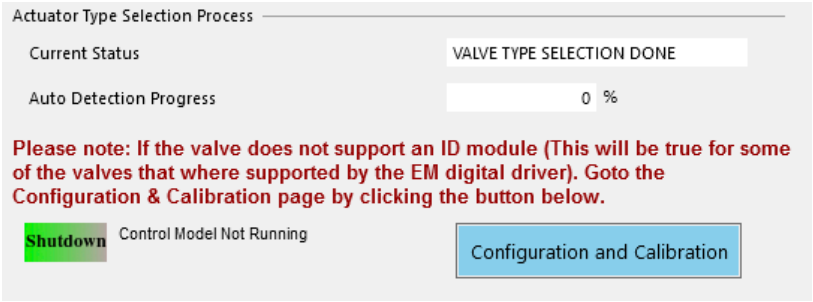


Figure 3-5. Actuator Type Selection Process

3.2.2.2 Auto Detection Control

If the Type/Serial Number Error indicator is illuminated, an Auto-Detection Request must be initiated to start the self-configuration process. Press the Auto Detection Request button on the Valve Type Selection Screen to begin the self-configuration process.

If the Type Not Supported indicator is illuminated and showing an error **DO NOT** select the Auto Detection Request. There are two courses of action that you may take:

1. Contact Woodward and request a software upgrade to include the type of valve you want to be supported by the DVP.
2. With the DVP powered off, connect a different valve that is supported by the DVP to the DVP and power the DVP on. After the DVP is connected to the communications channel, select the Auto Detection Request, and proceed with the steps that follow.

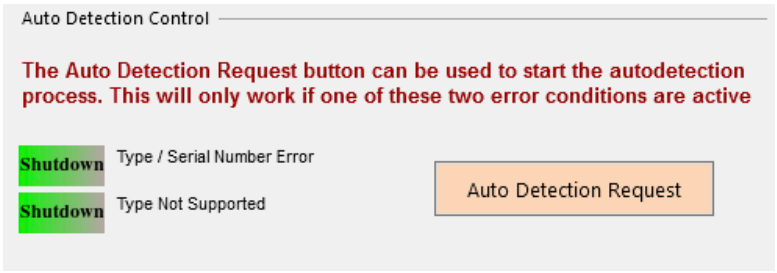


Figure 3-6. Auto Detection Control

3.2.2.3 Actuator Type Selection Diagnostics

This section displays flags that provide at-a-glance statuses with descriptive text adjacent to the flag. Red error messages are displayed in bold text. Valve Type and Power Board information are displayed within windows. This section is a display only and the flags tell the operator what actions to take to resolve the issue.

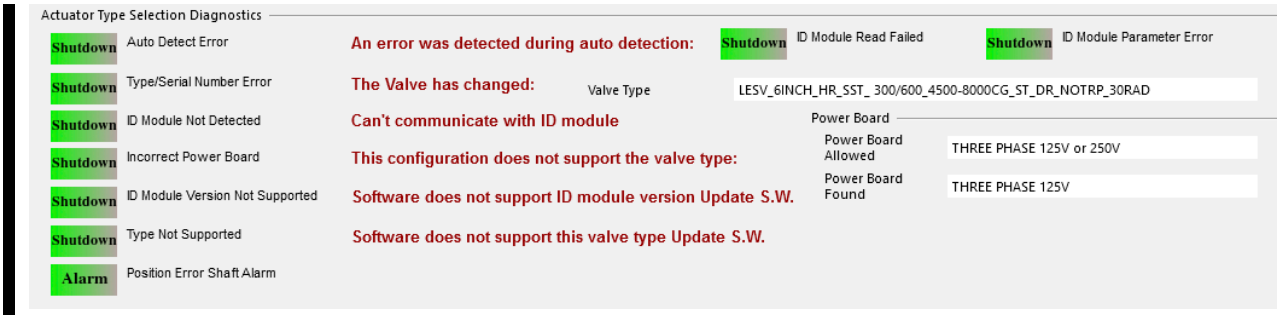


Figure 3-7. Actuator Type Selection Diagnostics

3.2.2.4 Selected Valve Type, Valve Specific Information, and Selected Control Module

Upon successful completion of the Valve Type Selection Process, the DVP is configured to the new valve/actuator system. The Valve Type Selection screen then shows the currently selected Valve Type, Control Mode as well as other valve specific information like Valve Serial Number and Product Code and Revision of the connected valve/actuator system.

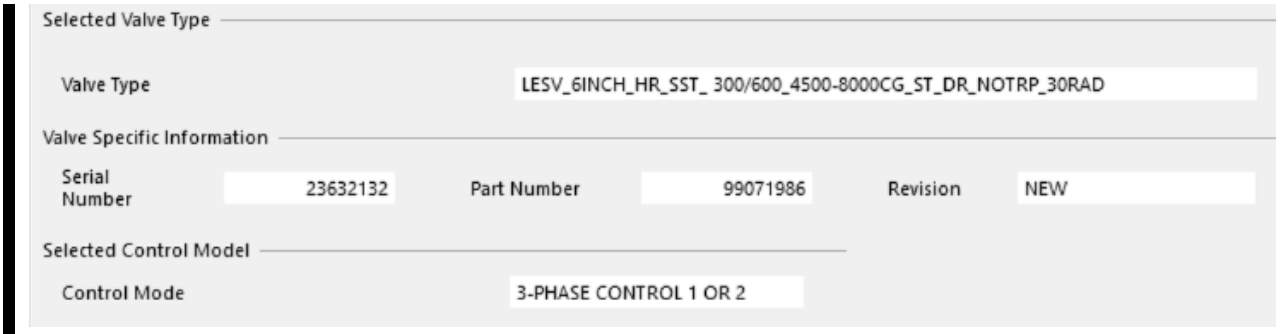


Figure 3-8. Information on Selected Valve

3.3 Setpoint Source Configuration

This page provides the demand input selection and the settings related to that input. These settings include scaling and diagnostic thresholds.

3.3.1 Setpoint Source Selection (Demand Input)

The input type used in DVP setpoint can be selected with the Mode parameters in this group.

From the pull-down list depicted in Table 3-1, the following options may be selected:

Table 3-1. Setpoint Source Selection (Demand Input)

Mode	Setpoint Signal Type
Manual Position	Internally generated setpoint, user-configurable from the Manual Control page.
Analog Input	4–20 mA 0–5 V
PWM Input	PWM signal
EGD Digital Input	UDP based Ethernet signal using the EGD (Ethernet Global Data) protocol.
Function Generator	Internally generated based on the function generator settings.
CANopen Digital Input	CANopen based protocol using 1 or 2 CAN Ports. Optional use Analog back up, if using 1 CAN port.

The DVP can be operated using different sources for the demand setpoint to the control. The Input Configuration page provides an overview on currently selected setpoint source and the setpoint settings for the selected source. Only the selected input source in the Input Configuration field is active. The drop-down menu shows the available input sources.

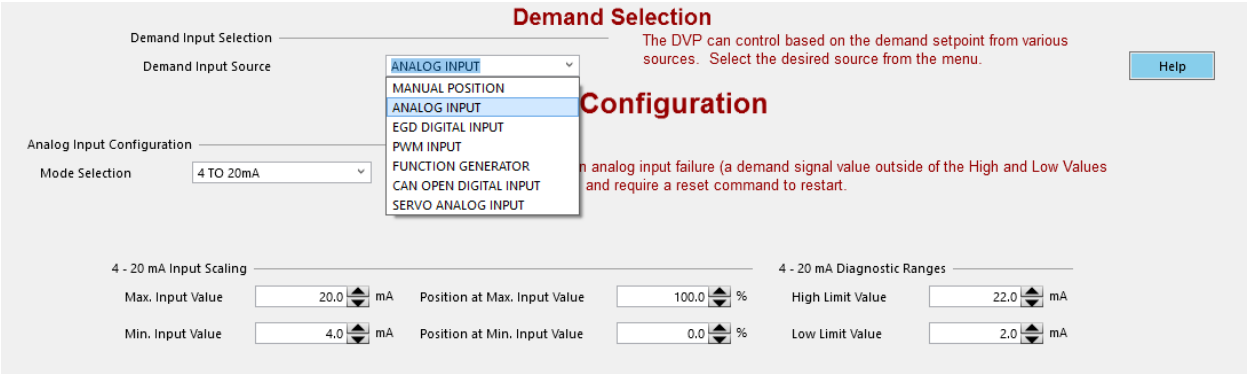


Figure 3-9. Service Tool Input Configuration, Edit Configuration Page

3.3.2 Manual Position Configuration

Other than selecting Manual Position from the dropdown menu, there is no operator action on this page. Manual operation is described in Chapter 2.

Figure 3-10. Service Tool Manual Position Configuration

3.3.3 Analog Input Configuration

The input type, scaling, and diagnostic settings for the analog input are displayed on the Analog Input Configuration page.

Figure 3-11. Service Tool Analog Input Configuration

3.3.3.1 Analog Input Mode Selection

The input type of analog setpoint is configurable from the dropdown menu and the following options may be selected:

- Turned Off
- 0–5 Vdc
- 4–20 mA
- 0-5 Vdc with reset*
- 4-20 mA with reset*

*The “with Reset” option provides an internal reset command when the input signal transitions from an input low error condition back into a normal operating range as determined by the diagnostic range settings. The reset command is issued one second after the input is at or above the low limit diagnostic threshold.

3.3.3.2 0–5 Vdc / 4–20 mA Input Scaling

By adjusting the input scaling values, the selected DVP analog input type (0–5 Vdc, 4–20 mA, 0-5 Vdc with reset, or 4-20 mA with reset) can be calibrated to the output of the control or transmitting device. Alternatively, the output values can be adjusted to match those observed at the transmitting device.

- Maximum Input Value of milliamps may be adjusted by typing in the selected value or clicking the up/down arrows.
- Minimum Input Value of milliamps may be adjusted by typing in the selected value or clicking the up/down arrows.
- Position at Maximum Input Value may be adjusted from one to one hundred percent by typing in the selected value or clicking the up/down arrows.
- Position at Minimum Input Value may be adjusted from zero to ninety-nine percent by typing the selected value or clicking the up/down arrows.

3.3.3.3 0–5 Vdc / 4–20 mA Diagnostic Ranges

Adjusting the Diagnostic Range settings modifies the diagnostic levels at which out of range input values are detected. The Analog Input Low diagnostic will be annunciated when the signal level is below the low limit setting. The Analog Input High diagnostic will be annunciated when the signal level is above the high limit setting.

- High Limit Value is typically set a few milliamps above the Maximum Input Value and may be adjusted by typing in the selected value or clicking the up/down arrows.
- Low Limit Value is typically set a few milliamps below the Minimum Input Value and may be adjusted by typing in the selected value or clicking the up/down arrows.

WARNING **Modification of these settings could affect operation and plant diagnostics annunciation. An appropriate review of the settings is recommended PRIOR to making these modifications.**

3.3.4 PWM Input

The input type, scaling, and diagnostic settings for the PWM input are displayed on the PWM Input Configuration page.

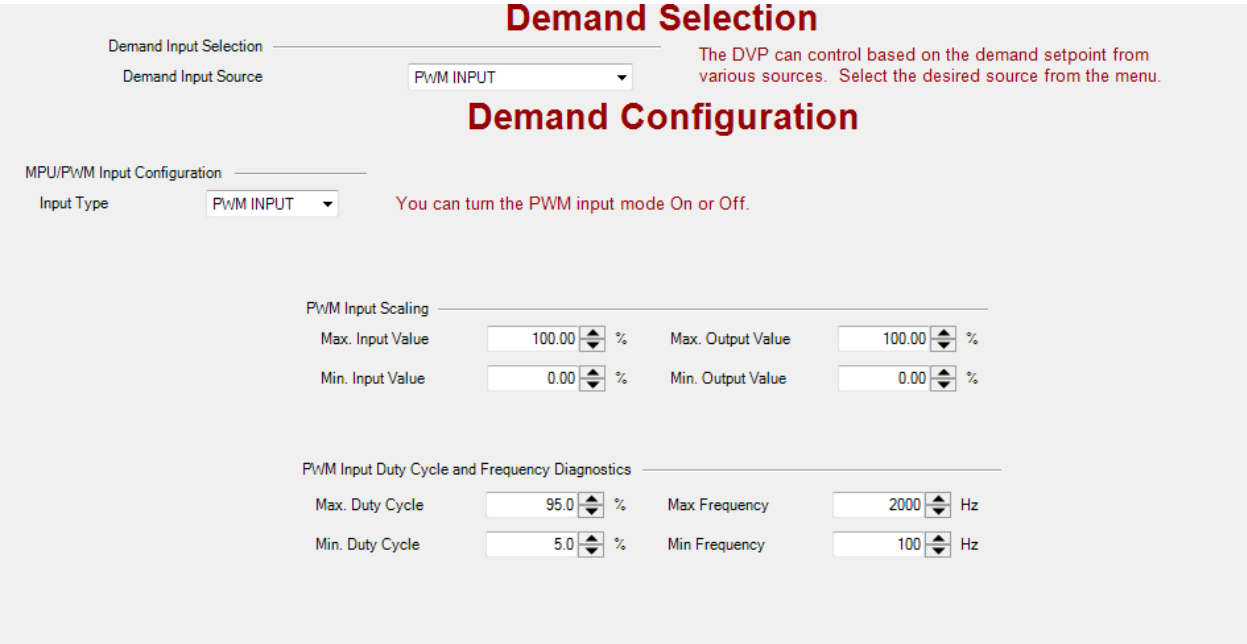


Figure 3-12. Input Configuration, PWM Input Configuration

3.3.4.1 PWM Input Mode Selection

The input type is configurable from the dropdown menu and the following options may be selected: “Turned Off” or “PWM Input”. To use this input, the mode must be set to PWM input.

3.3.4.2 PWM Input Scaling

By adjusting the input scaling values, the PWM input duty cycle can be calibrated to the output of the control or transmitting device. Duty cycle values are percent low (low-side driver). Alternatively, the output values can be adjusted to match those observed at the transmitting device.

3.3.4.3 PWM Diagnostic Ranges

Adjusting the Diagnostic Range settings modifies the diagnostic levels at which out of range input values are detected. Threshold settings are provided for both frequency and duty cycle.

WARNING **Modification of these settings could affect operation and plant diagnostics annunciation. An appropriate review of the settings is recommended PRIOR to making these modifications.**

3.3.5 Function Generator Configuration

This page has two options for modifying the information displayed. The Wave Pattern drop down menu and the Sweep Mode drop down menus which will be described below. Wave Pattern displays Position Demand High Point and Low Point, Duty Cycle in percentages, and the Start Frequency displayed in hertz. Sweep Mode displays Sweep Stop Frequency in Hertz, Sweep time in seconds, Number of Cycles, Synch Logging, and Sample Time in milliseconds.

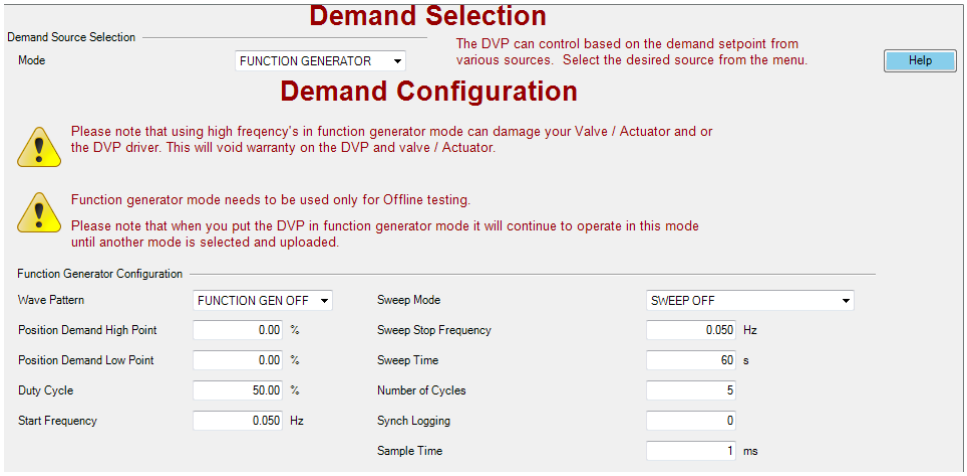


Figure 3-13. Function Generator

3.3.5.1 Wave Pattern Dropdown Menu

With the options of Off, DC, Sine Wave, Square Wave, Sawtooth, Triangle Wave, and Production Test, the values displayed for Position Demand High and Low Point, Duty Cycle, and Start Frequency are fully customizable.

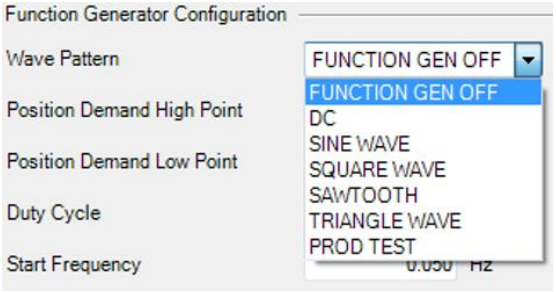


Figure 3-14. Function Generator Wave Pattern Dropdown Menu

Wave Patterns

Function Gen Off: Output is zero.
DC Offset Only: Output is a constant value set by “Position Demand Low Point”.
Sine Wave: Output is a sine wave with frequency set by “Start Frequency” and magnitudes set by “Position Demand Low Point” and “Position Demand High Point”.
Square Wave: Output is a square wave with frequency set by “Start Frequency” and magnitudes set by “Position Demand Low Point” (bottom of square wave) and “Position Demand High Point” (top of square wave) and with “Duty Cycle” determining the high time.
Sawtooth: Output is a sawtooth wave (ramp up, step down) with frequency set by “Start Frequency” and magnitudes set by “Position Demand Low Point” and “Position Demand High Point”.
Triangle Wave: Output is a triangle wave with frequency set by “Start Frequency” and magnitudes set by “Position Demand Low Point” (bottom of sawtooth) and “Position Demand High Point” (top of sawtooth).
Prod Test: The production test wave is a concatenation of triangle and square waves in one dynamic log. Segment 1 is a triangle wave from “Position Demand Low Point” to “Position Demand High Point” and back. Segment 2 is a ramp to the “Position Demand Low Point” +10%, followed by a square wave of magnitude “Duty Cycle”, then the “Position Demand Low Point”+10%. Repeats continuously.

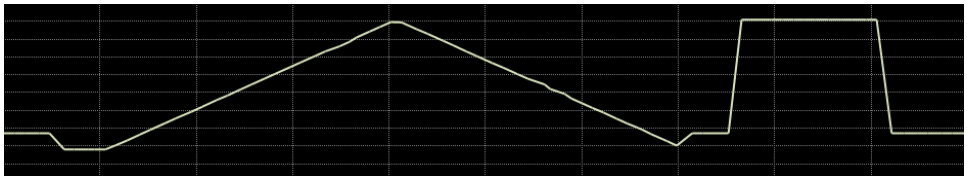


Figure 3-15. Function Generator Wave Pattern Prod Test

Each of these modes continuously repeats. The Sweep Mode setting can affect this and limit the number of cycles or the overall time.

NOTICE

DUTY CYCLE

The DVP is rated for full capability as stated in the specifications for 30 seconds and a cooling duration of 120 seconds. This cycle can be repeated as long as necessary. Although Woodward sizes the actuation system (valve/actuator/DVP) to ensure there is sufficient margin for the most critical application requirement, in a lab setting, the DVP can be over-driven if care is not taken to observe the operational duty cycle limits. Refer to the DVP hardware manual for further information on duty cycle limits.

3.3.5.2 Sweep Mode Dropdown Menu

The dropdown menu contains the options of Off, Linear Sweep, Linear Sweep Repeat, Number of Cycles Low, Number of Cycles Middle, Linear Frequency and Amplitude Sweep, and Log Sweep. The displayed values of Sweep Stop Frequency, Sweep time, Number of Cycles, Synch Logging, and Sample Time adjusted according to the selection from the dropdown menu.

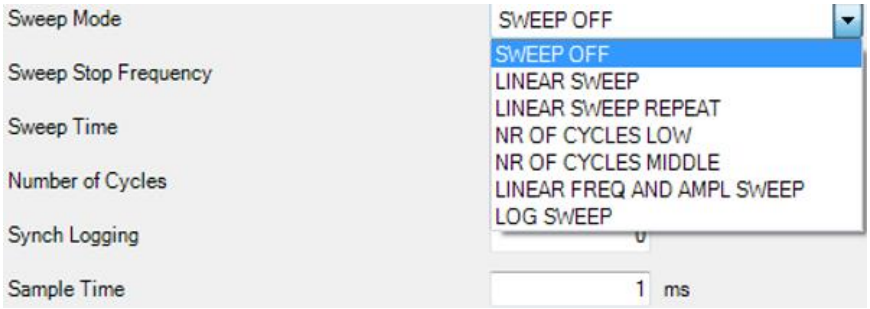


Figure 3-16. Function Generator Sweep Mode Dropdown Menu

Sweep Mode

Sweep Off: Frequency is set to the Start Frequency.
Linear Sweep: This sweep is a linear sweep over frequency based on the Start Frequency and the Sweep Stop Frequency. The parameter Sweep Time (Sec) is used to determine the time the sweep is going to take. The function starts when "Start Sweep" is commanded.
Linear Sweep Repeat: Same as Linear Sweep except the sweep continuously repeats.
Nr of Cycles Low: Output starts at the low command (Position Demand Low Point) and executes the specified number of sweeps (Number of Cycles). The function starts when "Start Sweep" is commanded.
Nr of Cycles Middle: Output starts at the mid-point command (between High Point and Low Point) and executes the specified number of sweeps (Number of Cycles). The function starts when "Start Sweep" is commanded.

3.3.6 CANopen Input Configuration

The settings for CANopen are provided on the CANopen Input Configuration page. This configuration page allows you to set the communication parameters and settings, providing options to set the configuration to your needs. The content of the Communications Settings section varies with the CAN Hardware ID Mode setting.

> **Note:** It is recommended that you do not adjust the Mode under “Communications Settings Selected by Hardware ID”. If you have a requirement to adjust these settings, contact Woodward for instructions not contained within this manual.

3.3.6.1 CANopen Communication Parameters

This section shows the communication parameter settings of the CANopen Digital Input. The Baud Rate and port-specific Node IDs are shown as well as the Timeout parameter that determines the quality of the CAN communication link. The DVP normally uses a non-standard implementation of the CANopen protocol. The number of PDOs has been increased over the standard setting to allow more data transfer between NMT and the DVP. This can be disabled to communicate with other customer’s products, which may require a true implementation of the CANopen protocol compliant to the standard. The status of the Extended PDOs (enabled or disabled) can also be seen in this section.

One of the following baud rates can be selected for the CANopen communication link:

- 125K Baud
- 250K Baud
- 500K Baud

A timeout value between 1 ms and 1000 ms specified for the CAN communication link. This value is specified once for both CAN channels and is modified by typing in the desired value in the window or clicking the up/down arrows.

3.3.6.2 CANopen Redundancy Manager Parameters

This section shows the parameter settings of the CANopen Redundancy Manager. The CANopen Redundancy Manager compares the two CANopen Position Demands on the two available CAN channels and checks the difference between them. If the difference between those two position demands is bigger than the specified limit, an alarm or shutdown command will be issued. The difference must be presented for longer than the time specified in the parameter settings for the fault condition to be detected by the Redundancy Manager. The Redundancy Manager is used in CANopen single mode between CAN port 1 and Analog.

CAN Node ID Selection

When using CANopen communications, it is necessary to set the CAN Node ID to a unique value to ensure that the DVP responds to commands intended for the appropriate device. There are two methods for setting this value, software or hardware/wiring. The method is defaulted to a predetermined configuration based on the DVP part number but can be changed using the Service Tool. With the software option, the node ID setting is a user-defined value set in software. The hardware/wiring (also referred to as harness coding) option uses discrete inputs to select an index which sets the node ID value. The index is determined by the power-up state of the discrete inputs. Note that the discrete input condition is based on open or closed state at power-up, ignoring the active high/low configuration. Changes to any Node ID-related software settings require a power cycle to take effect.

The discrete input CAN ID selection has three different options (see CAN Hardware ID Mode). The index can be based on two, three, or four discrete inputs, allowing three, seven, or 15 valid preprogrammed settings. This selection method is set using the Service Tool as part of the CAN demand configuration.

Table 3-2. Two Input Index Selection

Index Selected	Discrete Input 5	Discrete Input 4
INVALID	Open	Open
1	Open	Closed
2	Closed	Open
3	Closed	Closed

Table 3-3. Three Input Index Selection

Index Selected	Discrete Input 5	Discrete Input 4	Discrete Input 3
INVALID	Open	Open	Open
1	Open	Open	Closed
2	Open	Closed	Open
3	Open	Closed	Closed
4	Closed	Open	Open
5	Closed	Open	Closed
6	Closed	Closed	Open
7	Closed	Closed	Closed

Table 3-4. Four Input Index Selection

Index Selected	Discrete Input 5	Discrete Input 4	Discrete Input 2	Discrete Input 1
INVALID	Open	Open	Open	Open
1	Open	Open	Open	Closed
2	Open	Open	Closed	Open
3	Open	Open	Closed	Closed
4	Open	Closed	Open	Open
5	Open	Closed	Open	Closed
6	Open	Closed	Closed	Open
7	Open	Closed	Closed	Closed
8	Closed	Open	Open	Open
9	Closed	Open	Open	Closed
10	Closed	Open	Closed	Open
11	Closed	Open	Closed	Closed
12	Closed	Closed	Open	Open
13	Closed	Closed	Open	Closed
14	Closed	Closed	Closed	Open
15	Closed	Closed	Closed	Closed

3.3.6.3 CAN Hardware ID Mode

The CAN Hardware ID Mode is configurable from the dropdown list and one of the following options may be selected:

- CAN Hardware ID Disabled
- CAN Hardware ID Discrete in – DI5, DI4, DI2, DI1
- CAN Hardware ID Discrete in – DI5, DI4, DI3
- CAN Hardware ID Discrete in – DI5, DI4

These discrete inputs in combination with the Demand Source Selection Mode establish the CAN Hardware Index and the Mode and Node IDs which are displayed in the following figures.

CAN Hardware ID Disabled

When the hardware ID mode is disabled, the Node ID is determined by the software setting “Port 1 Node ID”.

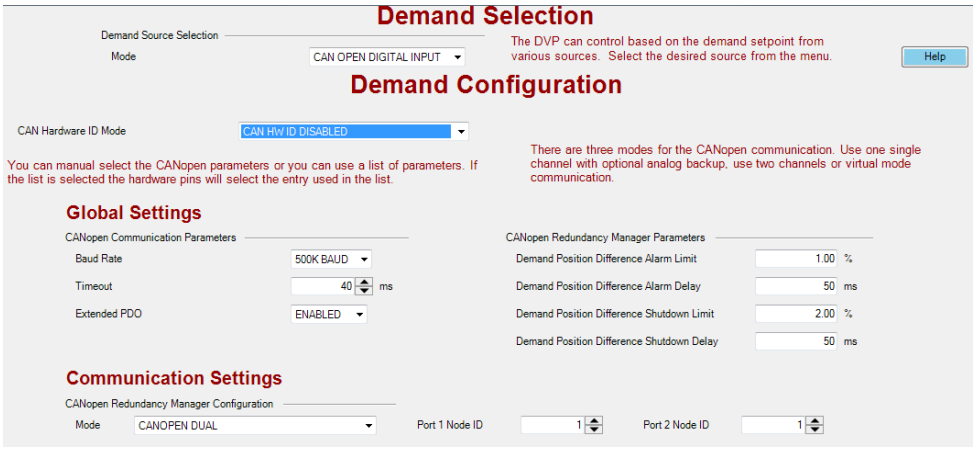


Figure 3-17. CANopen, Hardware ID Disabled

CAN Hardware ID Discrete in – DI5 DI4

With this selection the NODE ID is determined by the state of discrete inputs 4 and 5 at power-up (see table 3-2).

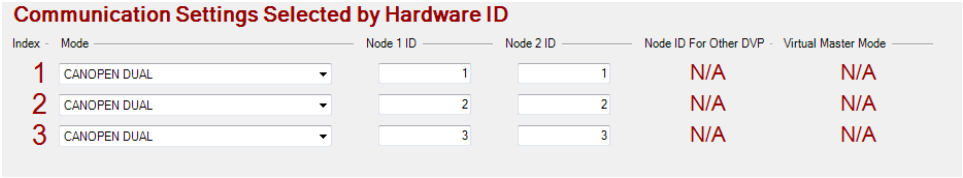


Figure 3-18. CANopen, DI5 DI4

CAN Hardware ID Discrete in – DI5 DI4 DI3

With this selection the NODE ID is determined by the state of discrete inputs 3, 4 and 5 at power-up (see table 3-3).

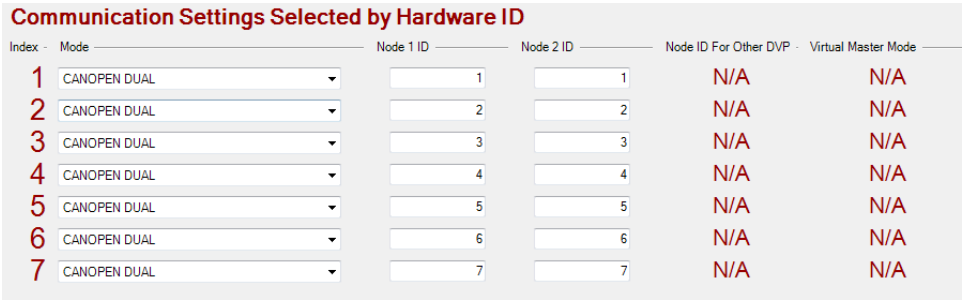


Figure 3-19. CANopen, DI5 DI4 DI3

CAN Hardware ID Discrete in – DI5 DI4 DI2 DI1

With this selection the NODE ID is determined by the state of discrete inputs 1, 2, 4 and 5 at power-up (see table 3-4).

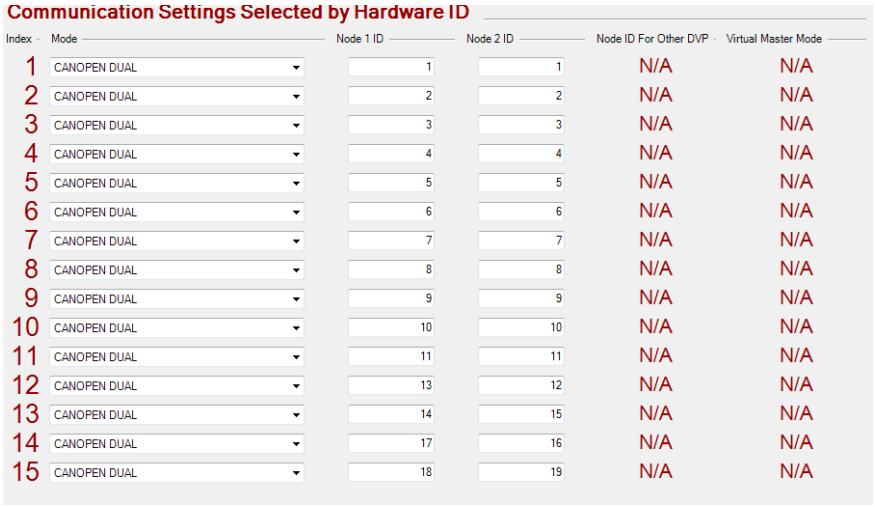


Figure 3-20. CANopen, DI5 DI4 DI2 DI1

3.3.6.4 CANopen Mode

The CANopen Mode is configurable from the dropdown list and one of the following options may be selected:

- CANopen Single with/without Analog Backup
- CANopen Dual is when both CAN ports are to be used.
- CANopen Virtual is used when two DVPs are linked together.

CANopen single mode (with or without backup):

This mode uses CAN port 1 for communication. An optional analog backup signal can be used. This backup signal provides the position demand if the CAN demand signal is considered failed.

CANopen Dual:

This mode uses CAN port 1 and CAN port 2. If the two ports are working correctly, information received from CAN port 1 is used. If communication by CAN port 1 is not possible any more (detected by communication time out), CAN port 2 is used for communication.

CANopen Virtual:

This mode is used when two DVPs are linked together to control more than one actuator or valve. This is used for Dual Redundant DVP Operation.

Port 1 Node ID

This value sets the node ID for the DVP on CAN port 1.

Port 2 Node ID

This value sets the node ID for the DVP on CAN port 2, when two ports are used.

Other DVP Node ID

In Virtual mode, this value sets the node ID for the second/other DVP (the DVP to which this one is paired).

Analog Input Settings

The analog input settings are used to determine the input mode, input scaling and diagnostic thresholds. See the Analog Input Configuration section earlier in this chapter for details on these settings.

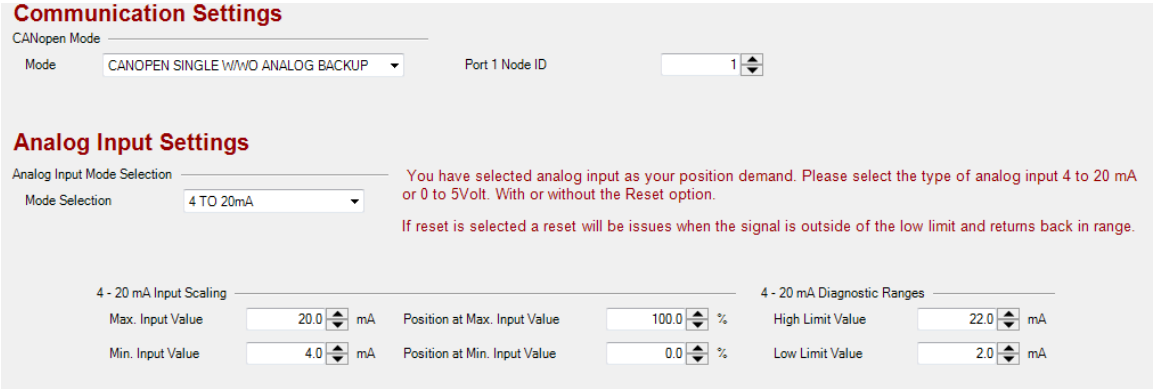


Figure 3-21. CANopen Single Mode with Analog Backup

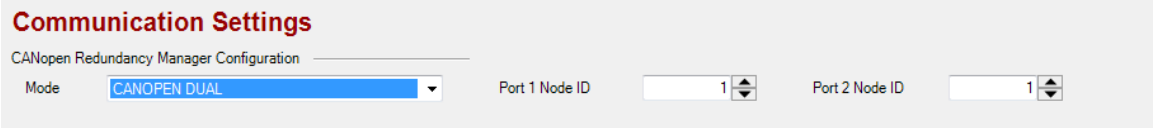


Figure 3-22. CANopen Dual Mode

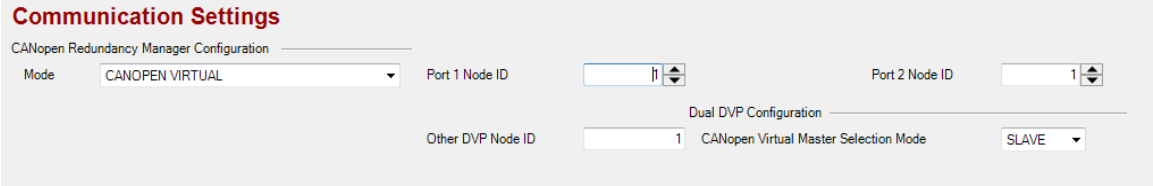


Figure 3-23. CANopen Virtual Mode

3.3.7 EGD Demand Configuration

The settings for EGD mode are provided on this screen.

EGD Mode

This setting determines the number of channels to use, none, 1, 2 or 3.

EGD Producer Rate

Heartbeat producer rate setting, in milliseconds.

EGD Timeout

Loss of signal delay time, in milliseconds.

EGD Stale Data Delay

Delay time for stale data diagnostic, in milliseconds.

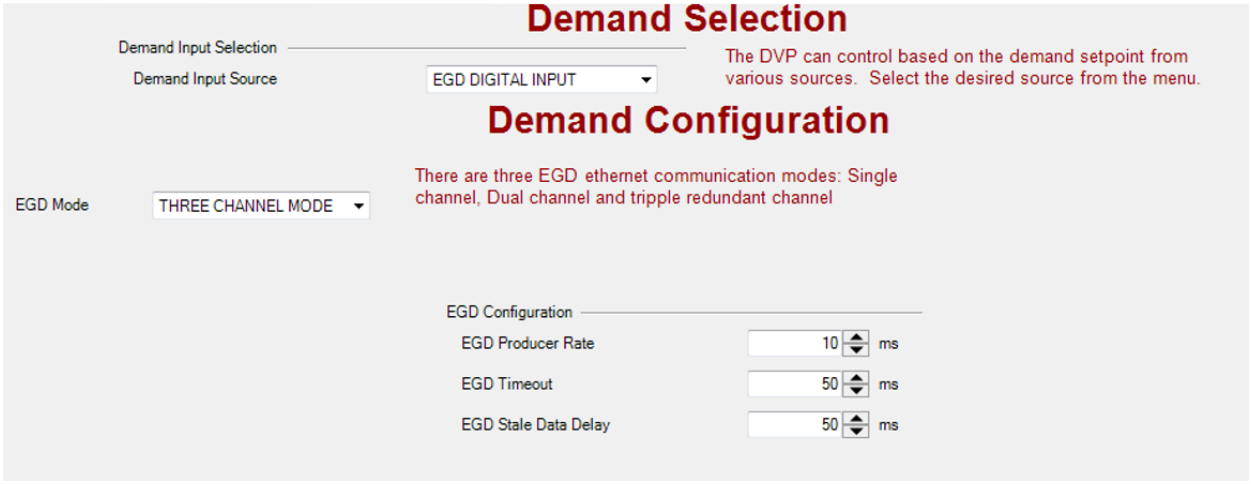


Figure 3-24. EGD Configuration

3.3.8 Servo Analog Input Configuration

The settings for Servo Analog Input mode are provided on this screen (Figure 3-25). These settings apply when the Demand Input Source is set to Servo Analog Input. DVP hardware supporting this mode is required for operation, specifically a servo interface module.

Input Setup

Number of Inputs Used: Sets the number of servo analog inputs used. When set to 1, input 1 is read and simplex operation is used. When set to 2, inputs 1 & 2 are read, and duplex operation is used. When set to 3, all three inputs are read, and triplex operation is used. Default 3, range 1-3.

Input Scaling: Sets the range on the servo analog inputs based on the max current value from customer controller. A value of 10mA implies the current command is +/-10mA. Default 10.0 mA, range 0-12.

Null Offset: Sets the null bias offset in mA. Should match torque motor on a simplex system, even if duplex/triplex. Default 0.8 mA, range 0 to 10.

Input Offset (null adjust)

Input 1/2/3 Offset: Sets the offset compensation for the specified input signal. Default 0.0 mA, range -1 to 1.

Input Fail High/Low Values

Fail High Threshold >: Out of range high failure threshold for the servo analog inputs, in mA. Exceeding this threshold will trigger an input failed high error. A setting of 13 mA will turn off this diagnostic since the input will only read up to about 12.5 mA. Default 10.5 mA, range -13 to 13.

Fail Low Threshold <: Out of range low failure threshold for the servo analog inputs, in mA. An input current below this threshold will trigger an input failed low error. A setting of -13 mA will turn off this diagnostic since the input will only read down to about -12.5 mA. Default -10.5 mA, range -13 to 13.

Input Open Wire Detection Values

Open Wire Threshold <: This sets a failure window for the servo analog input around zero current for the open wire diagnostic. The absolute value of the input current value below this threshold for the set delay time will trigger an open wire diagnostic. Default 0.25 mA, range 0-13.

Open Wire Delay: Sets the time delay for the open wire diagnostic, in msec. Default 5000 ms, range 0-30000.

Input Difference Error (Input Spread Detection)
Difference Error Threshold <: Sets the threshold for the servo analog input difference from the selected input signal, in mA. Exceeding this threshold for longer than the configured delay time will trigger a difference error diagnostic. Default 2.0 mA, range 0-13.

Difference Error Delay: Time delay for the difference error diagnostic, in msec. Default 1000 ms, range 0-30000.

Diagnostic Fault Configuration
All Inputs Failed: Sets the action when all the servo demand inputs are failed, no valid position demands remain. Default On and Shutdown, range off/on and Alarm /Shutdown.

Two Inputs Failed: Sets the action when two of three servo demand inputs are failed. Only valid when the number of inputs is 3. Will not turn on if number of inputs is less than 3. Default On and Alarm, range off/on and Alarm /Shutdown.

Input Difference Error: Sets the action when the servo analog inputs are not tracking each other within the configured limits. Default On and Alarm, range off/on and Alarm /Shutdown.

LVDT Output Configuration
Max Position Voltage: Setting for the LVDT feedback maximum output voltage in Vrms. Default 6.7 Vrms, range 0-8.

Min Position Voltage: Setting for the LVDT feedback minimum output voltage in Vrms. Default 0.7 Vrms, range 0-8.

Feedback Calibration
To support initial device setup, a feedback calibration mode is provided. On the Service Tool this is located at the bottom of the Setpoint Source Configuration page (Figure 3-25) which can be access by selecting the Edit Config button on the Input Configuration page (Figure 2-22). While enabled, warning indicators are provided on the dashboard and on the Input Configuration page (Figure 3-26).

With this mode the LVDT output voltages can be forced, thereby facilitating customer controller feedback calibration and testing.

Calibration Mode Selector
Used to manually check or calibrate the LVDT Va and Vb outputs. When set to “OFF”, the mode is disabled and not used. When set to “Feedback Calibration Mode”, all LVDT outputs are forced to internally generated voltage levels based on the “Feedback Position” % setting.

Manual Feedback Position Setting
Used to calibrate and/or verify the LVDT outputs. When enabled (mode set to Feedback Calibration Mode), sets the position output value for all LVDT signals. Default 0%, range 0-100.

This mode is intended for OFF-LINE USE ONLY.
Enabling this mode may result in valve/actuator movement.
LVDT output voltages will be in a manual open loop mode.

Feedback Calibration Procedure

Here is a high-level description of the controller feedback calibration procedure. Follow this guidance for each control channel. This procedure assumes the control channel has a facility to capture the feedback voltages at min and max to determine overall valve stroke for positioning.

1. Ensure device is shut down prior to enabling test.
2. Preset the Manual Feedback Position Setting at 0%.
3. Enable Calibration mode by setting the mode to “Feedback Calibration Mode”.
4. Set the “at min position” indicator on the position loop controller.
5. Set the Manual Feedback Position Setting to 100%.
6. Set the “at max position” indicator on the position loop controller.

The position calibration can be verified by enabling the mode, setting various manual feedback position values, and then confirming the values on the customer controller.

WARNING **Feedback Calibration mode must be turned off to return to closed loop operation.**

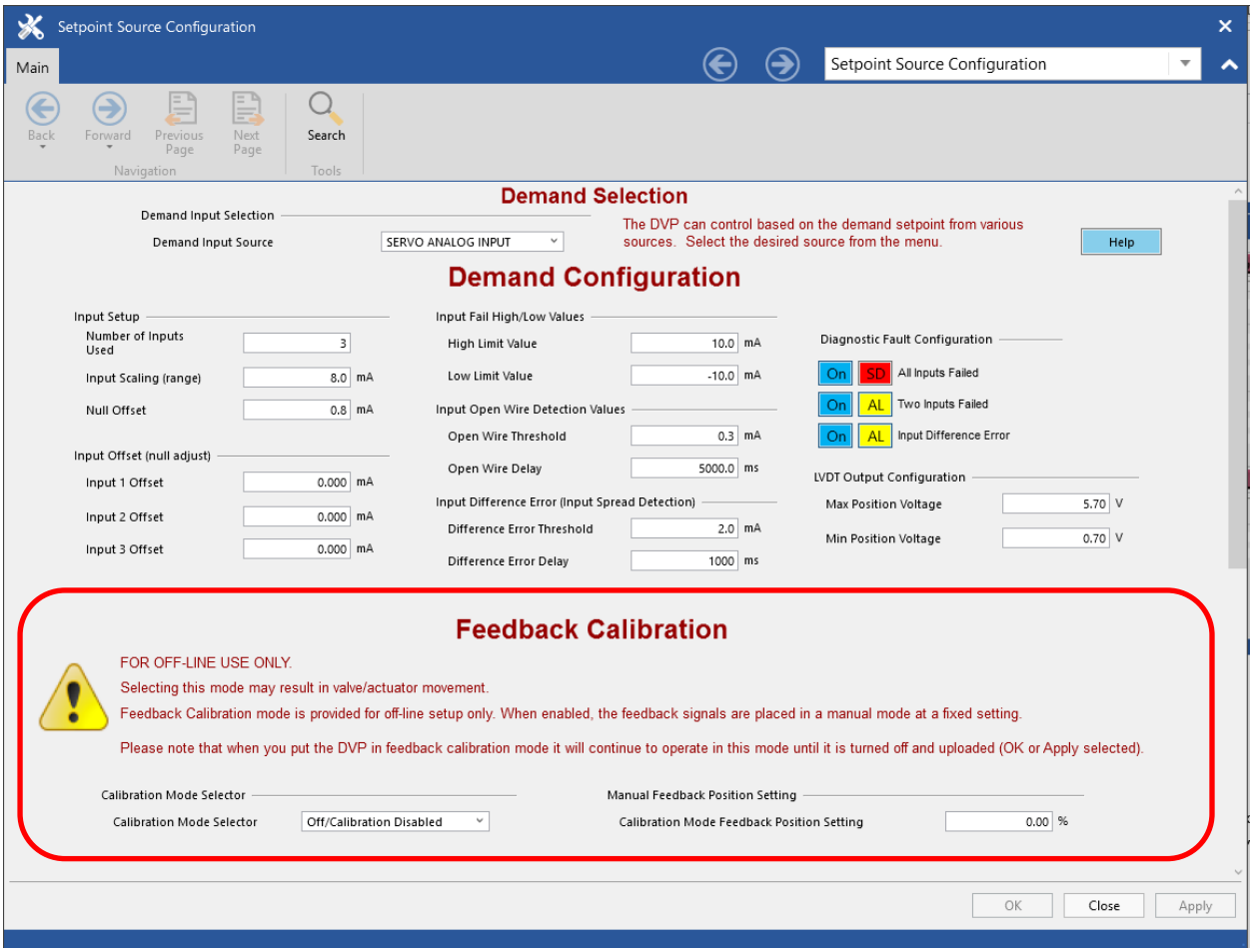


Figure 3-25. Servo Analog Input – Feedback Calibration

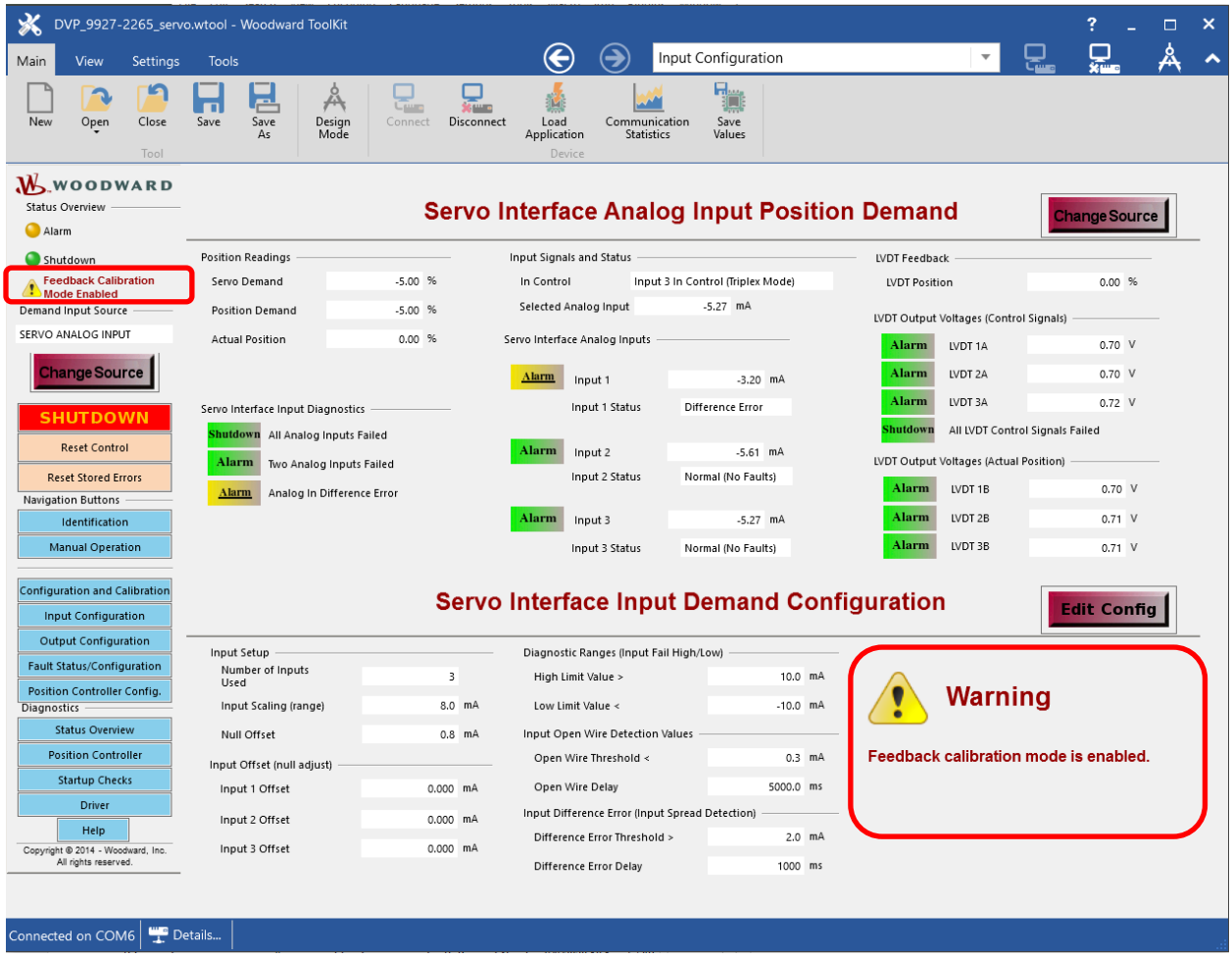


Figure 3-26. Servo Analog Input – Feedback Calibration Mode Indicators

Performance Verification

It is highly recommended that the full control range and dynamic performance of the valve or actuator is confirmed after completion of the calibration process to ensure the proper movement of the valve and actuator corresponds to the demand setting from the control system. Refer to servo interface module calibration procedures in the DVP hardware manual 35185.

3.4 Setpoint Source Modifications

This screen provides the demand filter settings.

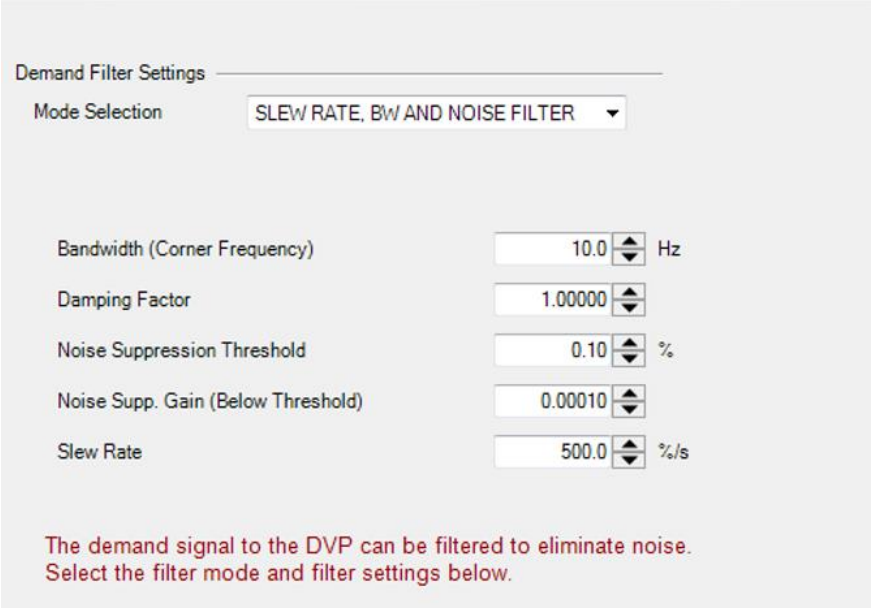


Figure 3-27. Setpoint Source Modifications Page

Note: Proceed with caution. Editing the configuration with the DVP in the wrong state of operations may result in errors or damage.

NOTICE

Before modifying any settings of the DVP, make sure the device is shut down. Modifying settings with the unit in operation may result in unexpected behavior.

⚠WARNING

The SHUTDOWN button will move the valve to the fail position (0% position, or 100% position for fail-open). This will potentially shut down the Prime Mover!

IMPORTANT

The setpoint filter is implemented in series with the control model.

3.4.1 Demand Input Filter Configuration

This group contains the settings for the setpoint filter. If the input filter is turned off, the setpoint signal is not filtered. The bandwidth filter acts to limit the system response to the specified settings (required by some applications). The noise suppression filter attenuates the amplitude of low amplitude, high frequency noise signals (due to speed pickup anomalies, or transducer noise). The input filter is used to shape the frequency response characteristics of the valve/actuator system for bandwidth, noise and slew rate limiting to certain applications.

Mode Selection

- Input Filter Off
- Bandwidth Filter
- Noise Filter
- BW and Noise Filter
- Slew Rate Filter
- Slew Rate and BW Filter
- Slew Rate and Noise Filter
- Slew Rate, BW, and Noise Filter

The active settings of the input filter are displayed in the Input Filter Settings group. This input filter is used to shape the frequency response characteristics of the valve/actuator system for bandwidth limiting certain applications.

The **Bandwidth filter** can be set to reduce input signal noise, i.e., from the magnetic pick-up signal variation. This is a linear second order filter for limiting the bandwidth of the setpoint of the position control. The units for the bandwidth of the filter are hertz (Hz). Note: This will not affect the bandwidth of the controller but will change the bandwidth of the input signal. Damping factor is a unit-less value.

The **Noise filter** will dampen the effects of small amplitude, high frequency signals. The Noise Suppression Threshold is provided in percent of position (%) and sets the voltage threshold below which the low gain filter is in effect. The noise suppression gain is a unit-less value. The filter input range is normalized at 0 to 1. Inputs with an amplitude change greater than the threshold shall pass through the filter with a gain of 1. Inputs with an amplitude delta less than the B1 threshold shall pass through the filter with a gain of B2/B1. This gain is equivalent to filter BW in rad/sec times the sample period. (B2/B1=BW*Ts)

The **Slew Rate limiter** can also be applied, to limit the maximum rate of change applied by the position demand signal. The unit of this limiter is percent per second.

For a Dual DVP system, the Slew Rate setting controls the rate of movement if only one actuator/valve is operational. Therefore, only modify the setting if intending to change that behavior. Additionally, for a Dual DVP system the slew rate should be set to the same value on both DVP units.

Any combination of these filters can be applied, as determined by the Mode selection.

3.4.2 Bandwidth Filter Setting

The active bandwidth frequency and damping factor are displayed when the bandwidth filter is selected.

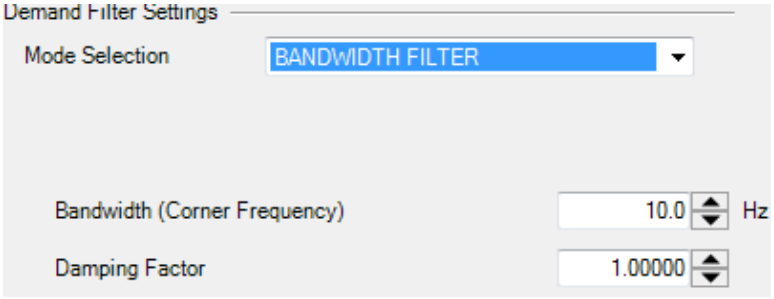


Figure 3-28. Bandwidth Filter Settings

3.4.3 Noise Filter Setting

The noise filter threshold and gain settings are displayed when noise filter is selected.

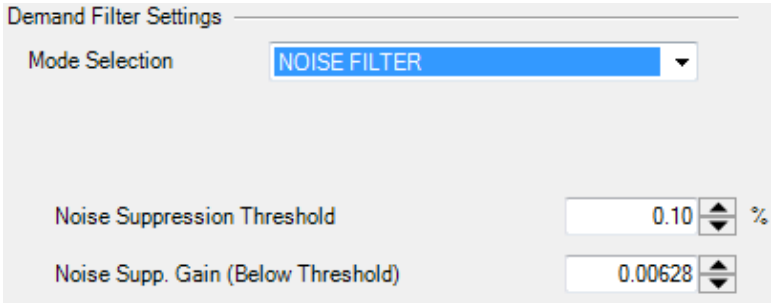


Figure 3-29. Noise Filter Settings

3.4.4 Bandwidth and Noise Filter

This page allows the filter to be set for a bandwidth and noise combination function. The filter is implemented in two parts: a second order filter limiting the bandwidth of the setpoint of the position control and a nonlinear filter that damps low amplitude, high frequency signals while allowing large amplitude signals to pass through.

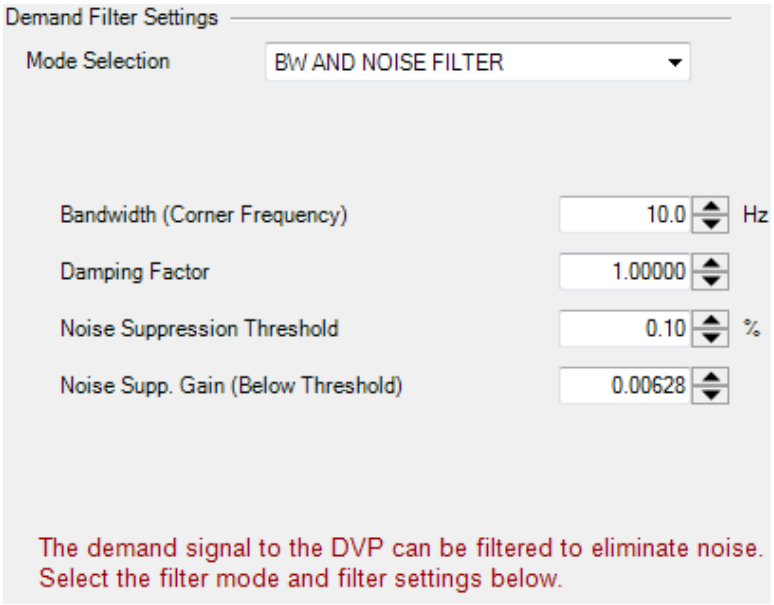


Figure 3-30. Demand Filter Settings - Bandwidth and Noise Filter Settings

3.4.5 Slew Rate Filter

A filter displayed in percentage per second, which limits the maximum rate of change determined by the user adjustments to the filter.

For a Dual DVP system, the Slew Rate setting controls the rate of movement if only one actuator/valve is operational. Therefore, only modify the setting if intending to change that behavior. Additionally, for a Dual DVP system the slew rate should be set to the same value on both DVP units.

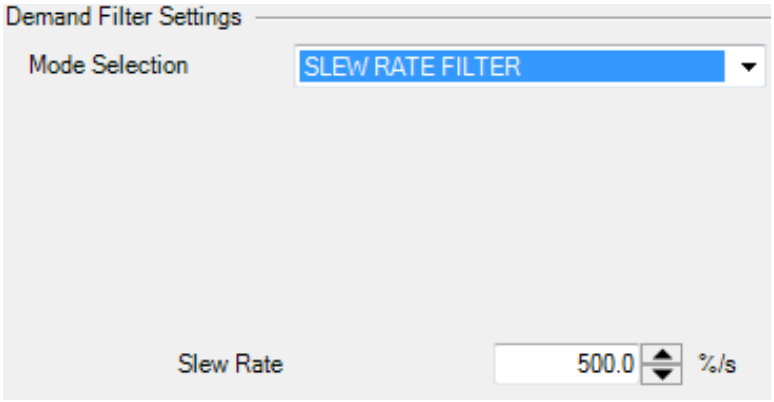


Figure 3-31. Demand Filter Settings - Slew Rate Filter Settings

3.4.6 Slew Rate and Bandwidth Filter

This page allows the filter to be set for slew rate and bandwidth combination function.

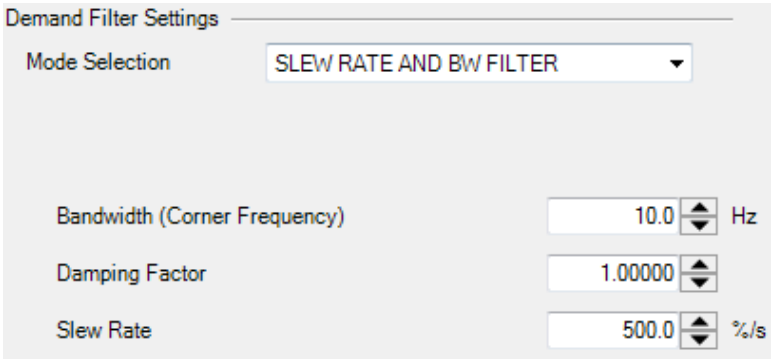


Figure 3-32. Demand Filter Settings - Slew Rate and Bandwidth Filter Settings

3.4.7 Slew Rate and Noise Filter

This page allows the filter to be set for slew rate and noise combination function.

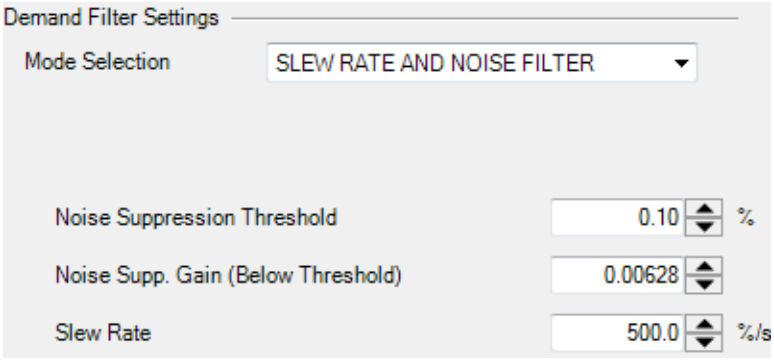


Figure 3-33. Demand Filter Settings - Slew Rate and Noise Filter Settings

3.4.8 Slew Rate, Bandwidth, and Noise Filter

This page allows the filter to be set for slew rate, bandwidth, and noise combination function.

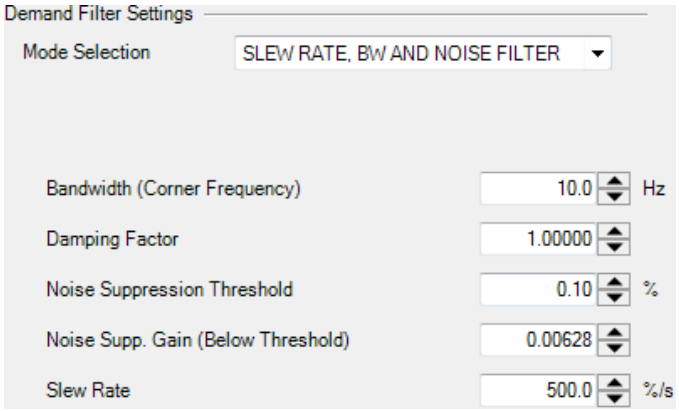


Figure 3-34. Demand Filter Settings - Slew Rate, Band Width, and Noise Filter

3.5 Current Diagnostics

3.5.1 Current Diagnostic Configuration – Off

With the current diagnostic drop down selected in the “OFF’ position, there are no additional options available.

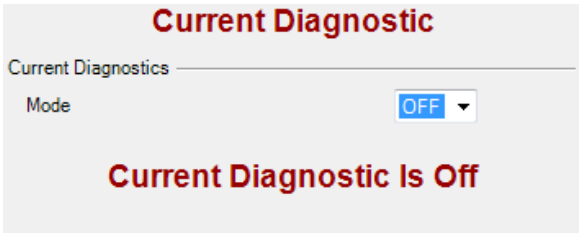


Figure 3-35. Current Diagnostic Configuration Off

3.5.2 Current Diagnostic Configuration – On

With the current diagnostic dropdown selected in the “ON” position, you may adjust the three limit settings of Limit and Delay Time to customize the results to your specific needs.

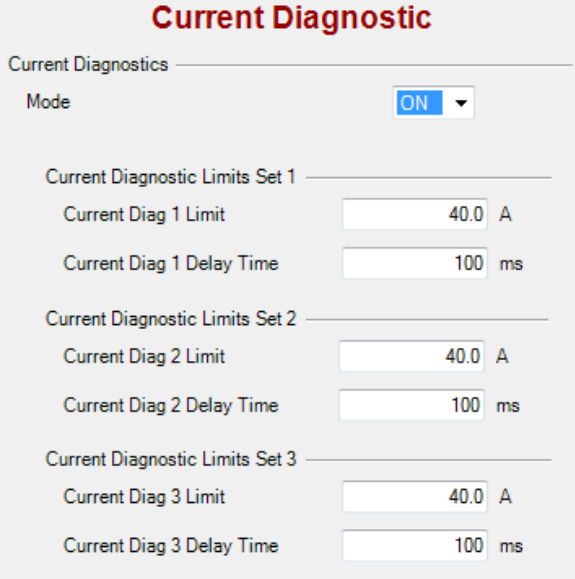


Figure 3-36. Current Diagnostic Configuration On

3.6 Fault Status and Status Flag Configuration

Some of the DVP’s process fault and status flags are user configurable. The configuration of these process fault and status flags is done on the Process Fault and Status Flag Configuration page.

This screen provides access to the user-configurable diagnostics. They can all be either enabled or disabled (using the left button) or configured as Alarm (yellow) or Shutdown (red) (using the right button).

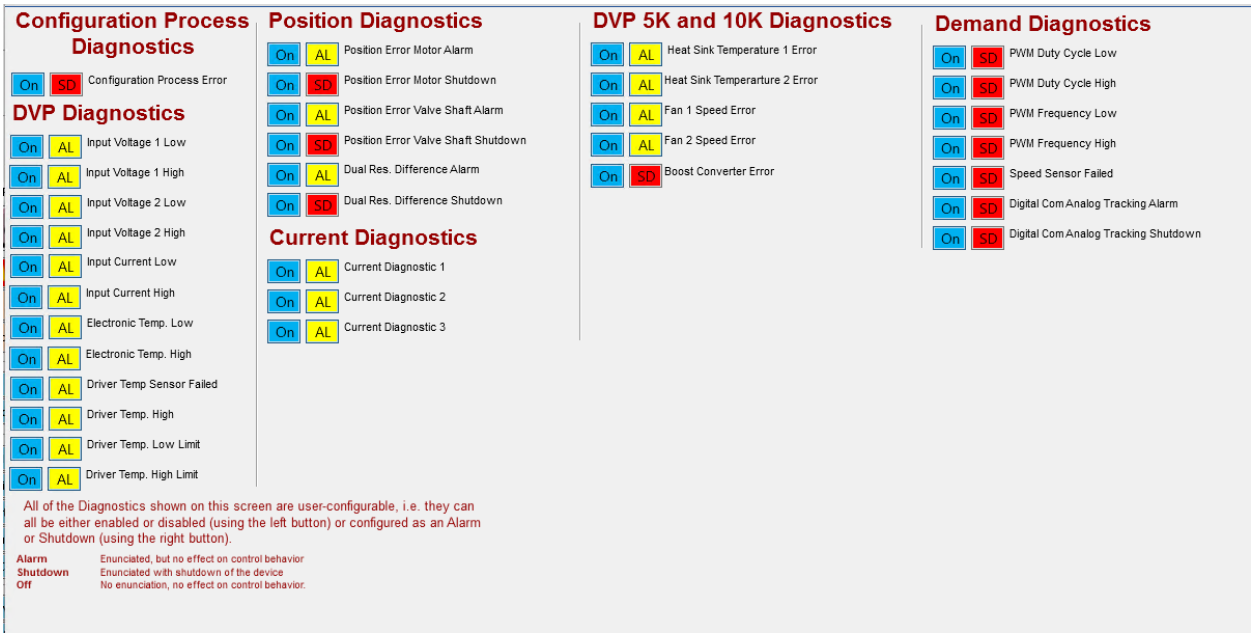


Figure 3-37. Process Fault and Status Flag Configuration Page

Each process fault or status flag can be configured as either an alarm or shutdown and can be configured as either active or disabled. In the presence of detected condition, a diagnostic configured as a shutdown will result with the DVP overriding the setpoint and directing the actuator to the failsafe position (in most cases 0%). If a diagnostic is configured as an alarm, the detected condition will be annunciated on the Service Tool, and a discrete output if selected, but the DVP will continue to control. A disabled diagnostic is annunciated and does not generate a shutdown condition.

Alarm: Enunciated, but no effect on control behavior.
Shutdown: Enunciated with shutdown of the device.
Off: The condition will not show up in an overall Alarm or Shutdown status, but the individual indicator will still show the actual status.

The window has three options for selected changes, Ok, Cancel or Apply. Selecting Cancel closes the window and ignores any changes. Selecting Ok saves the changes to the device and closes the window. Selecting Apply saves the changes to the device but keeps the window open.

⚠WARNING

Modification of these settings could affect operation and plant diagnostics annunciation. It is recommended that you conduct an appropriate review of the settings PRIOR to making these modifications.

⚠WARNING

Disabling diagnostic flags or changing their function from Shutdown to Alarm could result in a dangerous condition. It is recommended that you conduct an appropriate review of the settings PRIOR to making these modifications.

IMPORTANT

In the case of the analog input, EGD or PWM input diagnostics, if either one of these inputs is not used, the associated diagnostics are automatically disabled. It is not necessary to disable these diagnostics explicitly.

NOTICE

In some cases, if the DVP is operated continuously under conditions where one or more of these diagnostic conditions are detected, some performance degradation or reduction in component life may occur. It is the responsibility of the user to configure these settings to ensure safe operation.

3.7 Discrete Input Configuration

This page provides the discrete input settings for the overall action mode and active open/closed selection on each input.

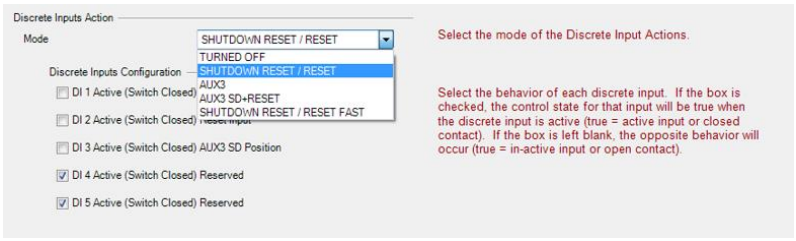


Figure 3-38. Discrete Inputs Configuration

Note: The option to select and use the DI signals is subject to being over-ridden if the CAN HW ID mode is enabled or the Motor brake functionality is in use.

3.7.1 Discrete Inputs Action

The action mode facilitates a choice of pre-set functionality for the discrete inputs. The functionality assigned to the discrete input is described below.

For **'TURNED OFF'**:
No actions selected; discrete input functions are not used.

For **'SHUTDOWN RESET / RESET'**:
Sets Discrete Input 1 to Shutdown/Reset and Discrete Input 2 to Reset. DI 3 is not used.

For **'AUX3'**:
Discrete Input 3 is assigned as Shutdown/Reset. Discrete inputs 1 & 2 are not used.

For **'AUX3 SD+RESET'**:
Sets DI 1= Shutdown/Reset, DI 2= Reset and DI 3= Shutdown/Reset.

For **'SHUTDOWN RESET / RESET FAST'**:
Sets Discrete 1 to Shutdown/Reset and Discrete 2 to Reset. Reset off delay time of 100 ms. This mode will do the same as the non-fast "Shutdown Reset/Reset", but the delay time has been reduced to 100 ms. This is used for legacy control system where the reset time has been typically set to 1 sec. This will make the DVP compatible with the reset / Run input on the EM digital Driver.

Shutdown/Reset Function

This is a dual function input. When 'Shutdown' is asserted, a shutdown is executed. When the shutdown assertion is removed, a reset is performed (after a 1sec delay, 100ms if Fast is configured). A Shutdown commanded by Discrete Input 1 will trigger an “External Shutdown” diagnostic. A Shutdown commanded by Discrete Input 3 will trigger an “AUX3 SD Position” diagnostic.

Reset Function

Reset is a command to clear all latched diagnostics that are no longer active. The reset command is executed upon assertion removal, after it was asserted. It is edge-triggered with a 1 sec delay. Example if input is configured as active closed and the reset discrete input is closed/asserted, the reset command occurs 1sec after the input opens (100ms if “Shutdown Reset/Reset Fast” is configured).

If a reset is triggered while the DVP is running, a reset command will be issued, which does not have any effect on the operation of the DVP. However, if the DVP is shut down, the issued reset command will start up the DVP and it will reset the shutdown, assuming it was no longer active.

Table 3-5. Discrete Input Action Summary

Action	Discrete Input 1 Function	Discrete Input 2 Function	Discrete Input 3 Function
TURNED OFF	*(not used)*	*(not used)*	*(not used)*
SHUTDOWN RESET/RESET	Shutdown/Reset	Reset	*(not used)*
AUX3	*(not used)*	*(not used)*	Shutdown/Reset
AUX3 SD+RESET	Shutdown/Reset	Reset	Shutdown/Reset
SHUTDOWN RESET/RESET FAST	Shutdown/Reset	Reset	*(not used)*

3.7.2 Discrete Inputs Active Open/Closed

Selection of active open (unchecked) or active closed (checked box) is provided for each input.

The default behavior of these discrete inputs is that their state is true or positive when the discrete input is active, or the input contact is closed. De-selecting the input box will reverse this default behavior. This behavior can be modified individually for each discrete input. For active open (unchecked), the Shutdown/Reset will issue a shutdown when the input is open.

We recommend that the shutdown discrete inputs be configured as active open to protect against broken wires. A broken wire will look like an open input, which will be the inactive state and would generate a shutdown.

⚠WARNING

Modification of these settings could affect operation of the DVP. An appropriate review of the settings is recommended PRIOR to making these modifications.

⚠WARNING

Modification of these settings could affect operation and plant diagnostics annunciation. An appropriate review of the settings is recommended PRIOR to making these modifications.

3.8 Analog Output Configuration

The scaling, and diagnostic settings for the analog output are displayed on the Analog Output Configuration page.

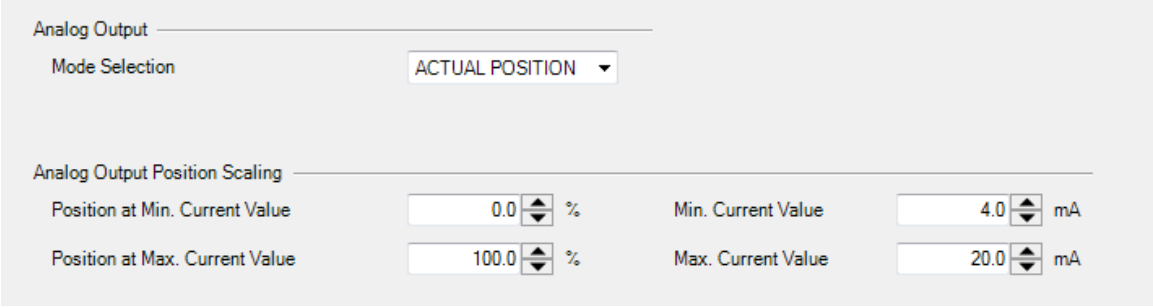


Figure 3-39. Analog Output Configuration

⚠WARNING

Modification of these settings could affect operation and plant diagnostics annunciation. It is recommended that you conduct an appropriate review of the settings PRIOR to making these modifications.

3.8.1 Analog Output Mode

The DVP control variable represented by the analog output signal is configurable from the Mode Selection pull-down list. The following options can be selected:

- Turned Off
- Actual Position
- Echo Setpoint
- Motor Current (quadrature current)

3.8.2 Analog Output Position Scaling

By adjusting the input scaling values, the selected DVP control variable can be calibrated to the input of a transmitting or monitoring device. Alternatively, the output values can be adjusted to match those observed at the transmitting device.

The position at minimum current value is directly related to the minimum current value (0.0% and 4.0 mA). Similarly, the value of position at maximum current value is directly related to the maximum current value (100.0% and 20.0 mA). As the current values increase or decrease, the actual position will increase and decrease proportionately.

3.9 Discrete Output 1 Configuration

The main configuration of the discrete outputs is performed on this page. Each of the discrete outputs is configured in the same manner. Each of the two discrete outputs can be configured to activate (or de-activate) upon detection of any of fault conditions monitored by the DVP.

From the pull-down list, the following options may be selected:

Table 3-6. Discrete Output 1 Configuration Options

Mode	Description
Turned Off	The output state is inactive (always off) in this mode.
Speed Switch	The output is based on the speed signal and is active above the on threshold and inactive below the off threshold. This option is only valid when a speed/MPU input is used.
Active when diagnostic is detected	The output is active for any of the user-selected conditions.
Inactive when diagnostic is detected	The output is inactive for any of the user-selected conditions.

The typical configuration would be for the output to become active upon detection of a diagnostic. To invert this behavior, select the second mode.

Figure 3-40. Discrete Output Configuration

Each discrete output can be triggered by any of the process fault and status flags detected within the DVP. To select which diagnostics will trigger the discrete output, select the check box to the left of the desired diagnostic. If more than one diagnostic is selected the discrete output will be triggered if any single condition is detected. This behavior acts as an OR condition.

The Discrete Output Flag Selection pages may be accessed by selecting the Advanced Configuration "Next" button in the figure above or from the dropdown menu as shown in the figure below.

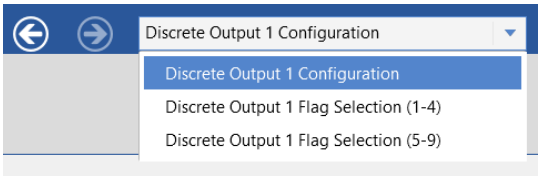


Figure 3-41. Discrete Output Flag Selection Dropdown Menu

WARNING

Modification of these settings could affect operation and plant diagnostics annunciation. An appropriate review of the settings is recommended PRIOR to making these modifications.

3.9.1 Combined Fault Flag Actions

Using the three Combined Fault Flag Actions Summary Flag, Summary Flag combined with Individual Flags, or Individual Flags, the discrete outputs can be triggered when higher-level diagnostic events like alarm, shutdown, or shutdown internal are issued.

The events that the discrete outputs react to can be configured by checking the appropriate checkbox. If more than one diagnostic is selected the discrete output will be triggered if any single condition is detected. This behavior acts as an OR condition.

3.9.2 Discrete Output 1 Flag Selection (1-4) and (5-9)

Extended configuration settings for the discrete outputs and are accessed by selecting the Advanced Configuration "Next" button or from the dropdown menu at the top/left of the Discrete Output Configuration page. Each of the discrete outputs has two extended configuration pages. The first page holds the process fault and status flags 1 to 4, the second page the flags 5 to 9.

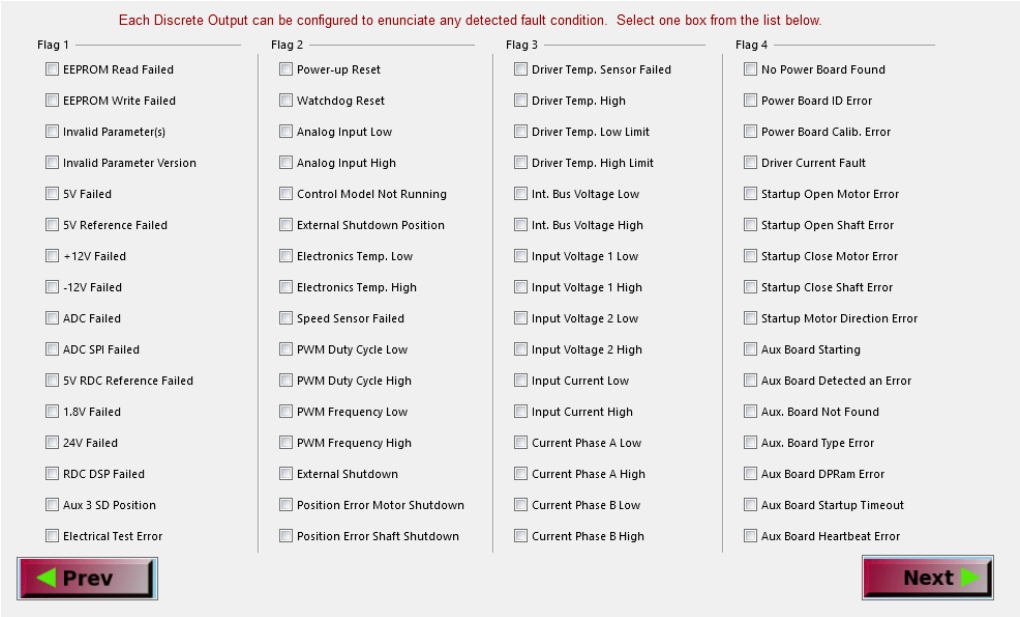


Figure 3-42. Discrete Output Flag Selection (1-4)

You may navigate back to the Discrete Output Configuration page by selecting the “Prev” button on the lower/left or to Discrete Output Flag Selection (5-9) by selecting the “Next” button on the lower/right corner of the page. The other option is to use the dropdown menu on the top/left corner of the page.

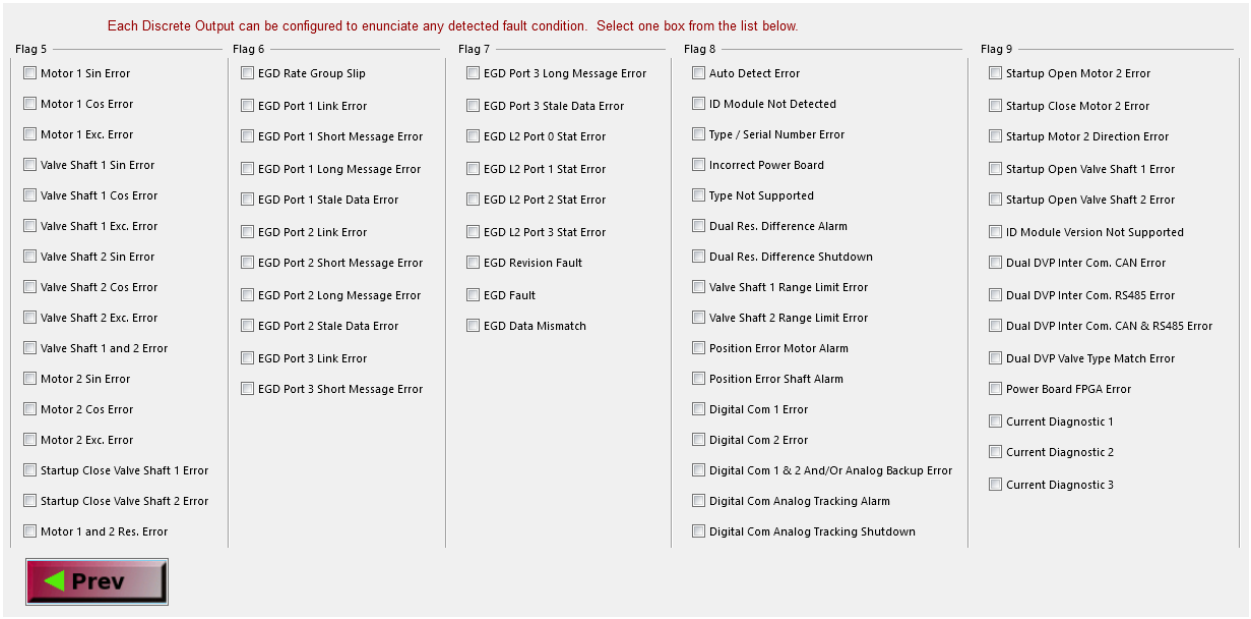


Figure 3-43. Discrete Output Flag Selection (5-9)

You may navigate back to the Discrete Output Flag Selection (1-4) page by selecting the “Prev” button on the lower/left corner of the page. Or by using the dropdown menu in the top/left corner of the page

3.10 Discrete Output 2 Configuration

This page provides the settings for discrete output 2. The settings are identical as those for discrete output 1, refer to that section for details.

3.11 Linearization Configuration

This page provides the linearization settings. When enabled the 11-point position curve is used, allowing for a non-linear relationship between the position command and actual position. When disabled, the linearization curve is not used.

The Position (%) values represent input breakpoints and must be continuously increasing in value. Each input breakpoint value must be larger than the previous and less than the next value. If not, a Linearization Monotonic diagnostic is annunciated.

The Scaled Position (%) values represent the output at the breakpoint. Between breakpoints the values are interpolated.

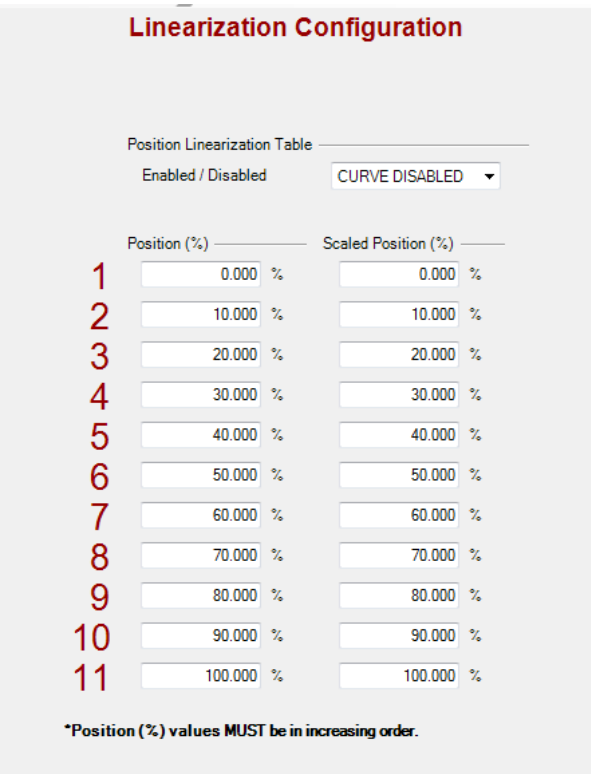


Figure 3-44. Linearization Configuration

3.12 User Force Limiter

This page provides the option to enable or disable the user force limiter. The user force limiter is not available on all valve types. See Appendix C for more details on the functionality of this mode.

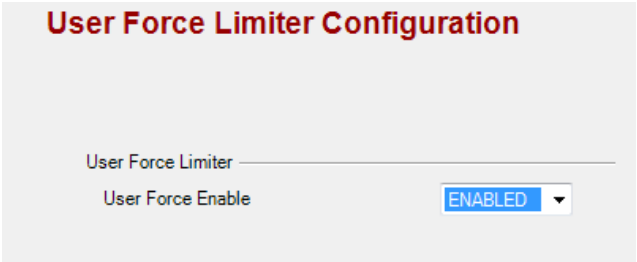


Figure 3-45. User Force Limiter Configuration

Chapter 4.
Managing DVP Settings Files

4.1 Managing DVP Settings Files

⚠WARNING

Incorrect settings may adversely affect the performance, accuracy, behavior, and safety of the valve/actuator/DVP system. Do not make changes to these settings without thoroughly reviewing the configuration section of this manual. Injury to personnel or equipment damage may result.

Management of the DVP settings files is performed via the “Settings” menu, accessible from the main toolbar. Selection from these options initiates the Setting Editor Wizard.

4.1.1 Valves with an ID Module

The DVP is shipped by factory default in auto-detect mode. As soon as a valve, which has an integrated ID module, is connected to the DVP for the first time, the DVP will auto-detect the type of valve and perform a self-configuration procedure. The content of the ID module is automatically imported into the DVP, and the control is configured with the valve specific settings (valve serial number, the product code, and the revision). After the auto-detection process is completed successfully, the DVP is configured specifically for this particular valve.

4.1.2 Valves without an ID Module

If no ID module is presented Woodward provides a valve configuration file that contains the pre-set valve parameter setting for your application. The settings file can be uploaded into the DVP using the DVP Service Tool Settings Editor Wizard. The settings should be verified with the serial number of the valve or actuator prior to the operation. (See Valve Type Selection Screen)

The configuration of the actuator and valve related settings are shown on the Valve Type Selection screen. This screen is used to verify that the correct application specific actuator/valve settings are present in the DVP. This should be verified after new settings have been loaded into the DVP using the DVP Settings Editor Wizard.

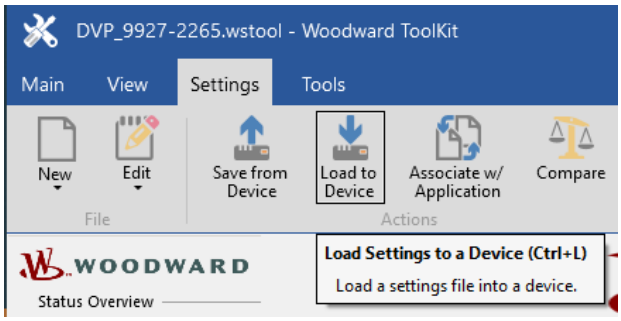


Figure 4-1. Settings Selection

4.1.3 Changing Settings on a DVP

If a pre-configured settings file does not exist or if additional modifications are required, see the next section “Creating a new DVP Settings File” for more information on creating a new settings file. If pre-configured settings files will be loaded to the control, see the “Loading a DVP Settings file to the DVP” section for more information.

4.1.4 Archiving DVP Settings

The settings in a DVP can be archived by following the steps in the next section, “Creating a new DVP Settings File”. This process generates a file (.wset) that can be stored, edited, loaded, and compared to other files.

⚠WARNING

Modification of these settings could affect operation of the DVP. It is recommended that you conduct an appropriate review of the settings PRIOR to making these modifications.

4.2 Creating a new DVP Settings File

As a first step, connect the DVP Service Tool to the DVP by pressing the connect button or selecting “Connect” from the “Device” menu in the main toolbar.

DVP settings files are created by using the DVP Settings Editor Wizard. The Settings Editor Wizard can be accessed using the “Settings” menu in the main tool bar.

Select “Save from Device to File…” to create a new settings file. The Service Tool will read the existing settings of the DVP and save them to a file with the extension .Wset. Edit the new file in the Settings Editor, save file changes, and load the file to the DVP to apply the new settings.

The following steps are the recommended procedure for creating new settings files and modifying the settings of the DVP.

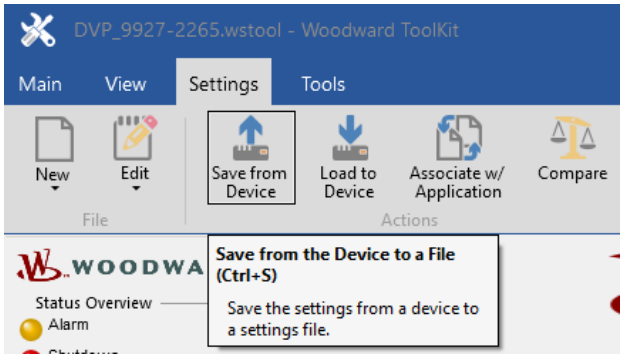


Figure 4-2. Saving Settings from DVP to File

First, specify a file name and a location to save the new settings file. Press the “Browse” button to open a dialog box that allows specifying a file name and a file location for the new settings file. If desired, select an existing settings file to be overwritten with new settings. The Settings Wizard will then issue a warning that the existing file has been selected to be overwritten. Press “OK” to confirm this step.

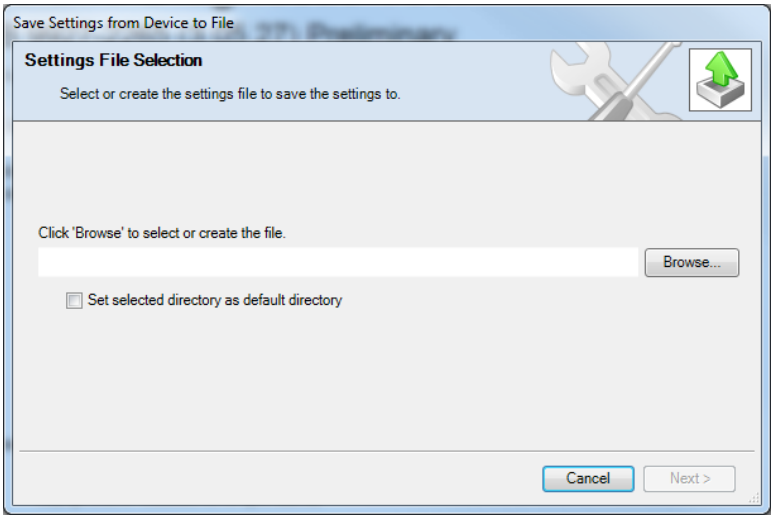


Figure 4-3. Specifying Settings File Name and Location

Once the name and file location of the new settings file have been specified or an existing settings file has been chosen to overwrite, press “Next” to proceed.

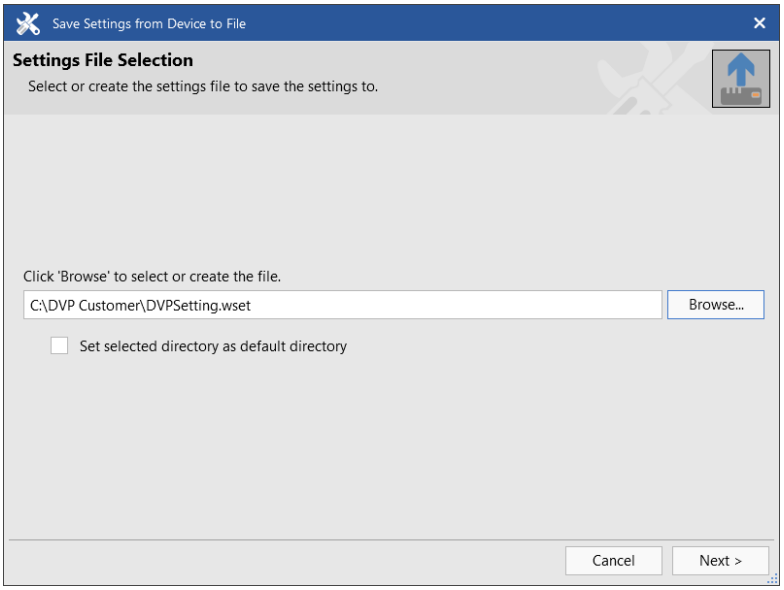


Figure 4-4. Selecting Settings File Location

Select the “Customer DVP Settings” group, which will be included in the new settings file. Select the radio button “Selected Groups” first and then check the “Customer DVP Settings” checkbox. Press “Next” to continue.

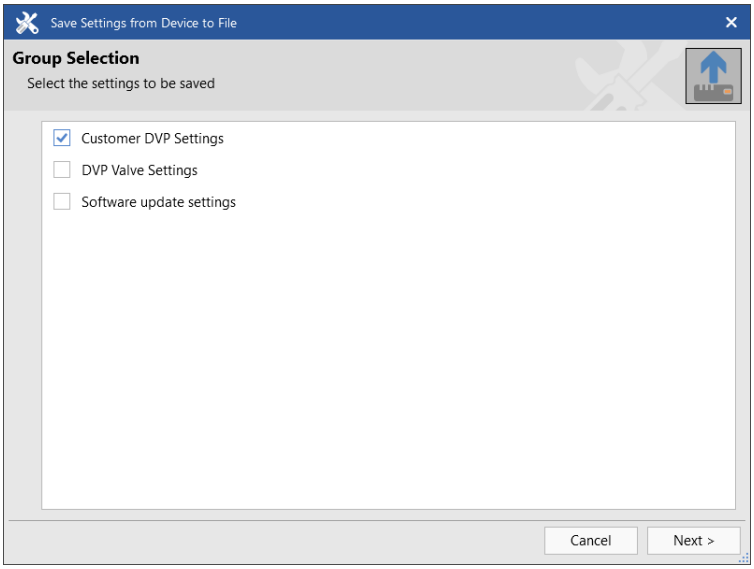


Figure 4-5. Customer DVP Settings Group

The Save Settings Wizard will connect to the DVP and will acquire all of the settings in the “Customer DVP Settings” group.

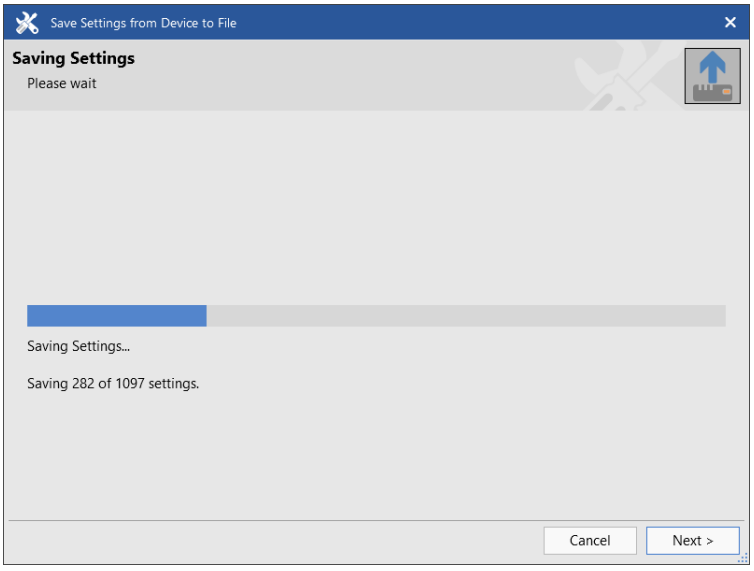


Figure 4-6. Saving Settings to the Customer DVP Settings Group

After this is completed, the following window will allow the user to enter notes for the settings file. Recommended notes for settings files may include the date of creation, the creator's name, and the purpose of modification. This step is optional and can be skipped by pressing the "Next" button to finalize the new settings file.

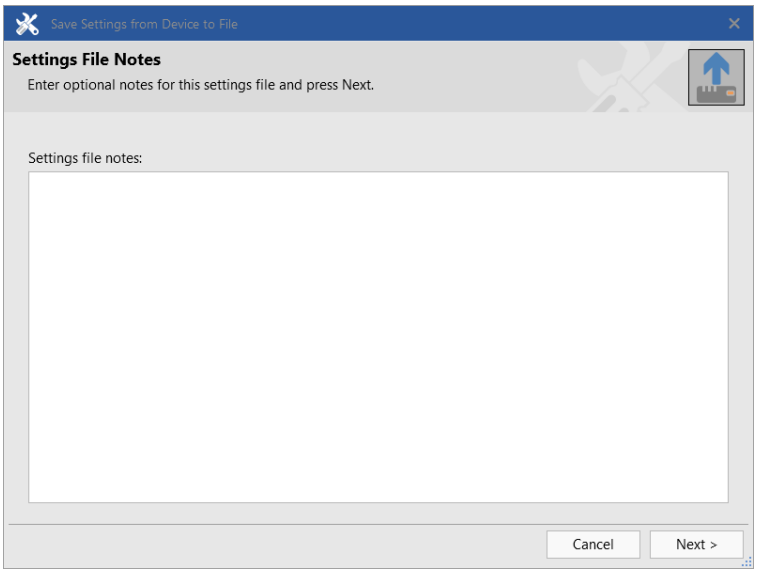


Figure 4-7. Entering Notes to Settings File

Press the "Close" button to close the Save Settings Wizard and finalize the new settings file.

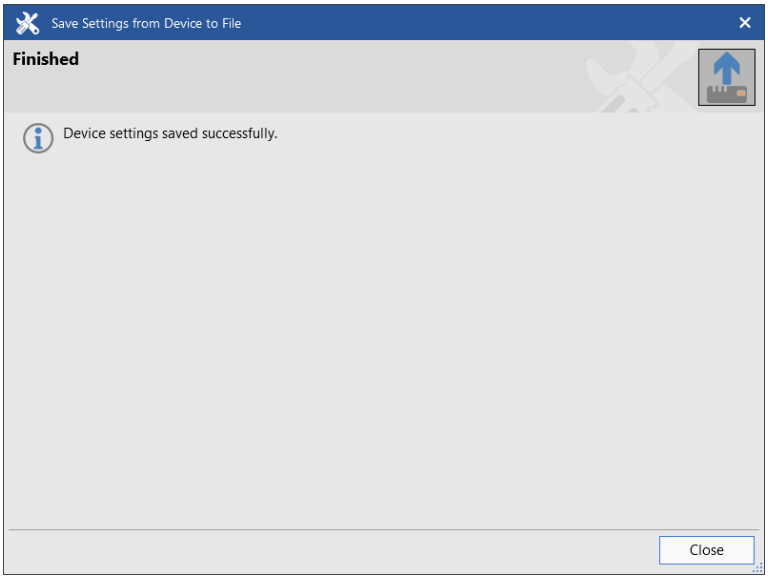


Figure 4-8. Finished Saving Settings Files

4.3 Modifying the DVP Configuration

Once a new settings file has been created, it can be modified using the DVP Settings Editor.

To start the Settings Editor, select “Edit Settings File…” from the “Settings” menu in the main toolbar.

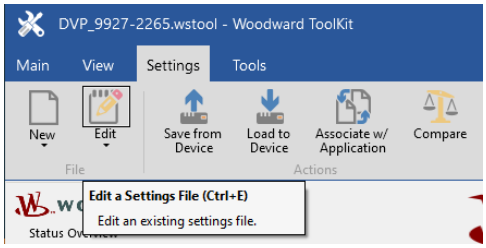


Figure 4-9. Selecting Edit Settings File

Select the settings file in the dialog box.

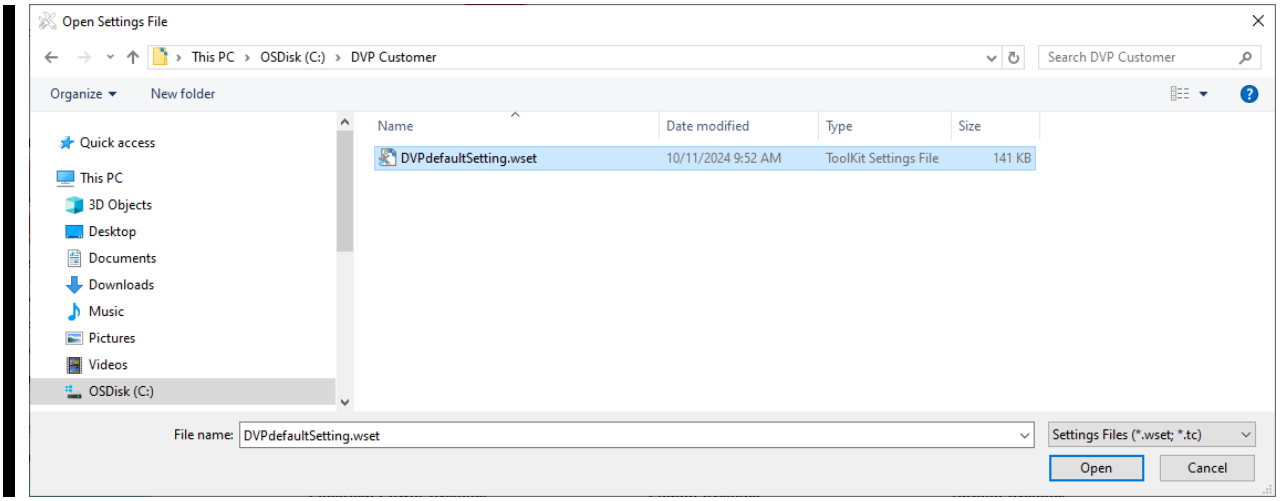


Figure 4-10. Opening Settings Files

IMPORTANT **It is NOT recommended to use the Generic Settings Editor. This Editor is not used in the DVP application.**

Upon completion, a Settings Editor window opens. Use this to make changes. Changes can be saved from the “File” menu selecting “Save” or “Save As”. Instructions for loading the file into the DVP are provided in the next section, “Loading a DVP Settings File to the DVP”.

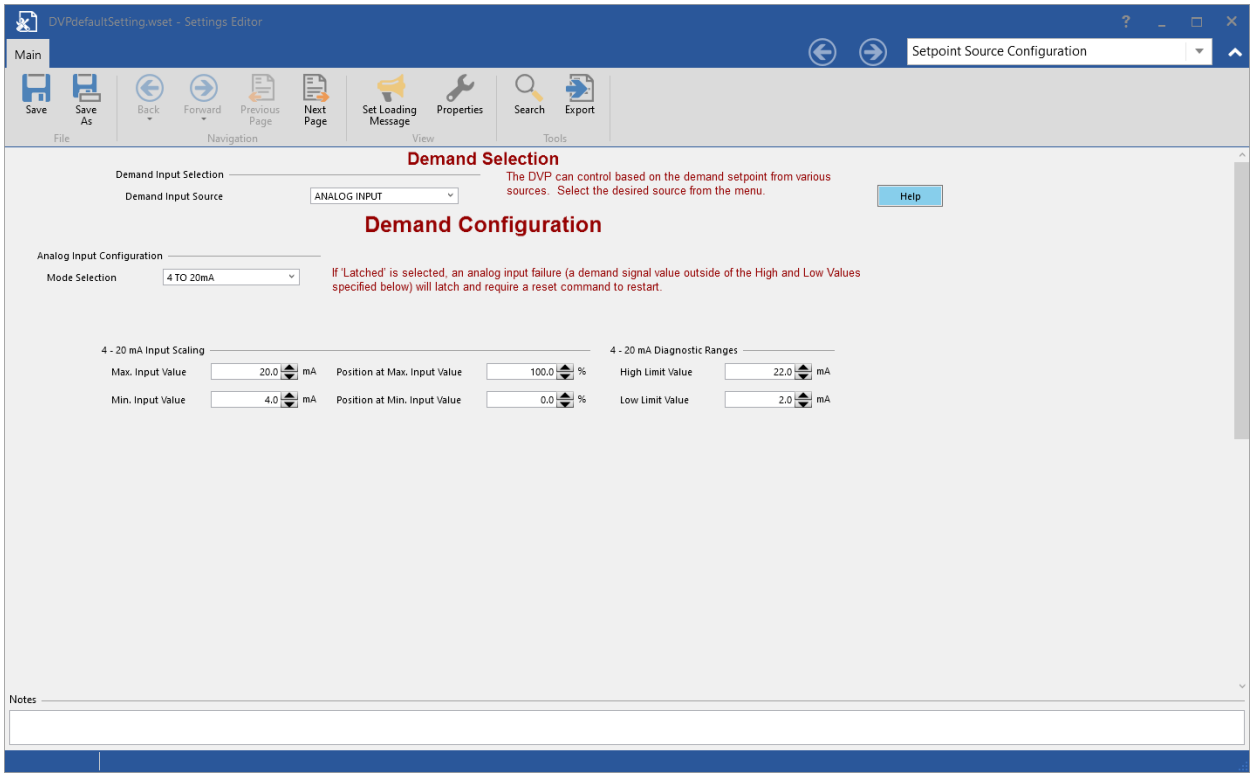


Figure 4-11. Settings Editor Window

4.4 Loading a DVP Settings File to the DVP

Certain actuator and valve products controlled by the DVP require specific setting combinations for proper operation. An example of required configuration variables includes the motor and gear train specifics required to ensure that the LELA ball screw actuator can position precisely over a 1.5 inch (38 mm) travel for one valve type, or 2 inches (51 mm) of travel for another valve type. These settings are made in the DVP by uploading a pre-determined configuration provided by Woodward.

To obtain the configuration file for the actuator/valve unit, contact Woodward at 1-800–523-2831 and request product applications engineering. Provide the applications engineer with the part number, serial number, and manufacturing date code for your unit. The applications engineer will e-mail a copy of the appropriate settings file(s) for your devices and the DVP Service Tool.

⚠WARNING

Incorrect settings may adversely affect the performance, accuracy, behavior, and safety of the valve/actuator/positioner system. Do not make changes to these settings without thoroughly reviewing the section of this manual regarding configuration. Injury to personnel or equipment may result.

A DVP settings file is loaded to the DVP following these steps:

To start, launch the DVP Service Tool and connect to the device.

WARNING

The SHUTDOWN button will move the valve to the fail position (0% position, or 100% position for fail-open). This will potentially shut down the prime mover!

Shut down the valve actuator by pressing the shutdown key and make sure the device is properly shut down and shutdown indicator is illuminated.

Select “Load Settings File to Device…” from the “Settings” menu in the main toolbar.

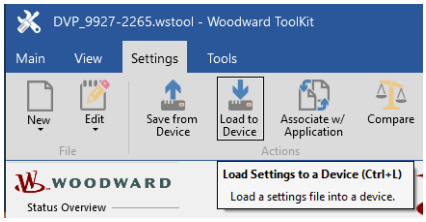


Figure 4-12. Selecting to Load Settings Files into DVP

This will start the Load Settings Wizard.

Press “Next” and select the settings file to be downloaded to the DVP.

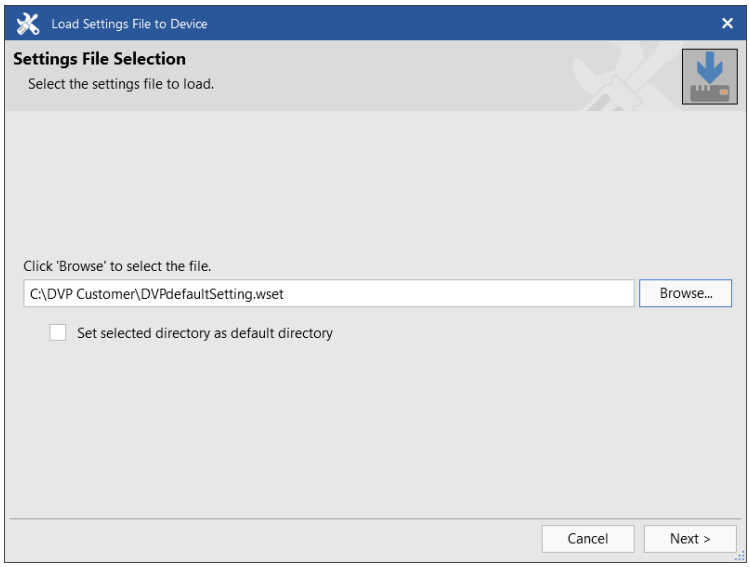


Figure 4-13. Load Settings File Selection

NOTICE

Make sure to review the modified settings on the appropriate DVP Service Tool pages before restarting the DVP. Do NOT restart the DVP without reviewing the settings.

NOTICE

As is the case with similar software-based devices, it is possible to use settings files from older firmware with newer firmware (i.e., from DVP 5418-6262 NEW to DVP 5418-6873A). However, newer firmware settings files cannot be downloaded to DVPs with older firmware (i.e., from DVP 5418-7707- to DVP 5418-7432 NEW). If conversion of newer settings files to older firmware is necessary, see 'Converting a DVP settings file to an older version'. Contact Woodward for additional information or assistance.

It is a rare occasion, but you may be prompted to choose your desired setting if the Settings File is being converted from an older version. The screen below will appear if this prompting occurs.

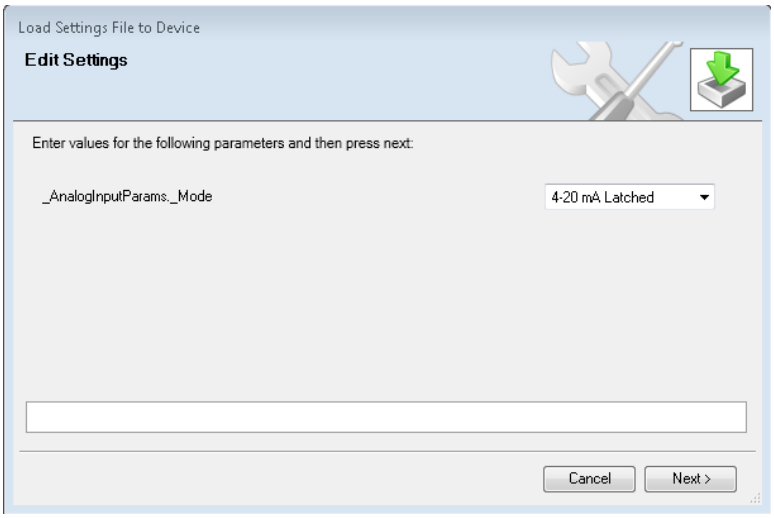


Figure 4-14. Edit Settings from Older Settings File Prompt

The Settings Editor will then download the parameter settings from the Settings File to the DVP.

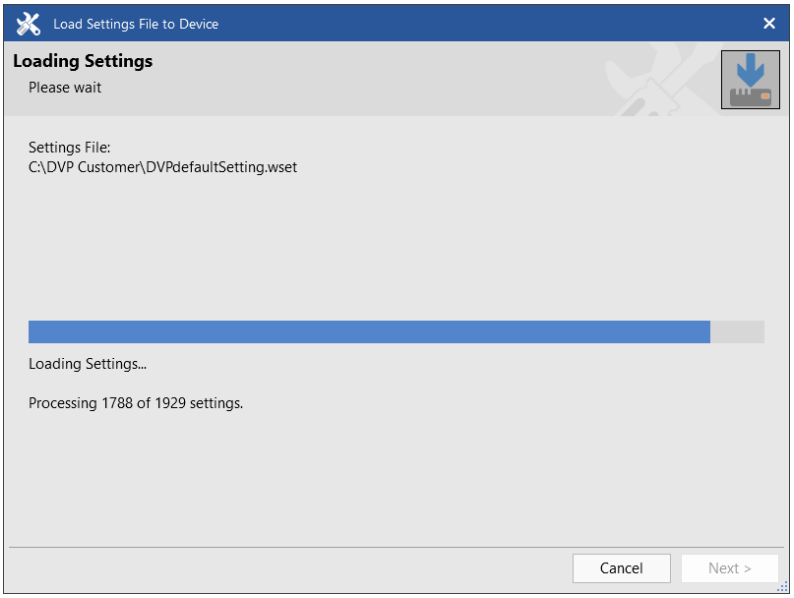


Figure 4-15. Loading Settings into DVP

There will be a fault reported if any value cannot be loaded due to having an incompatibility. If the screen below appears, it means the load failed and you should check the Diagnostic Log (under the Help menu) to determine which value(s) may need manual updating. Contact Woodward if further assistance is required.

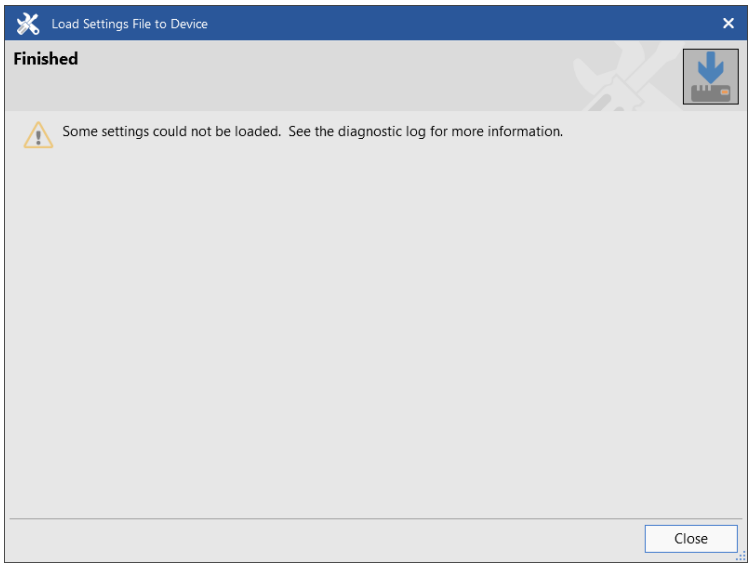


Figure 4-16. File Incompatibility Fault Screen

Confirm a successful download by pressing the “Close” button.

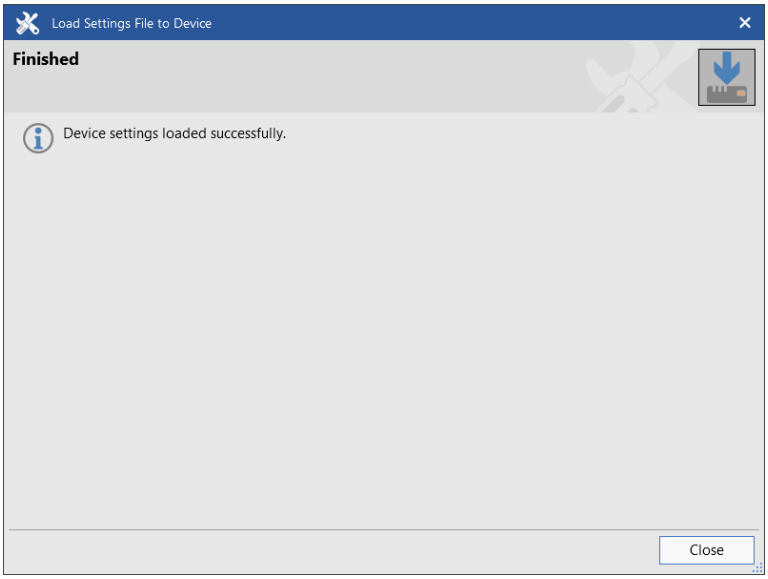


Figure 4-17. Completion of Loading Settings into the DVP

The DVP Service Tool will then resume normal monitoring operation using the new settings.

NOTICE

It is required for the user to cycle power on the DVP after loading settings and before attempting to operate the unit. The internal DVP parameters are invalid as indicated by a fast red/green status LED on the driver and an active Invalid Parameter(s) fault indicator. NOTE: in DVP firmware prior to 5418-8086, the Invalid Parameter(s) fault indicator on the Internal DVP Fault Status screen can be cleared by Reset Control, but the fault will still be present.

4.5 Converting a DVP Settings File to the Newer Version

The DVP Settings File can be converted from an older version to newer one, compatible with firmware supported by the current Service Tool.

NOTICE

It is possible to convert older firmware settings files to newer ones (i.e., from DVP 5418-6262 NEW to DVP 5418-6873A). However, conversion from newer firmware settings to older ones (i.e., from DVP 5418-7707- to DVP 5418-7432 NEW) cannot be automatically converted by the DVP Service Tool. If conversion of newer settings files to older firmware is necessary, see 'Converting a DVP settings file to an older version'. Contact Woodward for additional information or assistance.

To start conversion, launch the DVP Service Tool.
Select “Associate Settings File with Application……” from the “Settings” menu in the main toolbar.

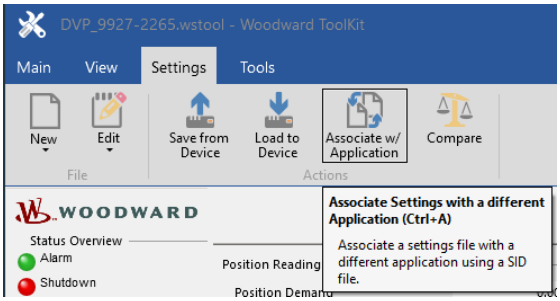


Figure 4-18. Selecting to Associate Settings File with Application

This will start the settings file conversion wizard.

Press “Next” and select the source settings file to be converted.

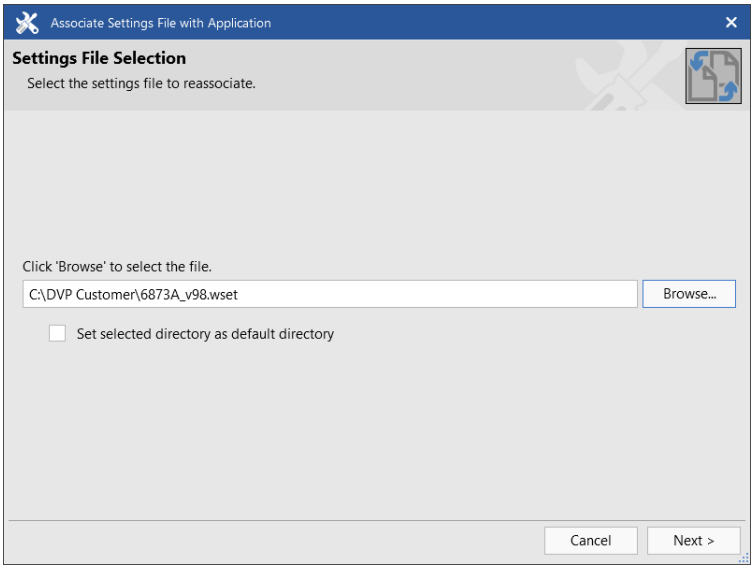


Figure 4-19. Selecting Settings File to Conversion

Press “Next” and select the target firmware specification to which settings file will be converted.

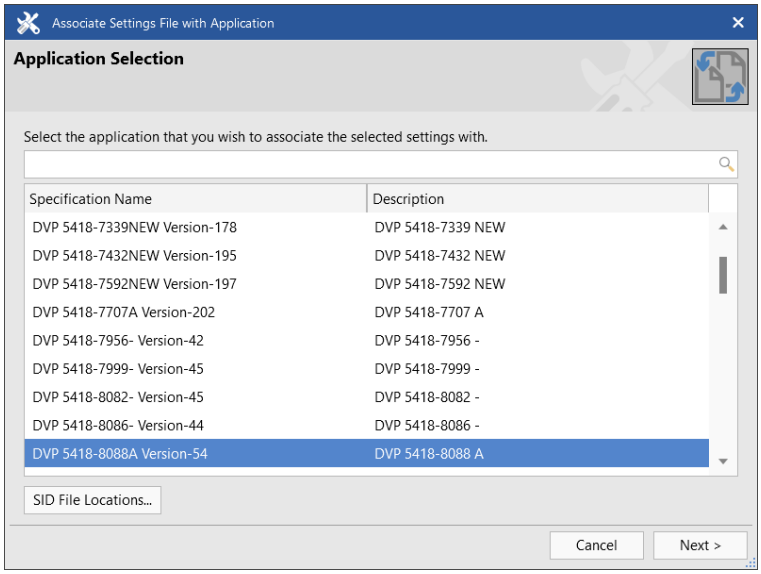


Figure 4-20. Selecting Target Firmware Specification

Press “Next” and select the file to save converted settings. New file can be created as well.

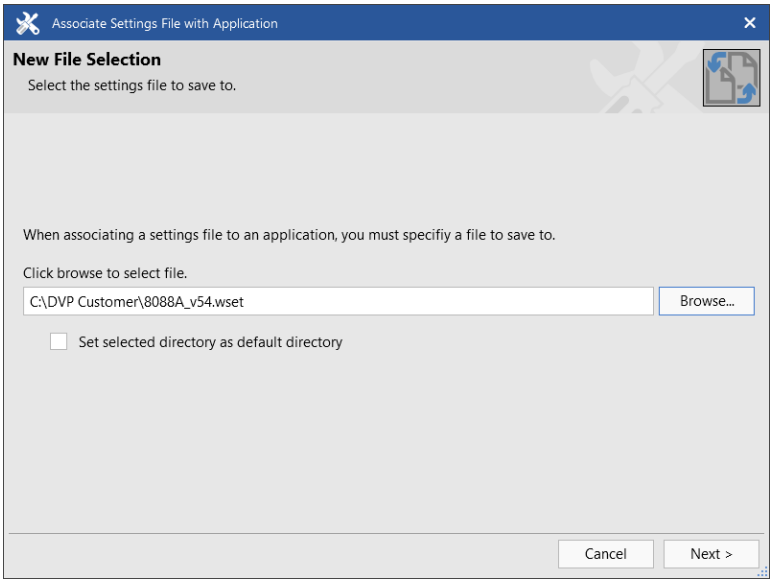


Figure 4-21. Selecting/Creating the File to Store Converted Settings

Press “Next” to start conversion.

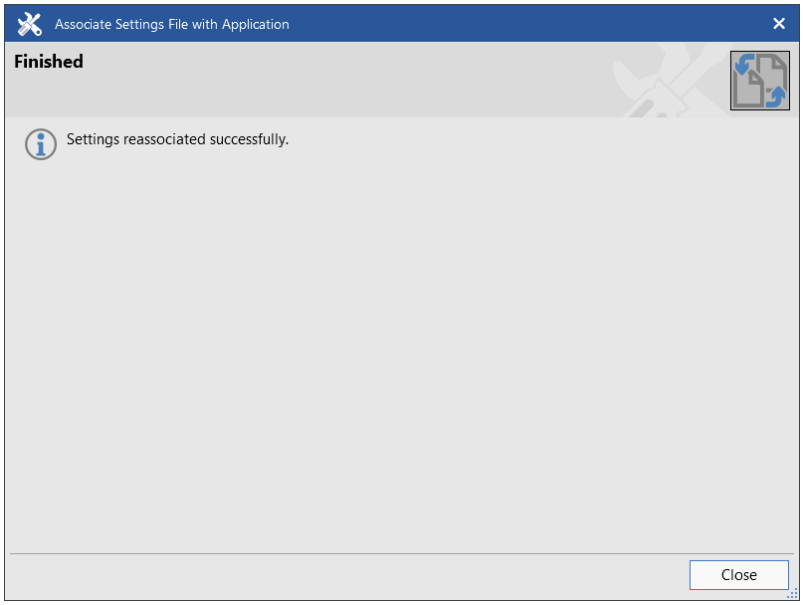


Figure 4-22. Completion of DVP Settings File Conversion

Confirm a successful conversion by pressing the “Close” button.

There will be a fault reported if the settings cannot be converted due to having an incompatibility. If the screen below appears, it means the conversion failed and you should check the Diagnostic Log (under the Help menu) to determine the reason of the problem.

NOTICE

It is possible to convert older firmware settings files to newer ones (i.e., from DVP 5418-6262 NEW to DVP 5418-6873A). However, conversion from newer firmware settings to older ones (i.e., from DVP 5418-7707- to DVP 5418-7432 NEW) cannot be automatically converted by the DVP Service Tool. If conversion of newer settings files to older firmware is necessary, see 'Converting a DVP settings file to an older version'. Contact Woodward for additional information or assistance.

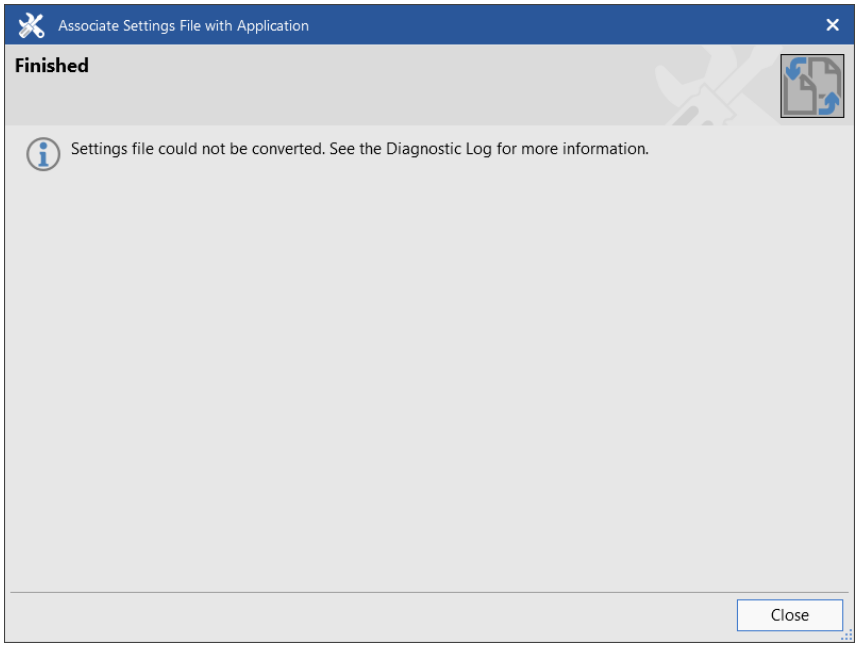


Figure 4-23. Settings File Conversion Fault Screen

4.6 Converting a DVP Settings File to an Older Version

Conversion of a DVP Settings file to an older version can only be done manually. The steps required for this process are provided below.

Select “New from SID Specification defaults” from the Settings menu. In the window, select the “Specification Name” corresponding to the older DVP version and press OK. In the Settings Selection window, select “Customer DVP Settings” and press OK. This will instantiate a default settings file for the older DVP version.

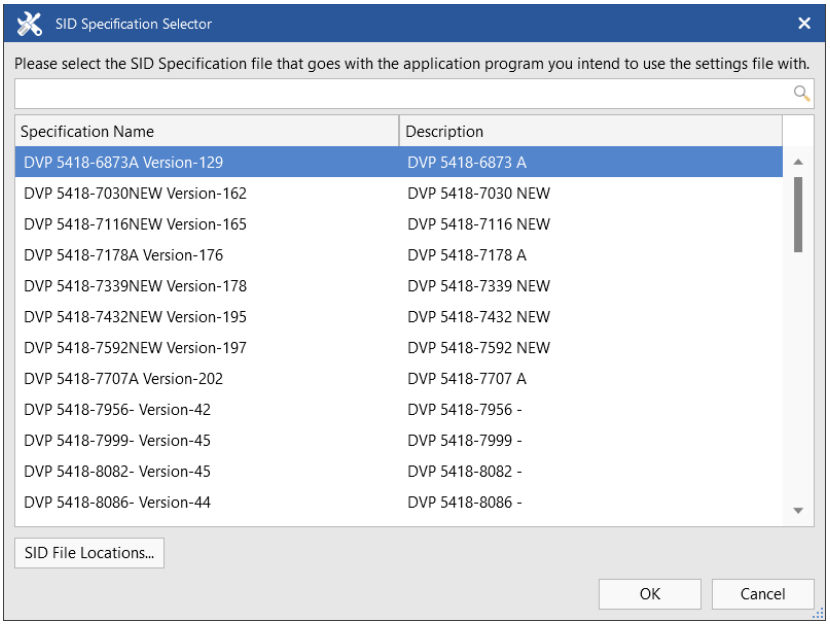


Figure 4-24. Settings Comparison File Selection

Open the settings file for the newer version using “Edit Settings File” from the Settings menu.

Modify the settings in the older version to match the newer version.

Save the older settings file to an appropriate filename.

4.7 Comparing DVP Settings Files

DVP Settings files can be compared using the DVP Service Tool following the options described in this section. The settings in a DVP can be compared to those in another unit, but first they must be saved into a file. To save these settings to a file, follow the steps in “Creating a new settings file”.

IMPORTANT

Feature differences may exist. Not all features may be available. Newer firmware versions may have features or functions not available in an older version.

4.7.1 Settings Compare Function

Initiate the settings file comparison from the “Compare Settings Files” selection under the Settings menu.

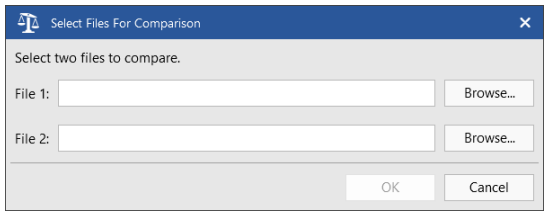


Figure 4-25. Settings Comparison File Selection

Use the Browse buttons to select the two files and then select OK. The results window is displayed.

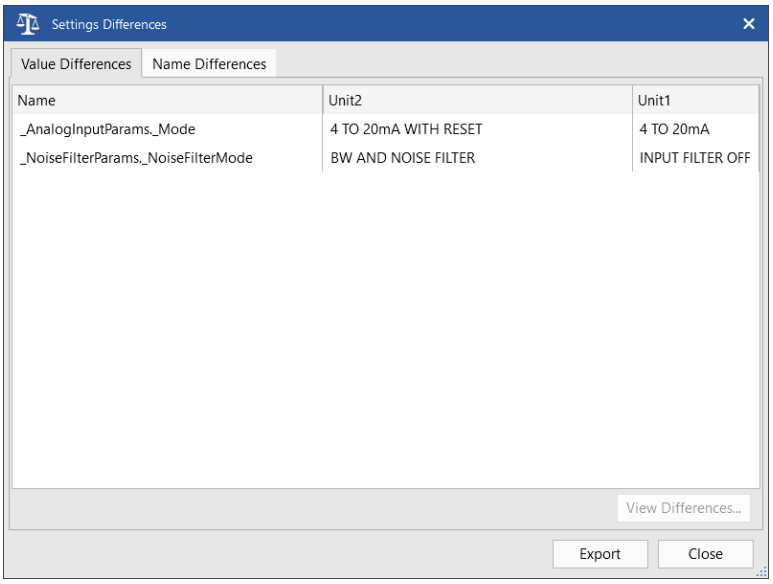


Figure 4-26. Settings Comparison Results Window

The comparison window shows the differences of ***all*** settings between the two settings files (including those that may not have been in place for the original application). In many cases, the new functions were not needed in existing applications. In the case that new functions have been added, it is at the user’s discretion whether to disable the new function (where possible), or to apply proper settings for use of the function in the existing application. Please refer to the description of available functions in latest published manual.

The “Name” displayed is the actual software setting name. This name is converted to a user-friendly display value in the Service Tool. This conversion is not documented herein, but in most cases can be implied. For instance, the “_AnalogInputParams._Mode” is the Analog Input Mode Selection.

To interpret the results, an understanding of the parameters that are different is required as well as if they are relevant to the application. For instance, if the demand selection used in the application is not “CAN OPEN DIGITAL INPUT”, then all CANopen differences can be ignored since they are not used. Contact Woodward for assistance if needed. Alternatively, the settings can be compared using the Manual Settings Comparison described below.

4.7.2 Manual Settings Comparison

An alternate option to compare the settings of two DVPs is to simply open each file and compare them side-by-side. The advantage of this option is that only the relevant settings are displayed.

Open each settings file from the “Edit Setting File” selection under the Settings menu. Compare all pages in the settings editor.

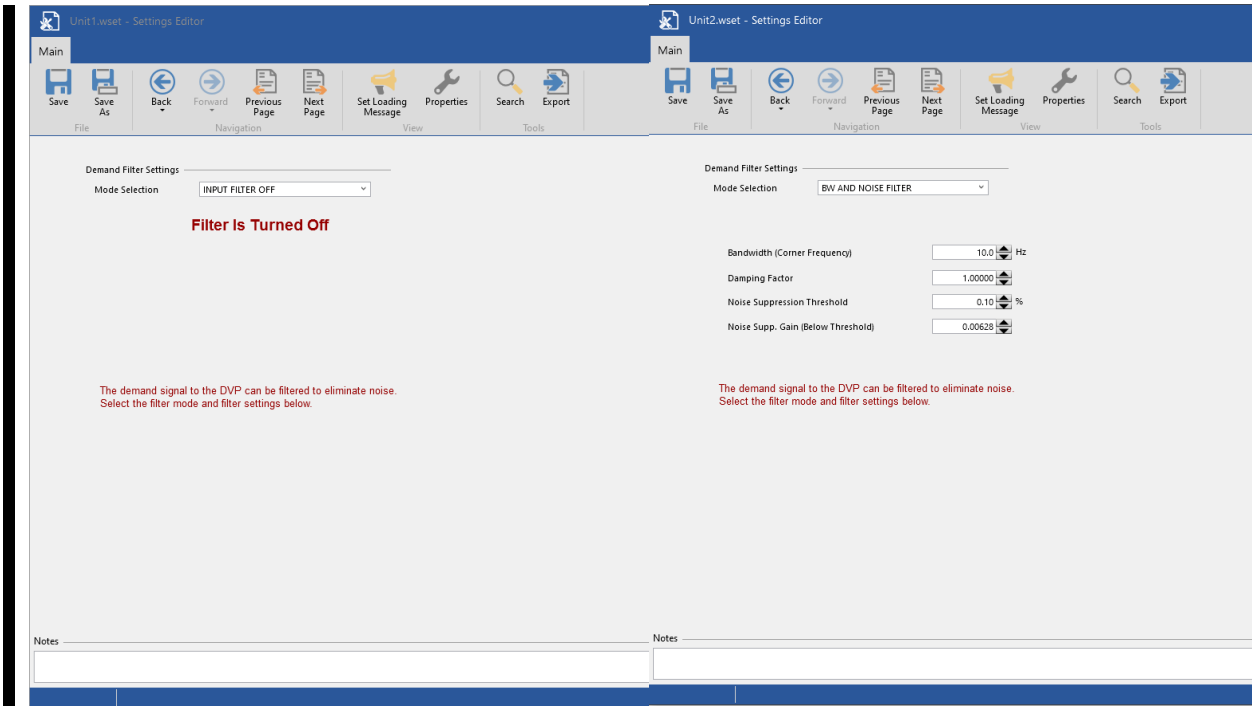


Figure 4-27. Side-by-Side Settings Comparison

Chapter 5.
Product Support and Service Options

Product Support Options

If you are experiencing problems with the installation, or unsatisfactory performance of a Woodward product, the following options are available:

- Consult the troubleshooting guide in the manual.
- Contact the manufacturer or packager of your system.
- Contact the Woodward Full Service Distributor serving your area.
- Contact Woodward technical assistance (see “How to Contact Woodward” later in this chapter) and discuss your problem. In many cases, your problem can be resolved over the phone. If not, you can select which course of action to pursue based on the available services listed in this chapter.

OEM or Packager Support: Many Woodward controls and control devices are installed into the equipment system and programmed by an Original Equipment Manufacturer (OEM) or Equipment Packager at their factory. In some cases, the programming is password-protected by the OEM or packager, and they are the best source for product service and support. Warranty service for Woodward products shipped with an equipment system should also be handled through the OEM or Packager. Please review your equipment system documentation for details.

Woodward Business Partner Support: Woodward works with and supports a global network of independent business partners whose mission is to serve the users of Woodward controls, as described here:

- A **Full Service Distributor** has the primary responsibility for sales, service, system integration solutions, technical desk support, and aftermarket marketing of standard Woodward products within a specific geographic area and market segment.
- An **Authorized Independent Service Facility (AISF)** provides authorized service that includes repairs, repair parts, and warranty service on Woodward's behalf. Service (not new unit sales) is an AISF's primary mission.

A current list of Woodward Business Partners is available at:
https://www.woodward.com/en/support/industrial/service-and-spare-parts/find-a-local-partner

Product Service Options

The following factory options for servicing Woodward products are available through your local Full-Service Distributor or the OEM or Packager of the equipment system, based on the standard Woodward Product and Service Warranty (Woodward North American Terms and Conditions of Sale 5-09-0690) that is in effect at the time the product is originally shipped from Woodward or a service is performed:

- Replacement/Exchange (24-hour service)
- Flat Rate Repair
- Flat Rate Remanufacture

Replacement/Exchange: Replacement/Exchange is a premium program designed for the user who is in need of immediate service. It allows you to request and receive a like-new replacement unit in minimum time (usually within 24 hours of the request), providing a suitable unit is available at the time of the request, thereby minimizing costly downtime. This is a flat-rate program and includes the full standard Woodward product warranty (Woodward North American Terms and Conditions of Sale 5-09-0690).

This option allows you to call your Full-Service Distributor in the event of an unexpected outage, or in advance of a scheduled outage, to request a replacement control unit. If the unit is available at the time of the call, it can usually be shipped out within 24 hours. You replace your field control unit with the like-new replacement and return the field unit to the Full-Service Distributor.

Charges for the Replacement/Exchange service are based on a flat rate plus shipping expenses. You are invoiced the flat rate replacement/exchange charge plus a core charge at the time the replacement unit is shipped. If the core (field unit) is returned within 60 days, a credit for the core charge will be issued.

Flat Rate Repair: Flat Rate Repair is available for the majority of standard products in the field. This program offers you repair service for your products with the advantage of knowing in advance what the cost will be. All repair work carries the standard Woodward service warranty (Woodward North American Terms and Conditions of Sale 5-09-0690) on replaced parts and labor.

Flat Rate Remanufacture: Flat Rate Remanufacture is very similar to the Flat Rate Repair option with the exception that the unit will be returned to you in “like-new” condition and carry with it the full standard Woodward product warranty (Woodward North American Terms and Conditions of Sale 5-09-0690). This option is applicable to mechanical products only.

Returning Equipment for Repair

If a control (or any part of an electronic control) is to be returned for repair, please contact your Full-Service Distributor in advance to obtain Return Authorization and shipping instructions.

When shipping the item(s), attach a tag with the following information:

- Return authorization number
- Name and location where the control is installed
- Name and phone number of contact person
- Complete Woodward part number(s) and serial number(s)
- Description of the problem
- Instructions describing the desired type of repair

Packing a Control

Use the following materials when returning a complete control:

- Protective caps on any connectors
- Antistatic protective bags on all electronic modules
- Packing materials that will not damage the surface of the unit
- At least 100 mm (4 inches) of tightly packed, industry-approved packing material
- A packing carton with double walls
- A strong tape around the outside of the carton for increased strength

NOTICE

To prevent damage to electronic components caused by improper handling, read and observe the precautions in Woodward manual 82715, *Guide for Handling and Protection of Electronic Controls, Printed Circuit Boards, and Modules*.

Replacement Parts

When ordering replacement parts for controls, include the following information:

- The part number(s) (XXXX-XXXX) that is on the enclosure nameplate
- The unit serial number, which is also on the nameplate

Engineering Services

Woodward offers various Engineering Services for our products. For these services, you can contact us by telephone, by email, or through the Woodward website.

- Technical Support
- Product Training
- Field Service

Technical Support is available from your equipment system supplier, your local Full-Service Distributor, or from many of Woodward's worldwide locations, depending upon the product and application. This service can assist you with technical questions or problem solving during the normal business hours of the Woodward location you contact. Emergency assistance is also available during non-business hours by phoning Woodward and stating the urgency of your problem.

Product Training is available as standard classes at many of our worldwide locations. We also offer customized classes, which can be tailored to your needs and can be held at one of our locations or at your site. This training, conducted by experienced personnel, will assure that you will be able to maintain system reliability and availability.

Field Service engineering on-site support is available, depending on the product and location, from many of our worldwide locations or from one of our Full-Service Distributors. The field engineers are experienced both on Woodward products as well as on much of the non-Woodward equipment with which our products interface.

For information on these services, please contact one of the Full-Service Distributors listed at **https://www.woodward.com/en/support/industrial/service-and-spare-parts/find-a-local-partner**

Contacting Woodward's Support Organization

For the name of your nearest Woodward Full-Service Distributor or service facility, please consult our worldwide directory at **https://www.woodward.com/support**, which also contains the most current product support and contact information.

You can also contact the Woodward Customer Service Department at one of the following Woodward facilities to obtain the address and phone number of the nearest facility at which you can obtain information and service.

Products Used in Electrical Power Systems

Facility	Phone Number
Brazil	+55 (19) 3708 4800
China	+86 (512) 8818 5515
Germany	+49 (711) 78954-510
India	+91 (124) 4399500
Japan	+81 (43) 213-2191
Korea	+82 (51) 636-7080
Poland	+48 (12) 295 13 00
United States	+1 (970) 482-5811

Products Used in Engine Systems

Facility	Phone Number
Brazil	+55 (19) 3708 4800
China	+86 (512) 8818 5515
Germany	+49 (711) 78954-510
India	+91 (124) 4399500
Japan	+81 (43) 213-2191
Korea	+82 (51) 636-7080
The Netherlands	+31 (23) 5661111
United States	+1 (970) 482-5811

Products Used in Industrial Turbomachinery Systems

Facility	Phone Number
Brazil	+55 (19) 3708 4800
China	+86 (512) 8818 5515
India	+91 (124) 4399500
Japan	+81 (43) 213-2191
Korea	+ 82 (51) 636-7080
The Netherlands	+31 (23) 5661111
Poland	+48 (12) 295 13 00
United States	+1 (970) 482-5811

Technical Assistance

If you need to contact technical assistance, you will need to provide the following information. Please write it down here before contacting the Engine OEM, the Packager, a Woodward Business Partner, or the Woodward factory:

General

Your Name

Site Location

Phone Number

Fax Number

Prime Mover Information

Manufacturer

Turbine Model Number

Type of Fuel (gas, steam, etc.)

Power Output Rating

Application (power generation, marine, etc.)

Control/Governor Information

Control/Governor #1

Woodward Part Number & Rev. Letter

Control Description or Governor Type

Serial Number

Control/Governor #2

Woodward Part Number & Rev. Letter

Control Description or Governor Type

Serial Number

Control/Governor #3

Woodward Part Number & Rev. Letter

Control Description or Governor Type

Serial Number

Symptoms

Description

If you have an electronic or programmable control, please have the adjustment setting positions or the menu settings written down and with you at the time of the call.

Appendix A. Glossary of Terms

Numerical Terms

Term	Definition/Description
1.1V Failed	Internal 1.1 V is outside acceptable range of 1.034 V to 2.166 V. Internal electronics failure. (Applies only to DVP with servo interface module)
+12V Failed	Internal +12 V is outside acceptable range of 10.6 V to 15.8 V. Internal electronics failure.
–12V Failed	Internal –12 V is outside acceptable range of –13.7 V to –8.6 V. Internal electronics failure.
1.8V Failed	Internal 1.8 V is outside acceptable range of 1.818 V to 2.142 V. Internal electronics failure.
2.5V Failed	Internal 2.5 V is outside acceptable range of 2.35 V to 2.65 V. Internal electronics failure. (Applies only to DVP with servo interface module)
3.3V Failed	Internal 3.3 V is outside acceptable range of 3.102 V to 3.498 V. Internal electronics failure. (Applies only to DVP with servo interface module)
5V Failed	Internal 5 V is outside acceptable range of 4.86 V and 6.14 V. Internal electronics failure.
5V Failed (servo)	Internal 5 V is outside acceptable range of 4.7 V and 5.3 V. Internal electronics failure. (Applies only to DVP with servo interface module)
24V Failed	Internal +24 V is outside acceptable range of 22.1 V to 30.7 V. Internal electronics failure.
24V Failed (servo)	Internal +24 V is outside acceptable range of 20.16 V to 27.84 V. Internal electronics failure. (Applies only to DVP with servo interface module)
5V RDC Reference Failed	Internal 5 V RDC reference is outside acceptable range. Internal electronics failure.
5V Reference Failed	Internal 5 V reference is outside acceptable range. Internal electronics failure.
15V Anin Pwr fault 15V Anout Pwr fault	Internal 15 V is below the min value of 9.7V. Internal electronics failure (Applies only to DVP with servo interface module).

A

Term	Definition/Description
Actuator Type Selection Diagnostics	In case of a process fault during the Valve Type Selection Process this group shows the appropriate process fault flags
Actuator Type Selection Diagnostics ID Module Not Detected	During power up, the ID module cannot be read. Failure to read the ID module on the valve/actuator system. ID module calibration record corrupted. The valve does not have an ID module.
Actuator Type Selection Diagnostics ID Module Version Not Supported	During power up, the ID module version was detected as incompatible with the current version of DVP firmware.
Actuator Type Selection Process	This indicator group gives an overview of the current status of the Valve Type Selection Process. The progress of the auto-detection process is displayed as a percent value.
ADC Failed	Internal ADC in processor core has stopped running. Internal electronics failure.
ADC SPI Failed	External ADC in processor core has stopped running. Internal electronics failure.
All Analog Inputs Failed	Indication that all the servo demand inputs are failed, no valid position demands remain. (Applies only to DVP with servo interface module)

Analog In Difference Error	Indication that the inputs are not tracking each other within the configured limits. Analog input difference from the selected analog input is above the difference error threshold for longer than the difference delay. These are user configurable parameters. (Applies only to DVP with servo interface module)
Analog Input Configuration	A section within the Input Configuration and Setpoint Source Configuration screens that contains several readable and user configurable fields including Mode Selection Analog Input Scaling and Diagnostic Ranges.
Analog Input 2 Failed Low Analog Input 2 Failed Low Analog Input 3 Failed Low	The analog input is below the failed low diagnostic threshold. This is a user configurable parameter. (Applies only to DVP with servo interface module)
Analog Input 1 Failed High Analog Input 2 Failed High Analog Input 3 Failed High	The analog input is above the failed high diagnostic threshold. This is a user configurable parameter. (Applies only to DVP with servo interface module)
Analog Input 1 Open Circuit Analog Input 2 Open Circuit Analog Input 3 Open Circuit	Indicates the absolute value of the input current value is below the open wire threshold for longer than the set delay time. These are user configurable parameters. (Applies only to DVP with servo interface module)
Analog Input Configuration Mode Selection	User configurable setting that may be turned off or select voltage input or milliamp input.
Analog Input Demand	This indicator group gives an overview of the Analog Input signal and valve position information. The analog input demand signal from the control system scaled 0 to 100%.
Analog Input Demand Analog Position Demand	This displays the position that is being demanded by the Analog Input.
Analog Input Demand Analog Input High	The analog input is above the diagnostic threshold. This is a user configurable parameter.
Analog Input Demand Analog Input Low	The analog input is below the diagnostic threshold. This is a user configurable parameter.
Analog Input Scaling	This group gives the input scaling information for 4-20 mA or 0-5V analog inputs.
Analog Output	*Driver Output Data-Demanded Current*
Analog Output Configuration	A section within the Analog Output Configuration screen that contains several readable and user configurable fields including mode selection and analog output scaling ranges.
Analog Output Configuration Mode	This displays the current Analog Output Mode; Off, Actual Position (valve position), Echo Setpoint (demanded position) or Motor Current The user may select from any of these configuration modes.
Analog Output Position Scaling Max. Current Value	This allows setting of the maximum current that will represent the maximum position value (Position at Maximum Current Value) or maximum motor current (Motor Current at Maximum Current Value).
Analog Output Position Scaling Min. Current Value	This allows setting of the minimum current that will represent the Minimum position value (Position at Max. Current Value)
Analog Output Motor Current, Motor Current at Max. Current Value	This allows setting of the maximum motor current value that is correlated to the Analog Output Position Scaling Maximum Current Value
Analog Output Motor Current, Motor Current at Min. Current Value	This allows setting of the minimum motor current value that is correlated to the Analog Output Position Scaling Minimum Current Value
Analog Output Position Scaling Position at Max. Current Value	This allows setting of the maximum position that is correlated to the Analog Output Position Scaling Maximum Current Value
Analog Output Position Scaling Position at Min. Current Value	This allows setting of the minimum position that is correlated to the Analog Output Position Scaling Minimum Current Value

Analog Output Status Demanded Current	This displays the actual analog output current value from the DVP in mA.
Analog Values	The DVP section of the Status Overview Service Tool screen which displays the real time status of the DVP current, voltages, and temperatures.
Auto Detect Error	This diagnostic is only enabled when the DVP has been configured for auto detection (See Auto detection Section). This diagnostic is set when: The DVP fails to communicate with the ID module due to write or read problems or the calibration records in the ID module are corrupted (CRC16 failure). The DVP fails to write the calibration records into the non-volatile memory. Failure to read the ID module on the valve/actuator system. ID module calibration record corrupted. DVP non-volatile memory error.
Auto Detection Control	This indicator group contains Type/Serial Number Error and Type Not Supported status flags and the Auto Detection Request button.
Aux Board Detected An Error	One of the five possible errors associated with the Aux module has been set. *DP ram check error*: The aux module has detected a dual ported ram error. If the Aux program is started or stopped this error may occur due to the aux module and the DVP being out of synch. *MFT Synch error*: The DVP has not been able to provide the synch pulse on time to the aux module. *Version error*: DVP and aux module do not have compatible software versions. *Block Count error*: The DVP and Aux module software have a different number of interface blocks. *Heartbeat error*: The Aux module has not received a correct heartbeat from the DVP.
Aux Board DPRAM Error	The DVP has detected a Dual port ram error during the RAM check. Indicates defective Dual Port Ram or interface issue.
Aux Board Heartbeat Error	The Aux module has not sent the correct heartbeat value to its DVP. The aux module is not running, or the interface is defective.
Aux Board Not Found	The Control board has not detected the Aux Board. The selected input type requires an Aux Board and no Aux board is present.
Aux Board Starting	The control board is waiting until the aux board is started. Wait time is approximately two minutes for the M5200 module and 10 seconds for the Servo interface module. This is a typical situation during a power up or change of input type that will activate the aux board. This flag will reset automatically.
Aux Board Startup Timeout	After waiting for a signal from the aux board for the expected max delay time, the control board will timeout. Indicates there is no aux module program or it is not running.
Aux Board Type Error	The Control board has detected an incorrect Aux Board type. This occurs when the aux board needed, and the input type selected are not compatible.
AUX 3 SD Position	This status flag is set when Discrete Input 3 is set, and the Discrete Input Action Mode is set to Aux3 SD+Reset. When this Status Flag is set the DVP is in Shutdown Position

B

Term	Definition/Description
Baud Rate	The number of times per second a signal makes a transition between states and indicates the number of bits per second that are transmitted.
BLDC2 State	This indicates whether the BLDC2 control model is Running or Not Running. When in Running the DVP is controlling the position of the valve based on the Position Demand
Boost Converter Error	This status flag indicates the Boost Converter board did not reach the proper voltage (Applies only to DVP 5000, 10000, and 12000).

C

Term	Definition/Description
CAN Controller Open Error	The CAN Controller peripheral was unable to be opened properly. This may occur if the user is changing the CANopen settings (particularly selecting a lower baud rate) while connected to an active CAN network.
CAN Hardware ID Error	This status flag indicates an incorrect CAN Node ID address has been entered through the Discrete Input connector. This is only true if CAN Hardware ID Mode = CAN HW ID DISCRETE IN-DI5,DI4,DI2,DI1 or CAN HW ID DISCRETE IN-DI5,DI4,DI3 or CAN HW ID DISCRETE IN-DI5,DI4
CAN Hardware ID Mode	A user configurable menu where Disabled and three combinations of communications settings which may be selected by hardware ID.
CANopen	A setpoint source which sets the setpoint signal type of CANopen based protocol using 1 or 2 CAN Ports. Optional use Analog back-up (available if using 1 CAN port).
CANopen Dual Configuration	A section of the Input Configuration screen that is enabled when CAN Open Digital Input is the selected Input Source and CANopen Dual is the communications option. Baud Rate, Port 1 and 2 Node IDs, Timeout interval, and Extended PDO status are displayed.
CANopen Dual Configuration Port 1 Node ID	This indicates what Node ID is selected for CAN input 1. It is configurable by the user
CANopen Dual Configuration Port 2 Node ID	This indicates what Node ID is selected for CAN input 2. It is configurable by the user
CANopen Dual Configuration Timeout	Represents the maximum time allowed between CAN messages. If exceeded the affected port alarm will be activated.
CANopen Redundancy Manager Parameters	This is a display only section of the CANopen Demand Configuration section of the Input Configuration screen when CAN Open Digital Input is the selected Demand Input source. It shows the parameters that are associated with difference between CAN 1 and CAN 2 demand signals.
Check 100 Percent Error	This status flag indicates the 100 % position check has failed.
Configuration & Calibration	Screen within the Service Tool that is used when manual configuration of the DVP to a specific actuator or valve is required.
Configuration Process Error	This fault indicates a valve or actuator with configurable options (stroke length, actuator force limit) was not fully configured and calibrated.
Control Model Not Running	This status flag indicates the Control Model is not Running. The position of the Actuator/valve is not controlled by the DVP. If Actuator/valve has a return spring, the actuator/valve is be positioned by the return spring.
Controller Identification	A section of the Service Tool Identification screen which displays information on the controller including Part Number, Revision, and Serial Number.
Current Diagnostic	This feature allows the user to turn the mode on or off and when on will display the limits of three sets of diagnostics.
Current Diagnostic Setting	This shows the operational state of the Current Diagnostic Mode.
Current Phase A High	The phase A current sensor is at max output.
Current Phase A Low	The phase A current sensor is at min output.

Current Phase B High	The phase B current sensor is at max output.
Current Phase B Low	The phase B current sensor is at min output.
Current Setting	Displays motor current demand settings for Valve/Actuator startup checks

D

Term	Definition/Description
Demand Input Filter Configuration	This group contains the settings for the setpoint filter, and the Mode Selection is user configurable.
Demand Input Filter Settings	These user configurable settings allow selection for which input demand filters are enabled; Filter Off, Bandwidth Filter, Noise Filter, Bandwidth and Noise Filter, Slew Rate Filter, Slew Rate Filter and BW Filter, Slew Rate Filter and Noise Filter, Slew Rate Filter, BW and Noise Filter This also displays the break frequency of the Bandwidth filter. The DVP includes a demand signal filter.
Demand Input Filter Settings Bandwidth (Corner Frequency)	This displays the break frequency of the Bandwidth filter and is user configurable to set the Input Filter Bandwidth Corner Frequency (Hz).
Demand Input Filter Settings Damping Factor	This displays the damping factor of the Bandwidth filter, which changes the BW filter from under damped response to a critically damped response or to an over damped response. This is a user configurable Input Filter Damping Factor Setting.
Demand Input Filter Settings Mode Selection	This displays which input demand filters are enabled; Filter Off, Bandwidth Filter, Noise Filter, Bandwidth and Noise Filter, Slew Rate Filter, Slew Rate Filter and BW Filter, Slew Rate Filter and Noise Filter, Slew Rate Filter, BW and Noise Filter. These are user configurable mode selections.
Demand Input Filter Settings Noise Suppression Threshold	This displays the threshold above which the Noise Filter does not suppress the Input Demand signal.
Demand Input Filter Settings Noise Supp. Gain (Below Threshold)	This displays the gain of the noise filter when below the Noise Suppression Threshold.
Demand Input Filter Settings Slew Rate	This displays the maximum rate the Demand Input will be allowed to change internal to the unit. Demand Input signals exceeding this rate will be internally ramped at the defined rate until achieving the Demand Input.
Demand Input Source	This displays where the position demand originates; Manual Position, Analog Input, EGD Digital Input, PWM Input, Function Generator, CAN Open Digital Input, or Servo Analog Input.
Demand Position Difference Alarm Delay	This is the time delay before an alarm will be set (Ratio of 1-to-3).
Demand Position Difference Alarm Limit	This is the maximum allowed difference between Set Position from “Analog Input and CAN Port 1” or “CAN Port 1 and CAN Port 2” depending on the current mode. Alarm will be activated if difference is exceeded for longer than the Demand Position Difference Alarm Delay.
Demand Position Difference Shutdown Limit	This is the maximum allowed difference between Set Position from “Analog Input and CAN Port 1” or “CAN Port 1 and CAN Port 2” depending on the current mode. Shutdown will be activated if difference is exceeded for longer than the Demand Position Difference Shutdown Delay.
Demand Position Difference Shutdown Delay	This is the time delay before a shutdown will be set (Ratio of 1-to-3).
Demand Source Not Supported	The selected demand source is not supported by the DVP hardware.
Diagnostic Ranges	The Diagnostic Ranges are those settings used to detect that a Demand Position from the interface is valid (Position Demand Low Point, Position Demand High Point).
Digital Com 1 Error	This status Flag indicates when the CAN 1 Input is bad.
Digital Com 2 Error	This status Flag indicates when the CAN 2 Input is bad.

Digital Com 1 & 2 And/Or Analog Backup Error	This error occurs if both demand input sources have failed (CAN 1 and 2 if Dual CANopen mode or CAN 1 and Analog Input if CANopen with Analog Backup mode).
Digital Com Analog Tracking Alarm	The CAN demand and Analog Input demand do not match as defined by Demand Position Difference Alarm Limit and Demand Position Difference Alarm Delay.
Digital Com Analog Tracking Shutdown	The CAN demand and Analog Input demand do not match as defined by Demand Position Difference Shutdown Limit and Demand Position Difference Shutdown Delay.
Discrete Inputs Action	This displays the configuration of the Discrete inputs; Off, Shutdown Reset/Reset, Aux 3, Aux3 SD+Reset, Shutdown Reset/Reset FAST.
Discrete Input Functional Status	These status lights indicate whether a Discrete Input has been set.
Discrete Inputs Configuration	This tool provides you the ability to select the behavior of the 5 Discrete Inputs (DI1, DI2, DI3, DI4, and/or DI 5). Each of these options are available with each selection on the dropdown menu except for Turned Off.
Discrete Output Configuration	The main configuration of the discrete outputs is performed on this page. Each of the discrete outputs is configured in the same manner. Each of the two discrete outputs can be configured to activate (or de-activate) upon detection of any of fault conditions monitored by the DVP.
Discrete Output Status	These status lights indicate whether a Discrete Output has been set.
Driver	This Service Tool screen displays I/O State Discrete Input and Output status and Driver Input and Output Data in real time.
Driver Current Fault	The Driver fault status flag is detected by monitoring the currents in the driver output stages.
Driver Temp. High	The heat sink temperature is above the high temperature threshold.
Driver Temp. High Limit	The heat sink temperature is above the high limit temperature threshold.
Driver Temp. Low Limit	The heat sink temperature is below the low temperature threshold. The ambient temperature of the driver is below specification.
Driver Temp. Sensor Failed	The temperature sensor is at min or max. The temperature sensor has failed.
Dual Res. Difference Alarm	The difference between the resolver readings is larger than the permissible alarm limit values specific to the valve/actuator serial number. One or both resolvers have moved. There is an electrical problem with the resolver and/or its associated circuits resulting in an incorrect resolver reading.
Dual Res. Difference Shutdown	The difference between the resolver readings is larger than the permissible shutdown limit values specific to the valve/actuator serial number.
Dual DVP Status	The DVP has an option to operate in a dual redundant mode where two actuators are controlled by DVPs connected in a dual redundant configuration. Connection to the actuator is shown in the specific actuator manual. This page displays CANopen Mode, Dual DVP Diagnostics and Dual DVP Configuration. The status information will only display if the connected valve/actuator is a Dual DVP valve type.
Duty Cycle (Function Generator)	These values define the ratio of low time to high time when the Wave Pattern is SQUARE WAVE.
DVP Driver Output Information	This displays the driver output current information; real time.
DVP I/O State	A section of the Status Overview Service Tool screen which displays five Discrete Input Functional Status indications and two Discrete Output Status indications.
DVP Temperatures	These real-time measurements display the temperature of DVP Control Board or DVP Power Board in units of Celsius.

E

Term	Definition/Description
EEPROM Read Failed	After multiple retries and data comparison the software is not able to read from the non-volatile memory. Internal electronics failure.
EEPROM Write Failed	After multiple retries and data comparison the software is not able to write to the non-volatile memory. Internal electronics failure.
EGD	Ethernet Global Data (EGD) is a communications protocol developed by General Electric in 1998. EGD allows a device (the Producer) to transfer data to other devices (the Consumers) on the communications network.
EGD Data Mismatch	A fault which occurs if the corresponding variables from all non-faulted input channels do not match. This function is disabled if the EGD Fault is set to TRUE and is monitored for troubleshooting purposes only.
EGD Diagnostics	Service Tool Screen where up to three EGD ports may be monitored, error alarm causes may be diagnosed, and solutions to extinguish alarms may be determined.
EGD Digital Input	A setpoint source which sets the setpoint signal type which is UDP based Ethernet signal using the EGD protocol;
EGD Fault	Dependent on the EGD mode: 3 port, 2 port, or 1 port this flag indicates the data required to provide a set position to the DVP is missing. The EGD mode selection is set to more ports than supported with the control system. There are other error flags active: See associated troubleshooting steps for each error flag.
EGD L2 Port 0 Stat Error	The Ethernet interface is not communicating status information. DVP internal electronics failure.
EGD L2 Port 1 Stat Error	The Ethernet interface is not communicating status information. DVP internal electronics failure.
EGD L2 Port 2 Stat Error	The Ethernet interface is not communicating status information. DVP internal electronics failure.
EGD L2 Port 3 Stat Error	The Ethernet interface is not communicating status information. DVP internal electronics failure.
EGD Performance	Service Tool Screen which the user may monitor the performance of up to three EDG channels. The screen also contains buttons to open the EGD Diagnostics and Input Configuration screens directly from the EGD Performance screen.
EGD Port 1 Link Error	The EGD messages are received slower than the time out time that is a user setting. Wiring problem on Ethernet port 1. Control system not powered up. IP addresses incorrect.
EGD Port 1 Long Message Error	The EGD message length expected is not the same as the one received. Incorrect protocol definition.
EGD Port 1 Short Message Error	The EGD message length expected is not the same as the one received. Incorrect protocol definition.
EGD Port 1 Stale Data Error	The Application Level Heartbeat variable has not changed in time period greater than the stale data delay time. Data from the producer is not being updated (stale) in the EGD packet.
EGD Port 2 Link Error	The EGD messages are received slower than the time out time that is a user setting. Wiring problem on Ethernet port 2. Control system not powered up. IP addresses incorrect.
EGD Port 2 Long Message Error	The EGD message length expected is not the same as the one received. Incorrect protocol definition.
EGD Port 2 Short Message Error	The EGD message length expected is not the same as the one received. Incorrect protocol definition.
EGD Port 2 Stale Data Error	The Application Level Heartbeat variable has not changed in time period greater than the stale data delay time. Data from the producer is not being updated (stale) in the EGD packet.
EGD Port 3 Link Error	The EGD messages are received slower than the time out time that is a user setting. Wiring problem on Ethernet port 3. Control system not powered up. IP addresses incorrect.

EGD Port 3 Long Message Error	The EGD message length expected is not the same as the one received. Incorrect protocol definition.
EGD Port 3 Short Message Error	The EGD message length expected is not the same as the one received. Incorrect protocol definition.
EGD Port 3 Stale Data Error	The Application Level Heartbeat variable has not changed in time period greater than the stale data delay time. Data from the producer is not being updated (stale) in the EGD packet.
EGD Rate Group Slip	If the M5200 does not have the time to finish the task within the rate group. This will also give a heartbeat error flag.
EGD Revision Fault	Revision check of external and internal EGD protocol revision. The revision of the M5200 and the revision from the control system do not match.
Electronics Temp. High	The Control Board temperature sensor indicates a temperature above 140° C.
Electronics Temp. Low	The Control Board temperature sensor indicates a temperature below 45° C.
External Shutdown Position	Command sent by Digital communication protocols like: EGD, CANopen.
External Shutdown	Command sent by Service Tool or digital communication protocols like: EGD, CANopen or discrete inputs.
E-Stop 1 Tripped	This displays the status of the SIL/External Shutdown status. When this is activated, the DVP is in Shutdown Position mode.
E-Stop 2 Tripped	This displays the status of the SIL/External Shutdown status. When this is activated, the DVP is in Shutdown Position mode.
Extended PDO	Enables Transmit and Receive PDO's 5-8

F

Term	Definition/Description
Fault Status and Configuration Overview	The Process Fault Status Service Tool screen gives an overview of the entire range of process fault and status flags and their individual status.
Fault Status and Configuration Overview Internals	This Process Fault Status Service Tool screen gives an overview of the internal process fault and status flags and their individual status.
Final Element Feedback Transducer	The final element feedback transducer is the position sensor coupled to or most closely to the final output shaft. This is compared to the motor position sensors which are mounted to the motor.
Force Limiter (Actuator Force Limiter)	Settings associated with certain actuators that allow limiting force to less than the nominal capability of the actuator. These settings are not user adjustable.
Function Generator	A setpoint source which sets the setpoint signal type which is internally generated based on the function generator settings.
Function Generator Configuration	This is a section on the Input Configuration and Setpoint Source Configuration pages and has two options for modifying the information displayed; the Wave Pattern drop down, and the Sweep Mode drop down menus.
Function Generator Configuration Start Frequency	This displays the start frequency for a sweep function.
Function Generator Configuration Sweep Stop Frequency	This displays the stop frequency for a sweep function.
Function Generator Configuration Sweep Time	This displays the time that it will take to go from the start frequency to the stop frequency when is sweep mode.
Function Generator Configuration Synch Logging	This setting controls whether data logging will also start when a function generator sweep is started. A non-zero value enables this synchronized behavior.

G

Term	Definition/Description
None Currently	

H

Term	Definition/Description
Home	Screen within Service Tool that contains contact information for assistance and customer service at a variety of Woodward facilities.
Heat Sink Temp. Sensor 1 Error or Heat Sink Temp. Sensor 2 Error	This fault status flag indicates power board heat sink sensor (1 or 2) has failed (Applies only to DVP 5000, 10000, and 12000).

I

Term	Definition/Description
ID Module Not Detected	The DVP is unable to communicate with the ID module or there is no ID module attached to the Actuator or Valve.
ID Module Version Not Supported	Current version of software does not contain the specifications of the ID module.
Identification	Screen within Service Tool that contains Controller and Valve identification in addition to Service Tool and firmware version information.
Incorrect Power Board	During power up the DVP checks the ID module to determine the power board needed for the valve/actuator system. If the power board ID required and the power board detected do not match, this diagnostic will be annunciated. Valve/actuator system does not match the DVP power board.
Input Configuration	Service Tool Screen where six different input selections may be made, and the demand configuration may be edited by the user.
Input Current High	The Input current sensor is at maximum output.
Input Current Low	The Input current sensor is at minimum output.
Input Power Information	This displays the input voltage to the DVP (source 1 and source 2), the internal power bus voltage and the input current to the DVP; real time.
Input Voltage 1 High	The measured voltage at Input 1 is higher than the DVP specification limit.
Input Voltage 1 Low	The measured input voltage on input number 1 is lower than the DVP specification limit.
Input Voltage 2 High	The measured input voltage is higher than the DVP specification limit.
Input Voltage 2 Low	The measured input voltage on input number 2 is lower than the DVP specification limit.
Int. Bus Voltage High	The internal bus voltage sensor is at maximum.
Int. Bus Voltage Low	If the internal bus voltage Sensor is at minimum
Invalid Parameter(s)	CRC16 check failures on both parameter sections. If a new embedded program has been loaded, the parameters have not been updated. NOTE: In DVP firmware prior to 5418-8086, the Invalid Parameter(s) fault indicator on the Internal DVP Fault Status screen can be cleared by Reset Control, but the unit still requires the user to correct the parameters and cycle power. Another indication of this fault being present is when the Input Voltage and Input Current fields are 0.0 on the Status Overview screen.
Invalid Parameter Version	Version information does not correct in the non-volatile memory. Internal electronics failure.

J

Term	Definition/Description
None Currently	

K

Term	Definition/Description
None Currently	

L

Term	Definition/Description
Linearization Monotonic Shutdown Error	The Linearization settings stored in the unit are not monotonically increasing, and the unit will not begin operation until this fault is resolved by updating the Linearization settings.
LVDT1 Readback Pwr Fault LVDT2 Readback Pwr Fault LVDT3 Readback Pwr Fault	Internal 5 V used for voltage readback inputs is below the min value of 4.5 V. Each voltage is isolated and monitored independently. Indicates internal electronics failure. (Applies only to DVP with servo interface module)
LVDT1A Voltage Error LVDT2A Voltage Error LVDT3A Voltage Error	The measured output voltage differs from the commanded output voltage by more than 0.8 Vrms for longer than 2 seconds. Indicates a possible wiring problem. (Applies only to DVP with servo interface module)

M

Term	Definition/Description
M5200	Refers to the optional aux board in the DVP that provides Ethernet communications.
M5200 CPU Load	CPU Load of the M5200 in EGD mode.
M5200 Detected An Error	One of the five possible errors associated with the M5200 has been set. *DP ram check error*: The M5200 has detected a dual ported ram error. If the M5200 program is started or stopped this error may occur due to the M5200 and the DVP being out of synch. *MFT Synch error*: The DVP has not been able to provide the synch pulse on time to its M5200. *Version error*: DVP and its M5200 do not have compatible software versions. *Block Count error*: The DVP and M5200 software have a different number of interface blocks. *Heartbeat error*: The M5200 has not received a correct heartbeat from the DVP.
M5200 DPRAM Error	The DVP has detected a Dual port ram error during the RAM check. Defective Dual Port Ram or interface.
M5200 Heartbeat Error	The M5200 has not sent the correct heartbeat value to its DVP. The M5200 is not running, or the interface is defective.
M5200 Starting	The control board is waiting until the M5200 aux board is started. Wait time is approximately 2 minutes. This is a typical situation during a power up or change of input type that will activate the M5200 aux board. This flag will reset automatically.
M5200 Startup Timeout	After 2 min waiting for a signal from the M5200 aux board the control board will timeout. There is no M5200 program, or it is not running.
Manual Input Manual Position Demand	This is the position setpoint provided while in Manual Operation.
Manual Operation	Service Tool Screen, where operating the DVP in manual control is monitored. Capabilities include Position Controller information such as Position Demand, Actual Position and Actual Current.
Manual Position	A Demand Input Source which sets the setpoint signal type, which is the Internally generated setpoint, user-configurable from the Manual Control page
Mode	“Mode” is used to describe a parameter which selects one option to the exclusion of the other available options.

Mode Selection	Allows the user multiple options for input filter configurations. The selected configuration is then displayed in the Mode Selection window of the Position Controller Configuration page.
Motor	This section displays information related to the Motors resolvers
Motor 1 Cos Error Motor 2 Cos Error	The Cosine input voltage is out of range on the motor resolver. The wiring to the resolver is disconnected or failed. The resolver failed open or is intermittent.
Motor 1 Exc. Error Motor 2 Exc. Error	The Sine and Cosine voltage combined are below the diagnostic threshold. The excitation wiring to the resolver is shorted or intermittent. The resolver excitation coil is shorted. The resolver gain is too low due to resolver wiring problem. Excitation circuit failure.
Motor 1 Sin Error Motor 2 Sin Error	The Sine input voltage is higher than the diagnostic limit on the motor resolver. The wiring to the resolver is disconnected or intermittent. The resolver failed open or is intermittent.
Motor 1 and 2 Res. Error	This is a summary indication that an error is detected in both motor 1 and motor 2.
Motor Calibration Point	This value is the factory calibration point for the motor resolver.
Motor Control Parameters	A section of the Service Tool Status Overview Screen Position Controller which displays parameters of Actual Current and Actual Current (Filtered).
Motor Control Parameters Actual Current	Real-time current being fed to the actuator; raw current.
Motor Control Parameters Actual Current (Filtered)	This is the actual current driven into the actuator after filtering.
Motor Current	The selection will use the actual current which is the current that the driver is applying to the motor. This signal will have a lot of movement such as the current from the current controller continues moving to keep the position of the valve in the same position as the demanded position.
Motor Max. Direction Startup Direction Settings – Direction Limit	Startup Checks This displays the maximum motor revolution(s) that is allowed during the startup check.
Motor Max. Startup Direction Settings	This section defines the Startup, max direction, current setting, upper and lower limits, and the startup values from the last startup check.
Motor Maximum Startup Limit Settings Actual Avg. Startup Position Motor 1	The displays the last maximum direction startup check value for Motor Res 1.
Motor Maximum Startup Limit Settings Actual Avg. Startup Position Motor 2	The displays the last max direction startup check value for Motor Res 2.
Motor Minimum Startup Limit Settings	This section defines the Startup, min direction, current setting, upper and lower limits, and the startup values from the last startup check.
Motor Position Error Alarm Limit	This is the minimum difference between demanded position and measured position (from the motor resolver) that will trigger a Motor Position Error Alarm.
Motor Position Error Alarm Delay Time	This is the minimum time the Motor Position Error Alarm Limit must be exceeded before an alarm is triggered.
Motor Position Error Shutdown Limit	This is the minimum difference between demanded position and measured position (from the motor resolver) that will trigger a Motor Position Error Shutdown.
Motor Position Error Shutdown Delay Timer	This is the minimum time the Motor Position Error Shutdown Limit must be exceeded before a shutdown is triggered.
Motor Resolver Difference Diagnostics	These diagnostics are for monitoring differences between redundant motor resolvers (Dual Res. Difference Alarm and Dual Res. Difference Shutdown).
MPU/PWM Input	A setpoint source which sets the setpoint signal type of PWM signal.

N

Term	Definition/Description
No Power Board Found	During power up the control board will read the power board. This diagnostic will be set if no Power Board is found. DVP internal electronics failure or there is no power board connected.
Number of Cycles	The number of sweep cycles combined with the number of cycles run.

O

Term	Definition/Description
Output Configuration	A Service Toll screen which provides status information on the DVP's analog and digital output section. Three text indicators show the currently active outputs and which mode they have been configured to.

P

Term	Definition/Description
Position Control State	This displays the controller model that is being used to control the actuator and the state of the controller; Running or Not Running.
Position Controller	A screen in Service Tool which provides Motor and Actuator/Valve Position Readings, Position Sensor Diagnostics, and Position Error Diagnostics. Additionally, Motor Resolver Difference Diagnostics and Motor Position Control State are provided.
Position Controller Configuration	A screen in Service Tool which provides the Position Controller Configuration menu indicates the general overview of the actuator operation. User individual configuration edit options are also available on this screen.
Position Controller Not Ready	This status flag indicates the DVP is not controlling position. This occurs during power-up initialization and when in a shutdown position state.
Position Demand	Position demand signal currently being used by the DVP.
Position Demand High Point	This value specifies the threshold above which the Position Demand is considered to have failed.
Position Demand Low Point	This value specifies the threshold below which the Position Demand is considered to have failed.
Position Error Motor Alarm	The Motor position is not tracking the set point within limitations set by the tracking error alarm parameters. Incorrect Parameter Settings. Contamination in the valve/actuator system.
Position Error Configuration	This display only group displays Motor Position and Shaft Position errors in four categories: Alarm Limit, Alarm Delay Time, Shutdown Limit, and Shutdown Delay Time.
Position Error Motor Shutdown	The Motor position is not tracking the set point within limitations set by the tracking error shutdown parameters.
Position Error Motor Alarm	The motor position sensor is not tracking the set point within limitations set by the tracking error alarm parameters. Contamination in the valve/actuator system, incorrect or damaged motor wiring, and/or motor failure could be a cause for this diagnostic.
Position Error Shaft Alarm	The motor position sensor is not tracking the set point within limitations set by the tracking error alarm parameters. Contamination in the valve/actuator system, incorrect or damaged motor wiring, and/or motor failure could be a cause for this diagnostic.
Position Error Shaft Shutdown	There is an error bigger than the stem position error parameters between the stem position and the demanded position. Excessive Valve/Actuator Wear. Incorrect or damaged motor wiring. Motor Failure. DVP electronics failure.

Position Error Valve Shaft Alarm	There is an error bigger than the stem position error parameters between the stem position and the demanded position. Excessive Valve/Actuator Wear. Incorrect or damaged motor wiring. Motor Failure. DVP electronics failure.
Position Offset	Position offset value – configured during valve factory calibration
Position Readings	A section of the Service Tool Status Overview Screen Position Controller which displays readings of Position Demand, Actual Position, and Actual Position Sensors 1 and 2.
Position Readings Actual Position	A value derived by different sensors represented in percentage that is the reported position (real-time position) of the valve or actuator as seen by the DVP.
Position Readings Actual Position Sensor 1	This value shows the actual position according to Position Sensor 1. Note that the physical sensor mapped to Position Sensor 1 is dependent on the specific valve or actuator in use.
Position Readings Actual Position Sensor 2	This value shows the actual position according to Position Sensor 2. Note that the physical sensor mapped to Position Sensor 2 is dependent on the specific valve or actuator in use.
Position Readings Position Demand	This represents the Position Demand value currently seen from the selected Position Demand interface, but subject to the following limitations: 1) The value will be forced into the range of 0.0% to 100.0%, inclusive. 2) When the unit is in the Shutdown state the value will be forced to the defined shutdown position (0.0% or 100.0% dependent on the specific valve or actuator in use).
Position Sensor Diagnostics	This displays the Fault status flags associated with the Shaft Resolver. Some actuators have one shaft (final element) resolver, and some have two shaft (final element) resolvers.
Position Sensor Diagnostics Motor 1 and 2 Res. Error	Both the Motor 1 and Motor 2 resolvers have active faults detected. This is a summary fault indicator, and the specific causes can be narrowed by reviewing the other specific resolver fault indicators.
Power Board Calib. Error	During power up the calibration record in the control is set to “No Power Board” this diagnostic will be set. The control board has not been calibrated during electrical production.
Power Board Diagnostics Fan 1 Speed Error	This fault status flag indicates Fan 1 is slowing down or has stopped (Applies only to DVP 5000, 10000, and 12000).
Power Board Diagnostics Fan 2 Speed Error	This fault status flag indicates Fan 2 is slowing down or has stopped (Applies only to DVP 5000, 10000, and 12000).
Power Board Diagnostics Heat Sink Temp. Sensor 1 Error	This fault status flag indicates power board heat sink sensors # 1 has failed (Applies only to DVP 5000, 10000, and 12000).
Power Board Diagnostics Heat Sink Temp. Sensor 2 Error	This fault status flag indicates power board heat sink sensors # 2 has failed (Applies only to DVP 5000, 10000, and 12000)
Power Board ID Error	During power up, the Power board ID and the stored ID in the calibration record do not match. The Power board has been changed to a different type after calibration.
Power–up Reset	CPU reset by a power up event.
PWM Duty Cycle High	The PWM input duty cycle is above the given setting (User setting)
PWM Duty Cycle Low	The PWM input duty cycle is below the given setting (User setting)
PWM Frequency High	The PWM frequency is above the given setting (User Setting)
PWM Frequency Low	The PWM frequency is below the given setting (User Setting)

Q

Term	Definition/Description
None Currently	

R

Term	Definition/Description
Readback1 +15V Pwr Fault Readback2 +15V Pwr Fault Readback3 +15V Pwr Fault	Internal 15 V is outside acceptable range of 13.35 V to 16.65 V. Each voltage is isolated and monitored independently. Indicates internal electronics failure. (Applies only to DVP with servo interface module)
Readback1 -15V Pwr Fault Readback2 -15V Pwr Fault Readback3 -15V Pwr Fault	Internal -15 V is outside acceptable range of -17.25 V to -12.75 V. Each voltage is isolated and monitored independently. Indicates internal electronics failure. (Applies only to DVP with servo interface module)
Reduced Torque Error	This Fault status flag indicates the system torque has been reduced due a reduction in motor current
Reduced Slew Rate Error	This Fault status flag indicates the system slew speed has been reduced; loss of second actuator in a dual system, input current limiter
Relubrication Function Configuration	This configuration is dependent upon the valve or actuator that is being read by the DVP and the settings are not configurable by the user. This page is a display only and displays relubrication activity which are perturbations (small vibrations) that are introduced into the valve to prevent silt build up.
Resolver	This section displays LVDT information, resolver position, signal amplitude, LVDT drive circuit gain
Resolver Diagnostics	This Service Tool screen displays Resolver, Motor, and Valve diagnostics and displays setting information. There are also Motor and Valve fault indicators that show errors in the diagnostic process.
Resolver Difference	
RDC DSP Failed	DSP that runs the Resolver-to-digital converter has stopped running. Internal electronics failure.

S

Term	Definition/Description
Sample Time	An interval represented in milliseconds which is associated with Sweep Mode of how frequently sample readings are taken.
Servo Board Cal Not Completed	Indicates the DVP servo inputs/outputs are not all calibrated, unit will not function as expected, return to the factory. (Applies only to DVP with servo interface module)
Servo Board NVRAM Fault	The Servo Board detected a nonvolatile memory data corruption/failure. (Applies only to DVP with servo interface module)
Servo Interface Module or SIM	Refers to an optional internal Aux module that provides an interface for up to three analog inputs demand signals and provides LVDT control signal feedback outputs. Used to replace existing hydraulic systems with an electric alternative.
Servo Position	This selection sends the 4-20mA equivalent of the Servo Position to the output using scaling defined in the other parameters in this group/
Setpoint Source Selection Configuration	This feature of the Input Configuration screen of Service Tool enables the user to select from six configuration options which include Manual Position, Analog Input, EGD Digital Input, PWM Input, Function Generator, and CANopen Digital Input. These options adjust the settings of the DVP.
Shaft Position Error	The Shaft position is not tracking the set point within limitations set by the position error parameters.

Shaft Position Error Alarm Limit	This is the minimum difference between demanded position and measured position (from the shaft resolver) that will trigger a Shaft Position Error Alarm.
Shaft Position Error Alarm Delay Time	This is the minimum time the Shaft Position Error Shutdown Limit must be exceeded before a shutdown is triggered.
Shaft Position Error Shutdown Limit	This is the minimum difference between demanded position and measured position (from the shaft resolver) that will trigger a Shaft Position Error Shutdown.
Shaft Position Error Shutdown Delay Time	This is the minimum time the Shaft Position Error Alarm Limit must be exceeded before a shutdown is triggered.
Shutdown Shutdown Position	This indicates a shutdown condition is detected. The position of the Actuator/valve is controlled by the DVP at zero percent. This indicates a shutdown condition is detected where safe positioning is not possible, so driver output is turned off. The position of the Actuator/valve is not controlled by the DVP. If Actuator/valve has a return spring, the actuator/valve is be positioned by the return spring.
Speed Signal Fault	Only used if speed sensor is active. DVP does not support speed sensor input with present version.
Start Frequency	This displays the start frequency for a sweep function.
Startup Checks	This Service Tool screen shows DVP Diagnostics Valve/Actuator Startup Checks include Position Offset, Motor Calibration Point, Minimum Direction Startup, Maximum Direction Startup and Motor Direction Check.
Startup Close Motor or Startup Close Shaft Error	During calibration at the factory, the feedback values at the startup position recorded. The readings corresponding to the fully closed position are recorded in both the opening and closing direction at torques enough to overcome the backlash in the gear train, but not to open the valve. During power-up and initialization, the DVP verifies that the valve is at the min stop. This diagnostic occurs if the feedback reading is not within the calibrated range when checking the closing direction.
Startup Close Valve Shaft 2 Error	This is the same as Startup Close Valve Shaft 1 Error but for the second shaft resolver. Some actuators use 2 shaft resolvers.
Startup Max Check Res 1 Failed Or Startup Max Check Res 2 Failed	This indicates the primary final element position sensor (“Res 1”) or the secondary final element position sensor (“Res 2) did not fall within the startup max limit range. This is most common with valve/actuators which do not have the ID module and require manual set-up see Appendix D, E, F in Manual 26912 for set-up instructions. For valve/actuators with ID modules, this can occur due to wiring problems or foreign debris which do not allow the device to close properly. See also information on startup checks.
Startup Open Motor or Startup Open Shaft Error	During calibration at the factory, the feedback values during the startup sequence are recorded. The readings corresponding to the fully closed position are recorded in both the opening and closing direction at torques enough to overcome the backlash in the gear train, but not to open the valve. During power-up and initialization, the DVP verifies that the valve is at the min stop. This diagnostic occurs if the feedback reading is not within the calibrated range when checking the opening direction.
Startup Motor Direction Error Or Startup Motor 2 Direction Error	Most commonly a motor wiring problem. Motor not connected, or phases are connected incorrectly. Can also be caused by a resolver wiring problem; resolver moving in the incorrect direction. Less frequently, a motor defect, open or short circuit. If shorted, it is likely that a Driver Current Fault flag is also detected. Least common: DVP electronics failure.
Startup Open Valve Shaft 2 Error	This is the same as Startup Open Valve Shaft 1 Error but for the second shaft resolver. Some actuators use 2 shaft resolvers.
Startup Position Lower Limit	This displays the lower limit of a specific startup check.
Startup Position Upper Limit	This displays the upper limit of a specific startup check.

Status Overview	DVP Service Tool screen which contains Position Controller, DVP I/O State, and DVP Analog Value information. A user customizable trend chart is also included to provide a real-time graphical reference to the performance of the DVP.
Stroke Length	A setting associated with certain actuators that allow some adjustment of the actuation length. These settings are not user adjustable.
Sweep Mode	This dropdown menu within the Function Generator Configuration section is a user configurable, multiple option menu to set different sweep modes such as Linear, Linear Repeat, and Number of Cycles Low/High.

T

Term	Definition/Description
Trend Chart	A trend chart displays the time varying position set point, actual position, and filtered motor drive current. Trend charts are a feature in several Service Tool screens such as Manual Operation.
Timeout	A user configurable time interval, typically in milliseconds, which is a buffer.
Two Analog Inputs Failed	Two of three servo demand inputs are failed. Only valid when the number of inputs is 3. (Applies only to DVP with servo interface module)
Type Not Supported	**This diagnostic is annunciated if the valve type reported by the valve/actuator system in the ID module is not supported by the DVP software. Valve type not supported by the DVP. DVP software is not the required revision for this valve.**
Type / Serial Number Error	If during power up the DVP detects a valve/actuator system with a different serial number or valve type this diagnostic will be annunciated. User has connected a different valve to the DVP. User has loaded a parameter set to the DVP that does not match this valve/actuator system serial number.

U

Term	Definition/Description
User Force Limiter	A mode supported on specific actuators to allow controlling the force and slew rate during installation and rigging.

V

Term	Definition/Description
Valve Identification	A section on the Service Tool Identification screen which displays Valve Type, Part Number, Revision, and Serial Number. This information is provided through communications between the valve and the DVP.
Valve Shaft 1 Cos Error	The Cosine input voltage is out of range on the valve shaft (final element) for Resolver number 1.
Valve Shaft 1 Exc. Error	The Sine and Cosine voltage combined are too low.
Valve Shaft 1 Sin Error	The Sine input voltage is out of range on the valve shaft (final element) Resolver number 1.
Valve Shaft 2 Cos Error	The Cosine input voltage is out of range on the valve shaft (final element) for resolver number 2.
Valve Shaft 2 Exc. Error	The Sine and Cosine voltage combined are too low. The excitation wiring to the resolver is shorted or intermittent. The resolver excitation coil is shorted. The resolver gain is too low due to resolver wiring problem. Excitation circuit failure.
Valve Shaft 2 Sin Error	The Sine input voltage is out of range on the valve shaft (final element) resolver number 2.

Valve Shaft 1 and 2 Error	The shaft (final element) resolver redundancy manager has detected a Valve shaft (final element) 1 and Valve shaft (final element) 2 error. Valve shaft (final element) 1 error is true if any of the following errors are detected: • Valve shaft (final element) 1 Sine Error • Valve shaft (final element) 1 Cosine Error • Valve shaft (final element) 1 Exc. Error Valve Stem 2 error is true if any of the following errors are detected: • Valve shaft (final element) 2 Sine Error • Valve shaft (final element) 2 Cosine Error • Valve shaft (final element) 2 Exc. Error
Valve Shaft 1 Range Limit Error or Valve Shaft 2 Range Limit Error	During calibration at the factory, the final element feedback range (difference between minimum and maximum stop) is recorded. This diagnostic occurs if the final element #1 or #2 resolver reading is detected outside the allowable resolver range.
Valve Shaft Max. Startup Range Settings Actual Avg. Startup Position	This value shows the average reading obtained for the shaft resolver during the Max portion of the startup checks. This value is used to determine the status of Startup Open Valve Shaft 1 Error or Startup Open Valve Shaft 2 Error.
Valve Shaft Min. Startup Range Settings Actual Avg. Startup Position	This value shows the average reading obtained for the shaft resolver during the Min portion of the startup checks. This value is used to determine the status of Startup Close Valve Shaft 1 Error or Startup Close Valve Shaft 2 Error.
Valve Type Selection	Service Tool screen which contains Actuator Type Selection Process, Auto Detection Control, Actuator Type Selection Diagnostics, Selected Valve Type, Valve Specific and Control Module information. The user may invoke a self-configuration process using data acquired from the valve's Identity (ID module).

W

Term	Definition/Description
Watchdog Reset	CPU reset without a power up event.
Wave Pattern	This dropdown menu within the Function Generator Configuration section is a user configurable, multiple option menu to set wave patterns such as DC, Sine Wave, and Square Wave.

X

Term	Definition/Description
None Currently	

Y

Term	Definition/Description
None Currently	

Z

Term	Definition/Description
Zero Cut-off Configuration	This display-only feature traditionally disables power to the motor, and closing of the valve is achieved by the return spring. Entry/exiting of this state is when the position demand and actual position meet certain limit criteria. The DVP and valve remain active and functional, but disabling power to the motor prevents high frequency noise from wearing the motor gear teeth.

	Beginning with DVP firmware version 5418-8088/rev 6.13 a new current controlled mode exists for some valve types where the motor will drive with constant current in the closing direction. NOTE: More recent DVP firmware versions (5418-8082/rev 6.11 and later) only use position demand (i.e. no longer use actual position) in determining when to activate/deactivate the Zero Cut-off state.
Zero Cut-off Inhibited	This status indicator LED indicates that the Zero Cut-off mode is not supported by the valve type and will be treated as if the mode is disabled. Any settings for Zero Cut-off Configuration will be ignored.

Appendix B.
DVP Software Upgrade

This chapter addresses the options for upgrading the DVP software to a newer released version using the DVP Service Tool.

The steps provided in this section can be applied to any DVP software upgrade. Appendix G provides an overview of the entire process needed including updating DVP settings for compatibility with the upgraded software version.

IMPORTANT **Contact Woodward for DVP upgrade compatibility, firmware, and any additional special instructions required.**

General Upgrade Information

Perform the software upgrade using the DVP Service Tool version 9927-1736E (or later). Obtain DVP Service Tool through Woodward service personnel or from the Woodward software download website. To know which version of the Service Tool will be suitable for the DVP, Woodward requires that you provide the part number, serial number, and manufacturing date code of the DVP. The product part number, serial number, and product date code print on the Product ID label.

The DVP software is supplied in the form of a file with the extension ".wapp" (for example, DVP 5418-2959NEW.wapp). It is important to save the file in a local drive where it can be easily accessed for later use.

The upgrade process will replace the application software running on the DVP. Except when otherwise noted, the new application software is backwards compatible with older versions of the software.

⚠WARNING **Woodward recommends performing the software upgrade when the DVP is operating OFFLINE. In the process of upgrading the software, the DVP will stop its operation and the valve/actuator system will shut down.**

NOTICE **Check the system to ensure it is safe to upgrade before proceeding with the software upgrade.**

During the upgrade process, the current DVP configuration automatically converts to the new software version.

NOTICE **Make sure to review the upgraded settings on the appropriate DVP Service Tool pages before resetting the DVP. Do NOT reset the DVP without reviewing the settings.**

Software Upgrade Procedure

1. Start the DVP Service Tool. Next, select Load Application from the File Menu.

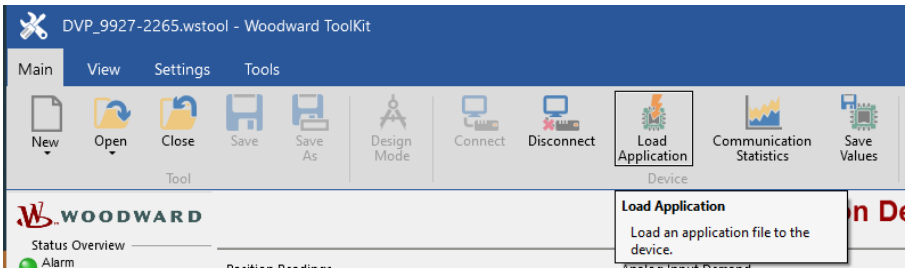


Figure B-1. Load Application

2. Press **Next** to continue or press **Cancel** to stop the upgrade process.

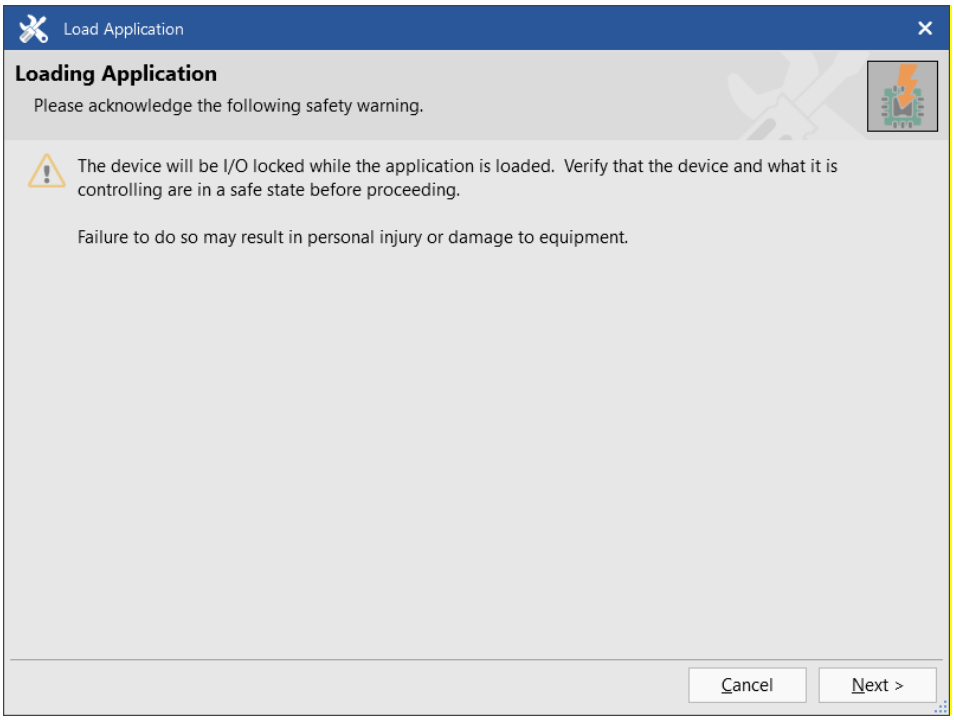


Figure B-2. Warning Note

3. Use the Browse Button to locate the Software Application file (*.wapp). It is recommended that you save the file in a local drive where it can be easily located (Figure B-3). To continue the upgrade process, press **Next**.

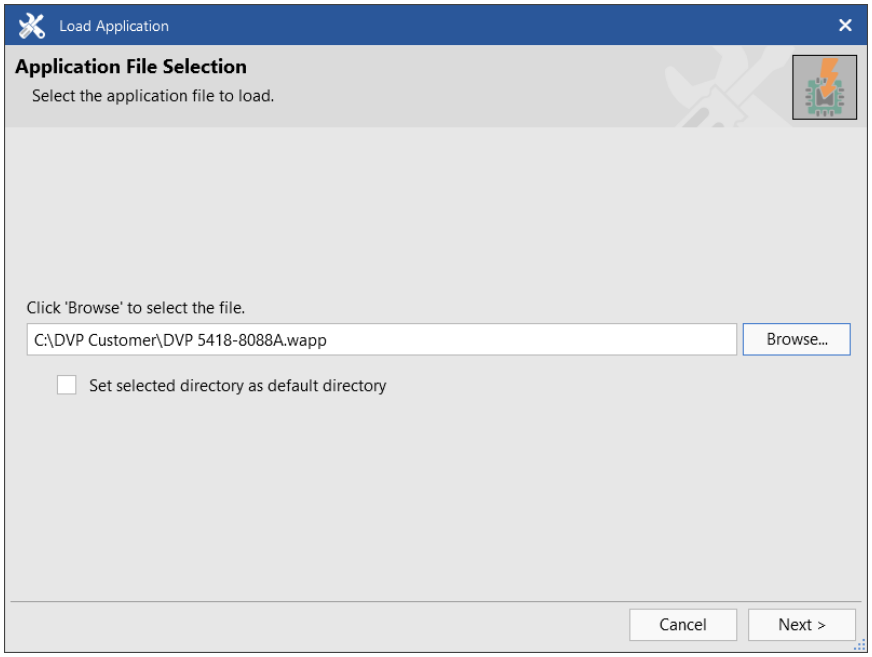


Figure B-3. Software File

4. The Restore Settings window will pop up as shown in Figure B-4. Place a check into the checkbox to allow the DVP to restore the device current settings after loading the application. Press **Next** to continue the upgrade process

IMPORTANT

Woodward recommends checking the checkbox to allow the DVP to restore the device's current setting and configuration during the software upgrade.

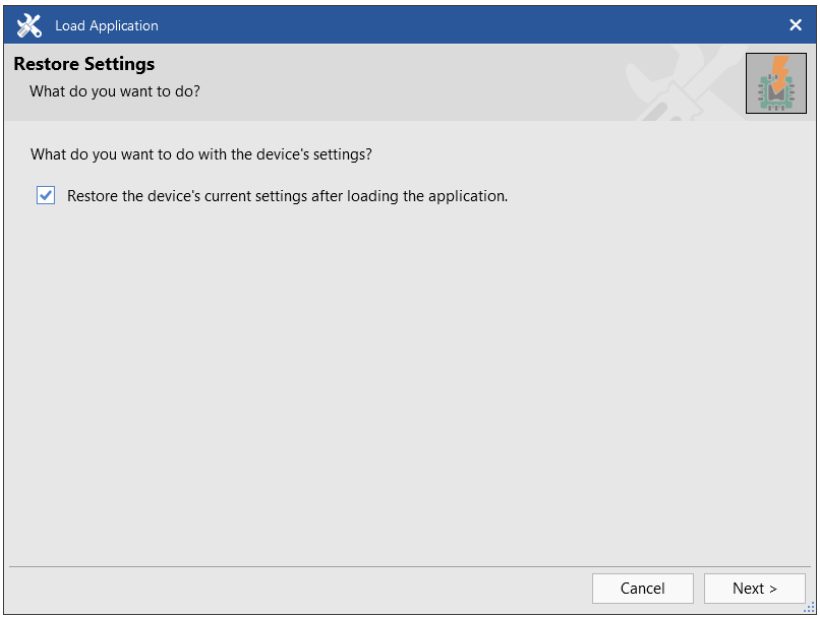


Figure B-4. Restore Settings

5. Occasionally there is a situation when the Service Tool does not support the conversion between the existing and the new firmware so ToolKit will be unable to convert from the old to the new settings file format. The figure below is what you can expect to see should this situation occur.

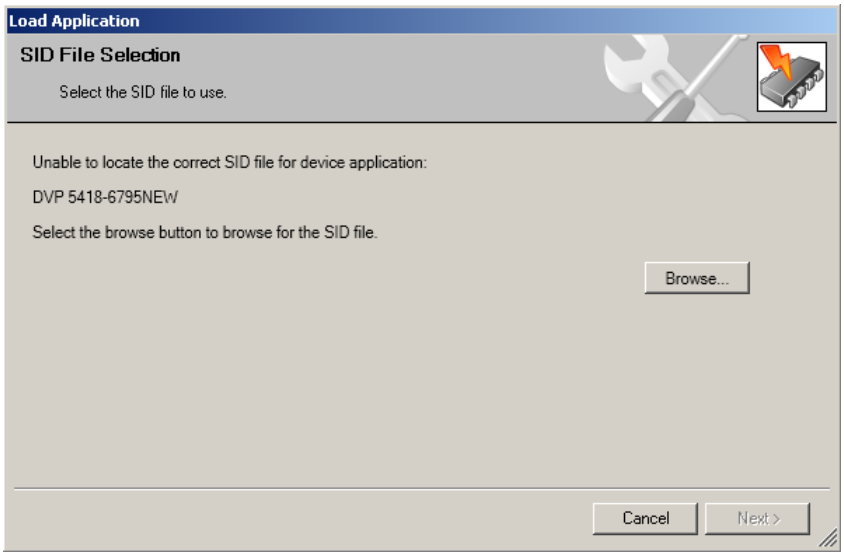


Figure B-5a. Notification When Old to New Firmware is Not Supported (SID File)

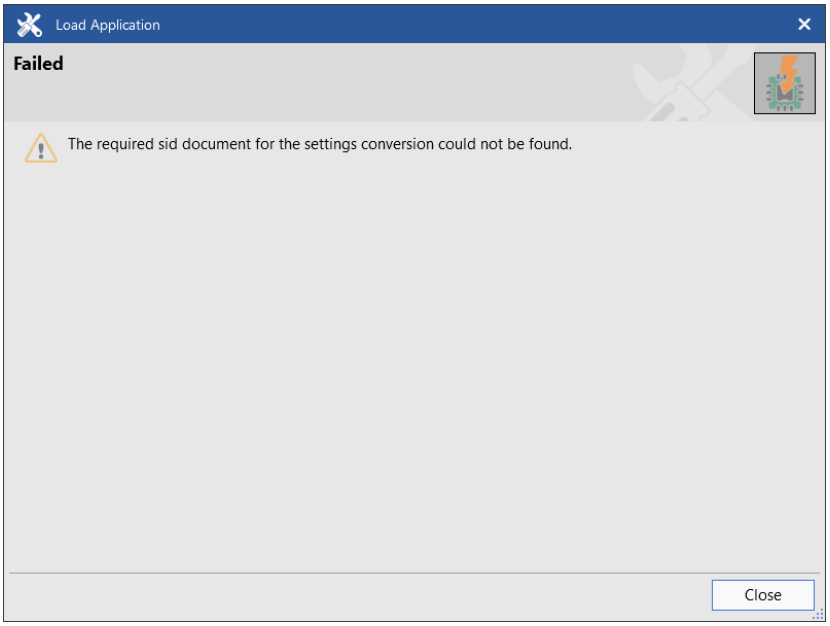


Figure B-5b. Notification When Old to New Firmware is Not Supported (Settings Conversion)

If you experience this situation, the best practice is to capture the previous firmware settings manually. Then load the new firmware without marking the checkbox in the Restore Settings dialog window. Then duplicate the captured settings in the DVP following the firmware update.

Note: Prior to beginning the procedure to load new firmware you may want to stop and capture the existing settings. If you move forward, the ability to capture those settings is lost.

6. Set the Baud Rate setting to AutoDetection for the Service Tool automatically detects the correct Baud Rate for the communication link. To continue, press **Next**.

7. The Group Selection window pops up as shown on Figure B-6. It is recommended that Software update settings group is selected when upgrade software from previous revision to the newest revision.

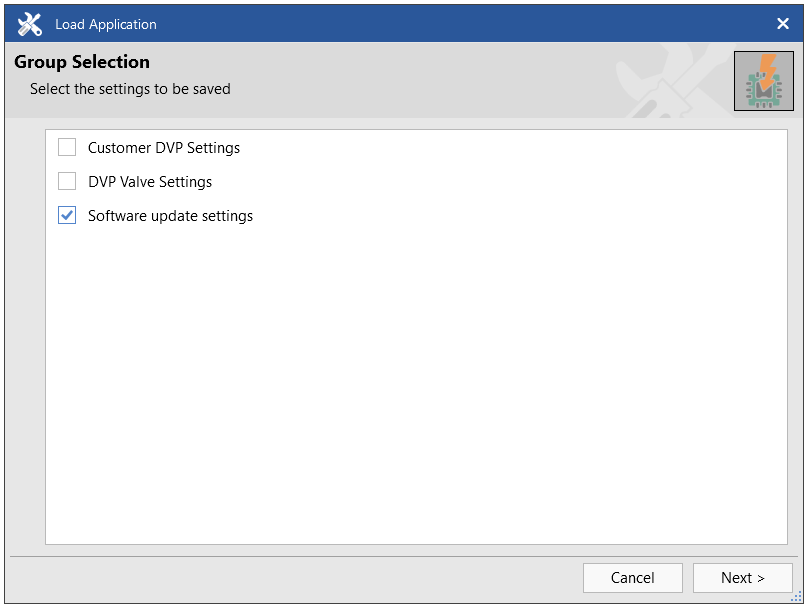


Figure B-6. Group Selection

IMPORTANT **Do NOT press Cancel while the software is being uploaded. The user configuration settings will be lost.**

8. Press the Next button to continue the loading DVP software application. The loading window status will automatically be displayed as shown on Figure B-7.

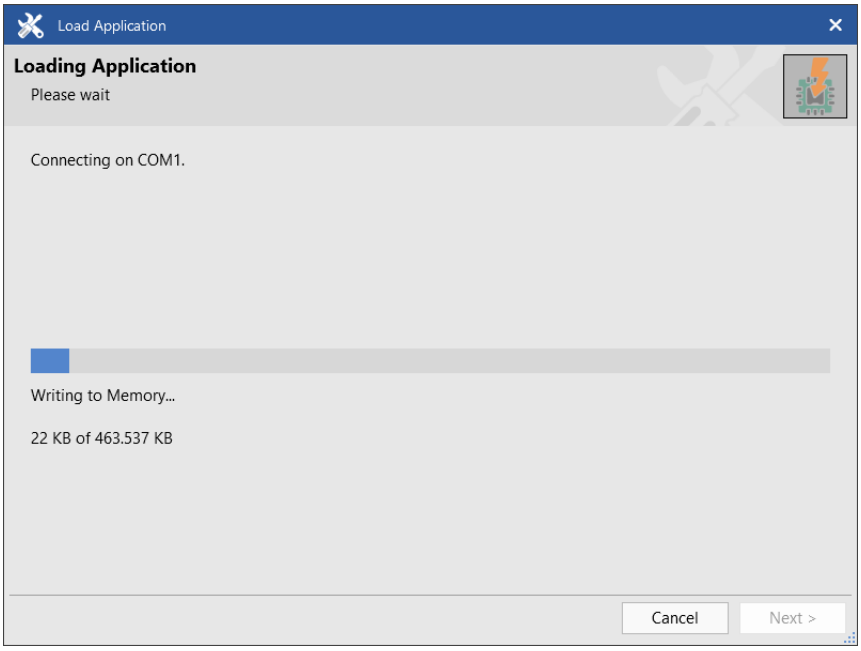


Figure B-7. Writing Application to DVP Memory

Note: The DVP setting is loaded after the Application has been updated Figure B-8. It is recommended that you do not interrupt the current operation.

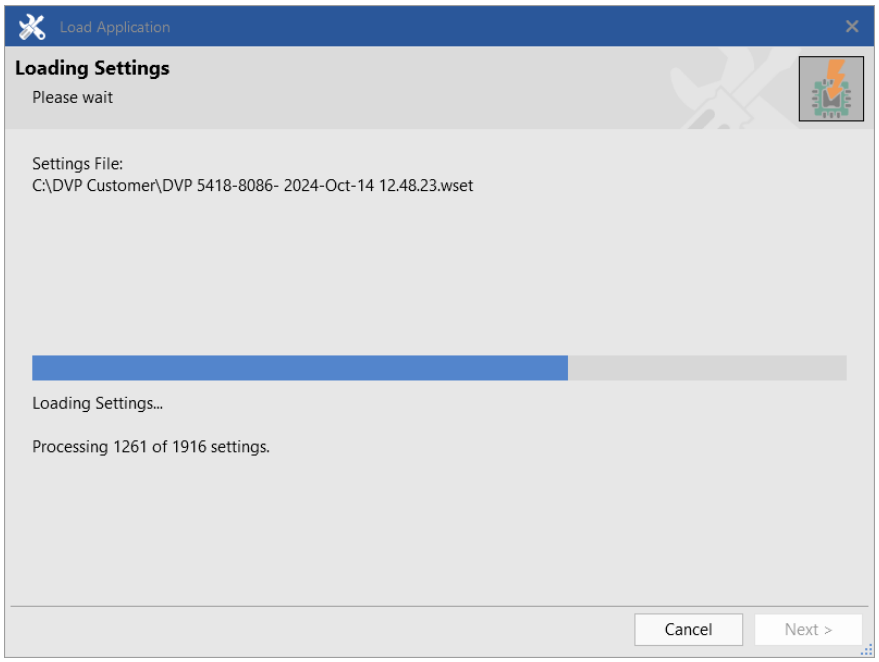


Figure B-8. Reload DVP Setting

9. The successful completion of Application Software upgrade displays in Figure B-9. If the software application upload was successful, to continue, press **Close**.

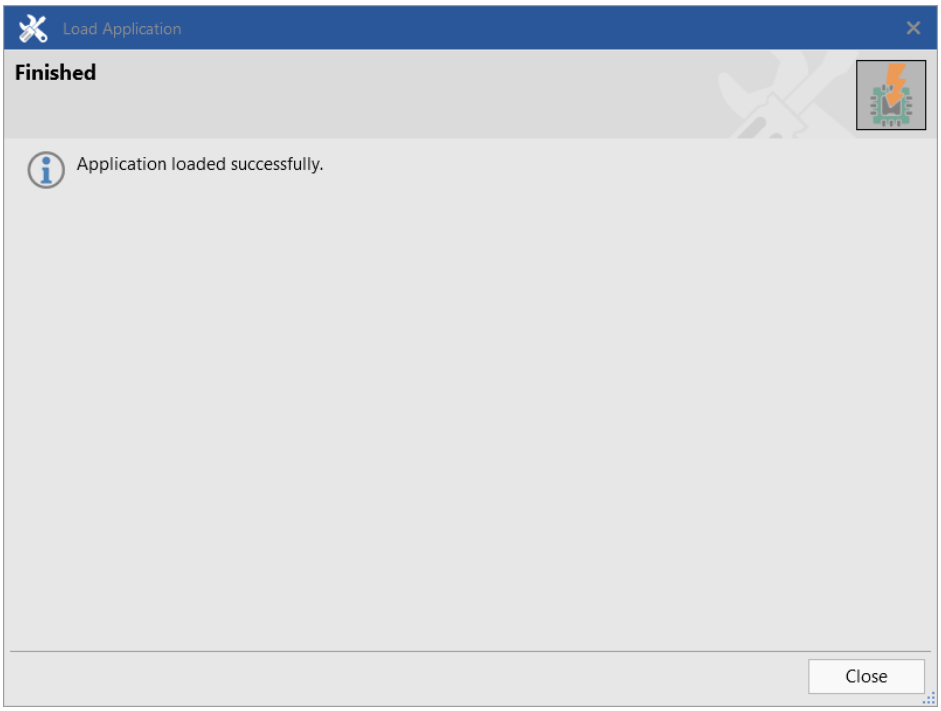


Figure B-9. Success of Application Upgrading

10. In the event the Restore Setting operation fails, manually load the extracted settings. Settings can be loaded by selecting “Load Settings File to Device…” from the “Settings” menu in the main toolbar. The settings file that was extracted will have a name that identifies the firmware revision

programmed, the date of the programming operation, and the time of the programming operation (i.e., DVP 5418-7178NEW 2015-Dec-09 10.14.42.wset).

11. Press the Connect button or select Connect from the Device menu to connect the Service Tool to the DVP running the new Application Software.

Appendix C.
User Force Limiter Mode

Introduction

The User Force Limiter (UFL) mode lets the user independently control the actuator force and slew rate. When used properly, this mode simplifies commissioning and prevents damage to an unadjusted linkage. On initial entry into UFL mode, the user adjustable force and slew rate are set to zero (0). The user must gradually increase the force and slew rate until the actuator begins to move. The user force and user slew rate are multiplied with the default maximum force and default maximum slew rate to reduce the actuator's force and slew rate. When UFL mode is disabled, the force and slew rate return to the factory defaults.

This feature is not available in all applications. At the time of this publication only ELA28/IGVA and ELA28/NGVA actuators are supported (table C-1).

> **Note:** The Reduced Torque Error always displays yellow when DVP is in User Force Mode. This is a nominal condition.

When selecting Disabled on the User Force Enable selector, the User Force/Slew Rate percent of maximum inputs return to zero.

> **Note:** Only use the User Force Limiter Mode for initial setup. Disable User Force Limiter mode after initial system setup is complete.

When using the User Force Limiter mode, it is recommended that the demand input source be set to Manual. When complete, set the input source back to the original settings.

Table C-1. Maximum Rated Force and Slew Rate

9904-3207 IGVA	9904-3208 NGVA
Max Rated Force = 20 kN	Max Rated Force = 26 kN
Max Rated Slew Rate = 65.0 mm/sec	Max Rated Slew Rate = 49.2 mm/sec

First Enable

The user can reduce the actuator maximum force and maximum slew rate. The initial values of User Force/Slew Rate Percent of maximum are zero and the user must increase those values to initiate actuator movement.

IMPORTANT

If the user issues a shutdown or reset control when the User Force Limiter mode is enabled, the DVP may fail the startup checks if the User Force/Slew Rate Percent of Maximum are set too low.

Figure C-1 shows how the UFL screen appears after enabling UFL.

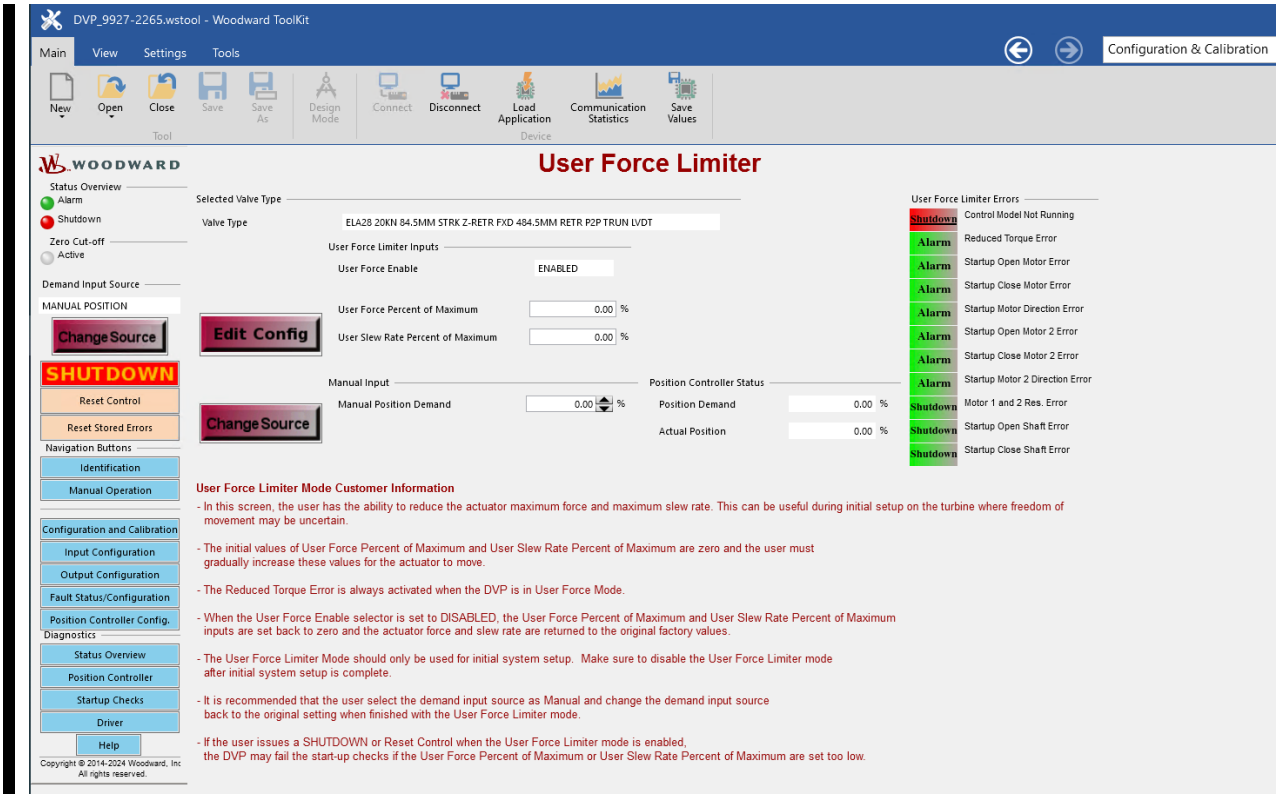


Figure C-1. UFL First Enable Screen

First Startup

This screen provides the user the ability to reduce actuator maximum Force and Slew Rate which is useful during initial setup on a turbine where freedom of movement is restricted or limited.

Figure C-2 is how the screen appears when enabling UFL Mode and the user has clicked the Reset button resulting in multiple alarms enunciated. The Reduced Torque Error is set because of enabling UFL mode. The other errors are all part of the actuator start-up check sequence. They show that because with UFL mode enabled, and the force and slew rate set at 0%, the DVP cannot move the actuator to perform the start-up checks. The specific alarms may vary depending upon the actuator type which is communicating with the DVP.

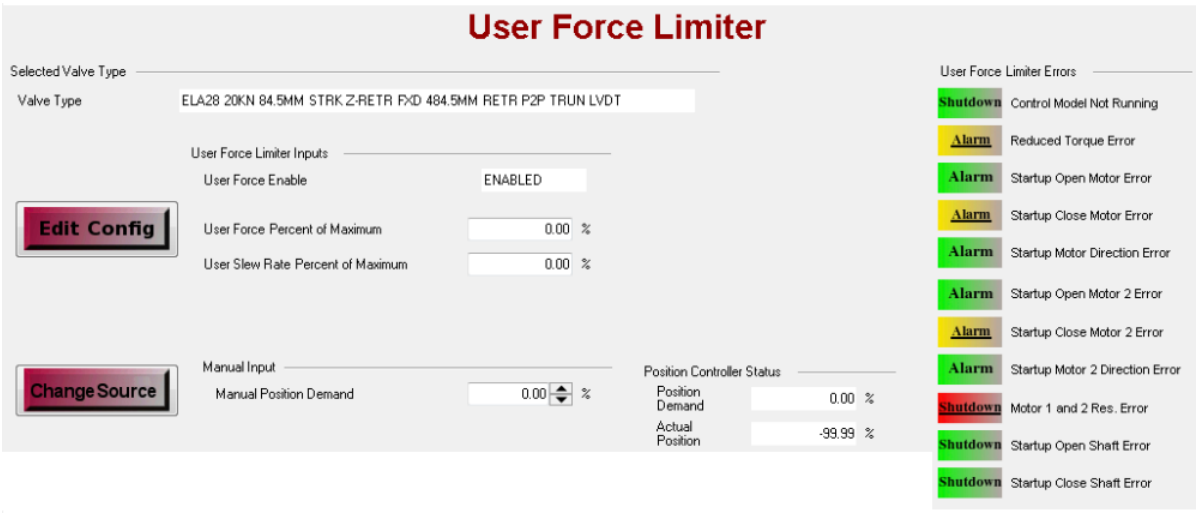


Figure C-2. First Startup Screen

Need to Change Demand Source

This screen shows a warning that the setpoint source of the DVP is not in manual control. The warning on this screen is telling the user that the Manual Position mode is not selected, so another interface is in control of the Position Demand. A user will typically use Manual Position mode during UFL operation so the Position Demand can be controlled from the Service Tool. If this is desired, then click and select Manual Position from the dropdown menu. When this action is complete, continue with normal operations.

Figure C-3 shows that selecting Manual Operation is required for proper operation of the UFL.

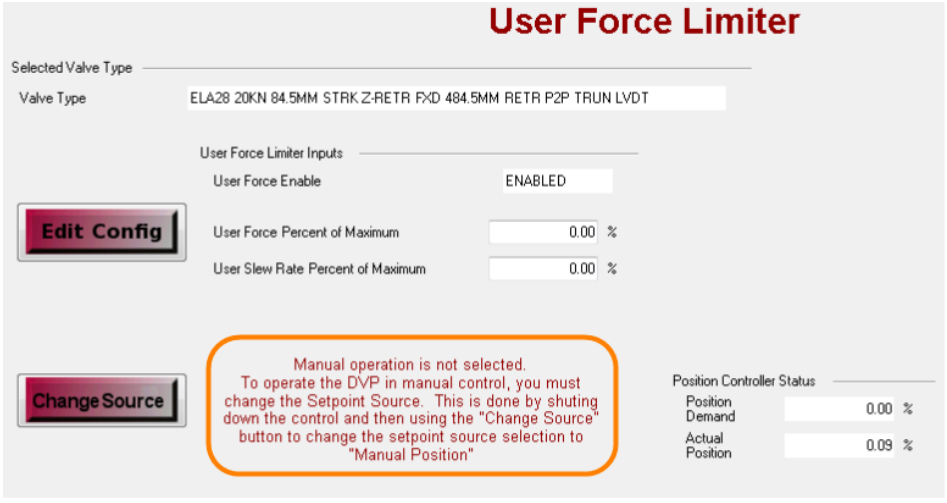


Figure C-3. Manual Operation Warning Message

Normal Commissioning Situation

There are configurations possible due to the flexibility of UFL to adapt to a plethora of user-specific situations. Examples of two of these follows.

Figure C-4 shows a normal commissioning situation where the user has moved the actuator to 50% at reduced force and slew rate.

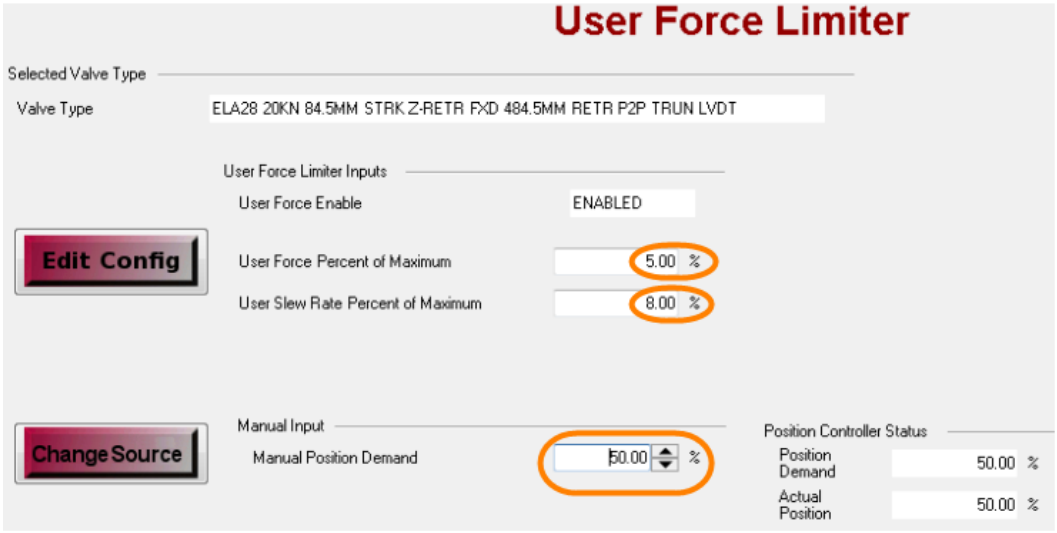


Figure C-4. Actuator 50%, Reduced Force, Reduced Slew Rate

Figure C-5 shows the DVP will remain at 50% position even though the command is asking for 80% because the Slew rate is at 0%. No time-out or error will activate (other than the Reduced Torque Error)

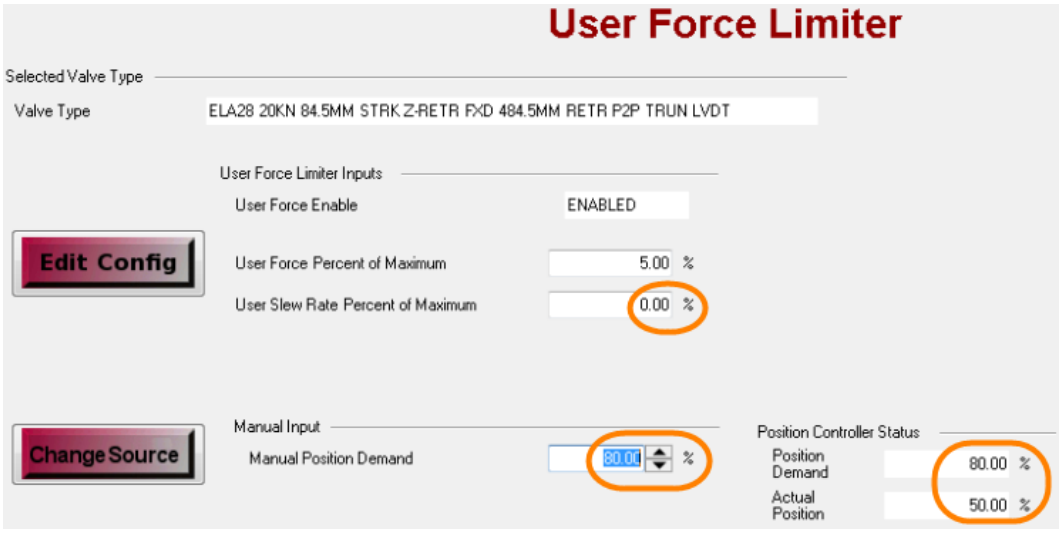


Figure C-5. Position Demand 80%, Slew Rate 0%

Appendix D.
3151A EML100 Quick Start Guide

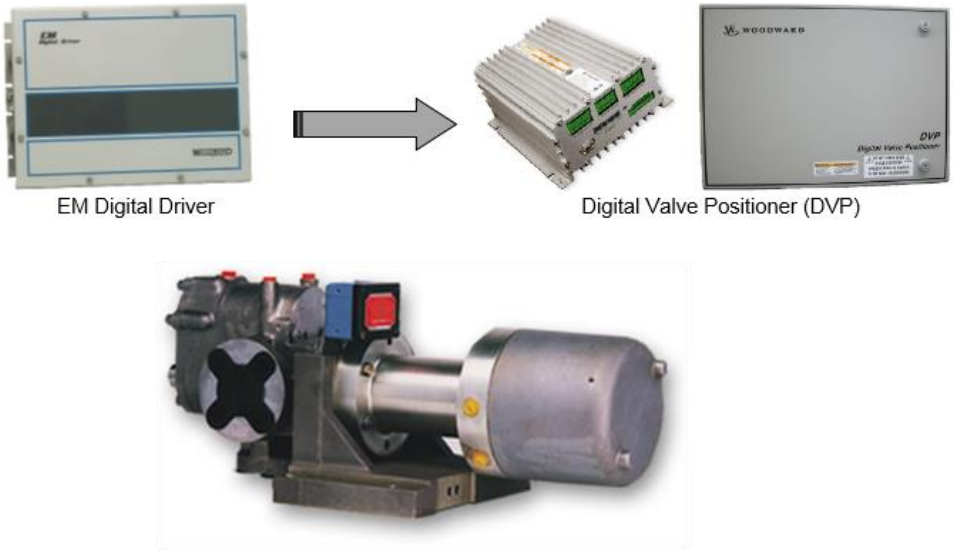


Figure D-1. 3151A Water Valve with EML100

For existing installations, this guide provides instructions on how to replace an EM Digital Driver using analog demand/feedback with a Digital Valve Positioner (DVP) and quickly get your valve online and operational. The DVP does not support RTSIO (Real Time SIO).

For new installations, follow the instructions for your specific DVP located in the Installation section of the DVP manual. Then follow the appropriate valve to driver wiring diagram and Service Tool setup located in this Appendix.

Advanced Startup Diagnostics

The DVP driver offers many improvements over the EM Digital Driver. A noted improvement that is covered in this appendix is the Advanced Startup Diagnostics. This is a startup check performed before the valve is put into operation or run mode by the driver. This check is used to help determine possible wiring or valve issues before the valve is put into operation. This startup diagnostic uses small levels of motor current to verify proper motor and resolver connections.

The startup parameters must be populated by following the instructions in the Service Tool. The DVP Service Tool provides specific instructions for calculating these values and loading them into the driver.

Disconnecting the EM Digital Driver

⚠WARNING

POWER TO UNIT:
Make sure the power to the EM Driver is turned off before removing the wiring from the driver. Always check to ensure all power is off and it is safe before proceeding with the DVP installation.

1. Before disconnecting your valve from the EM Digital Driver, confirm the unit operates with no faults by utilizing the Woodward Driver Interface Program “DIP” software.

2. Once you have confirmed that there are no existing errors, remove all power to the EM Digital Driver and close out the Woodward DIP software

NOTICE

Make sure all wires are correctly labeled before disconnecting from the driver.

3. Disconnect all wiring terminations from the EM Digital Driver and associated terminal blocks, taking care to retain all wire labeling.

4. Remove all connections (cable glands, conduits, etc.) from the EM Digital Driver as required by your specific installation.

5. Remove the EM Digital Driver and replace with the Digital Valve Positioner (DVP)

Installing the Digital Valve Positioner (DVP)

NOTICE

To prevent damage to electronic components caused by improper handling, read and observe the precautions in Woodward manual 82715, *Guide for Handling and Protection of Electronic Controls, Printed Circuit Boards, and Modules*.

1. Replace the EM Digital Driver with the DVP by making the appropriate hardware connections for your specific driver model.

2. Terminate existing wiring to DVP terminal blocks as shown in the following wiring diagrams. Power and Input signal terminations must follow this installation manual.

3. Disregard position resolver 2 connections for single resolver valves.

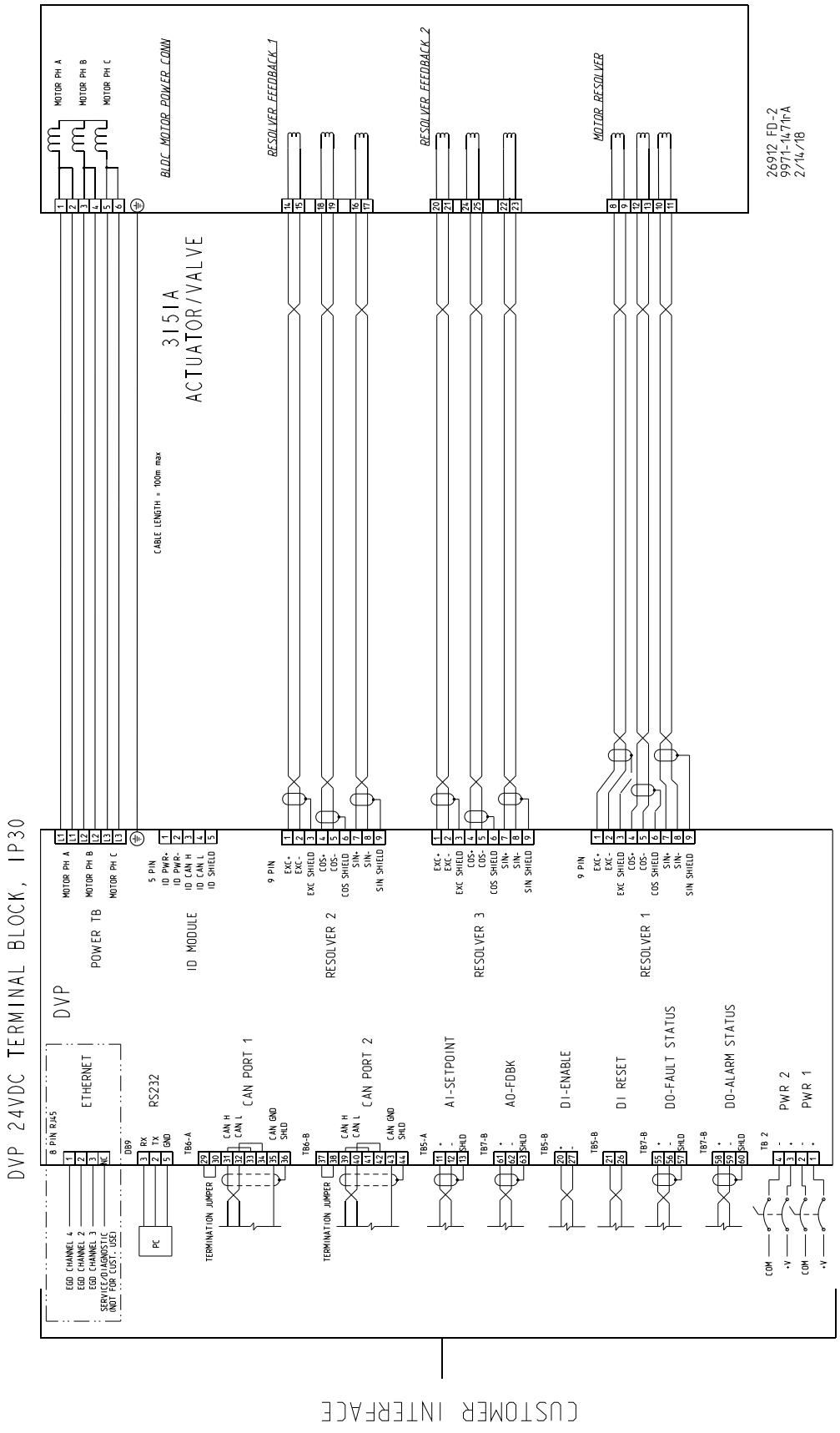


Figure D-2. DVP to 3151A Communications Connections

DVP Software Download

When all connections have been made, the DVP Calibration software can be loaded to the DVP via the RS-232 port.

Figure D-3. DVP Calibration Software Data Flow

IMPORTANT

Before you begin, Go to https://www.woodward.com/?s=DVP and download the DVP Service Tool. DVP SERVICE TOOL MUST BE INSTALLED TO CONFIGURE THE DVP.

Install and Load DVP Service Tools

1. Go to https://www.woodward.com/?s=DVP
2. Locate the DVP Tools and follow the instruction on the screen to continue to download the Tool.
3. After downloading the Service Tool, run the installer and follow on-screen prompts to install.

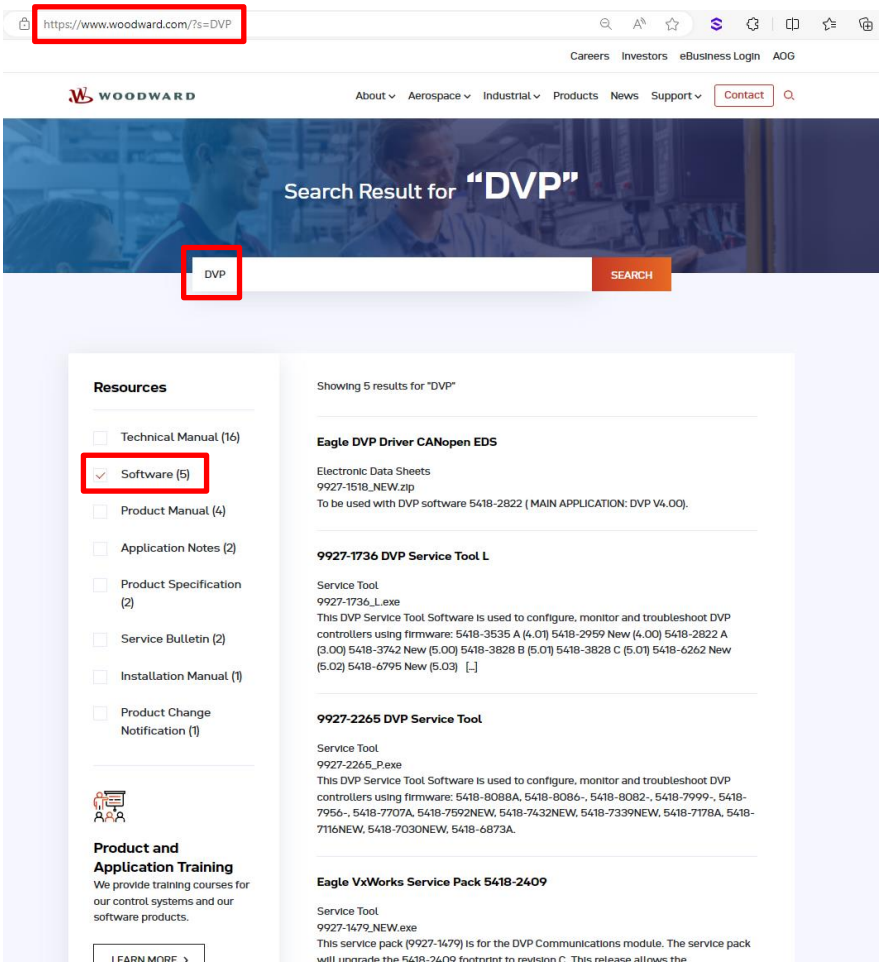


Figure D-4. Service Tool Download Window

4. The DVP Tools is packaged with the valve setting *.wset files required for valve calibration. The installer places all the setting *.wset files in your local directory:
C:/Program Files/Woodward/DVP Service Tool

Using DVP Service Tool to Begin Controlling the 3151A EML100 Valve

Connect to the DVP (via RS-232 port) to begin controlling the 3151A EML100 valve using DVP Service Tool.

1. Click “**Connect**”.

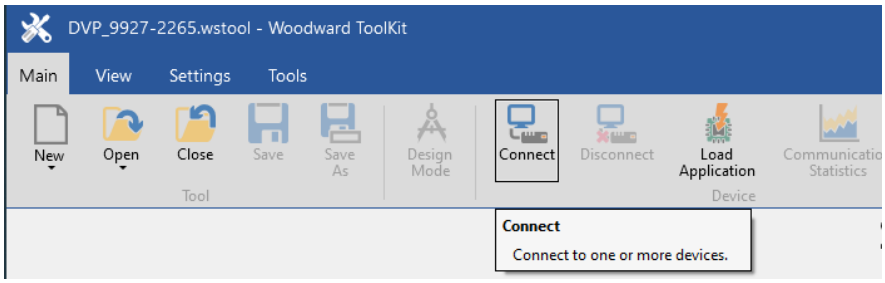


Figure D-5. Service Tool Connection Button

2. Select the correct COM Port in which the computer is connected to the DVP, and then select connect.

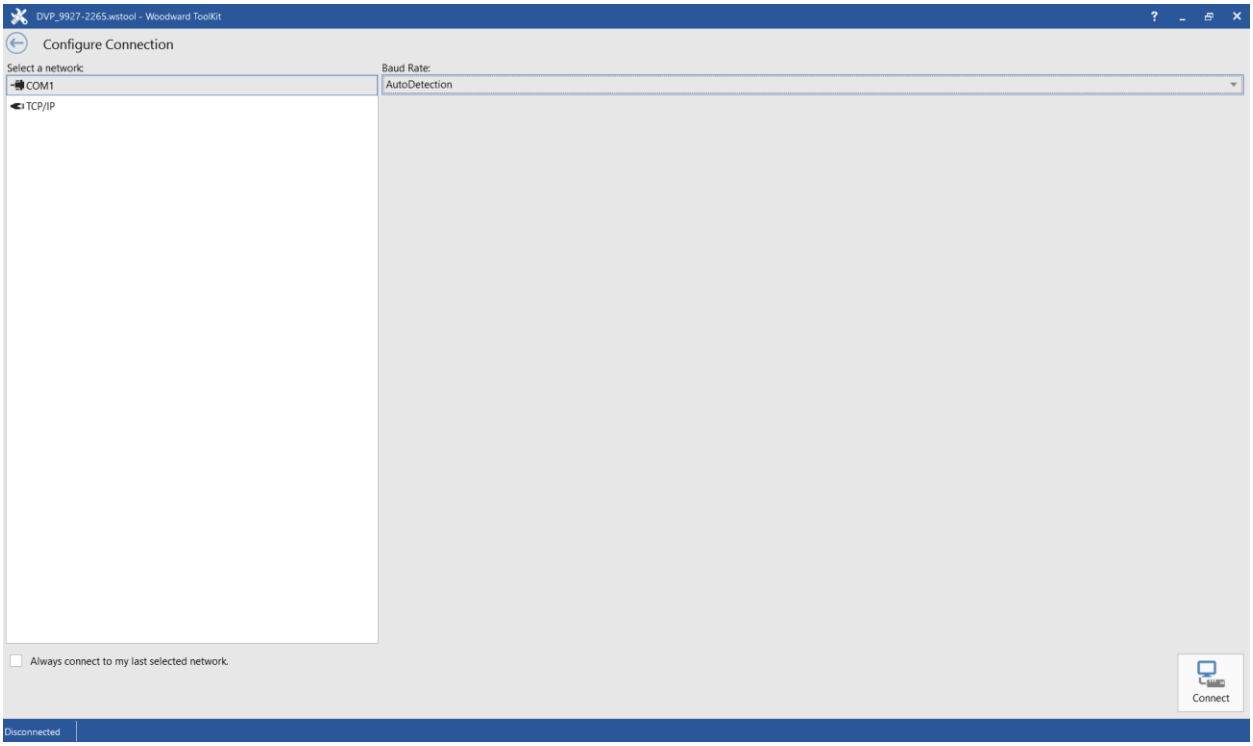


Figure D-6. Communications Channel Connection Verification

Loading the Valve Setting file to DVP

1. Click **Settings; Load Setting from File to Device**.

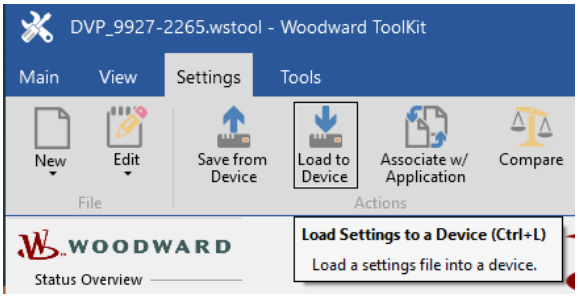


Figure D-7. Setting Menu

DVP Service Tool 9927-1736

- Browse to *C:\Program Files (x86)\Woodward\DVP Service Tool* for 64 bit machines or *C:\Program Files\Woodward\DVP Service Tool* for 32 bit machines.

DVP Service Tool 9927-2265

- Browse to *C:\Program Files (x86)\Woodward\DVP 9927-2265* Service Tool for 64 bit machines or *C:\Program Files\Woodward\DVP 9927-2265* Service Tool for 32 bit machines.

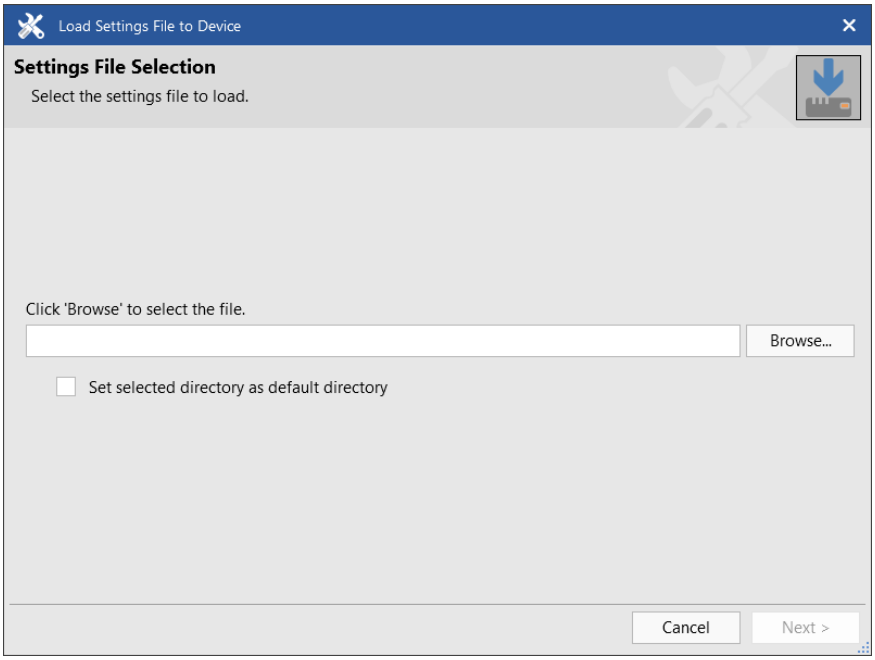
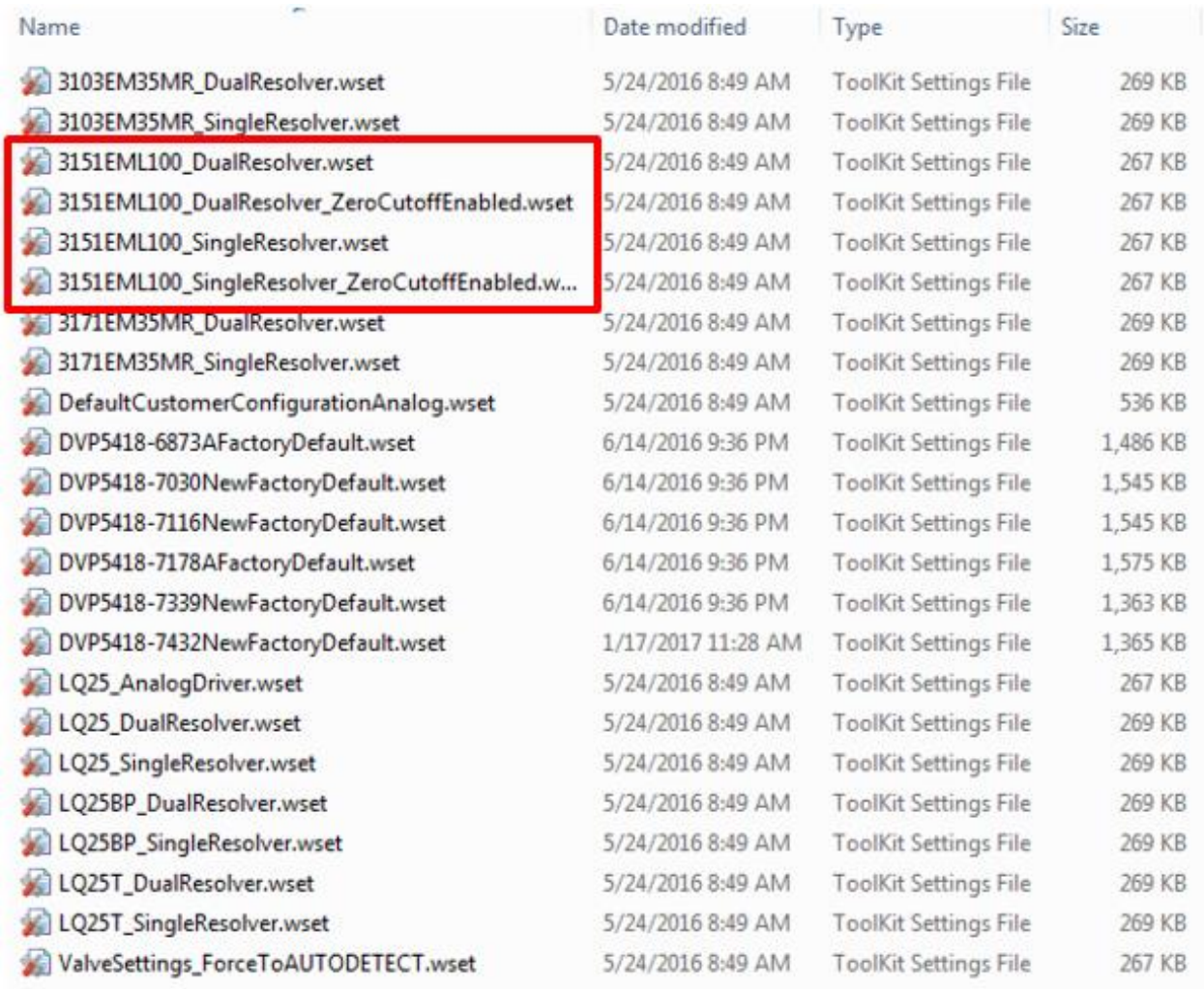


Figure D-8. Load File Window

2. Select the .wset file which corresponds to the valve installed in the field and load file to DVP. When file load is completed, close load settings file window.



Name	Date modified	Type	Size
3103EM35MR_DualResolver.wset	5/24/2016 8:49 AM	ToolKit Settings File	269 KB
3103EM35MR_SingleResolver.wset	5/24/2016 8:49 AM	ToolKit Settings File	269 KB
3151EML100_DualResolver.wset	5/24/2016 8:49 AM	ToolKit Settings File	267 KB
3151EML100_DualResolver_ZeroCutoffEnabled.wset	5/24/2016 8:49 AM	ToolKit Settings File	267 KB
3151EML100_SingleResolver.wset	5/24/2016 8:49 AM	ToolKit Settings File	267 KB
3151EML100_SingleResolver_ZeroCutoffEnabled.w...	5/24/2016 8:49 AM	ToolKit Settings File	267 KB
3171EM35MR_DualResolver.wset	5/24/2016 8:49 AM	ToolKit Settings File	269 KB
3171EM35MR_SingleResolver.wset	5/24/2016 8:49 AM	ToolKit Settings File	269 KB
DefaultCustomerConfigurationAnalog.wset	5/24/2016 8:49 AM	ToolKit Settings File	536 KB
DVP5418-6873AFactoryDefault.wset	6/14/2016 9:36 PM	ToolKit Settings File	1,486 KB
DVP5418-7030NewFactoryDefault.wset	6/14/2016 9:36 PM	ToolKit Settings File	1,545 KB
DVP5418-7116NewFactoryDefault.wset	6/14/2016 9:36 PM	ToolKit Settings File	1,545 KB
DVP5418-7178AFactoryDefault.wset	6/14/2016 9:36 PM	ToolKit Settings File	1,575 KB
DVP5418-7339NewFactoryDefault.wset	6/14/2016 9:36 PM	ToolKit Settings File	1,363 KB
DVP5418-7432NewFactoryDefault.wset	1/17/2017 11:28 AM	ToolKit Settings File	1,365 KB
LQ25_AnalogDriver.wset	5/24/2016 8:49 AM	ToolKit Settings File	267 KB
LQ25_DualResolver.wset	5/24/2016 8:49 AM	ToolKit Settings File	269 KB
LQ25_SingleResolver.wset	5/24/2016 8:49 AM	ToolKit Settings File	269 KB
LQ25BP_DualResolver.wset	5/24/2016 8:49 AM	ToolKit Settings File	269 KB
LQ25BP_SingleResolver.wset	5/24/2016 8:49 AM	ToolKit Settings File	269 KB
LQ25T_DualResolver.wset	5/24/2016 8:49 AM	ToolKit Settings File	269 KB
LQ25T_SingleResolver.wset	5/24/2016 8:49 AM	ToolKit Settings File	269 KB
ValveSettings_ForceToAUTODETECT.wset	5/24/2016 8:49 AM	ToolKit Settings File	267 KB

Figure D-9. Valve File Directory

3151 EML100 Valve Calibration

NOTICE

Carefully follow all instructions below to set up the DVP driver. Failure to follow these instructions can result in damage to the valve.

Ensure all wiring is correct and there are no resolver Sine, Cosine or Excitation errors before starting the calibration procedure.

Select the “Configuration and Calibration” button located in the navigation buttons panel.

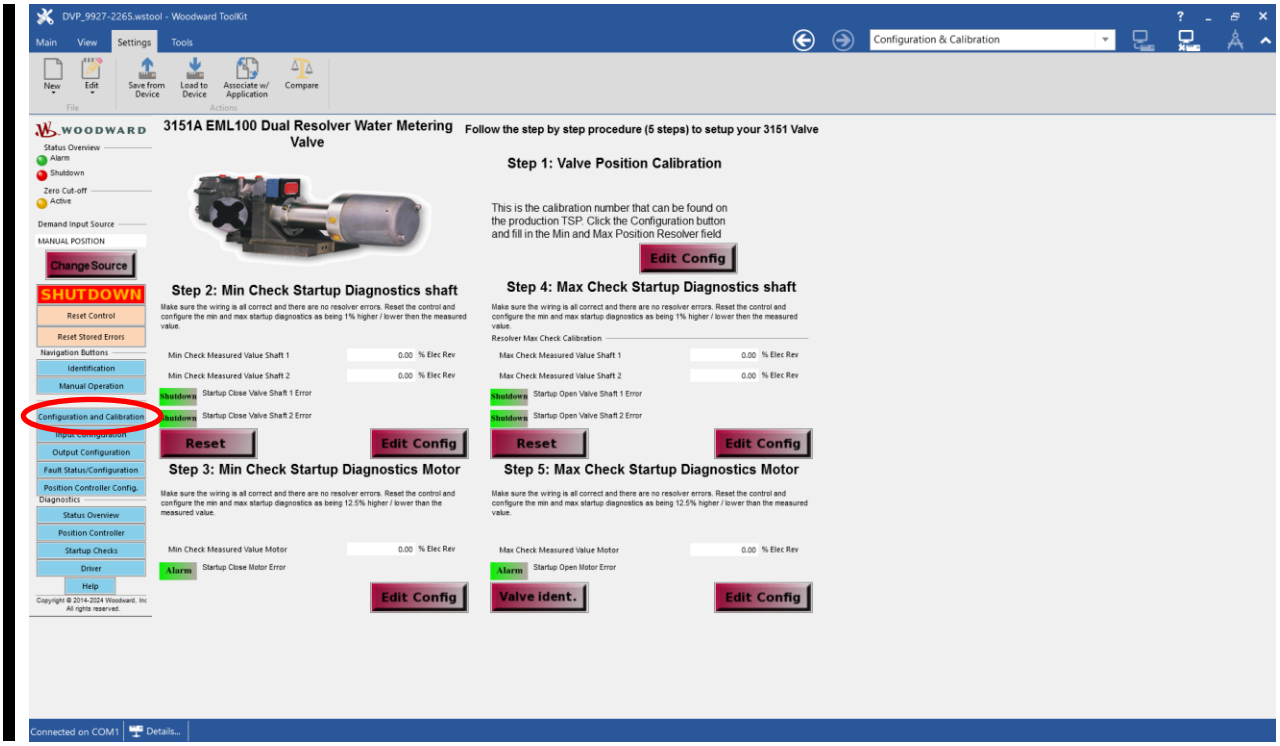


Figure D-10. Configuration & Calibration Menu

Locate the resolver at minimum (4.0 ma) and maximum (20 ma) flow.

This can be found on from the nameplate of the valve, or the TSP record, or calibration sheet. Note the values for later use.

WOODWARD
LOVELAND, COLORADO
CAGE (FSCM) ØTFM1

TSP - 11496
PAGE 8
REV B

FLOW CALIBRATION SCHEDULE
FOR EML100 / 3151A ASSEMBLY

DESIGNATION NO: 8915-948 or 8915-1024	DATE TESTED 10-19-2010
S/N 1301703	TESTED BY: CB

1) Proof pressure test valve at 2000 psig for 2 minutes. No external leakage. ☒

2) **Calibration Data**: Resolver at **Min flow** (4.0 mA) -- Test point 1: 235.1 (degrees). Resolver at **Max flow** (20.0 mA) --Test point 11: 313.7 (degrees).
These values to be used as the electrical Min and Max flow stops during customer calibration and are stamped on the actuator motor decal.

Test Point	Valve Pos. %	Set Demand Current mAmp	Set P1 psig	Set PN psig	Water flow (ref) pph	Record Metered Flow Wf of SG=. 77 fluid (pph) Nom.	Min.	Rec.	Max.	Water Inlet pph	Record Inlet Flow Wi of SG=. 77 fluid (pph) Min.	Rec.	Max.	Record Values Position (0.001) inches	Resolver Position deg	ΔP psid	EML100 current Amps
1	0	4.00	1357	80	0	0	N/A	54	439	7500	6581	6785	7898	.000	235.1	229	0.56
2	10	5.60	1357	150	3000	2632	2500	7681	2764	7500	6581	7212	7898	.043	233.9	95	0.91
3	20	7.20	1357	230	6002	5265	5002	5784	5528	7500	6581	7530	7898	.087	242.9	93	1.26
4	30	8.80	1357	315	9003	7897	7502	7736	8292	9003	7502	7862	9082	.132	251.9	91	1.60
5	40	10.40	1357	400	12004	10530	10004	10362	11057					.176	260.8	89	1.94
6	50	12.00	1357	495	15005	13162	12504	13211	13820					.219	269.4	86	2.20
7	60	13.60	1357	590	18006	15795	15005	16212	16585					.263	278.4	83	2.67
8	70	15.20	1357	700	21007	18427	17506	19165	19348					.306	287.0	80	2.95
9	80	16.80	1357	815	24008	21060	20007	21924	22113					.350	295.9	77	3.17
10	90	18.40	1357	925	27009	23692	22507	24493	24877					.394	304.7	74	3.31
11	100 Max	20.00 Stop	1357	1040	30011	26325	25009	26501	27641					.438	313.7	73	3.52
		± 0.08	± 10	± 10													

Resolver position at Hard Stop Minimum 223.3 (degrees). Resolver position at Hard Stop Maximum 315.3 (degrees).
These values to be used as the minimum and maximum "Hard Stop" resolver positions during customer calibration.

3) Set min flow switch at 4.5 mA. Check operation of both the NO and NC contacts. ☒

4) Drain calibrating fluid and install protective covers where required. ☒

Note: Above calibration data assumes use of MIL-F-7024 Type 2 calibrating fluid at 70 ± 10 °F (SG = 0.77).
To convert the recorded mass flow rates to the equivalent mass flow rate of water (SG = 1.0), multiply by {sqrt [1.0/0.77]} or 1.140.

Figure D-11a. Single Resolver TSP Example

WOODWARD

TSP-11496
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REVISION: L

PRODUCTION TEST SPECIFICATION
FOR 3151A LIQUID VALVES WITH EML 100 ACTUATOR

Desc: EML100/3151A - SAE 8915-948 EXCEPT ATEX/PED

PART NO: 8915-1024 TESTED BY: Rbrenc

S/N: 20921434 DATE TESTED: 6/5/2017

W/O: 9860739 UUT RESULT: Passed

TEST STATION: 8701-1565

		Specification	Actual
4.4	Position Calibration The 4mA and 20mA values are used as the electrical Min and max flow stops and are stamped on the actuator motor decal		
	Resolver 1		
	Resolver at Minimum Flow (4mA)	Record Only	157.70°
	Resolver at Maximum Flow (20mA)	Record Only	245.90°
	Resolver at Hard Stop Minimum	Record Only	152.70°
	Resolver at Hard Stop Maximum	Record Only	248.89°
	Resolver 2		
	Resolver at Minimum Flow (4mA)	Record Only	N/A°
	Resolver at Maximum Flow (20mA)	Record Only	N/A°
	Resolver at Hard Stop Minimum	Record Only	N/A°
	Resolver at Hard Stop Maximum	Record Only	N/A°
4.6	Proof Pressure Test at 2000 psig	Pass/Fail	Pass

Figure D-11b. Single Resolver TSP Example

Select “Edit Config” button

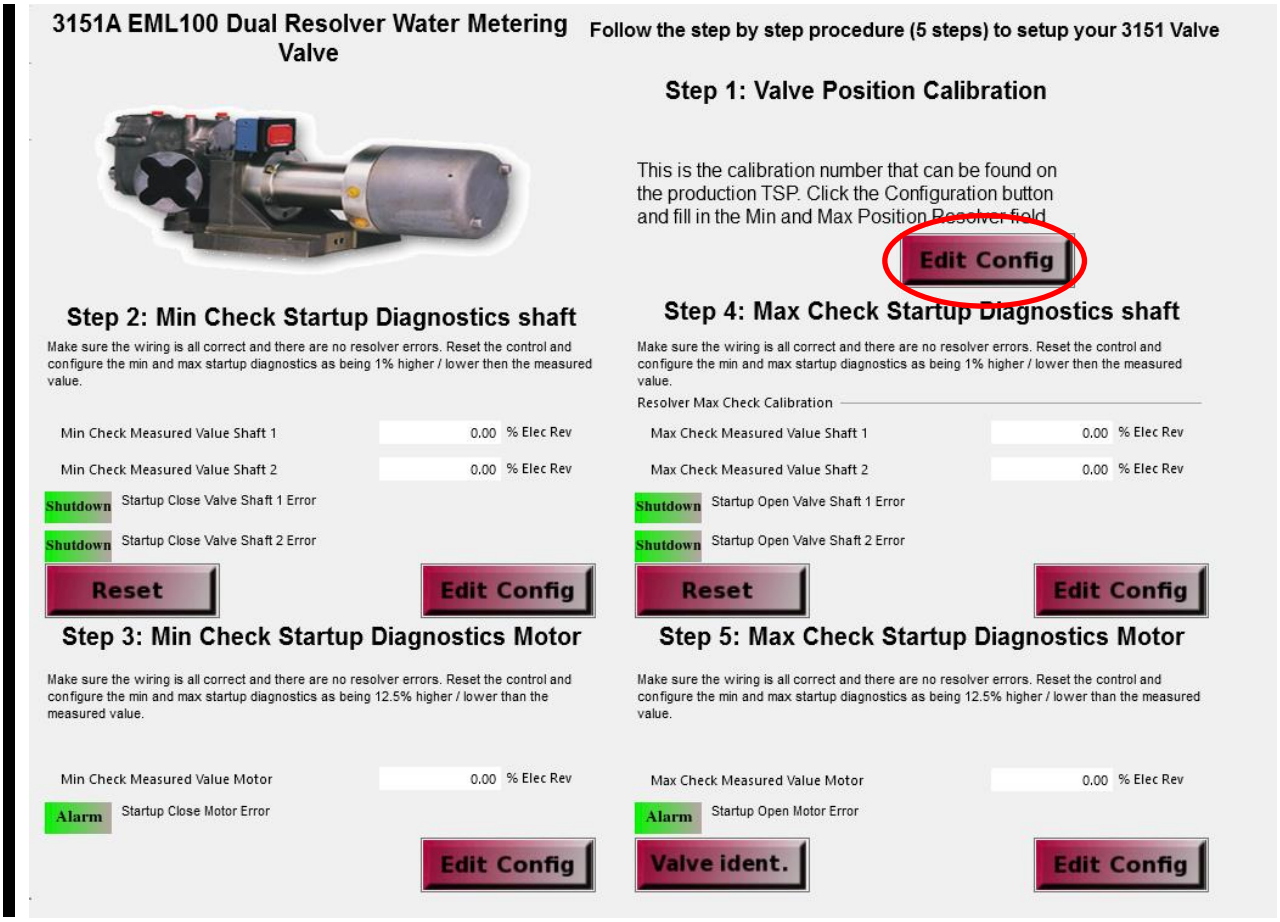


Figure D-12. Configuration & Calibration Menu

The Manual Configuration of Scaling and Startup Diagnostics window will open.

Note: This window will show different values to enter depending on if the valve is a single or double resolver valve as shown by the screenshots below:

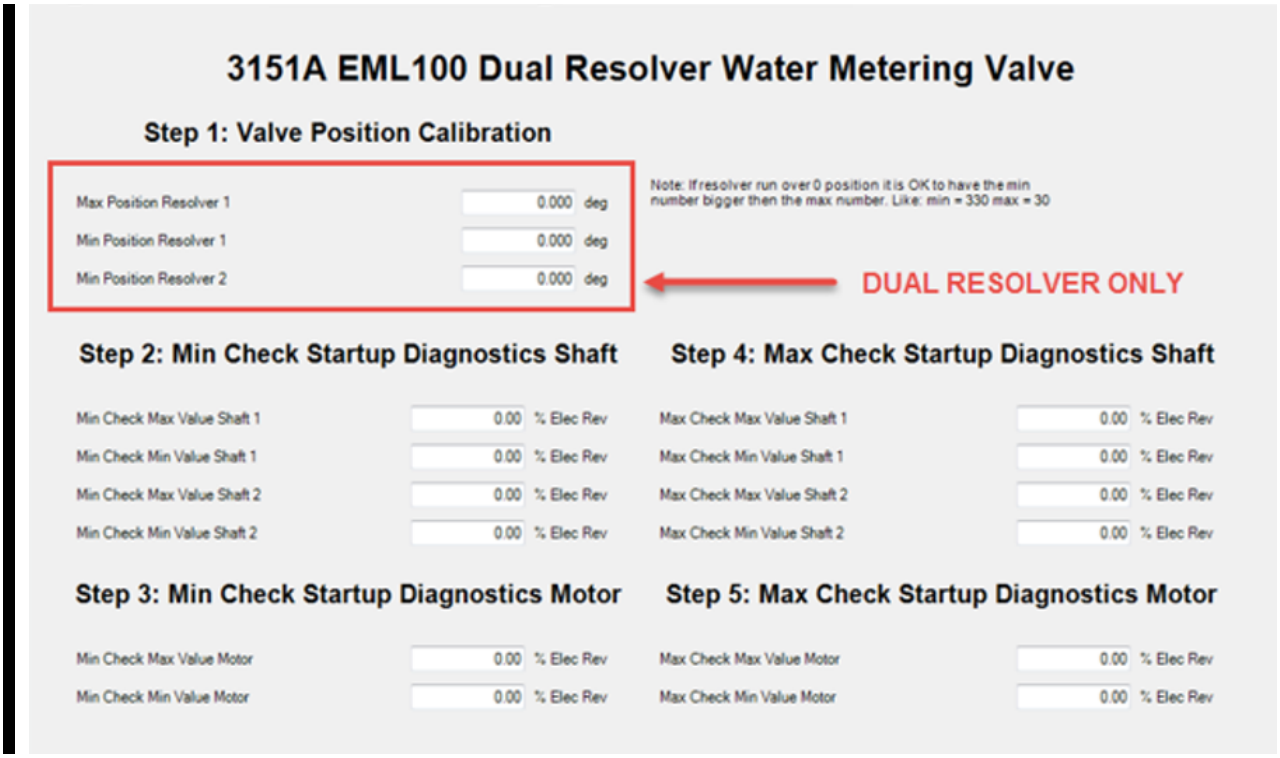


Figure D-13. Valve Position Calibration Information Entry Dual Resolver

1. Enter the resolver values found on the TSP or valve nameplate into their respective boxes. Click the "Apply" button. Press "OK" to close the Manual Configuration dialog box.

2. Complete steps 2-5. Follow the onscreen instructions for entering the startup check values. Perform a reset of the DVP after each step is completed. Use the Edit configuration button to enter startup check values into the appropriate fields.

   Note: For dual resolver valves steps 2-5 will have a total of 4 values that need to be entered: min and max start up for each shaft.

3. **Note:** For Steps 3 and 5: Use this value to calculate the min startup diagnostic levels for the motor resolver. For the LQ3151, these levels should be 12.5% higher / lower than the measured value.

4. If subtracting 12.5% from this number results in a number less than 0%, subtract the difference from 0% from 100% to get the correct number. For example:
   a. If Min Check Measured Value Motor = 8.5%
   b. Min Check Max Value Motor = 8.5+12.5 = 21%
   c. Min Check Min Value Motor = 8.5-12.5 = -4 = 100-4 = 96%

5. If adding 12.5% results in a number above 100%, the remainder above 100% becomes the correct value. For example:
   a. If Min Check Measured Value Motor = 94%
   b. Min Check Max Value Motor = 94 +12.5 = 106.5 = 6.5 %
   c. Min Check Min Value Motor = 94 – 12.5 = 81.5 %

After completing step 5, the valve configuration setup is complete.

Press "Reset Control". All Shutdowns on the calibration screen should show green.

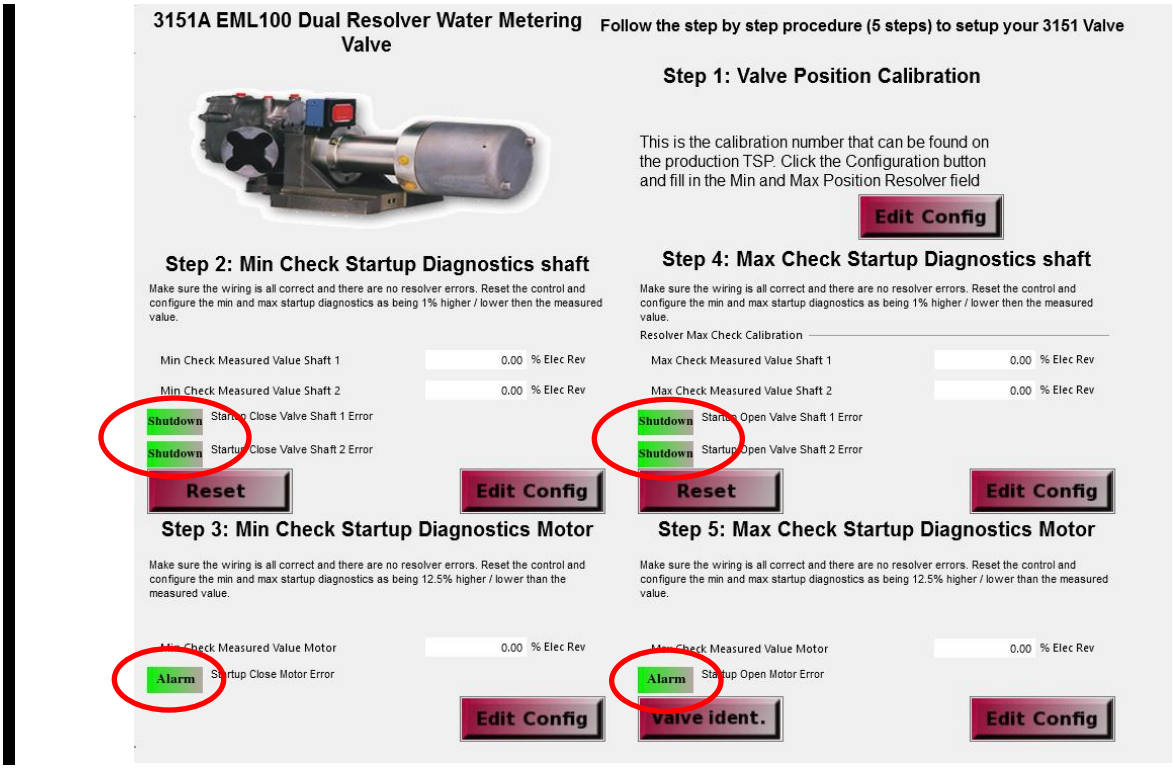


Figure D-14. Configuration & Calibration Menu

Pressing the "Valve Identification" button provides a place for you to record the part number, serial number, and revision of your valve within the DVP EEPROM.

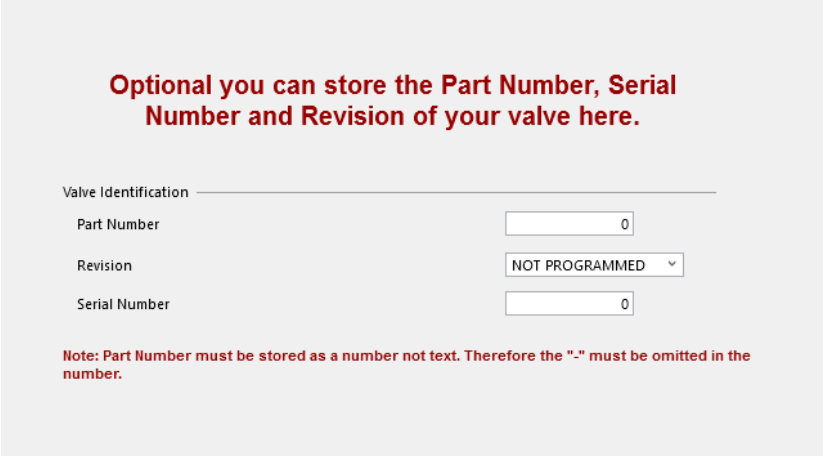


Figure D-15. Valve Identification Window

At this point all alarms should be cleared after a 4–20 mA source has been applied to the DVP. Please use the drop-down list to view “Process Fault & Status Overview” to confirm all alarms are “green” and you are now ready to begin controlling the 3151A Water Valve with EML100.

Figure D-16. Process Fault and Status Overview Window

Appendix E.
3103/3171/EM35MR Quick Start Guide

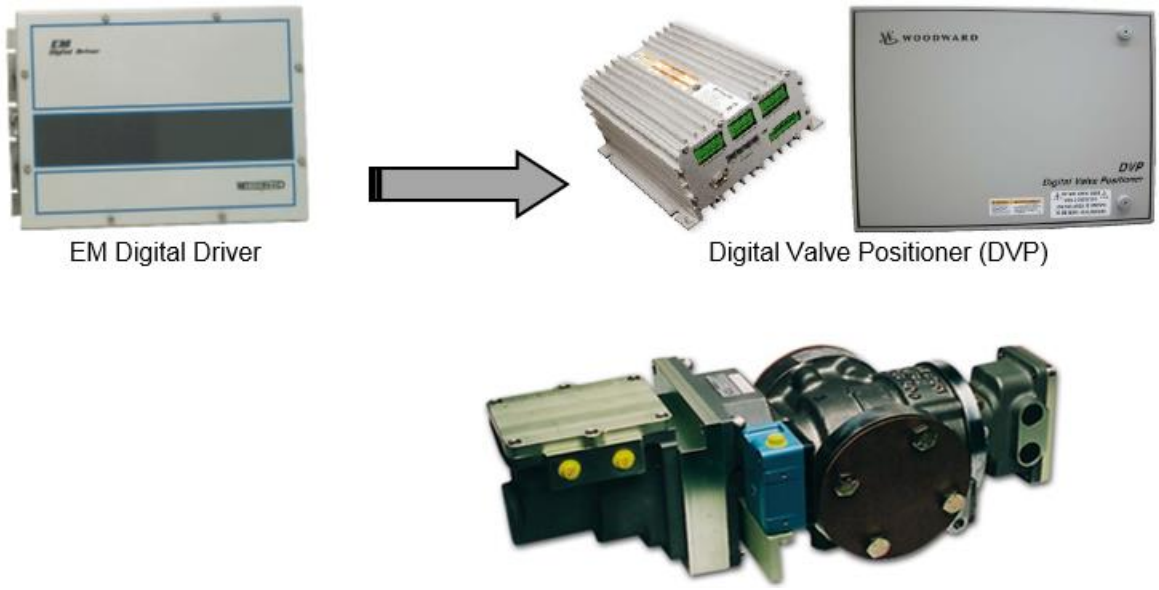


Figure E-1. DVP Data Flow
3103/3171/EM35MR Gas Valve

For existing installations, this guide provides instructions on how to replace an EM Digital Driver using analog demand/feedback with a Digital Valve Positioner (DVP) and quickly get your valve online and operational. The DVP does not support RTSIO (Real Time SIO).

For new installations, follow the instructions for your specific DVP located in the Installation section of the DVP manual. Then follow the appropriate valve to driver wiring diagram and Service Tool setup located in this Appendix.

Advanced Start-up Diagnostics

The DVP driver offers many improvements over the EM Digital Driver. A noted improvement that is covered in this appendix is the Advanced Startup Diagnostics. This is a startup check performed before the valve is put into operation or run mode by the driver. This check is used to help determine possible wiring or valve issues before the valve is put into operation. This startup diagnostic uses small levels of motor current to verify proper motor and resolver connections.

The startup parameters must be populated by following the instructions in the Service Tool. The DVP Service Tool provides specific instructions for calculating these values and loading them into the driver.

Disconnecting the EM Digital Driver

WARNING

POWER TO UNIT:
Make sure the power to the EM Driver is turned off before removing the wiring from the driver. Always check to ensure all power is off and it is safe before proceeding with the DVP installation.

1. Before disconnecting your valve from the EM Digital Driver, confirm the unit operates with no faults by utilizing the Woodward Driver Interface Program “DIP” software.

2. Once you have confirmed that there are no existing errors, remove all power to the EM Digital Driver and close out the Woodward DIP software

NOTICE

Make sure all wires are correctly labeled before disconnecting from the driver.

3. Disconnect all wiring terminations from the EM Digital Driver and associated terminal blocks, taking care to retain all wire labeling.

4. Remove all connections (cable glands, conduits, etc.) from the EM Digital Driver as required by your specific installation.

5. Remove the EM Digital Driver and replace with the Digital Valve Positioner (DVP)

Installing the 24 V Digital Valve Positioner (DVP)

NOTICE

To prevent damage to electronic components caused by improper handling, read and observe the precautions in Woodward manual 82715, *Guide for Handling and Protection of Electronic Controls, Printed Circuit Boards, and Modules*.

6. Replace the EM Digital Driver with the DVP by making the appropriate hardware connections for your specific driver model.

7. Terminate existing wiring to DVP terminal blocks as shown in the following wiring diagrams. Power and Input signal terminations must follow this installation manual.

8. Disregard position resolver 2 connections for single resolver valves.

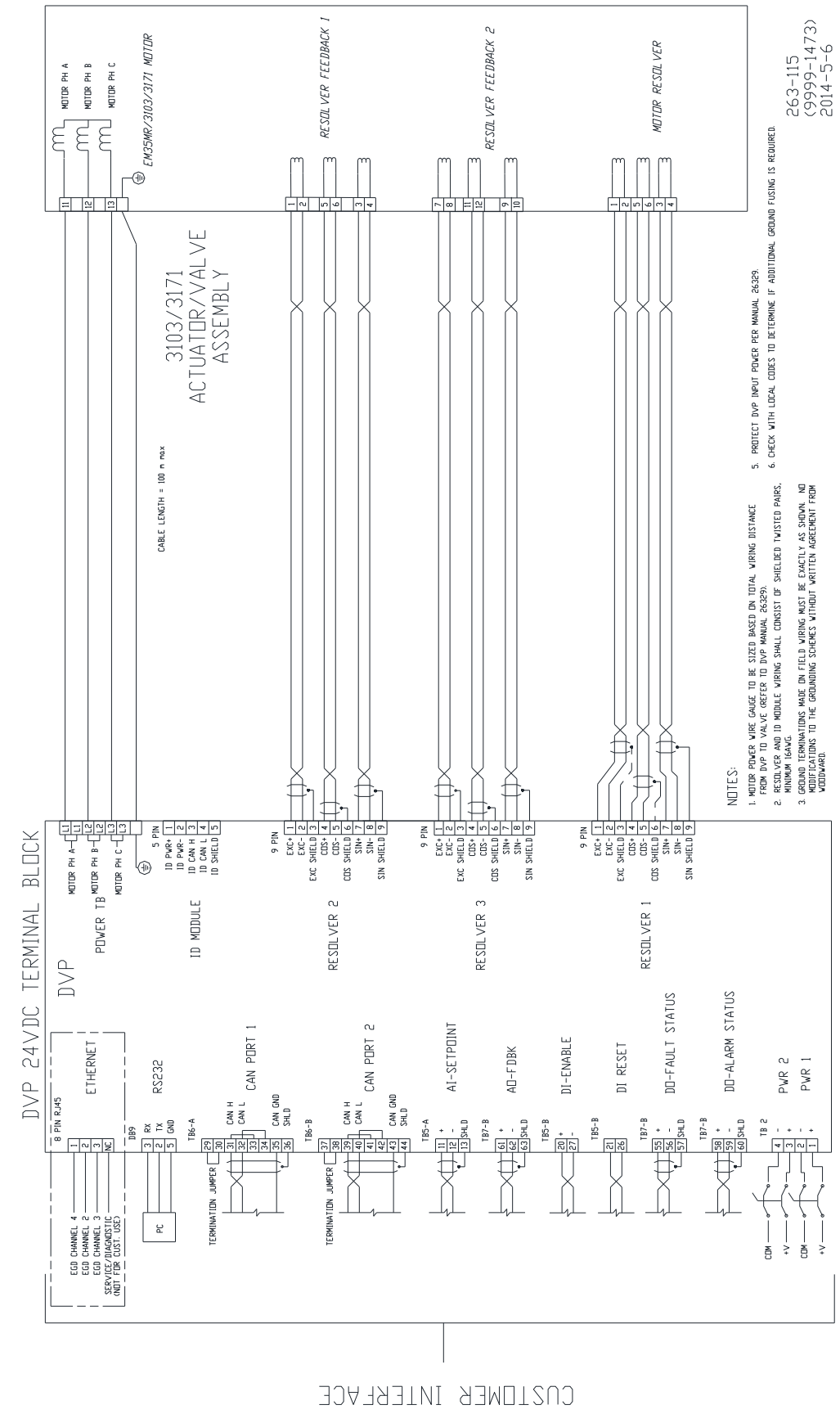


Figure E-2. DVP to 3103/3171 Communication Connections

DVP Software Download

9. When all connections have been made, the DVP calibration software can be loaded via the Service Tool to the DVP.

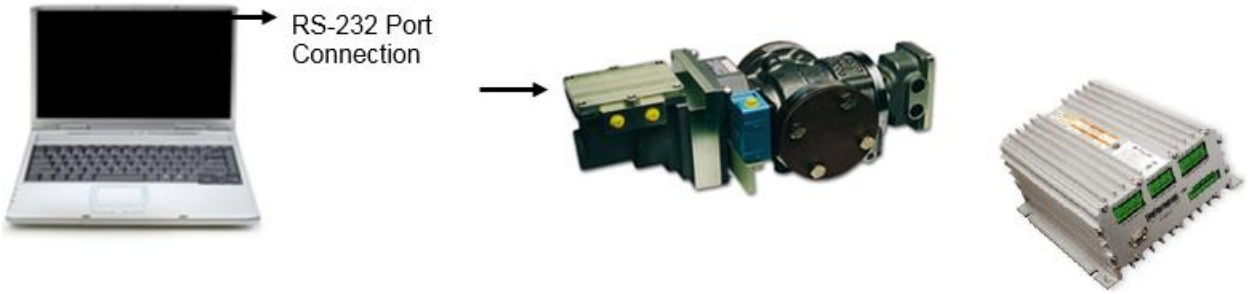


Figure E-3. Calibration Software Data Flow

IMPORTANT **Before you begin, Go to https://www.woodward.com/?s=DVP and download the DVP Service Tool. DVP SERVICE TOOL MUST BE INSTALLED TO CONFIGURE THE 24 V DVP.**

Install and load DVP Service Tools

1. Go to https://www.woodward.com/?s=DVP
2. Click on DVP Tools and follow the instructions on the screen to continue to down load the Tool.
3. After downloading the Service Tool, run the installer and follow on-screen prompts to install.

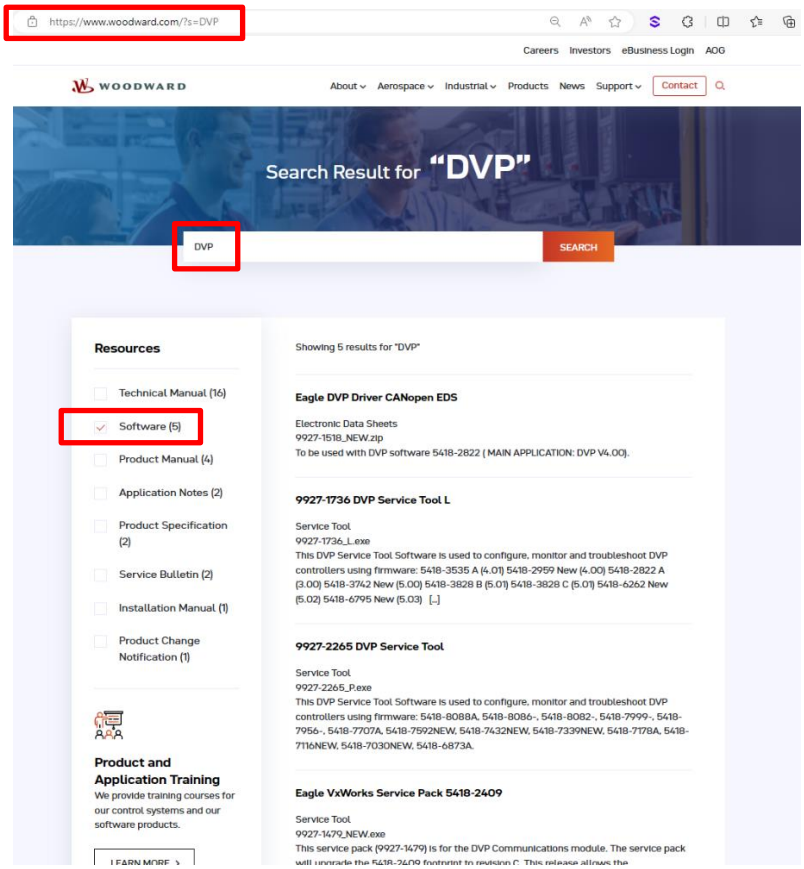


Figure E-4. Service Tool Installer

4. The DVP Tools is packaged with the valve setting *.wset files that require for valve calibration. The installer places all the *.wset files in your local directory:
   C:/Program Files/Woodward/DVP Service Tool

Using DVP Service Tool for Controlling the 3103/3171/EM35MR Valve

Connect to the DVP (via RS-232 port) to begin controlling the 3103 or 3171 valves using DVP Service Tool.

1. Click **Connect**.

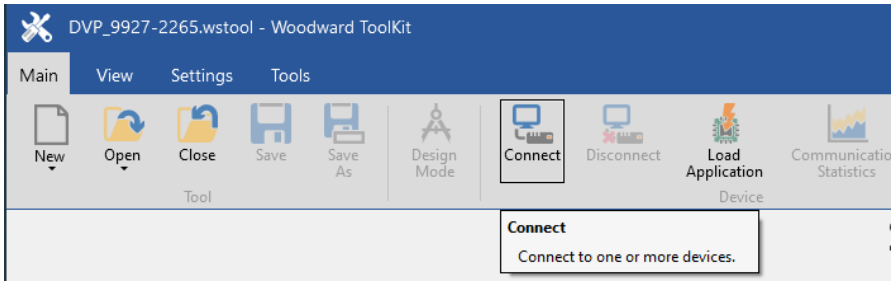


Figure E-5. Service Tool Connection Button

2. After the valve is connected, the bottom toolbar should display "**Connected on COM1**" in the left corner.

Figure E-6. Communications Channel Connection Verification

Woodward provides four settings files that can be loaded to the driver for controlling 3103 or 3171 Gas Valves controlling.

3. 3103EM35MR_SingleResolver.wset – For Single Resolver Application
4. 3103EM35MR_DualResolver.wset – For Dual Resolver Application
5. 3171EM35MR_SingleResolver.wset – For Single Resolver Application
6. 3171EM35MR_DualResolver.wset – For Dual Resolver Application

Loading Valve Setting file to DVP

Load one of the files listed above to the DVP using DVP Service Tool. In the following example, we will load a dual resolver 3103 .wset file to the DVP.

1. Click **Settings; Load Setting from File to Device**.

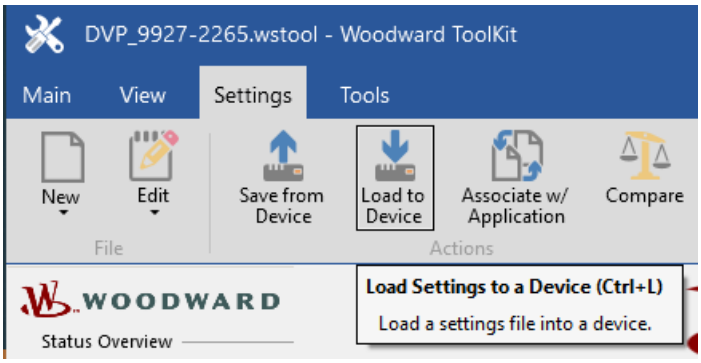


Figure E-7. Settings Menu

2. Locate **3103EM35MR_DualResolver.wset** and load settings to valve.

Loading Valve Input Type setting file to DVP

Load **DefaultCustomerConfigurationAnalog.wset** using DVP Service Tool.

3. Click **Settings; Load Settings from File to Device**.
4. Locate **DefaultCustomerConfigurationAnalog.wset** and begin loading (should take 3–5 seconds).

IMPORTANT **The DVP should now be communicating with the 3103 or 3171. Check that the correct valve is connected, and that the Shutdown status is red (see below).**

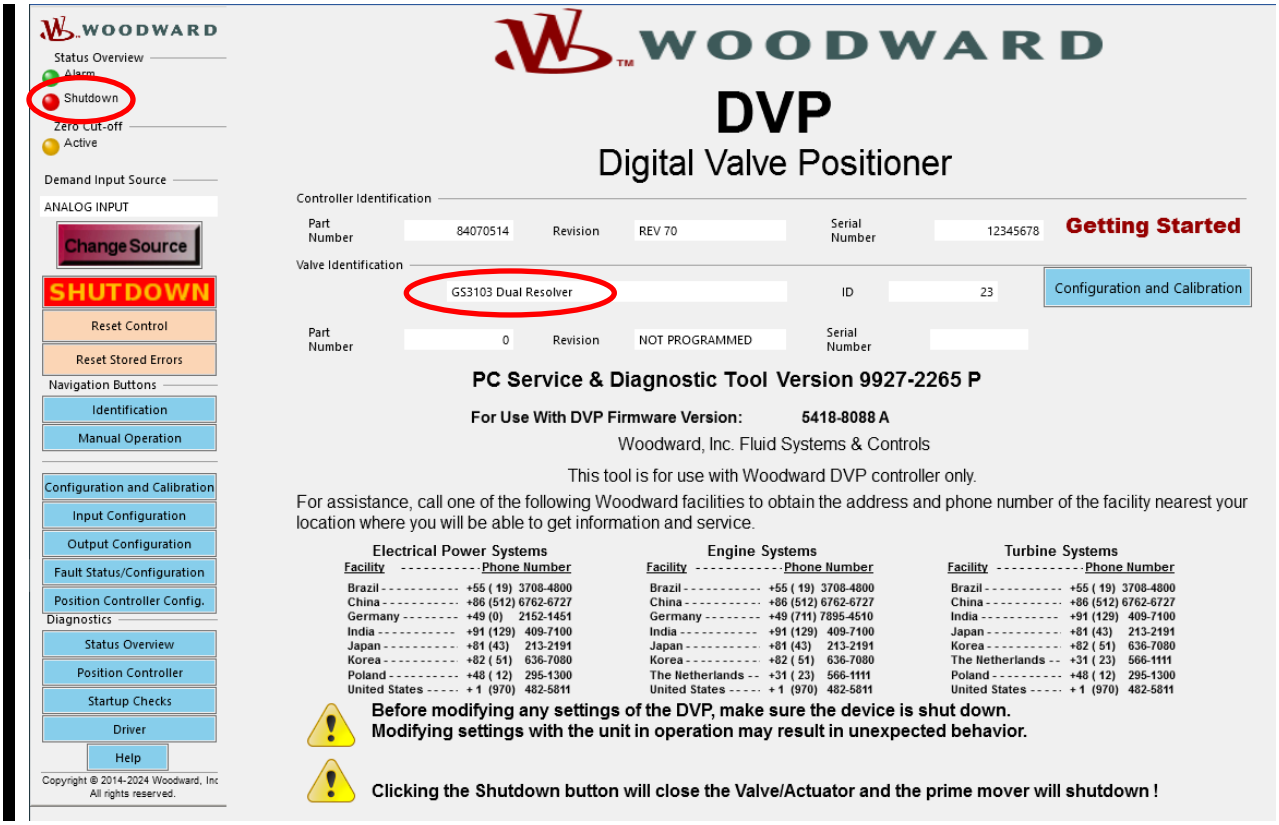


Figure E-8. Correct Valve Verification

Valve Calibration

Locate the resolver offset information for your valve from the nameplate, TSP record, or calibration sheet and record that information here.

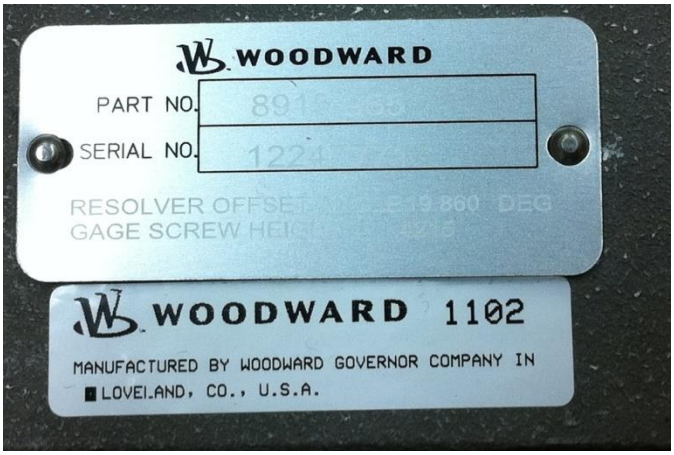


Figure E-9. Nameplate – Resolver Offset Information

Resolver #1 Offset _____ Degrees
Resolver #2 Offset _____ Degrees (if applicable)

Next you will need to select the **Configuration and Calibration** button located in the navigation buttons panel to proceed with valve calibration. The screen should look like the following picture.

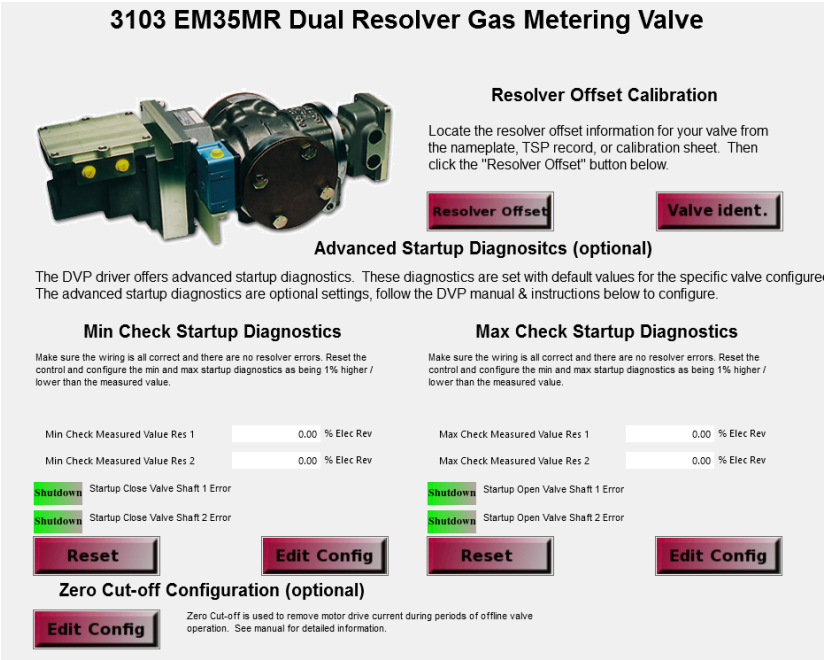


Figure E-10. Manual Configuration of Valve Calibration Window

NOTICE

Carefully follow all instructions below to set up the DVP driver. Failure to follow these instructions can result in damage to the valve.

Ensure all wiring is correct and there are no resolver Sine, Cosine or Excitation errors before starting the calibration procedure.

IMPORTANT

The screens below show a dual resolver 3103/EM35MR. For single resolver valves, all fields pertaining to Resolver 2 will not be shown by the Service Tool.

1. Click on configuration box under **Step 1: Valve Position Calibration** (Notice the Manual Configuration pop up dialog box).

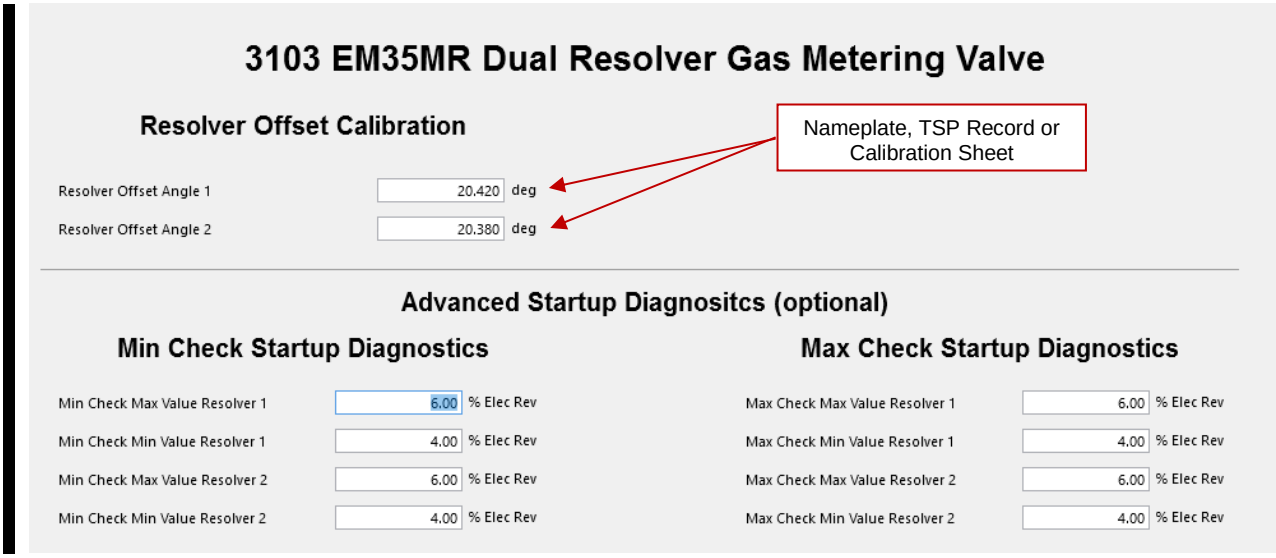


Figure E-11. Valve Position Calibration Information Entry

2. Enter the resolver values recorded on the previous page in the correct spaces, press enter and then the “Apply” button. Press “OK” to close the Manual Configuration dialog box.
3. Proceed to **Step 2: Min Check Startup Diagnostics** section on the Main GS3103 Manual Configuration and Valve Calibration screen.
4. Press “Reset Control”
5. Note the “Min Check Measured Value Shaft” value
   Min Check Measured Value Res 1 _____% Elec Rev
   Min Check Measured Value Res 2 _____% Elec Rev
6. Use these values to calculate the Min Check Startup Diagnostic levels. For the GS3103, these levels should be 1% above / below the measured value for each resolver.

Min Check Max Value Resolver 1 = Min Check Measured Value Res 1 +1%
_____% Elec Rev

Min Check Min Value Resolver 1 = Min Check Measured Value Res 1 - 1%
_____% Elec Rev

Min Check Max Value Resolver 2 = Min Check Measured Value Res 2 +1%
_____% Elec Rev

Min Check Min Value Resolver 2 = Min Check Measured Value Res 2 -1%
_____% Elec Rev

7. Press “Edit Config” button to open the Manual Configuration dialog box and enter the values calculated above.

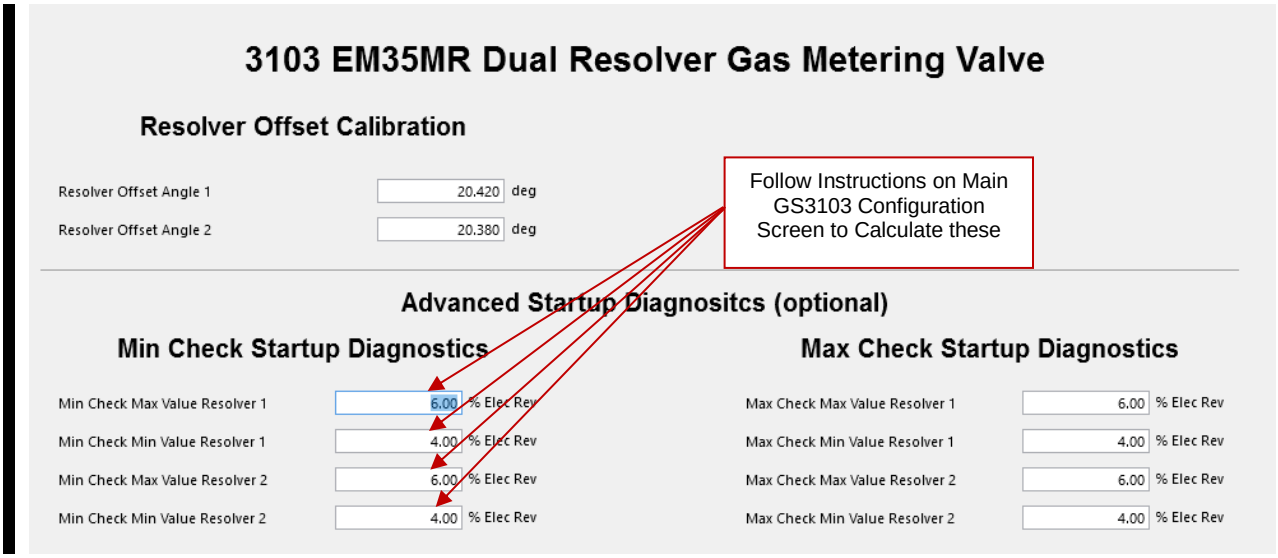


Figure E-12. Manual Config, Min Check Startup Diagnostics

8. After all values are entered, press enter, then the “Apply” button. Press “OK” to close the Manual Configuration dialog box.
9. Press “Reset Control”. Both the “Startup Min Check Res 1 Failed” and “Startup Min Check Res 2 Failed” indicators should turn green.
10. Continue to **Step 3: Max Check Startup Diagnostics** section of Main GS3103 Manual Configuration and Valve Calibration screen.
11. Press “Reset Control”
12. Note the following values:
    Max Check Measured Value Res 1 _____% Elec Rev
    Max Check Measured Value Res 2 _____% Elec Rev
13. Use these values to calculate the Max Check Startup Diagnostic levels. For the GS3103, these levels should be 1% above / below the measured value for each resolver.

Max Check Max Value Resolver 1 = Max Check Measured Value Shaft +1%
_____% Elec Rev

Max Check Min Value Resolver 1 = Max Check Measured Value Shaft - 1%
_____% Elec Rev

Max Check Max Value Resolver 2 = Max Check Measured Value Res 2 +1%
_____% Elec Rev

Max Check Min Value Resolver 2 = Max Check Measured Value Res 2 -1%
_____% Elec Rev

14. Press “Configuration” button to open the Manual Configuration dialog box and enter the values calculated above.

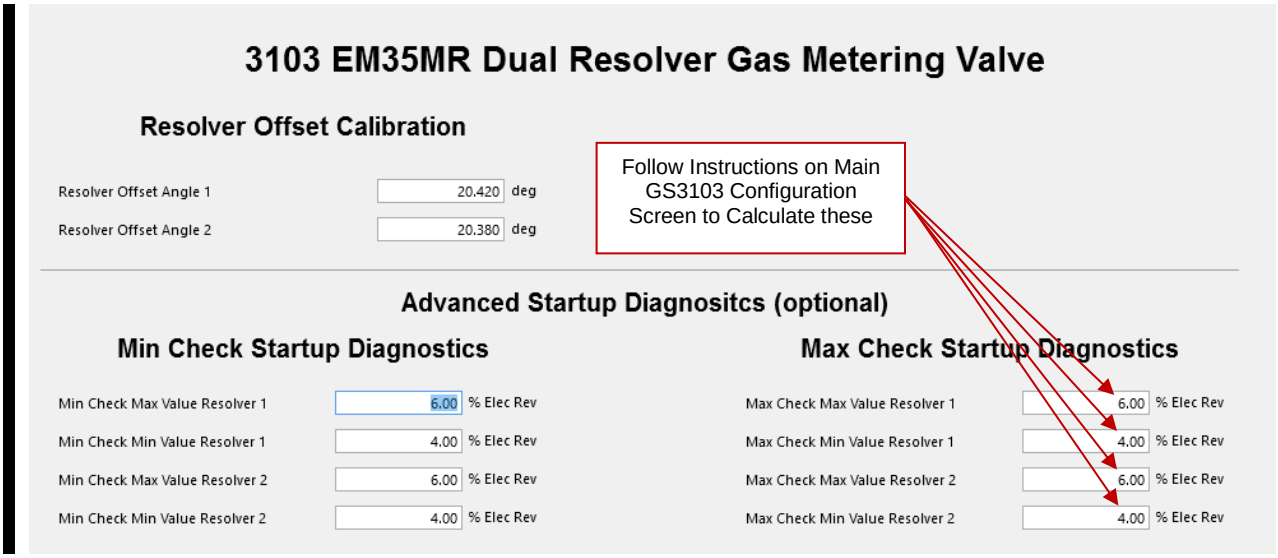


Figure E-13. Manual Config, Max Check Startup Diagnostics

15. After all values are entered, press enter, then the “Apply” button. Press “OK” to close the Manual Configuration dialog box.
16. Press “Reset Control”. Both the “Startup Max Check Res 1 Failed” and “Startup Max Check Res 2 Failed” indicators should turn green.

17. Pressing the “Valve ident.” button provides a place for you to record the part number, serial number, and revision of your valve within the DVP EEPROM.

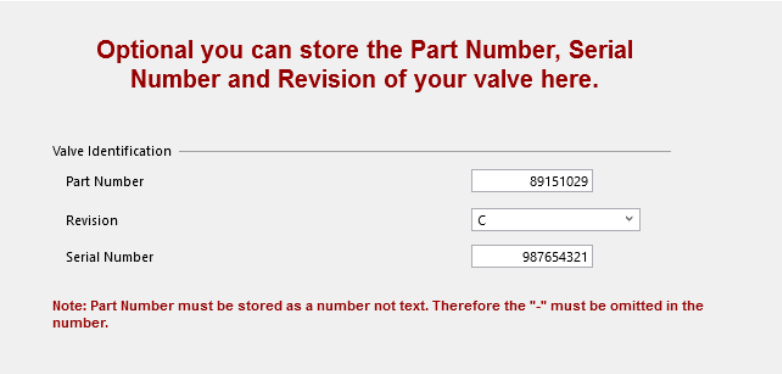


Figure E-14. Valve Identification Window

18. After all values are entered, press enter, then the “Apply” button. Press “OK” to close the Valve Identification dialog box.

    Note: The screens above show a Dual Resolver 3103/EM35MR, for Single Resolver valves, all fields pertaining to Res 2 will not be shown by the Service Tool.

IMPORTANT

If you have entered in all three values (Resolver Position Offset, MIN Check, and MAX Check) into all three steps and receive a “Position Error Fault”, please check motor wiring if all values are correctly entered.

At this point all alarms should be cleared after a 4–20 mA source has been applied to the DVP. Please use the drop-down list to view “Process Fault & Status Overview” to confirm all alarms are “green” and you are now ready to begin controlling the 3103 or 3171 valve.

Figure E-15. Process Fault & Status Overview Window

Zero Cut-off Functionality

WARNING

Only change DVP settings while the engine is not running and in a safe state.

Changing the values of the zero cut-off function while the engine is online may cause an unstable situation and resulting damage to the prime mover with possible personal injury, loss of life, or property damage.

The Zero Cut-off Function disables position control of the motor, and closing of the valve is achieved by the return spring (traditional spring-only mode) or the return spring assisted by constant motor current (seating current mode programmed for some newer valve types). The DVP and valve remain active and functional, but removing position control to the motor prevents high frequency noise from wearing the motor gear teeth. This important feature reduces premature wear of the motor gear set when the valve is idle in one position for extended periods. Typically, this mode of operation would be active when the engine is in a shutdown condition in standby. This mode is recommended for "peaking power" or "peak shaving" applications.

When the Zero Cut-off function is enabled, position control is disabled when the demand setpoint drops below the Low Limit setting and remains below this value for the indicated Zero Cut-off Time Delay. While in zero cut-off mode, the return spring (and possibly constant motor current, if enabled) applies the required force on the valve closure element to minimize seat leakage. When this mode is active, the Zero Cut-off Active LED found along the left panel of the screen is illuminated. With this proper closing force applied, there is virtually no variation of seat leakage over temperature. When the demand setpoint exceeds the Zero Cut-off High Limit setting, the valve resumes normal position control. There is no time delay when switching out of the Zero Cut-off mode.

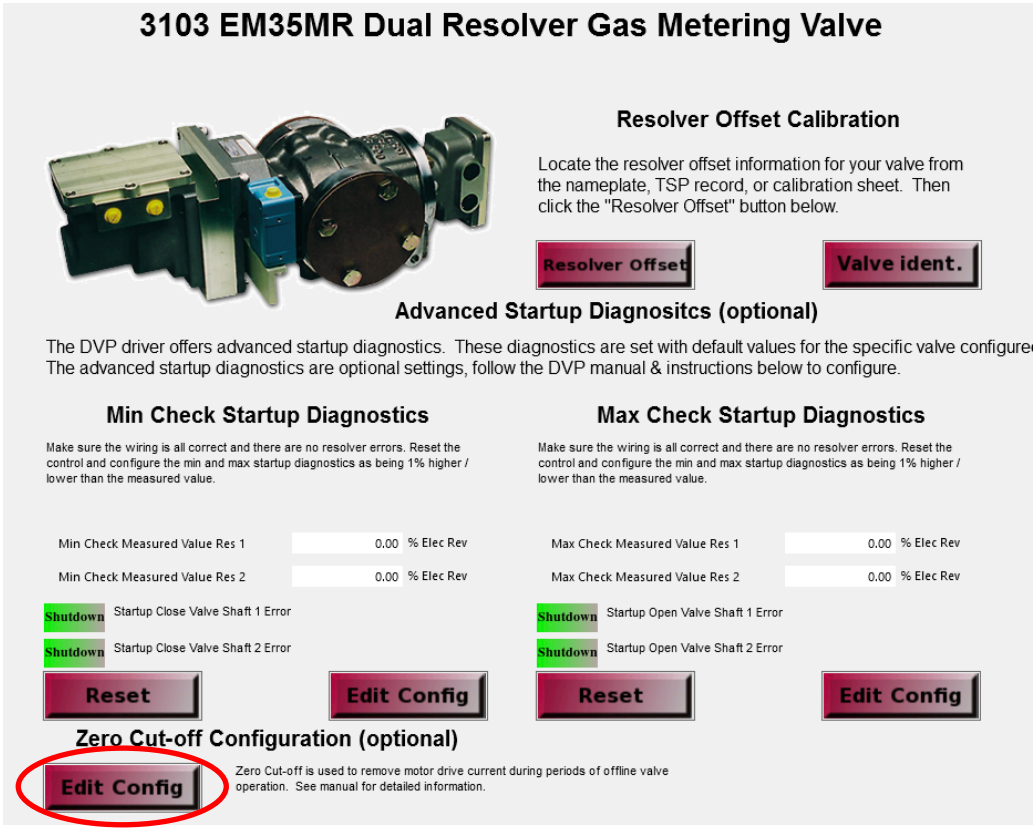


Figure E-16. Manual Configuration of Valve Calibration Window
Zero Cut-off Configuration

Zero Cut-off Operation

The available settings are:

- **Mode (ZERO CUTOFF ON, ZERO CUTOFF OFF)** - The mode enables or disables the function.
  - A new mode has been added (**ZERO CUTOFF ON CURRENT CONTROLLED**) for use with some actuators. It is not recommended to enable this mode for manually configured valves.
- **Low Limit (units are in % Position)** - This limit sets the lower threshold to determine the activation of the function.
- **High Limit (units are in % Position)** - This limit sets the upper threshold to determine the deactivation of the function.
- **Delay Time (seconds)** - This setting determines the number in seconds required to elapse (after the Low Limit Crossing) before the function activates.

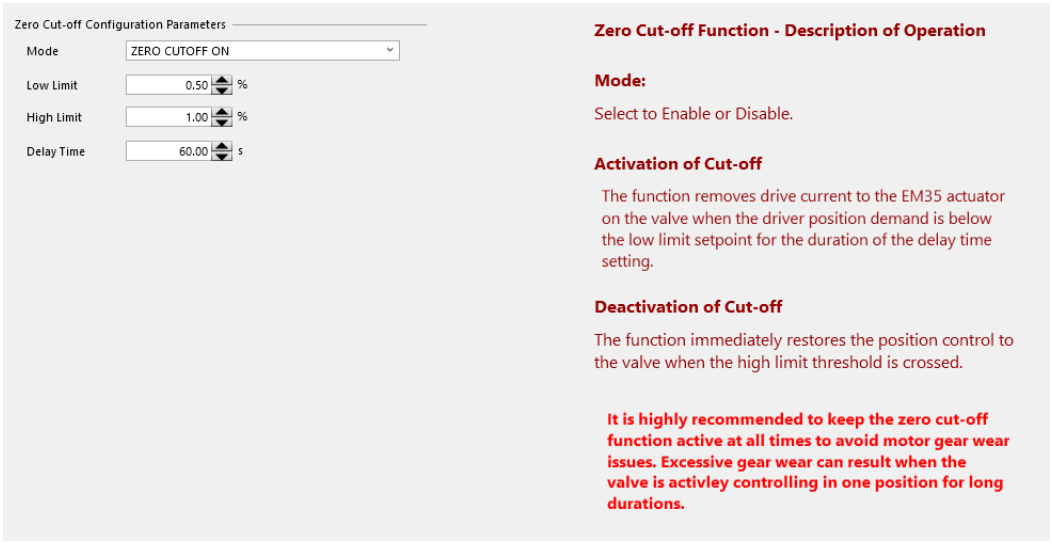


Figure E-17. Zero Cut-off Configuration Parameters Window

NOTICE

It is always highly recommended to keep the zero cut-off function active for spring returned valves to avoid motor gear wear issues. Excessive gear wear can result when the valve is actively controlling in one fixed position for long durations.

NOTICE

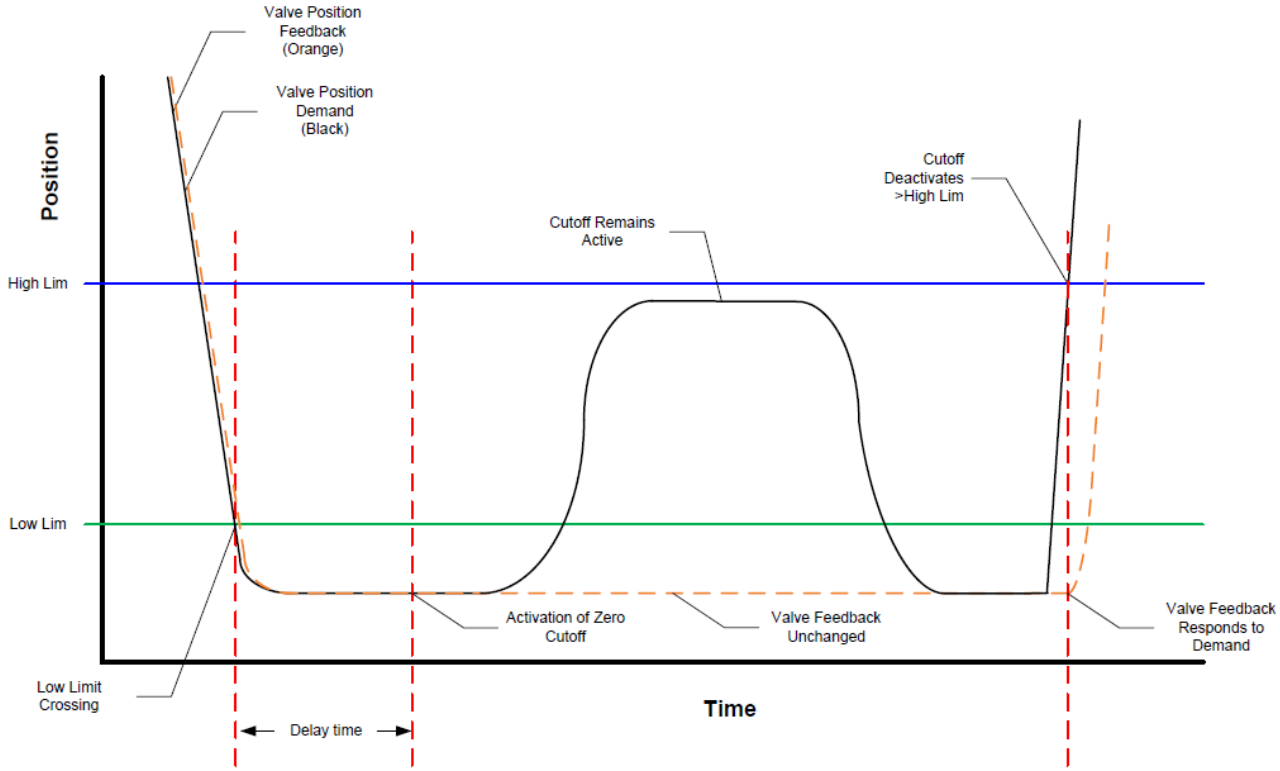
Woodward has provided default values that will likely meet most customer needs. It is recommended to not to alter these values. If altering them is necessary, be sure that the operator understands the impact of the values entered to avoid unexpected operational characteristics.

When active, the Zero Cut-off Function illuminates the yellow “Zero Cut-off Active” LED.

Figure E-18. Zero Cut-off Active/Inactive Indications

The criteria for activating the Zero Cut-off Function can be explained by the diagram below.

- The valve demand must be below the Low Limit Threshold for the duration of the delay time.
- The Zero Cut-off function will remain active until the demand crosses the upper limit.
- The valve will respond with zero delay when the cut-off deactivates.



*Timing chart is not to scale

Figure E-19. Zero Cut-off Timing Chart

Appendix F.
LQ25/LQ25T/LQ25BP Quick Start Guide

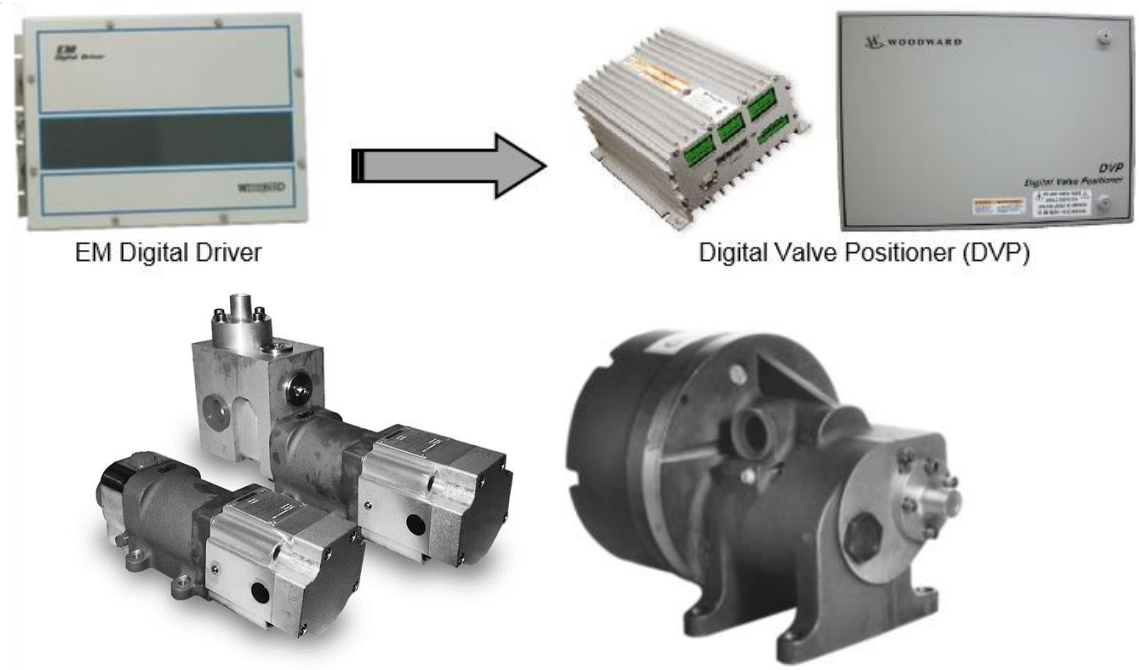


Figure F-1. DVP Data Flow
LQ25 Valve

For existing installations, this guide provides instructions on how to replace an EM Digital Driver/GS3 Driver using analog demand/feedback with a Digital Valve Positioner (DVP) and quickly get your valve online and operational. The DVP does not support RTSIO (Real Time SIO).

For new installations, follow the instructions for your specific DVP located in the Installation section of the DVP manual. Then follow the appropriate valve to driver wiring diagram and Service Tool setup located in this Appendix.

NOTICE **Stroke valve and confirm full travel prior to turbine startup. Failure to confirm full travel may result in a startup error.**

Advanced Start-up Diagnostics

The DVP driver offers many improvements over the EM Digital Driver. A noted improvement that is covered in this appendix is the Advanced Startup Diagnostics. This is a startup check performed before the valve is put into operation or run mode by the driver. This check is used to help determine possible wiring or valve issues before the valve is put into operation. This startup diagnostic uses small levels of motor current to verify proper motor and resolver connections.

The startup parameters must be populated by following the instructions in the Service Tool. The DVP Service Tool provides specific instructions for calculating these values and loading them into the driver.

This quick start guide released to support LQ25 - three speed and LQ25-1 speed in either single or dual resolver application.

Disconnecting the EM Digital Driver

WARNING

POWER TO UNIT:
Make sure the power to the EM Driver is turned off before removing the wiring from the driver. Always check to ensure all power is off and it is safe before proceeding with the DVP installation.

1. Before disconnecting your valve from the EM Digital Driver, confirm the unit operates with no faults by utilizing the Woodward Driver Interface Program “DIP” software.

2. Once you have confirmed that there are no existing errors, remove all power to the EM Digital Driver and close out the Woodward DIP software

NOTICE

Make sure all wires are correctly labeled before disconnecting from the driver.

3. Disconnect all wiring terminations from the EM Digital Driver and associated terminal blocks, taking care to retain all wire labeling.

4. Remove all connections (cable glands, conduits, etc.) from the EM Digital Driver as required by your specific installation.

5. Remove the EM Digital Driver and replace with the Digital Valve Positioner (DVP)

Installing the 24 V Digital Valve Positioner (DVP)

NOTICE

To prevent damage to electronic components caused by improper handling, read and observe the precautions in Woodward manual 82715, *Guide for Handling and Protection of Electronic Controls, Printed Circuit Boards, and Modules*.

6. Replace the EM Digital Driver with the DVP by making the appropriate hardware connections for your specific driver model.

7. Terminate existing wiring to DVP terminal blocks as shown in the following wiring diagrams. Power and Input signal terminations must follow this installation manual.

8. When all connections have been made, the DVP calibration software can be loaded to the DVP.

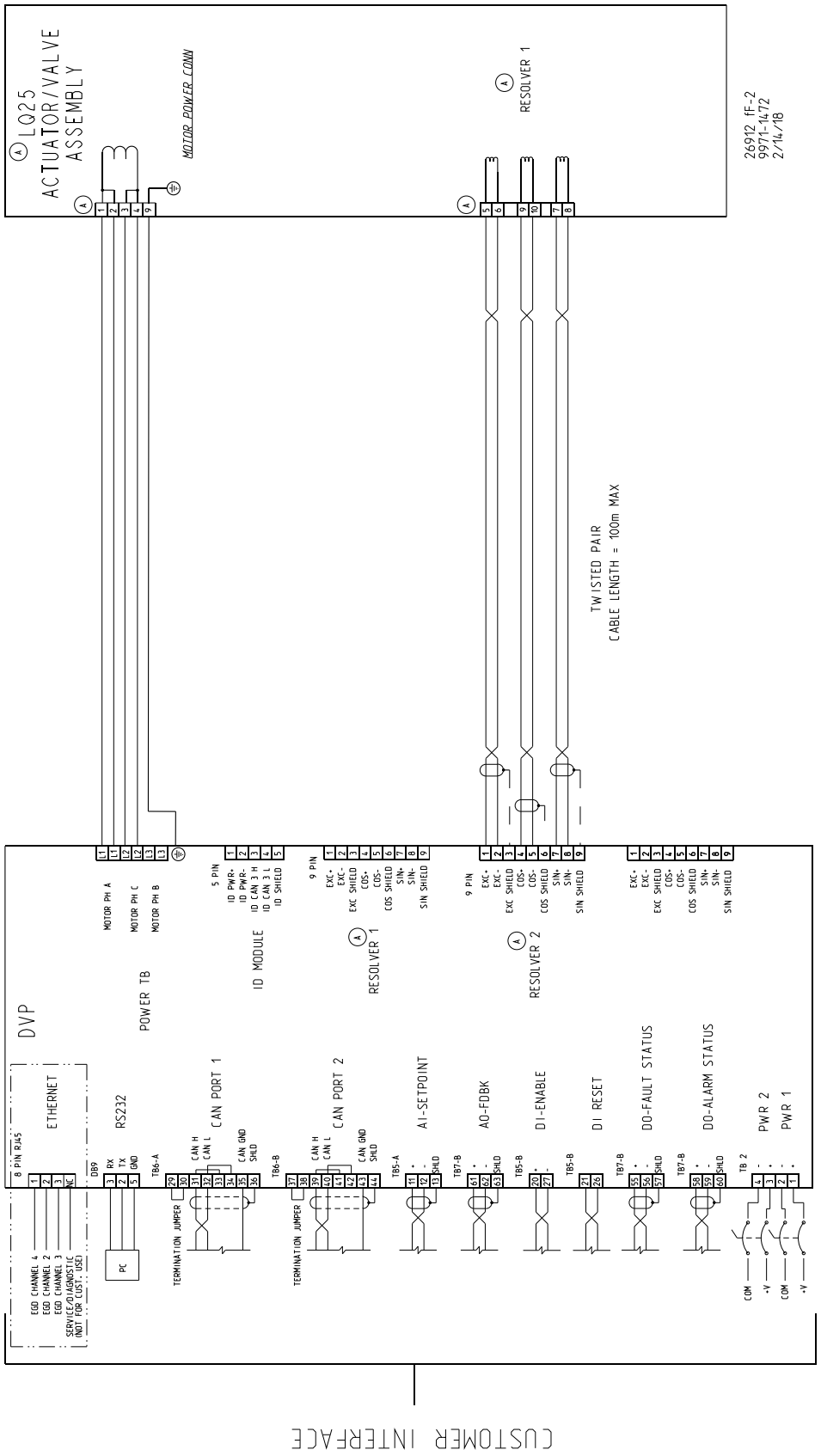


Figure F-2. DVP to LQ25 Communication Connections

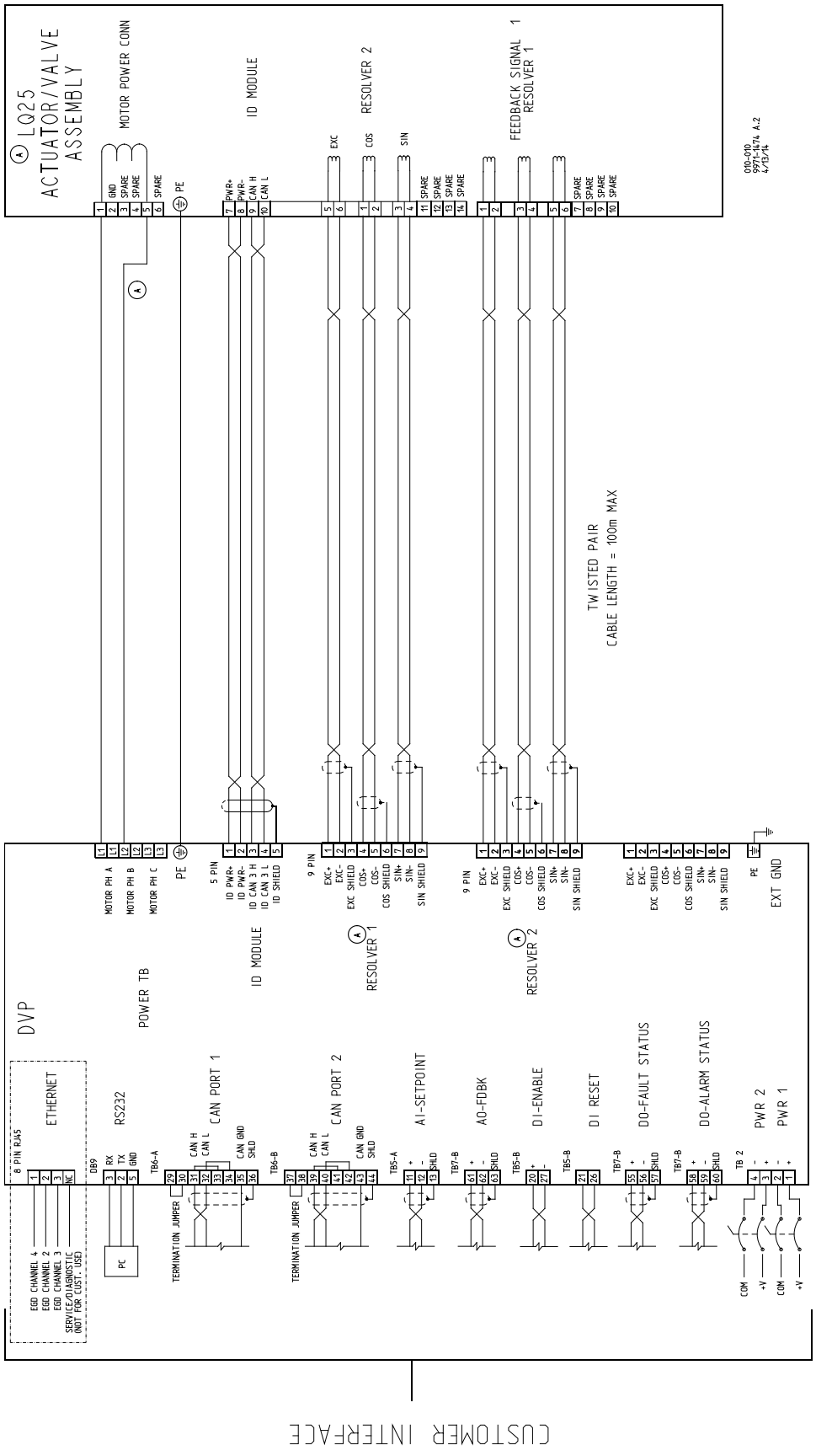


Figure F-3. DVP to LQ25 Dual Resolver Communication Connections

DVP Software Download

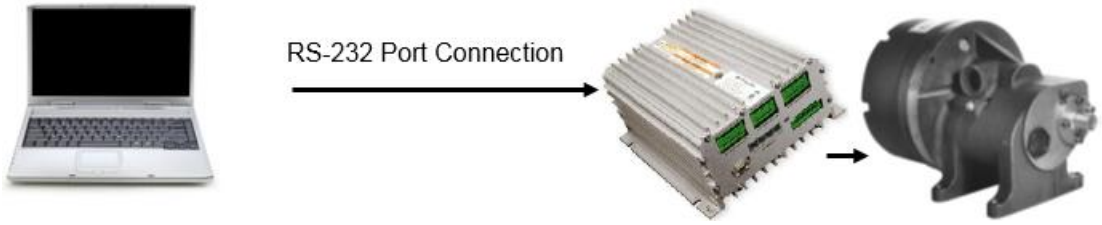


Figure F-4. Calibration Software Data Flow

IMPORTANT **Before you begin, Go to https://www.woodward.com/?s=DVP and download the DVP Service Tool. DVP SERVICE TOOL MUST BE INSTALLED TO CONFIGURE THE 24 V DVP.**

Install and load DVP Service Tools

1. Go to https://www.woodward.com/?s=DVP
2. Click on DVP Tools and follow the instruction on the screen to continue to download the Tool.
3. After downloading the Service Tool, run the installer and follow on-screen prompts to install.

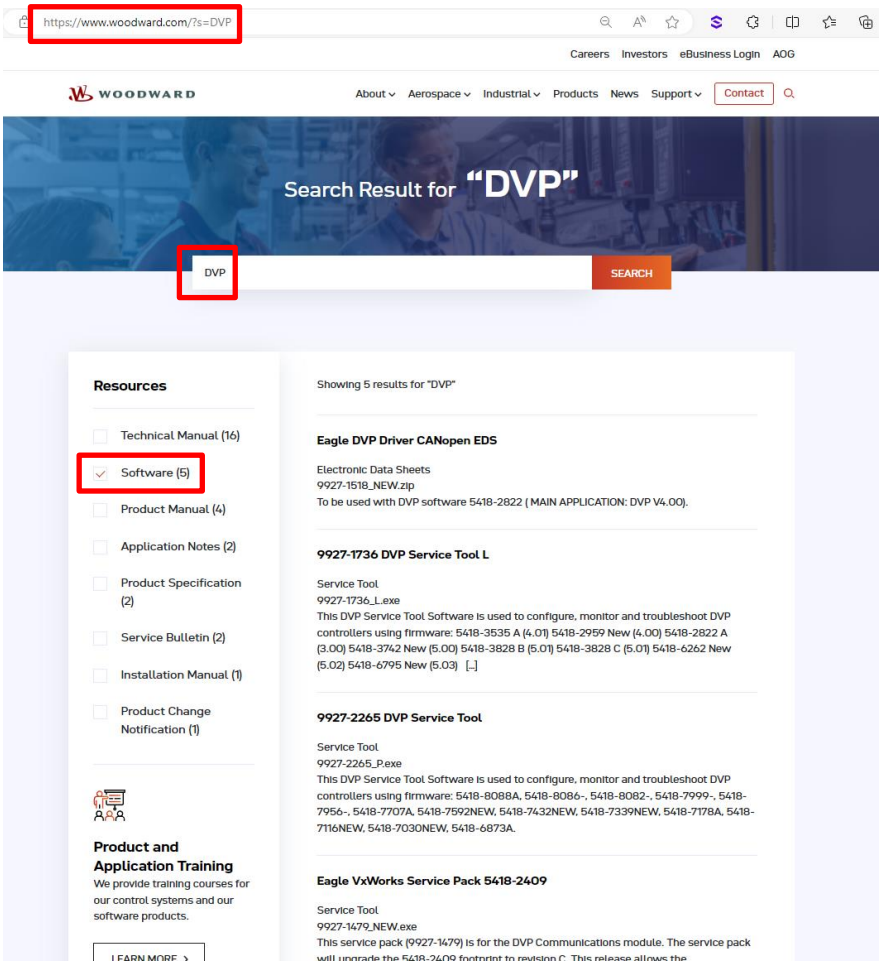


Figure F-5. Service Tool Installation Window

4. The DVP Tools is packaged with the valve setting *.wset files that are required for calibrating the valve. The installer places all the setting*.wset files in your local directory: C:/Program Files/Woodward/DVP Service Tool

Using DVP Service Tool to Begin Controlling the LQ25 Valve

Connect to the DVP (via RS-232 port) to begin controlling the LQ25 valve using DVP Service Tool.

1. Click "**Connect**".

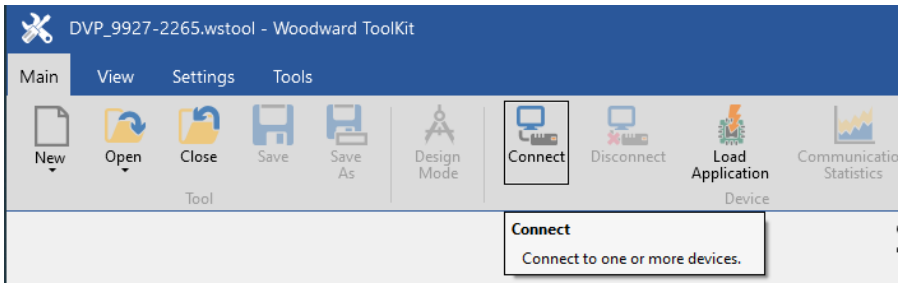


Figure F-6. Service Tool Connection Button

2. After the valve is connected, the bottom tool bar should say "**Connected on COM1**" in the left corner.

Figure F-7. Communications Channel Connection Verification

Loading Valve Setting File to DVP

Woodward provides settings files that can be loaded to the driver for configuring LQ25, LQ25T, or LQ25BP valves. Take special care to note the file naming difference between the LQ25_AnalogDriver and LQ25_SingleResolver or LQ25_DualResolver. The LQ25_AnalogDriver file should only be used with LQ25 valves using 1-speed resolvers:

Table F-1. Configuration File, Application, and Legacy Driver

Valve Configuration File	Valve Application	Legacy Driver
LQ25_AnalogDriver.wset	LQ25 single 1-speed resolver	GS/LQ Analog Driver
LQ25_SingleResolver.wset	LQ25 single 3-speed resolver	EM Digital Driver
LQ25_DualResolver.wset	LQ25 dual 3-speed resolvers	EM Digital Driver
LQ25T_SingleResolver.wset	LQ25T (throttling) single 3-speed resolvers	EM Digital Driver
LQ25T_DualResolver.wset	LQ25T (throttling) dual 3-speed resolvers	EM Digital Driver
LQ25BP_SingleResolver.wset	LQ25BP (bypass) single 3-speed resolvers	EM Digital Driver
LQ25BP_DualResolver.wset	LQ25BP (bypass) dual 3-speed resolvers	EM Digital Driver

3. Click **Settings; Load Setting from File to Device**.

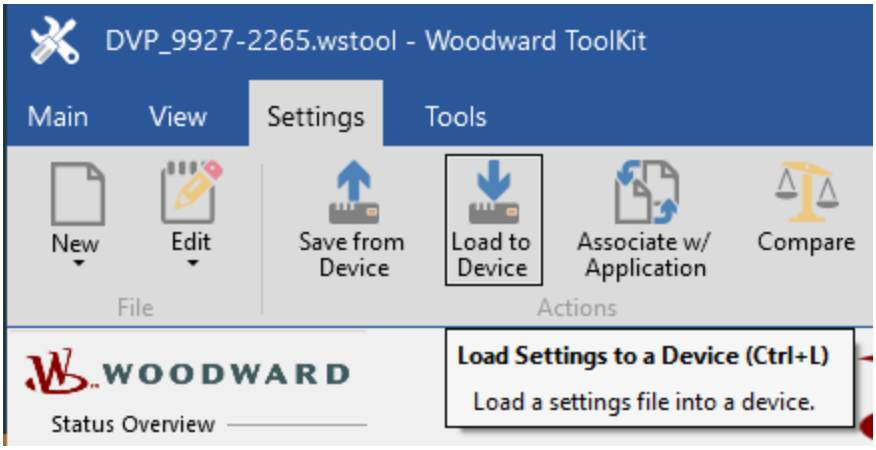


Figure F-8. Settings Menu

4. Locate **the applicable file** and load settings to valve (should take 3– 5 seconds).

Loading Valve Input Type Setting file to DVP

Load **DefaultCustomerConfigurationAnalog.wset** using DVP Service Tool. The input type on this file is set for Analog (4–20 mA) input demand.

5. Click **Settings; Load Settings from File to Device**.
6. Locate **DefaultCustomerConfigurationAnalog.wset** and begin loading (should take 3–5 seconds).

IMPORTANT **The DVP should now be communicating with the LQ25. Check that the correct valve is connected, and that the Shutdown status is red (see below).**

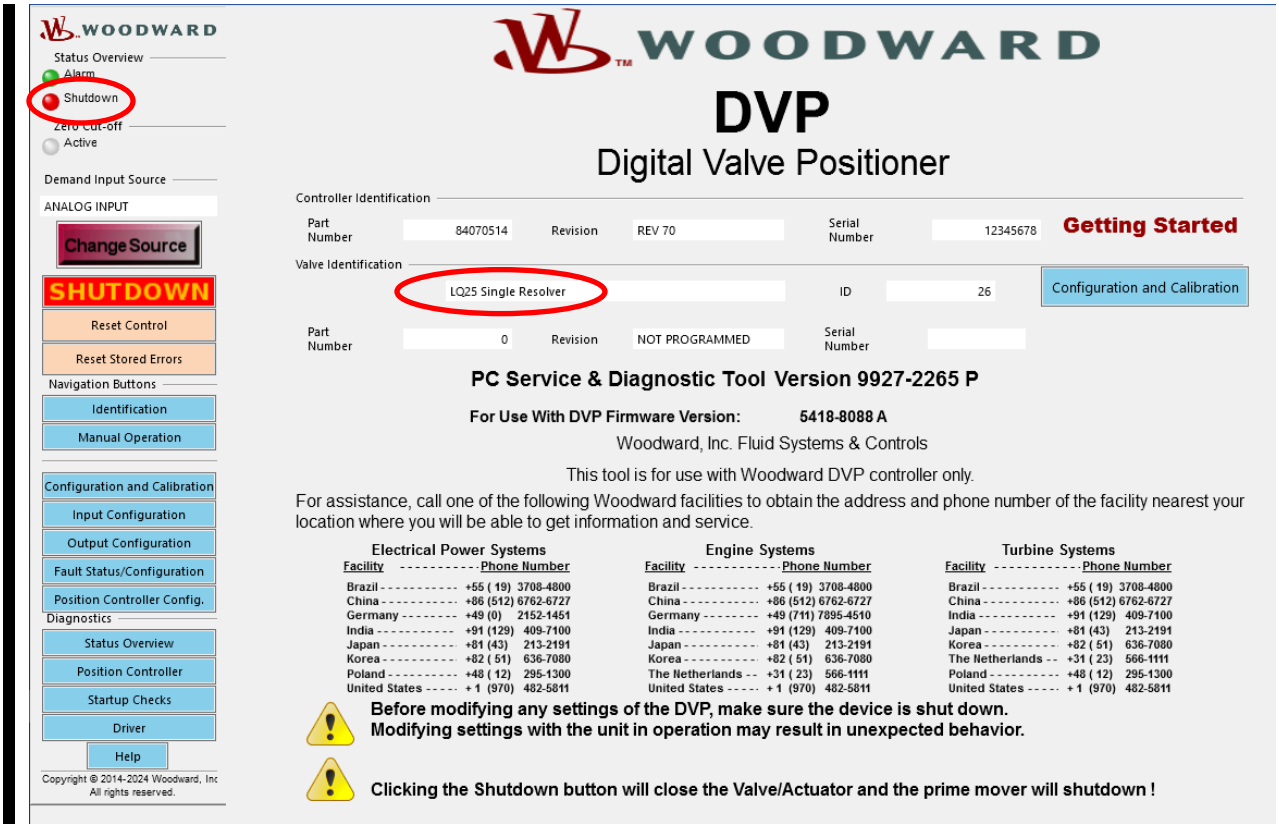


Figure F-9. Correct Valve Verification

Valve Calibration (3-Speed Resolver LQ's)

LQ25/LQ25T/LQ25BP Metering Valves

Locate the resolver settings for your valve from the nameplate, TSP record, or calibration sheet and record that information here:

Resolver 1 Reading at Min Position: _____ degrees
Resolver 2 Reading at Min Position: _____ degrees

Now you will need to utilize the drop-down list from the DVP Service Tool to locate **Configuration & Calibration** to calibrate the valve. The screen should look like the following picture.

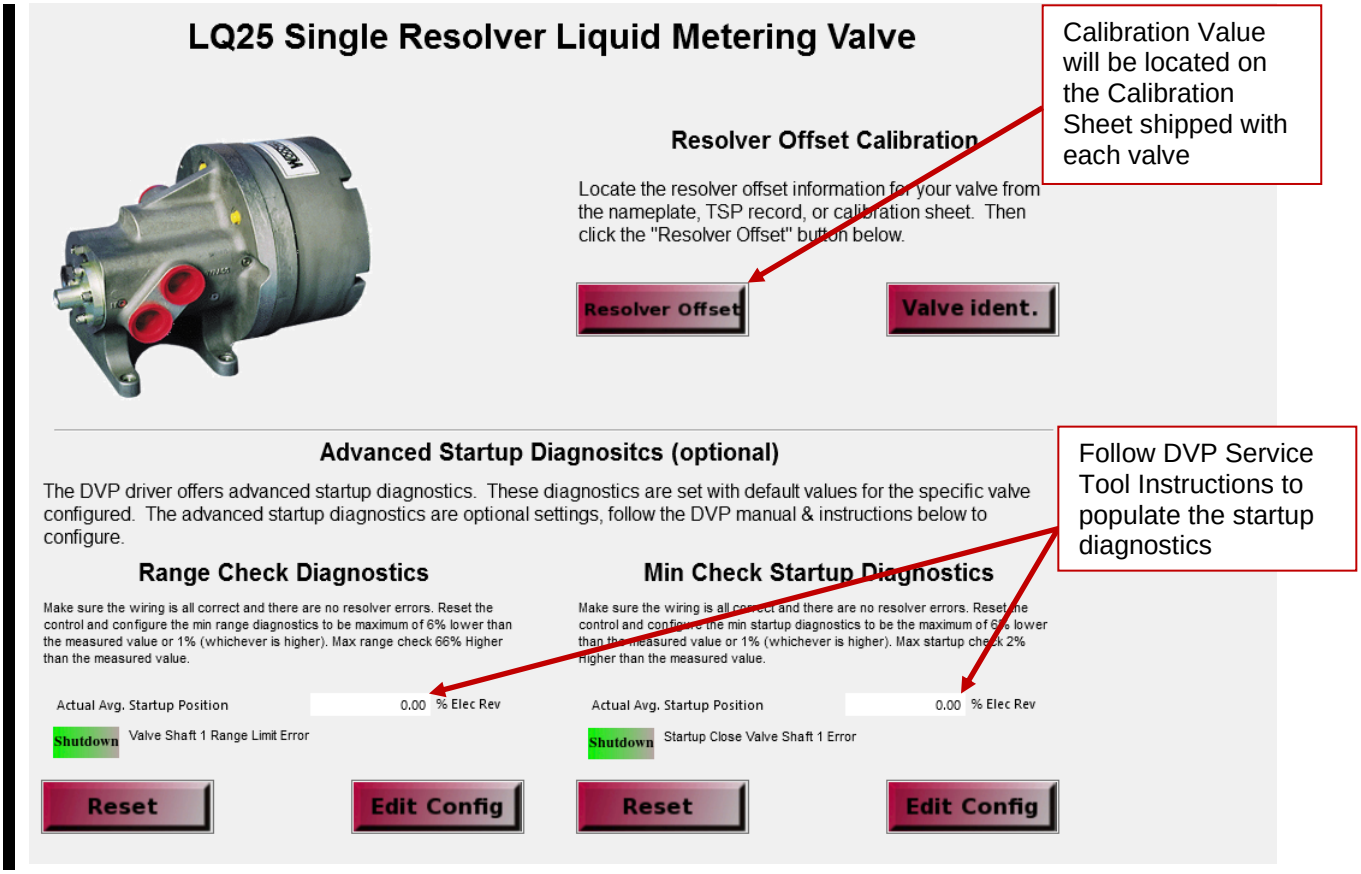


Figure F-10. Main LQ25 Configuration Screen

NOTICE

Carefully follow all instructions below to set up the DVP driver. Failure to follow these instructions can result in damage to the valve.

Ensure all wiring is correct and there are no resolver Sine, Cosine or Excitation errors before starting the calibration procedure.

1. Click on configuration box under **Step 1: Valve Position Calibration** (Notice the Manual Configuration pop up dialog box).

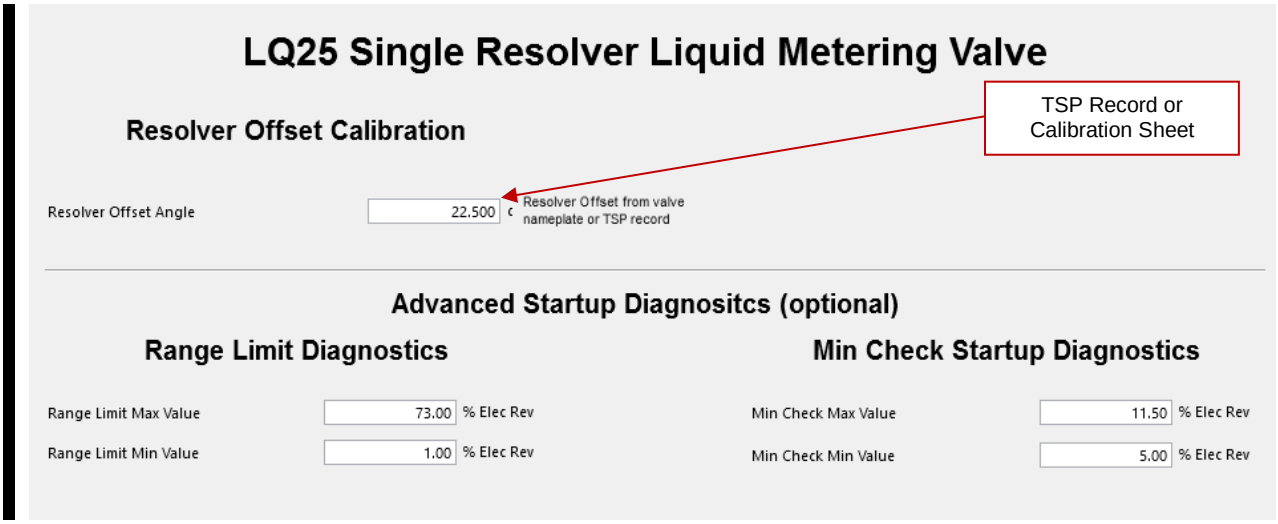


Figure F-11. Manual Configuration Dialog Window
Valve Position Calibration

2. Enter the resolver values recorded on the previous page in the correct spaces, press enter and then the “Apply” button. Press “OK” to close the Manual Configuration dialog box.
3. Proceed to **Step 2: Range Check Diagnostics** section of the LQ25 Manual Configuration screen.
4. Press “Reset Control”
5. Note the “Measured Value” for each resolver.
   Min Check Measured Value Shaft 1 _____% Elec Rev
   Min Check Measured Value Shaft 2 _____% Elec Rev
6. Use these values to calculate the Range Limit Diagnostic levels. For the LQ25, these levels should be calculated as:

Range Limit Max Value = Min Check Measured Value Shaft +66 %
Shaft 1 _____% Elec Rev
Shaft 2 _____% Elec Rev

Range Limit Min Value = Min Check Measured Value Shaft –6 % or +1 %, whichever is higher
Shaft 1 _____% Elec Rev
Shaft 2 _____% Elec Rev

7. Press “Configuration” button to open the Manual Configuration dialog box and enter the values calculated above.

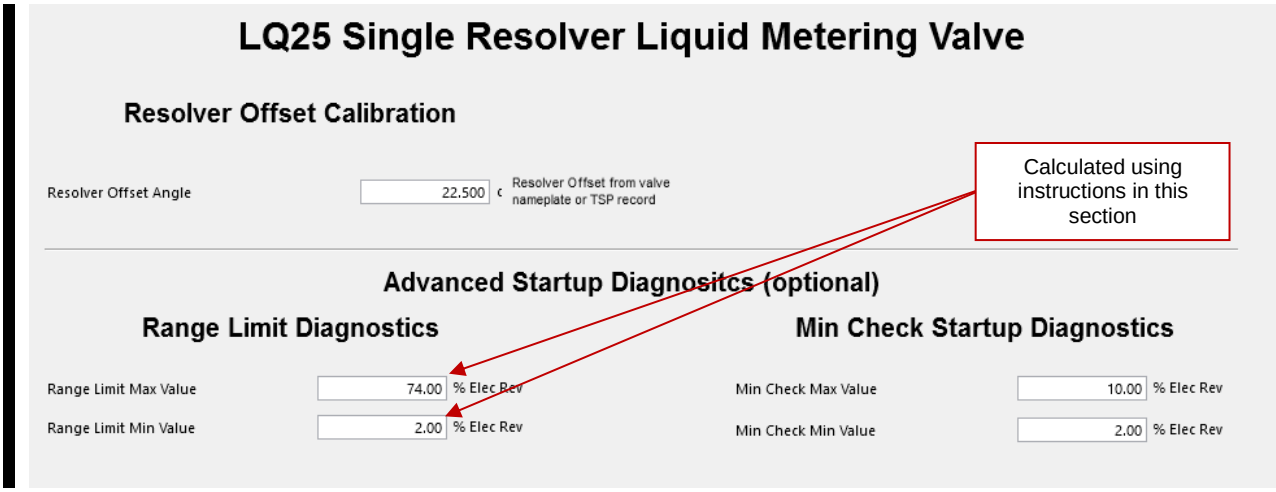


Figure F-12. Manual Configuration Dialog Window
Range Limit Diagnostics

8. After all values are entered, press enter, then the “Apply” button. Press “OK” to close the Manual Configuration dialog box.
9. Press “Reset Control”. The “Range Check Failed” indicators for each resolver should turn green.
10. Proceed to **Step 3: Min Check Startup Diagnostics** section of the LQ25 Manual Configuration screen.
11. Press “Reset Control”
12. Note the “Measured Value” for each resolver.
    Min Check Measured Value Shaft 1 _____% Elec Rev
    Min Check Measured Value Shaft 2 _____% Elec Rev
13. Use these values to calculate the Min Check Startup Diagnostic levels. For the LQ25, these levels should be calculated as:

Min Check Max Value = Min Check Measured Value Shaft +2 %
Shaft 1 _____% Elec Rev
Shaft 2 _____% Elec Rev

Min Check Min Value = Min Check Measured Value Shaft –6 % or +1 %, whichever is higher
Shaft 1 _____% Elec Rev
Shaft 2 _____% Elec Rev

14. Press “Configuration” button to open the Manual Configuration dialog box and enter the values calculated above.

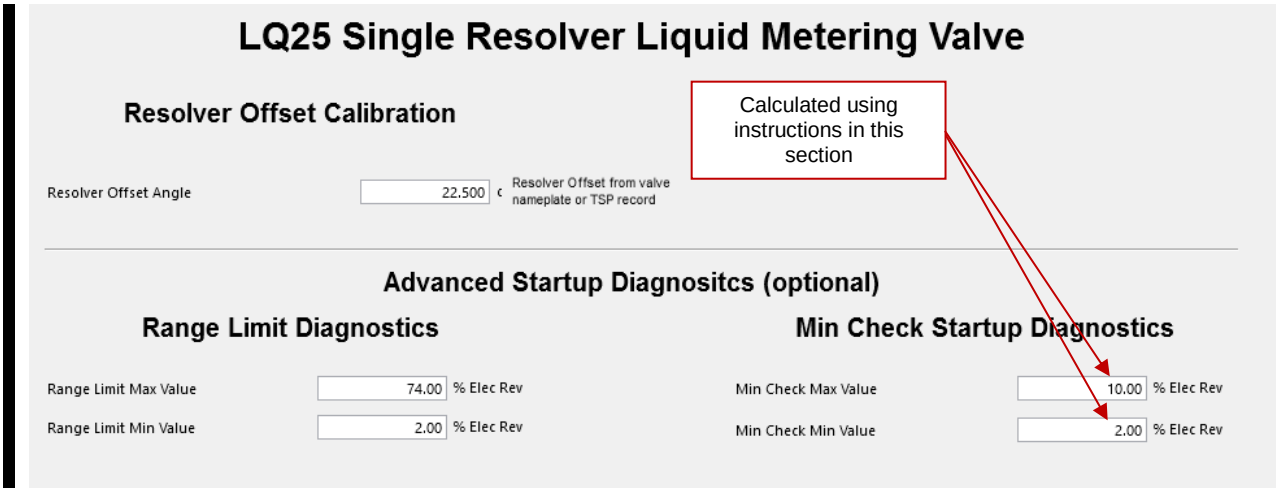


Figure F-13. Manual Configuration Dialog Window
Minimum Check Startup Diagnostics

15. After all values are entered, press enter, then the “Apply” button. Press “OK” to close the Manual Configuration dialog box.
16. Press “Reset Control”. The “Startup Min Check Failed” indicators for each resolver should turn green.

17. Pressing the “Valve Identification” button provides a place for you to record the part number, serial number, and revision of your valve within the DVP EEPROM.

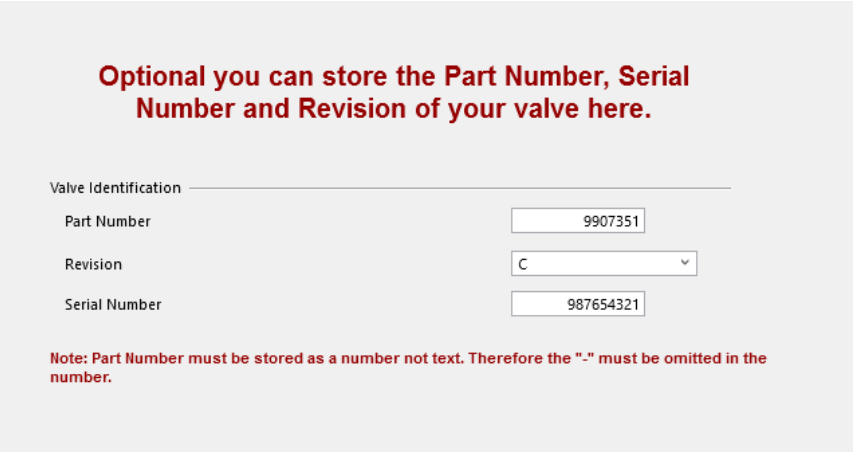


Figure F-14. Valve Identification Window

18. After all values are entered, press enter, then the “Apply” button. Press “OK” to close the Valve Identification dialog box.

    Note: The screens above show a Single Resolver LQ25. For Dual Resolver valves, all fields pertaining to the second resolver will be visible within the Service Tool.

Valve Calibration (1-Speed Resolver LQ)

LQ25 Analog Metering Valve

This section is specific to the LQ25 metering valve running on the Legacy GS/LQ analog driver.

The resolver offset for the LQ25 is set when loading the valve settings file (LQ25_AnalogDriver.wset); no customer entry is required for this offset. See Figure F-15 which shows how this looks in the Service Tool.

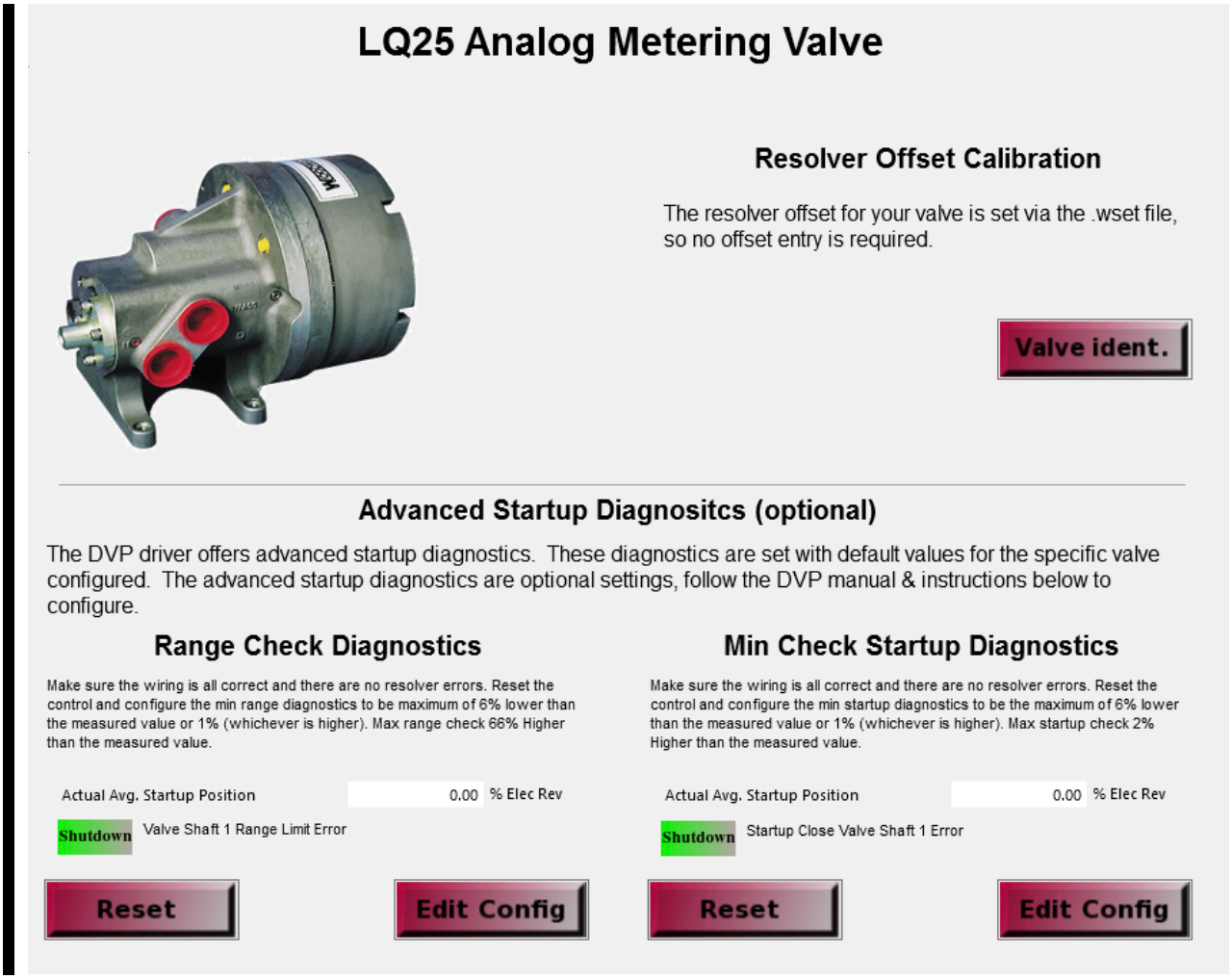


Figure F-15. LQ25 Resolver Offset Calibration

When opening the Valve Type Selection screen for a Single Speed LQ25, the screen below appears. There is no user configuration option for this page. ID Module Not Detected error is normal for single speed valves.

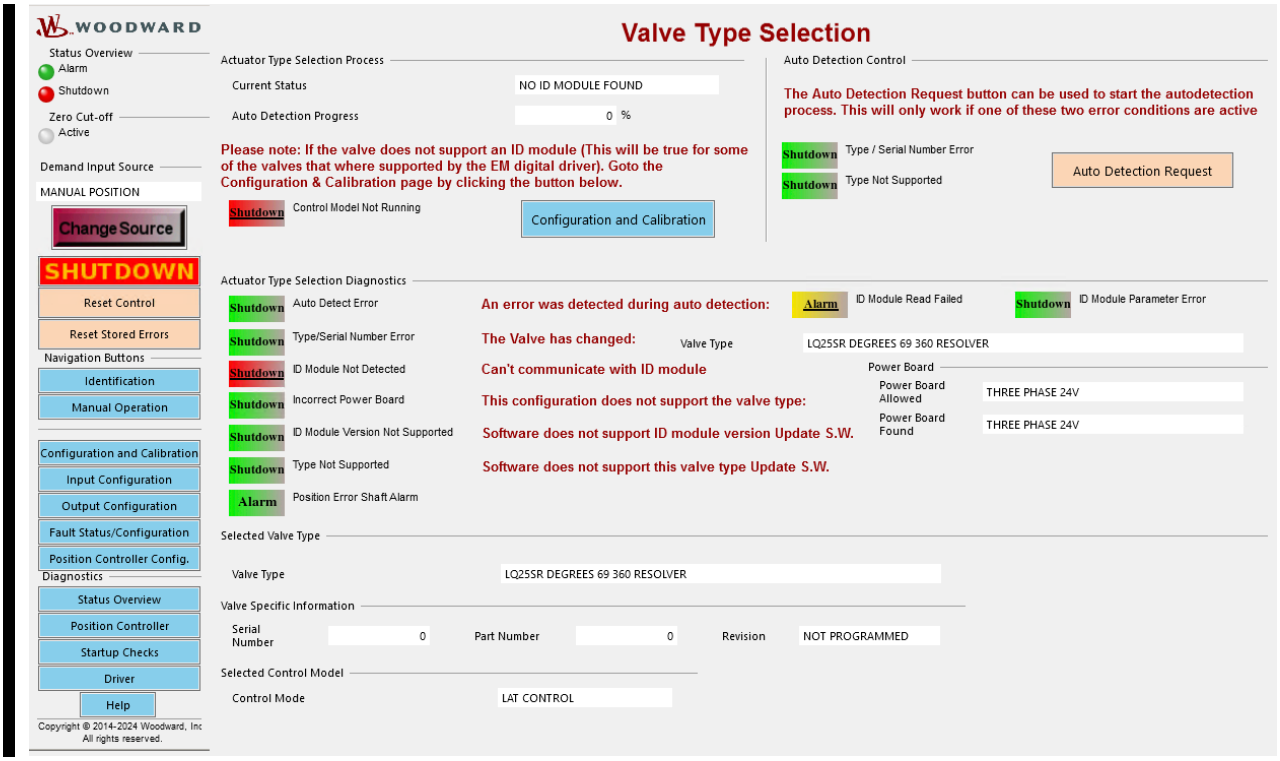


Figure F-16. LQ25 Valve Type Selection

At this point all alarms should be cleared after a 4–20 mA source has been applied to the DVP. Please use the Navigation button or drop-down list to view “Fault Status and Configuration Overview” to confirm all alarms are “green” and you are now ready to begin controlling the LQ25 valve.

Figure F-17. Process Fault & Status Overview

Appendix G.
DVP Conversion Process

This section provides a high-level process for conversion of a DVP from an older to a newer revision. Version references are identified in table G-1. The DVP firmware is updated using the process in Appendix B.

5.0X to 6.0X Conversion Process Standard Solution

The general steps in the process are as follows:

A. Record Redundancy Manager Values (Refer to “Instructions to record the 5.03 Redundancy Manager Values” section below)
B. Convert 5.0X WSET files to 5.03
C. Convert 5.03 WSET files to 6.01
D. Convert 6.01 WSET files to the desired 6.0x (most current) version
E. Confirm/Adjust Redundancy Manager Values

Notes:

1. Reference “Appendix B: DVP Software Upgrade” for firmware loading procedure
2. Record the Resolver Offsets, Valve Identification (Part and Serial Number) and Redundancy Manager Values.

The Standard Solutions involve using only the 9927-1736 Rev K and 9927-2265 Rev E or greater of the Service Tools.

DVP customers who are running Software 5.00 – 5.03 firmware perform the following Standard Solution Steps:

1. If not already installed, install the 9927-1736K Service Tool.
   Note: To ensure success, first uninstall any recent ToolKit version.
2. Start the 1736K Service Tool.
3. Connect to the target DVP.
4. Save the settings into a local WSET file using “Settings/Save from Device…” and selecting “Software update settings”.
5. Record the Resolver Offsets and Valve Identification settings.
6. Record the 5.0X Redundancy Manager Values (see instructions below).
7. Convert the WSET file to 5.03 SID format using the “Setting/Associate…” capability. Skip this step for units already running firmware version 5.03.
8. Close the 1736K Service Tool.
9. Install and open the 2265 Rev E or greater Service Tool.
10. Select the hardware platform you are upgrading:
    a. If you are upgrading the DVP firmware:
        i. Load the desired 6.0X Firmware into the DVP by using Service tool 9927-2265 Rev E or later and follow the SW upgrade procedure outlined in “Appendix B: DVP Software Upgrade.” Do not select the option to “Restore the device’s current settings after loading the application.”
        ii. Load the factory default settings (i.e., DVP5418-XXXXFactoryDefault.wset).
        iii. Cycle power on the DVP.
    b. If you are converting old WSET files to load into a DVP already running 6.0X Firmware, then connect the Service Tool to this DVP Hardware.
11. Convert the 5.03 WSET files to 6.01 using the “Associate Settings File with Application…” option.
12. Load the updated WSET file into the 6.0X DVP.
13. Confirm the settings for Resolver Offsets and Valve Identification and make any required changes.
14. Confirm the Redundancy Manager Values and make any required changes (see instructions below).

Note: After the 9927-2265 Rev E or greater Service Tool is installed the 9927-1736K version of the Service Tool will still be available. The most recent version of the ToolKit will run the 1736K version of the Service Tool so you can move between them if you have multiple DVP controls to convert.

Firmware Revision Number to Part Number Cross Reference

Each DVP firmware has a version reference and a part number reference. The table below provides a summary. Refer to the Firmware Identification section in Chapter 2 for information on identifying the DVP firmware part number.

Table G-1. Firmware Revision to Part Number Cross Reference

rev 3.00 = 5418-2822
rev 4.00 = 5418-2959
rev 4.01 = 5418-3535
rev 5.00 = 5418-3742
rev 5.01 = 5418-3828
rev 5.02 = 5418-6262
rev 5.03 = 5418-6795
rev 6.01 = 5418-6873
rev 6.02 = 5418-7030
rev 6.03 = 5418-7116
rev 6.04 = 5418-7178
rev 6.05 = 5418-7339
rev 6.06 = 5418-7432
rev 6.07 = 5418-7592
rev 6.08 = 5418-7707
rev 6.09 = 5418-7956
rev 6.10 = 5418-7999
rev 6.11 = 5418-8082
rev 6.12 = 5418-8086
rev 6.13 = 5418-8088

Instructions to Record the 5.0X Redundancy Manager Values

There are three redundancy manager values:
1. Mode used when error is detected
2. Max. Resolver Difference Alarm
3. Max. Resolver Difference Shutdown

These values are not normally displayed directly in the 1736K Service Tool, so they must be viewed from the saved WSET file. To do this, go to the Settings dropdown, choose “Edit Settings File…” and select the saved WSET file. In the editor, select the “Redundancy Manager Configuration“ screen. On that screen, you will see the three values listed above. This screen will look like this:

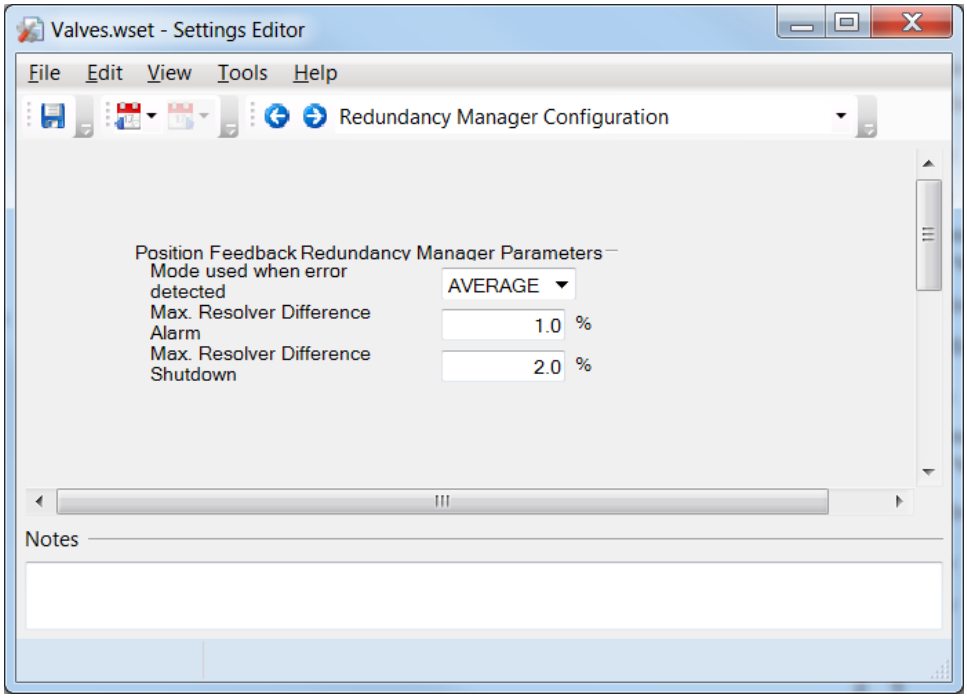


Figure G-1. Redundancy Manager Parameters

Record the values shown so that you can load them into the 6.0X DVP

Instructions to load Redundancy Manager Values into the 6.0x DVP

While in the 9927-2265 Rev E or greater Service Tool connected to your chosen 6.0x DVP version, go to the “Position Controller Configuration” screen. The “Redundancy Manager Parameters” section of that screen shows the three Redundancy Manager Values. If you need to adjust these values, click the “Edit Config” button, and modify the values in the following screen. NOTE: Some factory-configured valves with ID module do not allow configuring these settings.

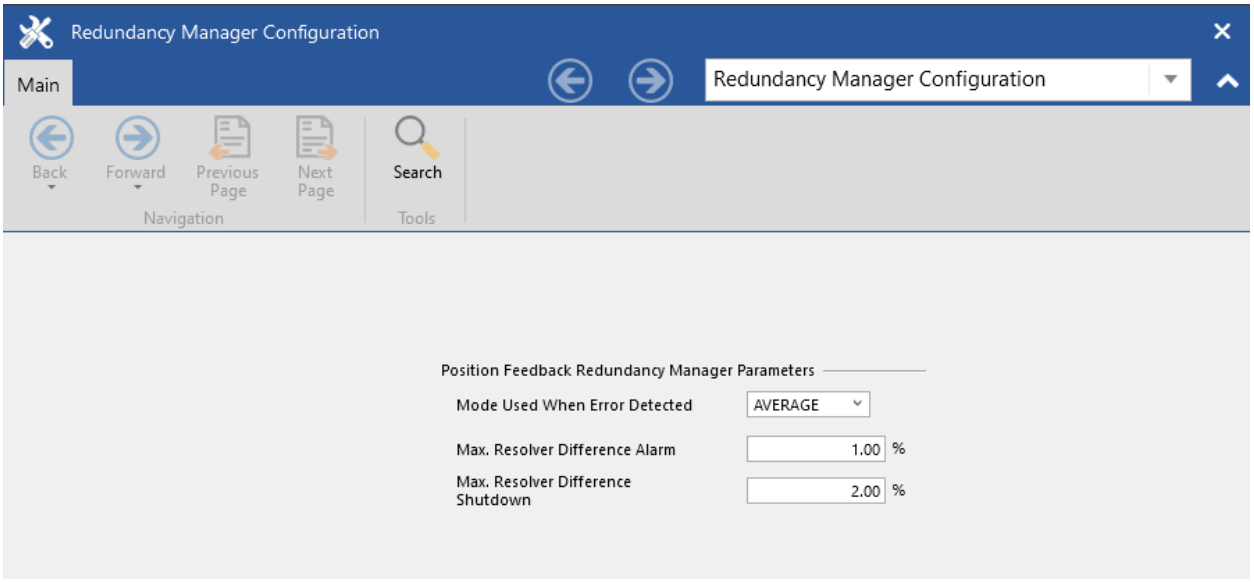


Figure G-2. Edited Redundancy Manager Parameters

Revision History

Changes in Revision G

- Update most screenshots to be accurate for the look of the latest tool (screen content updates, look of new ToolKit).
- Clarify that Zero Cut-off mode is intended for valves with a return spring.
- Clarify that recommendation to always enable Zero Cut-off mode is for valves with a return spring.
- Clarify that position driven to during Shutdown can be 100% position for fail-open valve.
- Add information about Zero Cut-off mode in newer DVP firmware no longer using Actual Position feedback for activating/deactivating.
- Brief descriptions on new functionality added in the latest DVP firmware (ver 6.13, 5418-8088)
  - Actuator Force Limiter
  - Stroke Length
  - Zero Cut-off with Seating Current/Current Controlled mode
- Screenshot of Configuration & Calibration screen for ELA Standalone actuators.
- Update links to Woodward website.
- Update/add items to Glossary:
  - Configuration Process Error
  - Force Limiter (Actuator Force Limiter)
  - Stroke Length
  - User Force Limiter
  - Zero Cut-off Configuration
  - Zero Cut-off Inhibited

Changes in Revision F

- Correction to section 3.3.8 Null Offset
- Updated notice box (page 112)
- Revised Invalid Parameters in Appendix A

Changes in Revision E—

- Added What's New section to Chapter 1.
- Edited content in sections 2.5.2, 2.8, 2.8.1, and 2.12.1
- Added sections 2.8.6 and 3.3.8
- Multiple additions to Appendix A

Changes in Revision D—

- Added Sections 1.1 Requirements, 1.2 Getting Started with the DVP Service Tool, 1.3 Connection Troubleshooting, and 1.4 Using the Service Tool Introduction and Instructions to Chapter 1.
- Removed the following sections from Chapter 2 and placed them in Chapter 1
  - Introduction
  - Getting Started with the DVP Service Tool
  - Connection Troubleshooting
  - Using the Service Tool Introduction and Instructions
  - Monitoring and Troubleshooting the Service Tool
- Reordered and renumbered remaining sections within Chapter 2 adding significant content including several figures
- Added Section 2.22 Linearization
- Added the following sections including tables and figures to Chapter 3
  - Configuration Window Options
  - Configuration Data Range
  - PWM Input
  - Wave Patterns
  - Sweep Mode
  - CANopen Communication Parameters
  - CANopen Redundancy Manager Parameters
  - CAN Node ID Selection

  - CAN Hardware ID Disabled
  - CANopen Mode
  - EGD Demand Configuration
  - Setpoint Source Modifications
  - Current Diagnostics
  - Fault Status and Status Flag Configuration
  - Discrete Input Configuration
  - Discrete Output 2 Configuration
  - Linearization Configuration
  - User force Limiter
- Much of Chapter 4, including the chapter title has been modified, added, or replaced
- The following Definitions/Descriptions have been replaced in Appendix A
  - Control Module Not Running
  - Dual Res. Difference Alarm
  - Dual Res. Difference Shutdown
  - Final Element Feedback Transducer
  - Heat Sink Temp. Sensor 1 Error or Heat Sink Temp. Sensor 2 Error
  - M5200
  - Motor 1 Cos Error
  - Motor 2 Cos Error
  - Motor 1 Exc. Error
  - Motor 2 Exc. Error
  - Motor 1 Sin Error
  - Motor 2 Sin Error
  - Motor 1 and 2 Res. Error
  - Position Controller Not Ready
  - Position Error Motor Shutdown
  - Position Error Motor Alarm
  - Position Error Valve Shaft Alarm
  - Position Sensor Diagnostics
  - Shutdown
  - Shutdown Position
  - Startup Close Motor or Startup Close Shaft Error
  - Startup Max Check Res 1 Failed Or Startup Max Check Res 2 Failed
  - Startup Open Motor or Startup Open Shaft Error
  - Startup Motor Direction Error Or Startup Motor 2 Direction Error
  - Valve Shaft 1 Cos Error
  - Valve Shaft 1 Exc. Error
  - Valve Shaft 1 Sin Error
  - Valve Shaft 2 Cos Error
  - Valve Shaft 2 Sin Error
  - Valve Shaft 1 and 2 Error
  - Valve Shaft 1 Range Limit Error or Valve Shaft 2 Range Limit Error
- First two paragraphs and Important box at beginning of Appendix B have been changed
- Added second paragraph in Appendix D
- Changed title and added first paragraph of Appendix G
- First paragraph added and first three rows of Table G-1 added to Appendix G
- Added section 4.7 Comparing DVP Settings Files

Changes in Revision C—

- Moved general information and getting started information from Chapter 2 to Chapter 1.
- Added compatibility and dashboard information to Chapter 1.
- Added content on PWM and EGD to Chapters 2 & 3.
- Added missing content (Stored Errors, EGD, PWM) information to Chapter 2.
- Removed duplicated configuration information from Chapter 2.
- Changed order of content in Chapter 3 to match the tool's settings editor page order.
- Settings file manipulation was moved into a new chapter (Chapter 4). Settings file association procedure was added.

- New content in Section 2.19 including 2.19.4, 2.19.5, and 2.19.6
  - Replaced descriptions of errors Startup Close Motor Error and Startup Close Valve Shaft 1 Error in Appendix A
  - Replaced error descriptions Startup Open Motor Error and Startup Open Valve Shaft 1 Error in Appendix A
  - The following listings in Appendix B Glossary have been updated: Control Model Not Running, Dual Res. Difference Alarm, Dual Res. Difference Shutdown, Final Element Feedback Transducer, Heat Sink Temp, Sensor 1 Error or Heat Sink Temp. Sensor 2 Error, M5200, Motor 1 Cos Error Motor 2 Cos Error, Motor 1 Exc. Error Motor 2 Exc. Error, Motor 1 Sin Error Motor 2 Sin Error, Motor 1 and 2 Res. Error, Position Controller Not Ready, Position Error Motor Shutdown, Position Error Motor Alarm, Position Error Valve Shaft Alarm, Position Sensor Diagnostics, Shutdown, Shutdown Position, Startup Close Motor or Startup Close Shaft Error, Startup Max Check Res 1 Failed OR Startup Max Check Res 2 Failed, Startup Open Motor or Startup Open Shaft Error, Startup Motor Direction Error Or Startup Motor 2 Direction Error, Valve Shaft 1 Cos Error, Valve Shaft 1 Exc. Error, Valve Shaft 1 Sin Error, Valve Shaft 2 Cos Error, Valve Shaft 2 Sin Error, Valve Shaft 1 and 2 Error, and Valve Shaft 1 Range Limit Error or Valve Shaft 2 Range Limit Error.
  - Deleted reference to Applications Note on Pg. 80
  - Deleted text on Pg. 67 referring to 10K and 12K DVP only
  - Added two new revisions to the Firmware Revision Number to Part Number Cross Reference section

Changes in Revision B—

- DVP12000/12K references added where appropriate.
- Most of Appendix D has new content including many new figures
- Added Firmware search criteria to section 2.1.4
- Removed 24V from section headers in Appendix D
- Many content changes to Appendix E
- Sub section “Loading Valve Setting File to DVP” in Appendix F has a new table and new content
- Valve Calibration Heading in Appendix F has new content
- Created section heading “Valve Calibration (1 Speed Resolver LQ)”

Changes in Revision A—

- Service Tool information from B26329 installed in Chapters 2 and 3
- Appendices C, D, E, F, and G added
- Added Figure 2-1
- Updated text in Section 2.17.5 Relubrication

Released

We appreciate your comments about the content of our publications.

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