Model VC-22D

Electronic Valve Controller

Installation / Operation / Maintenance

Written for Engine Version 2.8.5

Table of Contents

1 Introduction

The VC-22D is a fully functional standalone controller for Cla-Val electronic valves. The unit contains everything that is necessary to operate the valve with little or no configuration required by the end user. The VC-22D also comes with several communication options to make integration with a SCADA or PLC system seamless.

The controller has a display to show pertinent status information about the valve and 5 buttons for valve operation. The VC-22D also has interchangeable back plates allowing it to be easily mounted in several different scenarios. See **FIGURE 1.1** below:

Figure 1.1

2 Installation

The VC-22D can be mounted to walls, pipes, panel doors, din rails, and other miscellaneous objects depending on the interchangeable backplate that's purchased.

2.1 IP65 or IP68 Backplate

The VC-22D can be purchased with an IP65 backplate or an IP68 backplate. The IP65 and IP68 backplates have the same form factor, however the IP68 has cable glands that offer additional water proofing. **FIGURE 2.1** shows an exploded view of the VC-22D with an IP68 backplate and universal mounting adapter (purchased separately).

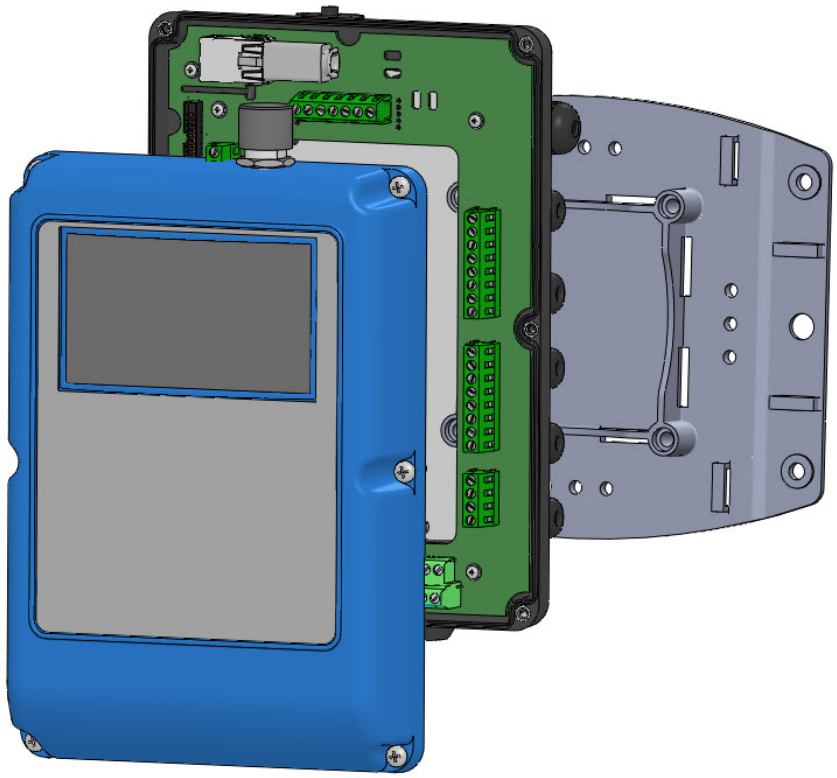


Figure 2.1

The IP65 or IP68 backplate are used for mounting the VC-22D in a non-enclosed space. IP65 backplates are good for indoor locations when heavy soaking with water is not expected. IP68 is best suited for outdoor environments or in vaults where frequent contact with water is expected.

FIGURE 2.2 shows common mounting scenarios using the IP65/68 backplate with the universal adapter bracket.

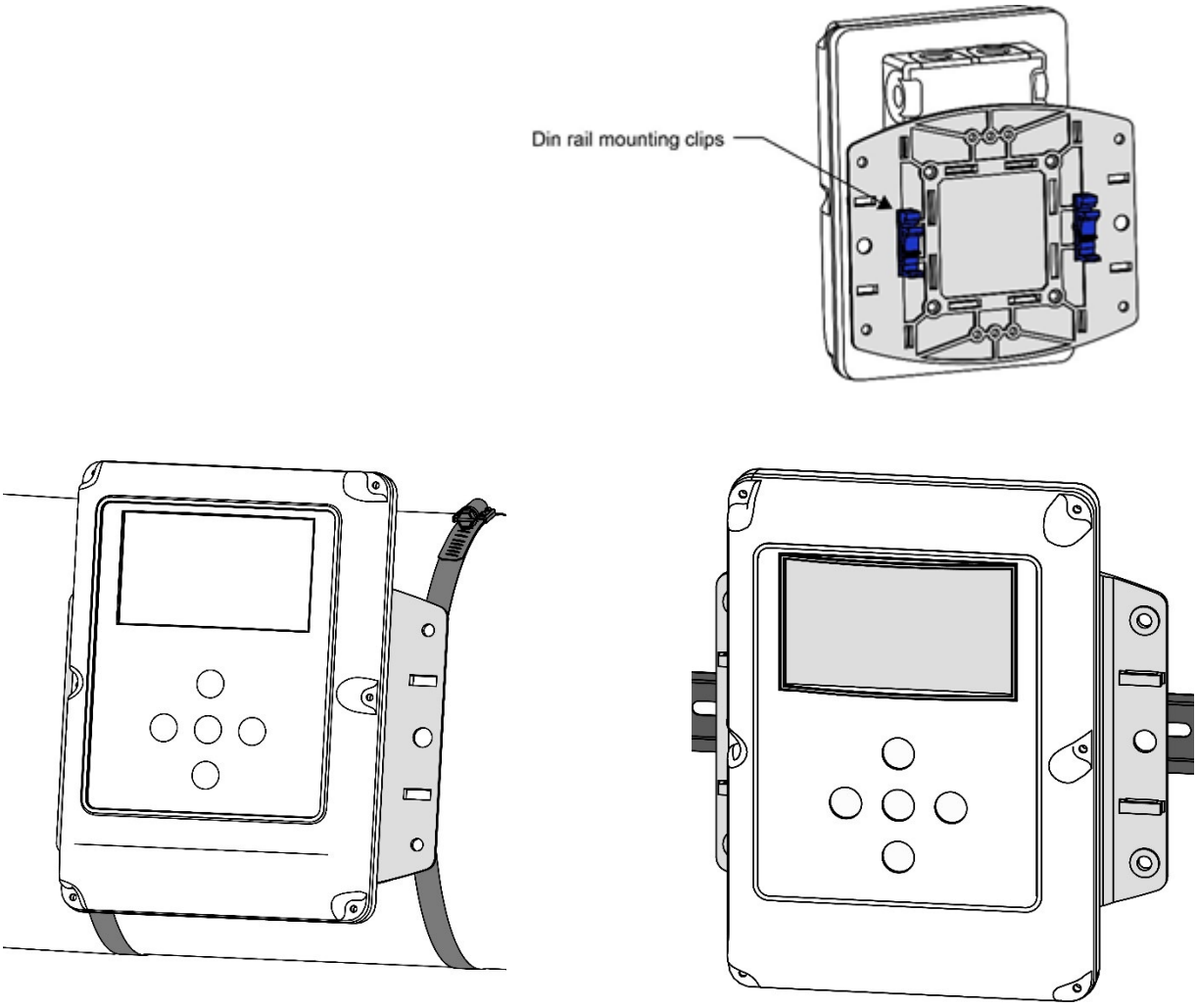


Figure 2.2

FIGURE 2.3 shows the overall dimensions for the unit.

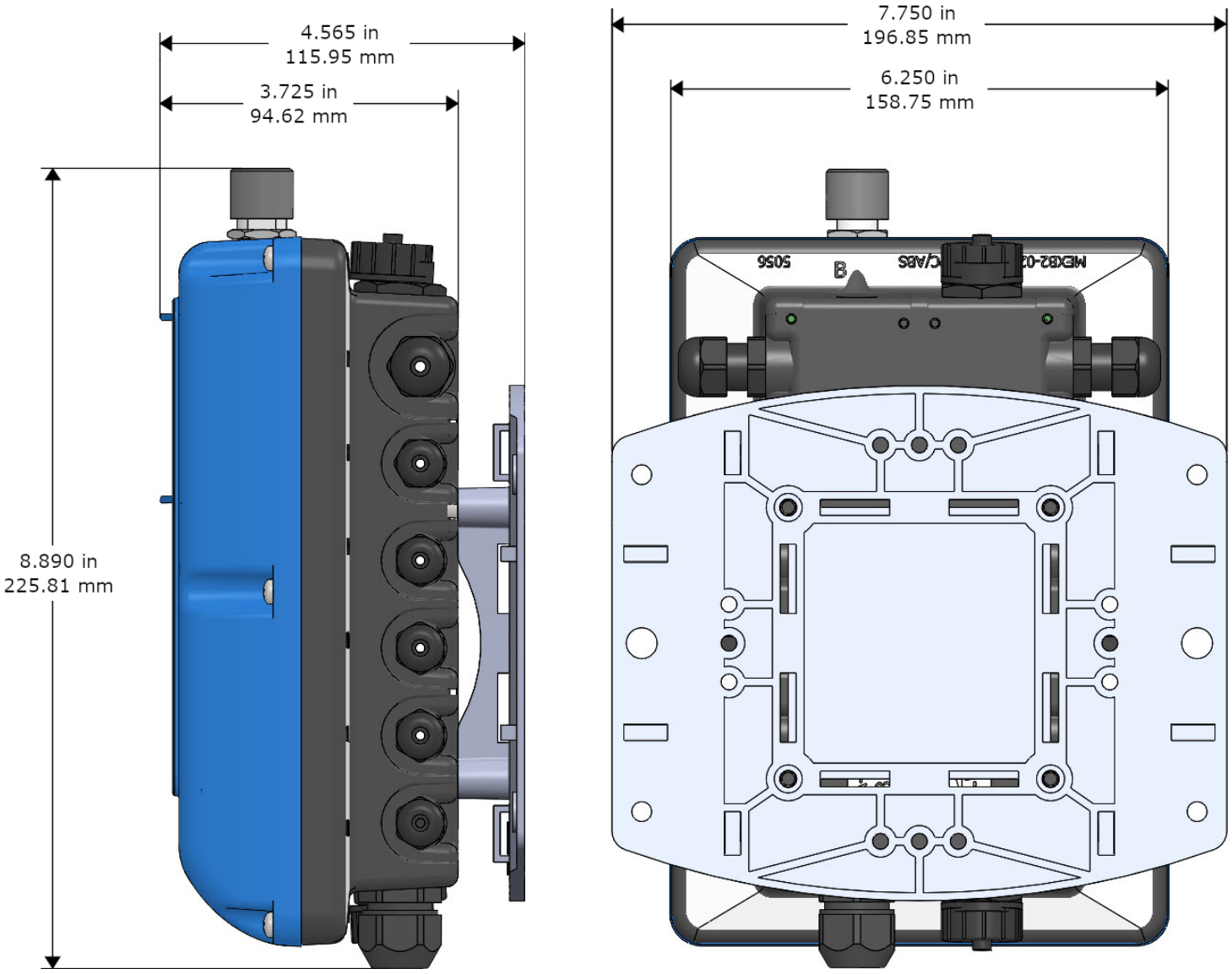


Figure 2.3

FIGURE 2.4 shows the dimensions for each mounting hole on the IP65/68 backplates, and the dimensions for each mounting hole on the universal adapter plate.

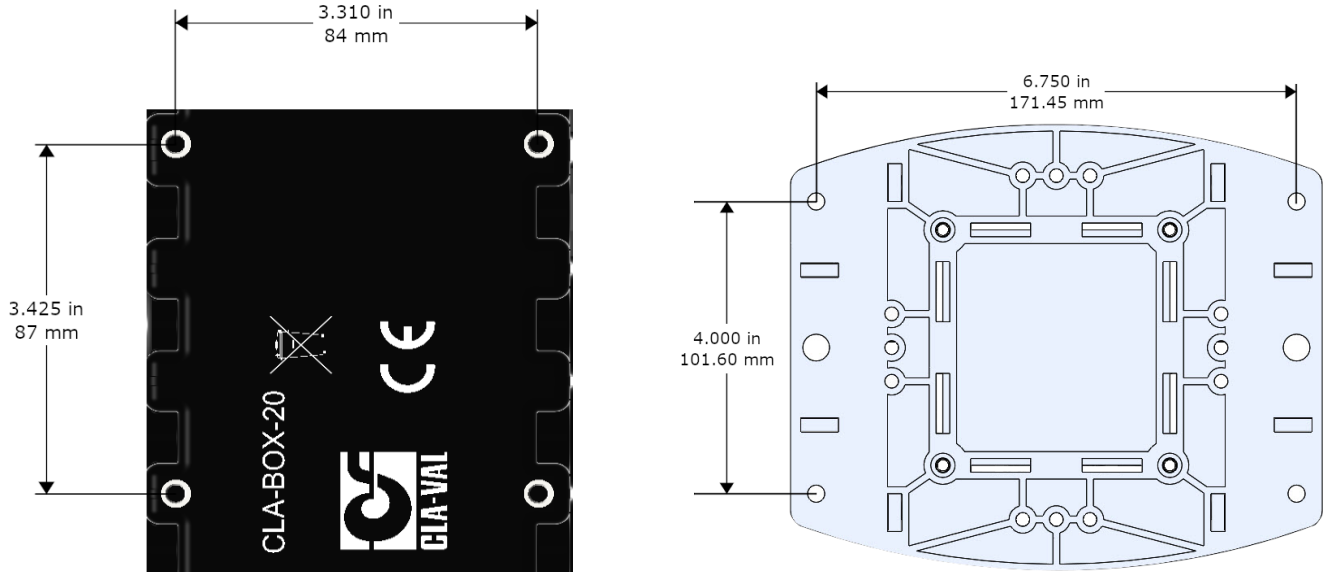


Figure 2.4

2.2 Panel Back Plate

The VC-22D can be purchased with a panel backplate which allows for easy mounting to the door of an electrical panel. **FIGURE 2.5** shows an exploded view of the VC-22D with a panel backplate.

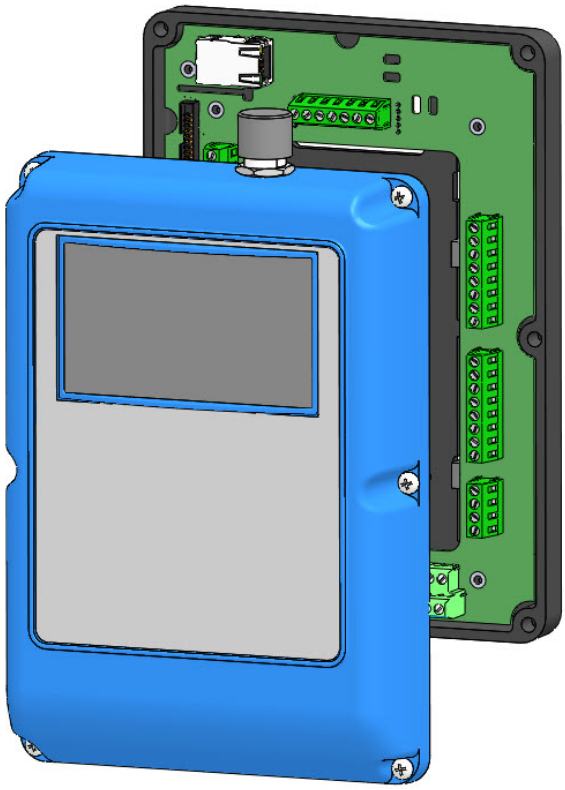


Figure 2.5

FIGURE 2.6 below shows the dimensions of the VC-22D with a panel backplate.

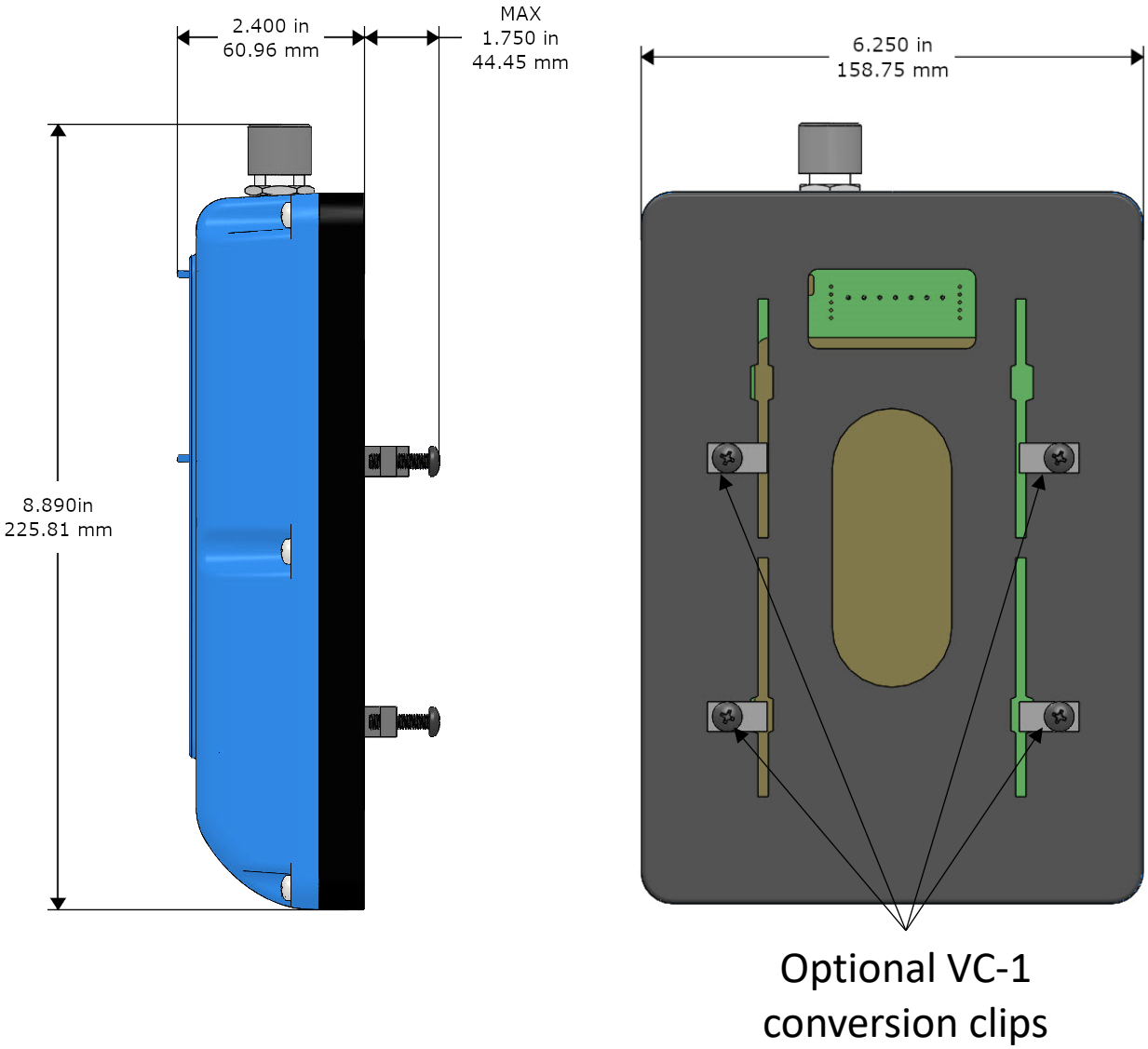


Figure 2.6

To mount the VC-22D on a control panel door, two screw holes must be drilled into the VC-22D's back panel. Two screw holes and a wireway hole must be drilled into the control panel door. See the drawing in **FIGURE 2.7** for dimensions.

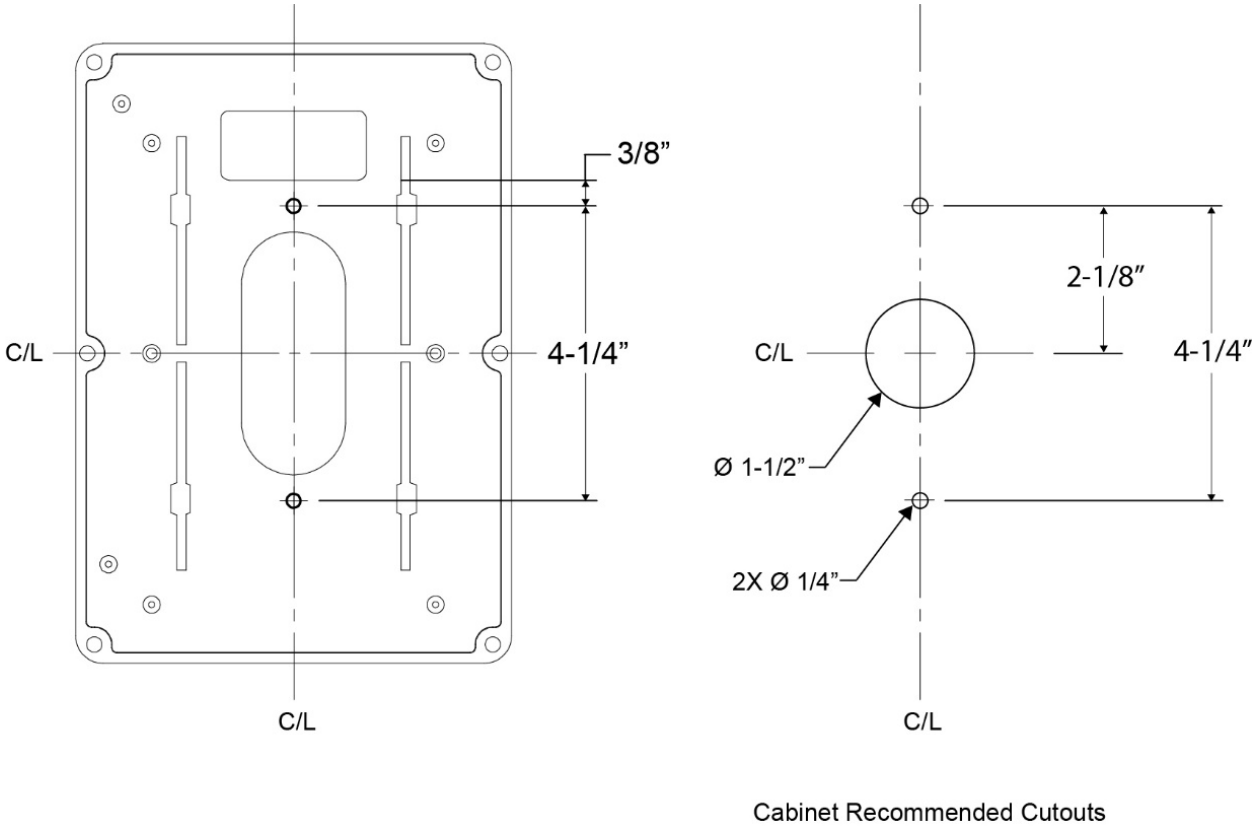


Figure 2.7

Sometimes, the VC-22D has been purchased to replace a previous generation VC-1 valve controller. In these cases, it may be preferred to mount the VC-22D over the existing VC-1 panel hole. To do this, remove the existing VC-1 and use the "optional VC-1 conversion clips" to mount the VC-22D in the existing panel hole. The dimensions of the panel hole are shown in **FIGURE 2.8**. Before and after pictures are shown in **FIGURE 2.9** and **FIGURE 2.10**.

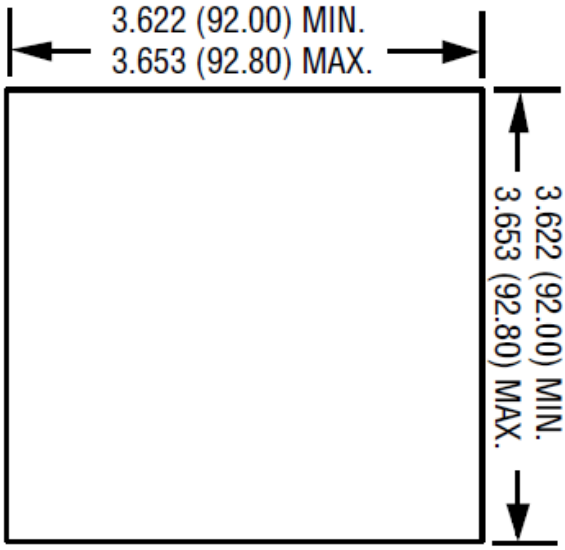


Figure 2.8

Figure 2.9

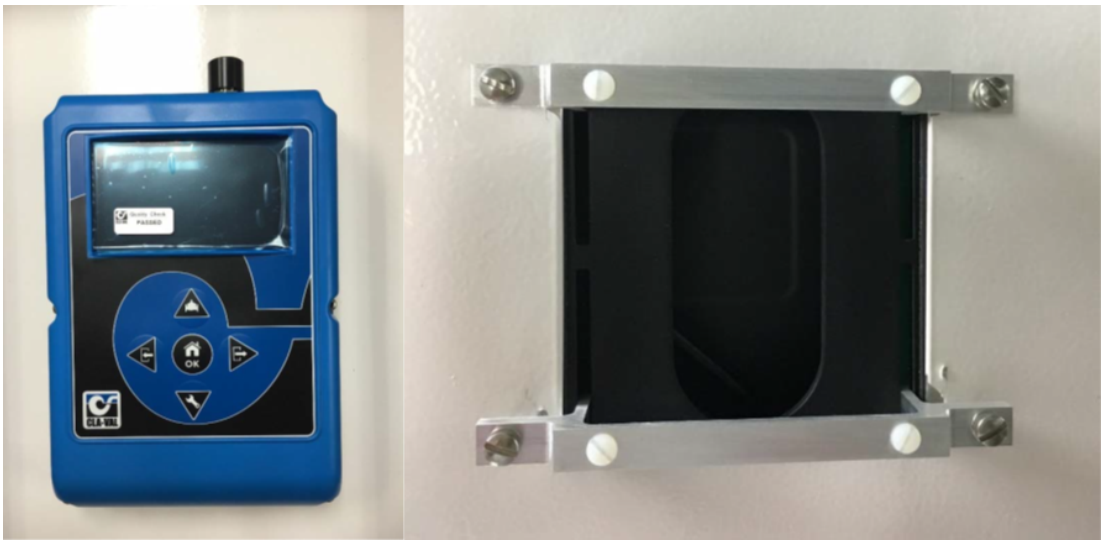


Figure 2.10

If replacing a VC-1, it's also likely the VC-22D must utilize the existing 120 VAC power supply and 120 VAC valve solenoids. If this is the case, an optional AC/DC panel mount power convertor may be purchased from Cla-Val. The power convertor is mounted on the back of the VC-1 conversion clips using the 4x 6-32 plastic screws as shown in **FIGURE 2.11** below. See section 3.3.4 for wiring instructions on the power convertor:

Figure 2.11

3 Electrical Wiring

3.1 Overview

The back plate of the VC-22D contains terminals for connecting a power supply, field IO, and serial communication wires. See **FIGURE 3.1** below to identify the terminals on the back plate:

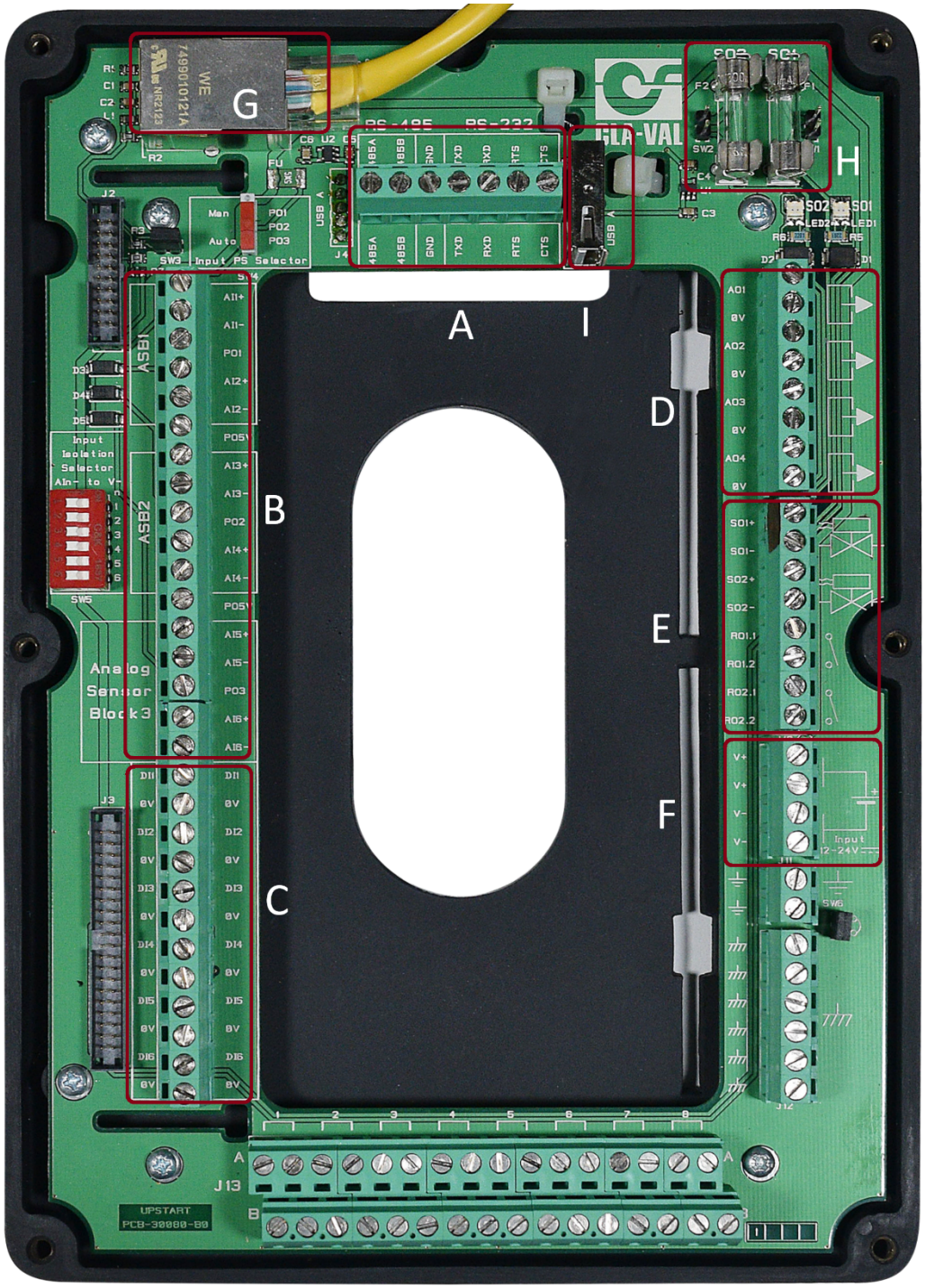


Figure 3.1

A: RS232 and RS485 Modbus terminals

B: 4-20mA analog input terminals

C: Digital input terminals

D: 4-20mA analog output terminals

E: Digital output terminals (2 solid state 24 VDC sourcing outputs for solenoids, 2 dry contact relays)

F: Power supply terminals

G: Ethernet cable port

H: Fuse block for solenoid digital outputs (Fuse rating of 800mA 250V, included in units shipped out with engine 2.8.3 and newer)

I: Internal USB port (included in units shipped out with engine 2.8.3 and newer)

3.2 Power Supply

The VC-22D is designed to be a low power controller. It can be powered from a standard power supply, solar panel, battery, or X143 generator. See **TABLE 3.1** below for the VC-22D's power supply requirements.

Allowed Power Supply Voltage	12-24 VDC
Current Demand	300 mA at 24 VDC (steady state)
Power Demand	36 Watts (maximum)

Table 3.1

The ratings provided in the **TABLE 3.1** do not account for additional demand from analog inputs, digital inputs, analog outputs, and digital outputs. To properly determine the amount of power and current supplied to the VC-22D, the user must add in additional demands from field IO.

As shown in **FIGURE 3.2**, the VC-22D comes with two sets of V+ terminals, V- terminals, and GND terminals. Either terminals may be used to power the unit, and the spare terminals have been included to provide power to an external device if desired.

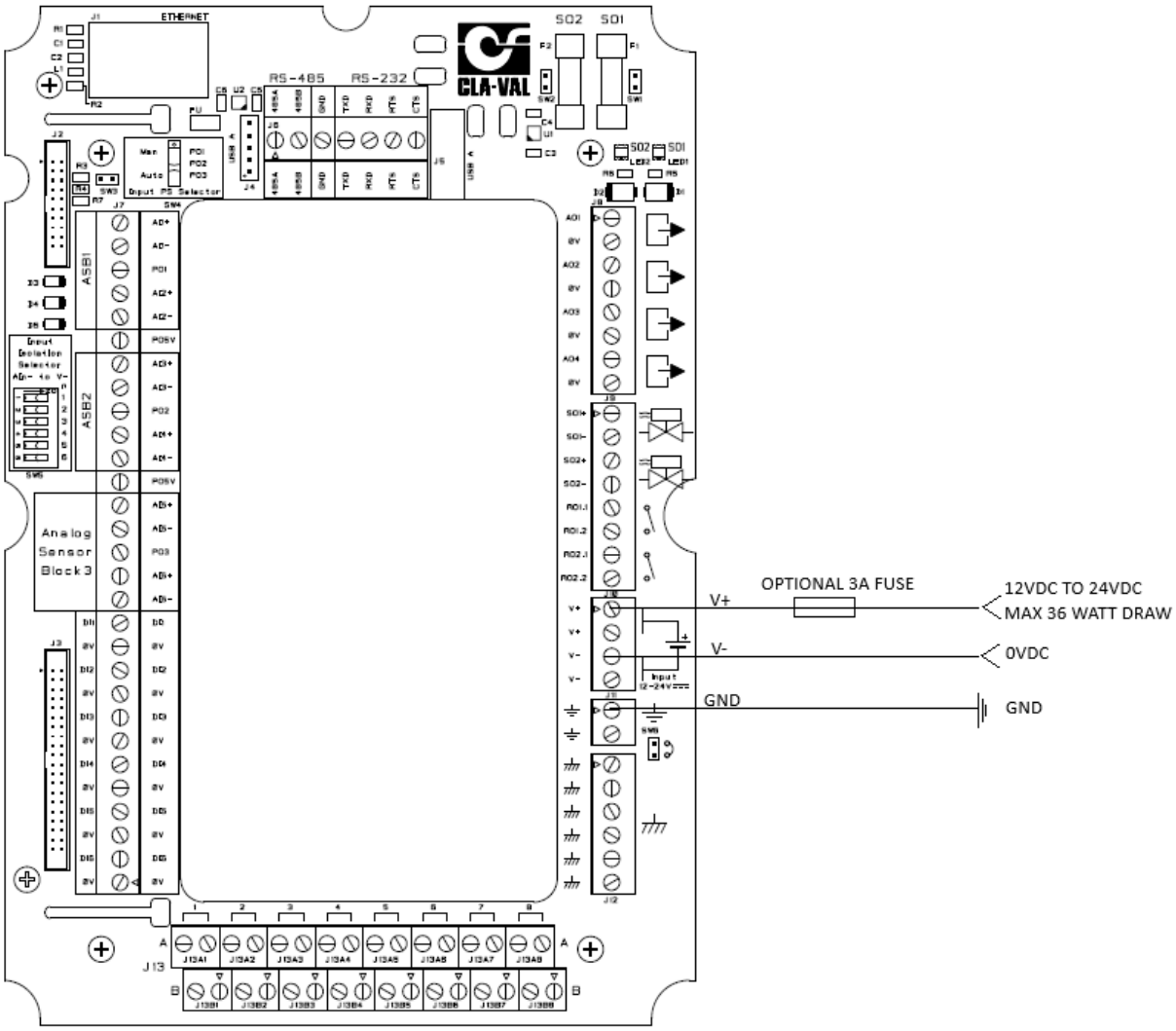


Figure 3.2

3.3 Inputs and Outputs

3.3.1 Analog Inputs

Each analog input can be configured in three different states as described below:

1. Isolated and current sinking
2. Non-isolated and current sinking
3. Non-isolated and current sourcing

Each analog input has a dip switch and three terminals. The dip switch controls whether the analog input is isolated or non-isolated. The terminals used determine whether the input is current sinking or current sourcing.

The VC-22D can work with the vast majority of 4-20mA sensors on the market because of the three configuration options stated above. The VC-22D supports two wire loop powered, two wire field powered, three wire field, and four wire 4-20mA sensors.

The following sections assist with identifying the type of analog sensor being used and how to wire it accordingly.

3.3.1.1 2 Wire - Field Powered

If the analog sensor meets the requirements below, it is a grounded 2 wired field powered sensor:

1. Sensor has two wires.
2. Power supply is in the field.
3. 4-20mA loop is grounded in the field.

The analog input should be configured as isolated and current sinking. **FIGURE 3.3** shows the dip switch position and a wiring diagram for this configuration.

Examples on two wire sensors supplied by Cla-Val which can be field powered:

1. X117D position transmitter.
2. X117C position transmitter.
3. X144/D flow transmitter.
4. X141 PT pressure transmitter.

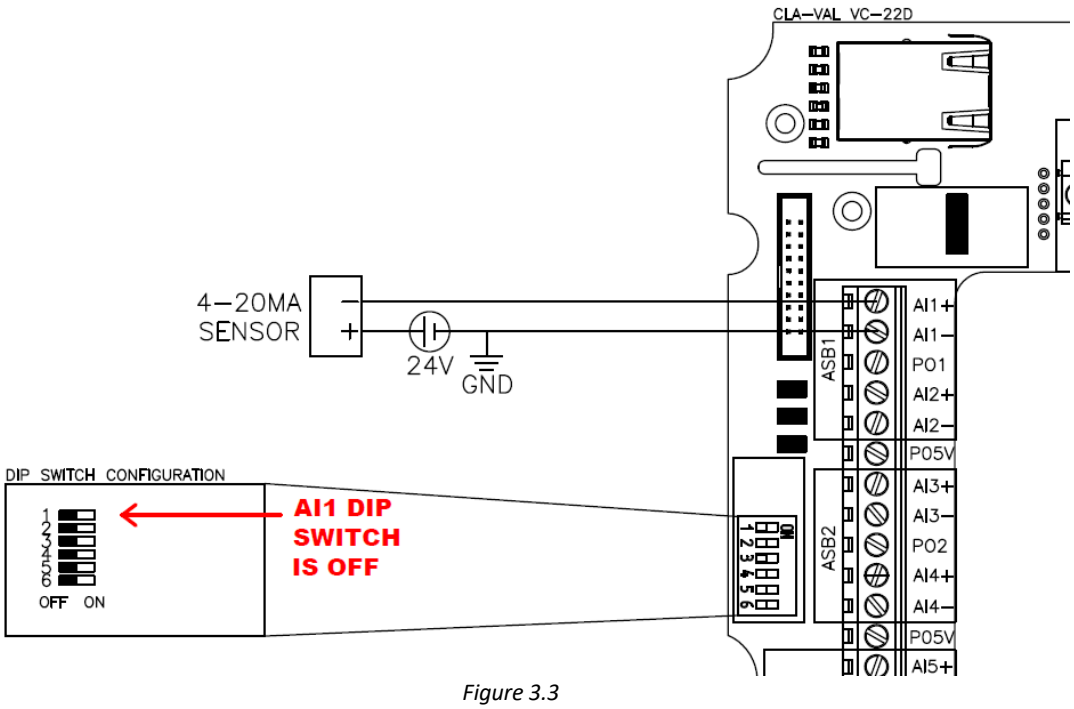


Figure 3.3

If the analog sensor meets the requirements below, it is an ungrounded 2 wired field powered sensor:

1. Sensor has two wires.
2. Power supply is in the field.
3. 4-20mA loop is not grounded in the field

The analog input should be configured as non-isolated and current sinking. **FIGURE 3.4** shows the dip switch position and a wiring diagram for this configuration.

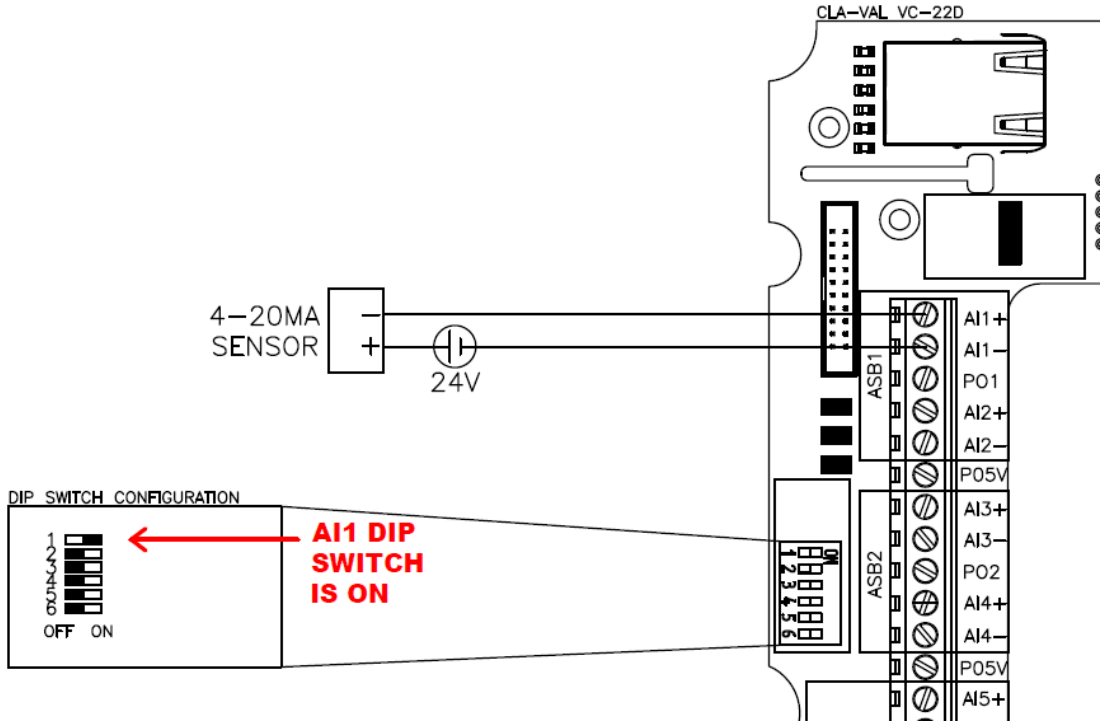


Figure 3.4

3.3.1.2 2 Wire - Loop Powered

If the analog sensor meets the requirements listed below, it is a 2 wired loop powered sensor:

1. Sensor has two wires.
2. Power supply is not in the field.
3. 4-20mA loop is not grounded in the field

The analog input should be configured as non-isolated and current sourcing. **FIGURE 3.5** shows the dip switch position and a wiring diagram for this configuration.

Examples on two wire sensors supplied by Cla-Val which can be loop powered:

1. X117D position transmitter.
2. X117C position transmitter.
3. X144/D flow transmitter.
4. X141 PT pressure transmitter.

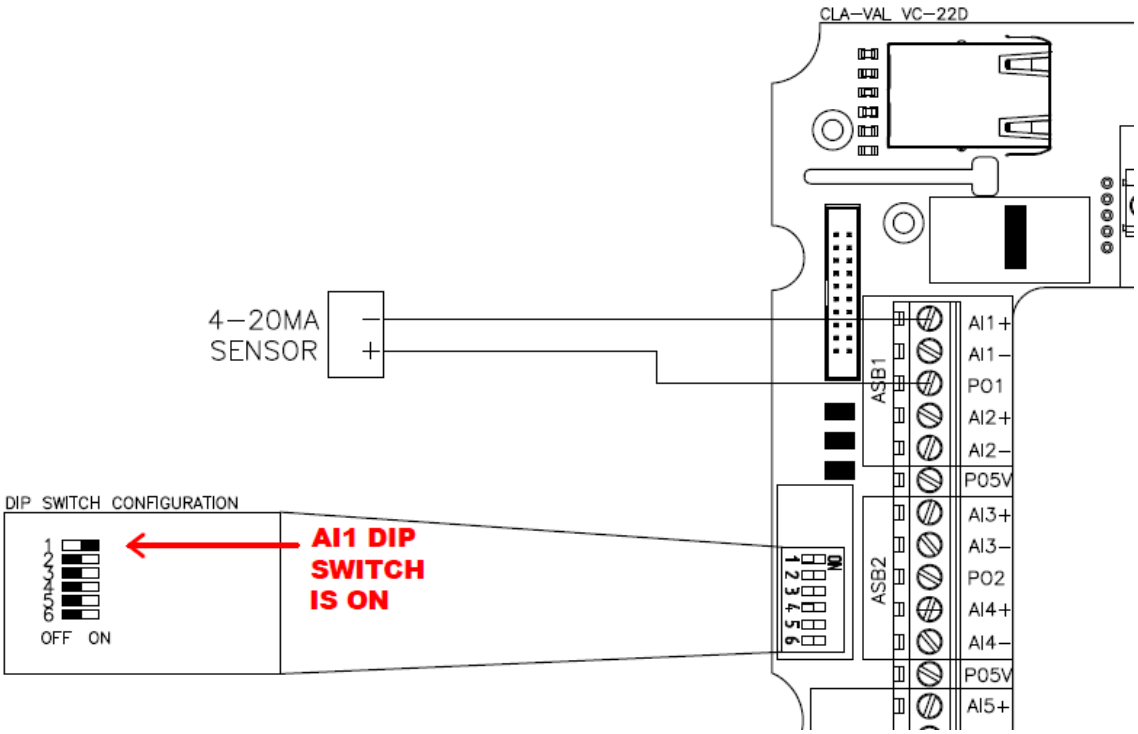


Figure 3.5

3.3.1.3 3 Wire – Loop powered

If the analog sensor meets the requirements listed below, it is a 3 wired loop powered sensor:

1. Sensor has three wires.
2. Power supply is not in the field.
3. 4-20mA loop is not grounded in the field

The analog input should be configured as non-isolated and current sourcing. **FIGURE 3.5** shows the dip switch position and a wiring diagram for this configuration.

Examples on 3 wire sensors supplied by Cla-Val which can be loop powered:

1. X117H Position transmitter.

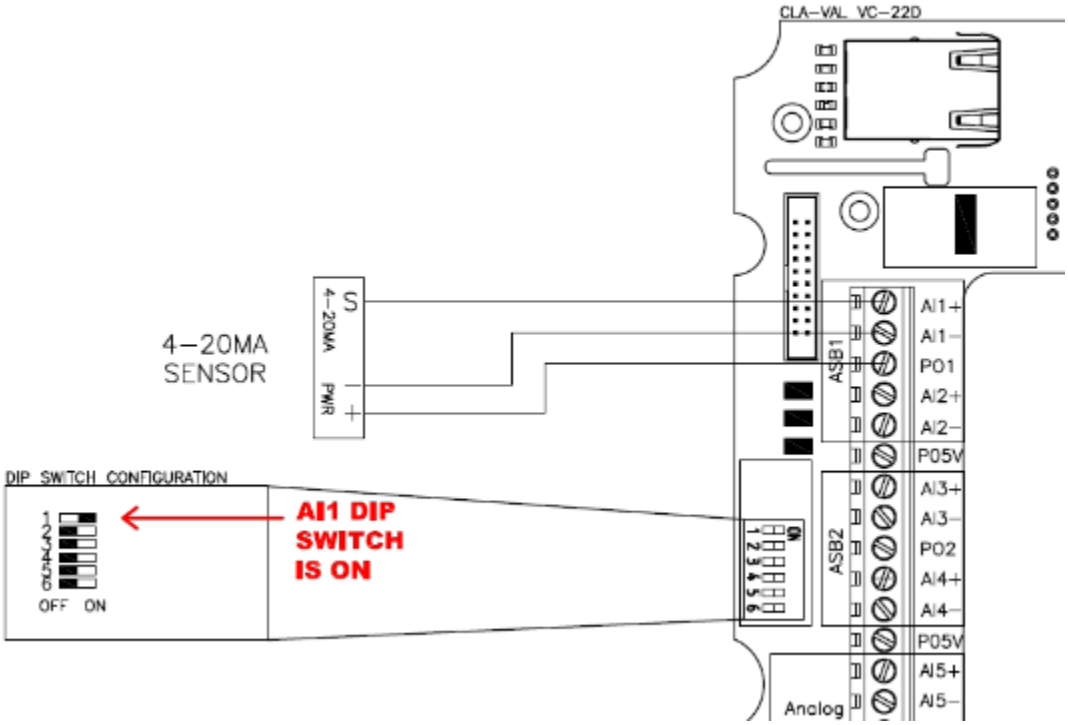


Figure 3.6

3.3.1.4 4 Wire

If the 4-20mA sensor has four wires, then the analog input should be configured as isolated and current sinking. With four wire sensors, the power supply typically exists in the field and the wiring diagram provided in **FIGURE 3.** can be used.

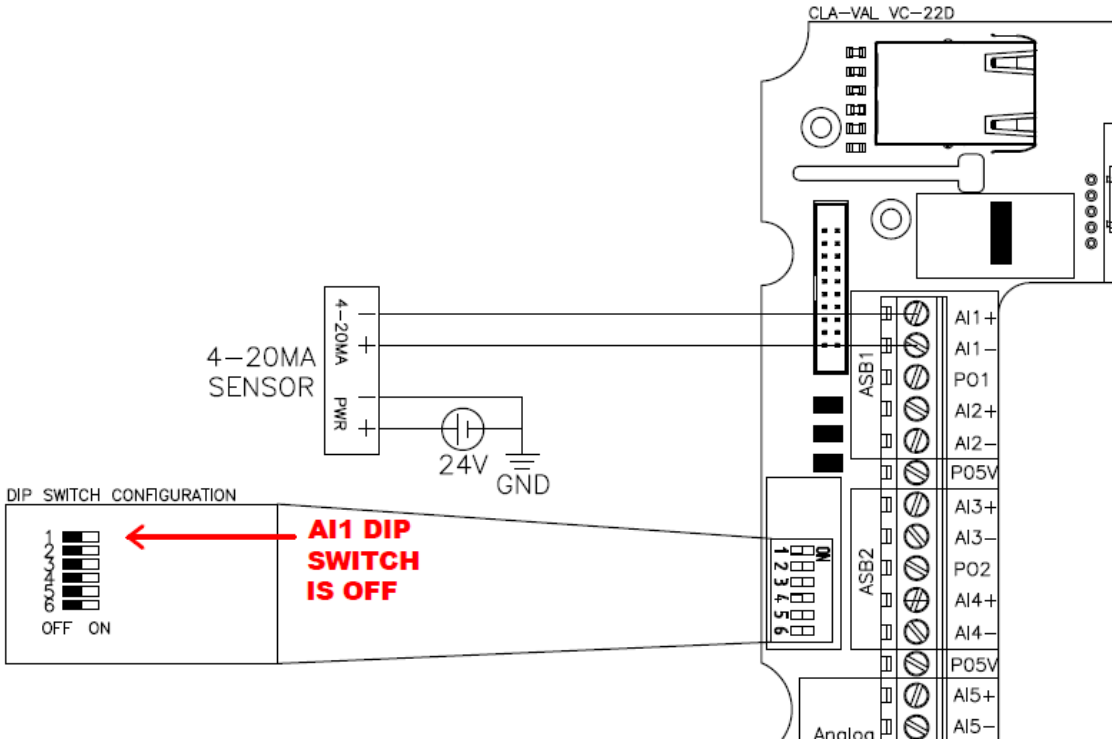


Figure 3.7

Sometimes, the four-wire sensor does not have a field power supply. In that case, the 24 VDC power can be provided by the VC-22D as shown in **FIGURE 3.**.

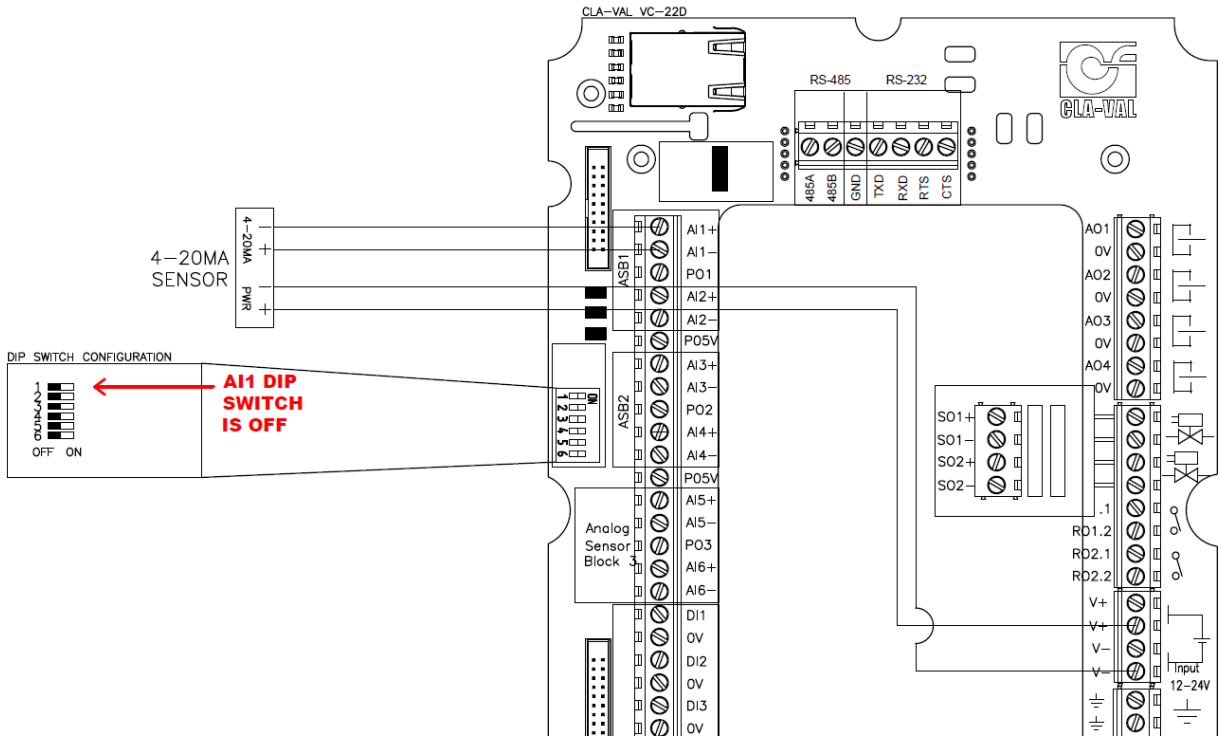


Figure 3.8

3.3.2 Digital Inputs

The digital inputs are non-isolated and current sourcing. They must be connected to a relay (“dry contact”) or NPN transistor. A wiring diagram for a digital input is shown in **FIGURE 3.**.

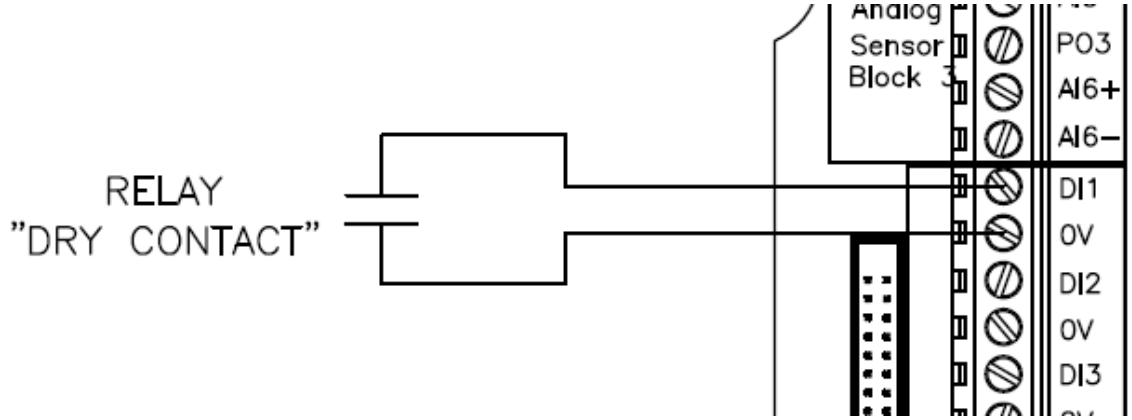


Figure 3.9

3.3.3 Analog Outputs

The analog outputs are non-isolated and current sourcing. They must be connected to an isolated and current sinking input on another device. A wiring diagram for an analog output is shown in **FIGURE 3.**.

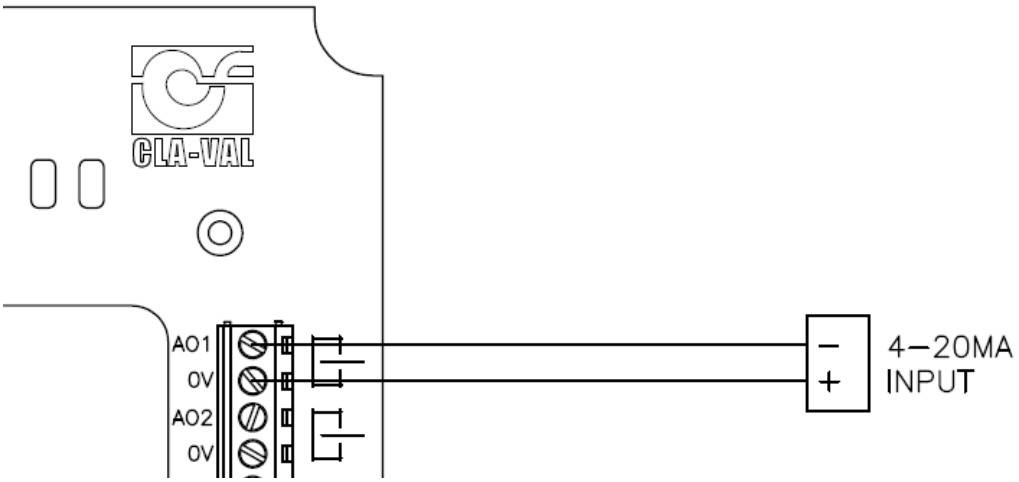


Figure 3.10

3.3.4 Digital Outputs

The VC-22D has solid-state relay and mechanical relay digital outputs. The solid-state relays are non-isolated and 24VDC current sourcing. They have a maximum current output of 1 amp. The mechanical relays are isolated and current sinking. They are rated for 24 VDC or 250 VAC at 6 amps maximum.

The solid-state relays are typically used for 24 VDC solenoids, and the mechanical relays are used for sending discrete output signals to other controllers. See **FIGURE 3.** wiring diagrams below digital outputs.

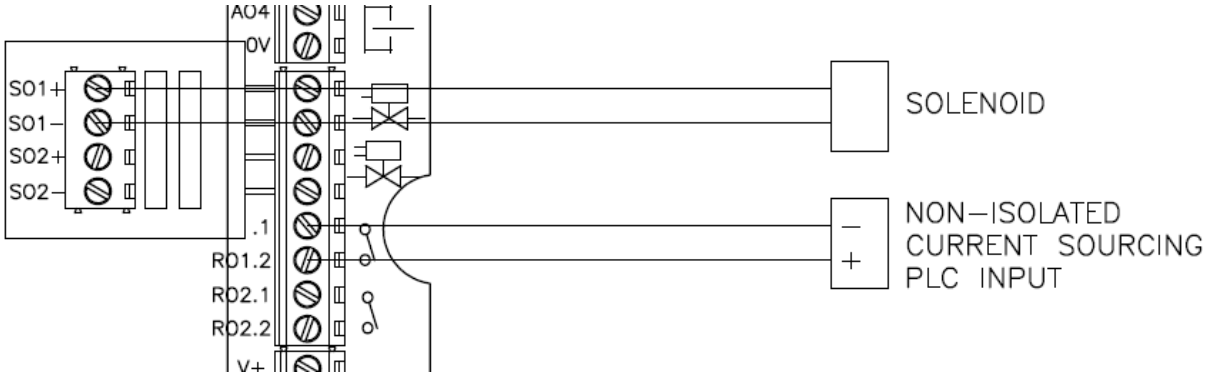


Figure 3.11

3.3.5 Cla-Val Power Converter

3.3.5.1 Standard EPC Module

If AC solenoids are used, then an AC/DC converter must be used, and the fuse block should be removed. Cla-Val recommends our EPC module (sold separately) for AC/DC conversion. The EPC module shown in **FIGURE 3.8** does not utilize mechanical relays which extends its service life much longer than "ice cube" relays which are commonly used for AC/DC conversion. Cla-Val offers two EPC modules, our standard module, and a panel mount module. The standard EPC module is wired as shown in **FIGURE 3.8, FIGURE 3.8**

Figure 3.6

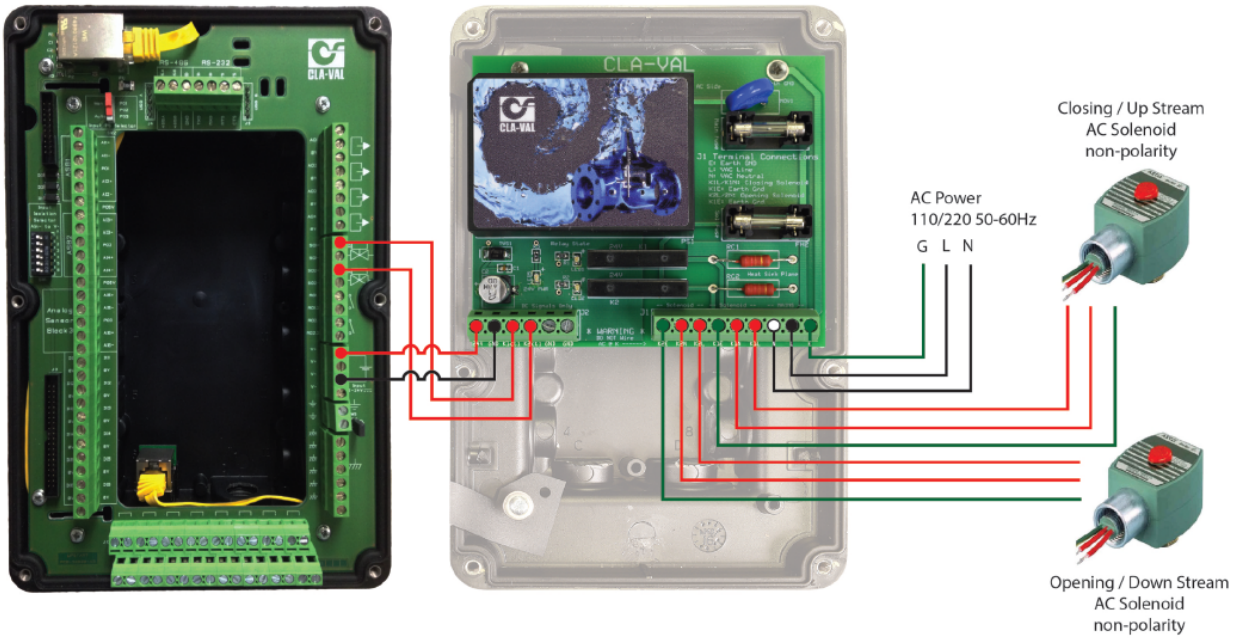


Figure 3.7

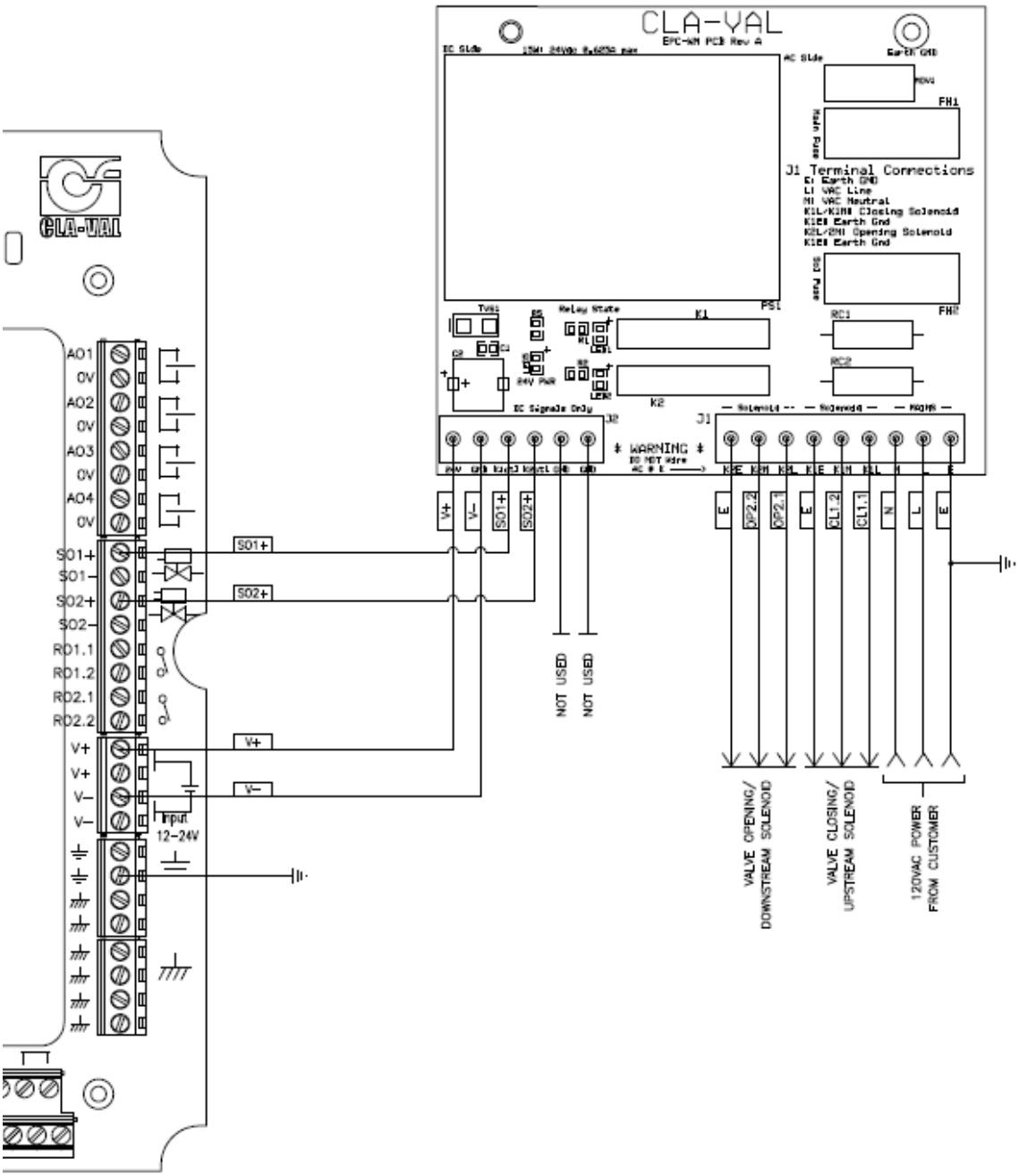

CLA-VAL
EPC-4M PCB Rev A
J1 Terminal Connections
WARNING
AO1
0V
AO2
0V
AO3
0V
AO4
0V
SO1+
SO1-
SO2+
SO2-
RO1.1
RO1.2
RO2.1
RO2.2
V+
V+
V-
V-
Input
12-24V
SO1+
SO2+
V+
V-
NOT USED
NOT USED
VALVE OPENING/
DOWNSTREAM SOLENOID
VALVE CLOSING/
UPSTREAM SOLENOID
120VAC POWER
FROM CUSTOMER

Figure 3.8

3.3.5.2 Panel Mount EPC Module

The panel mount EPC shown in **FIGURE 3.10** module is wired as shown in **FIGURE 3.10**, **FIGURE 3.10**

Figure 3.9

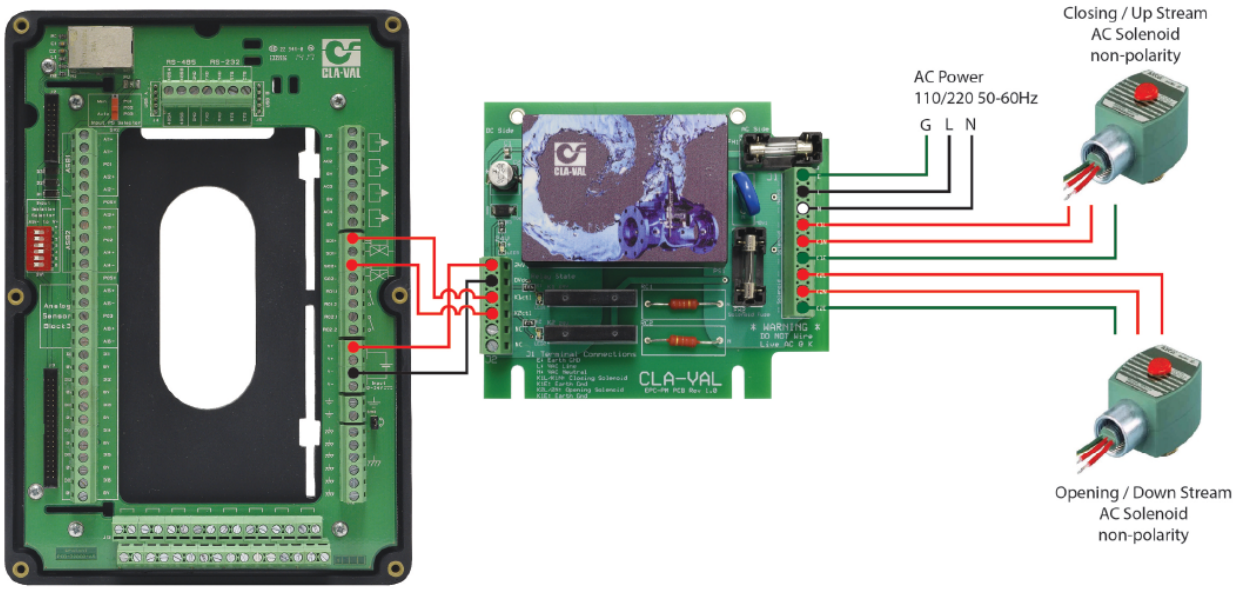


Figure 3.16

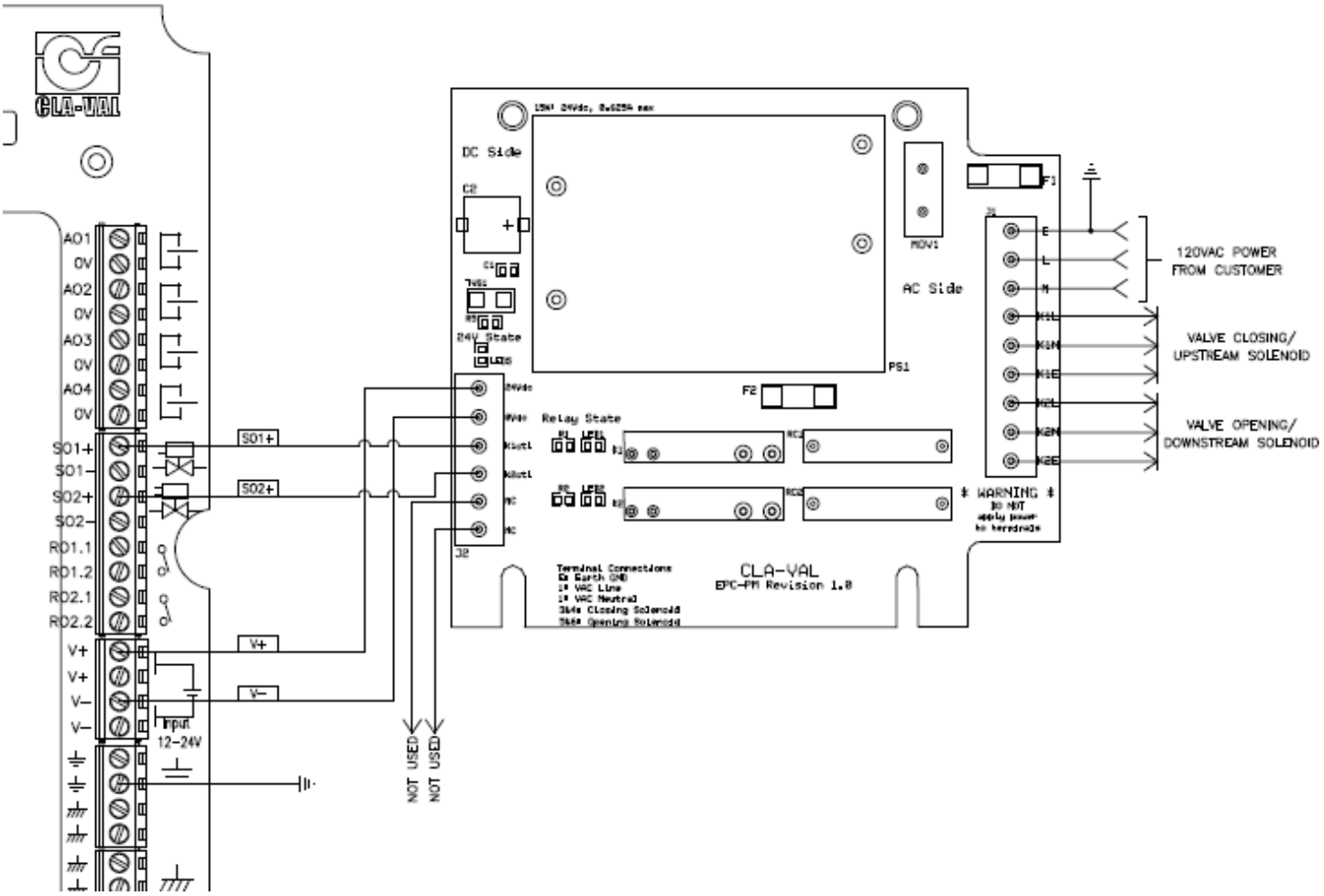

AO1
0V
AO2
0V
AO3
0V
AO4
0V
SO1+
SO1-
SO2+
SO2-
RO1.1
RO1.2
RO2.1
RO2.2
V+
V+
V-
V-
Input
12-24V
SO1+
SO2+
V+
V-
NOT USED
NOT USED
DC Side
AC Side
MOV1
F1
F2
PS1
24V State
Relay State
J2
J1
E
L
N
K1L
K1N
K1E
K2L
K2N
K2E
120VAC POWER
FROM CUSTOMER
VALVE CLOSING/
UPSTREAM SOLENOID
VALVE OPENING/
DOWNSTREAM SOLENOID
* WARNING *
CLA-VAL
EPC-PM Revision 1.0

Figure 3.10

4 Screen Navigation

4.1 Home Screen

The home screen includes a combination of graphics, text, and numeric displays providing pertinent process information for monitoring/operating a Cla-Val electronic valve. The home screen is customized for each ValvApp, but in general will include a Cla-Val valve graphic, simplified pilot system graphic, and numeric display for each input/output. An example home screen from the 131-Flow-Mag-V2.0 ValvApp is shown in **FIGURE 4.1**:

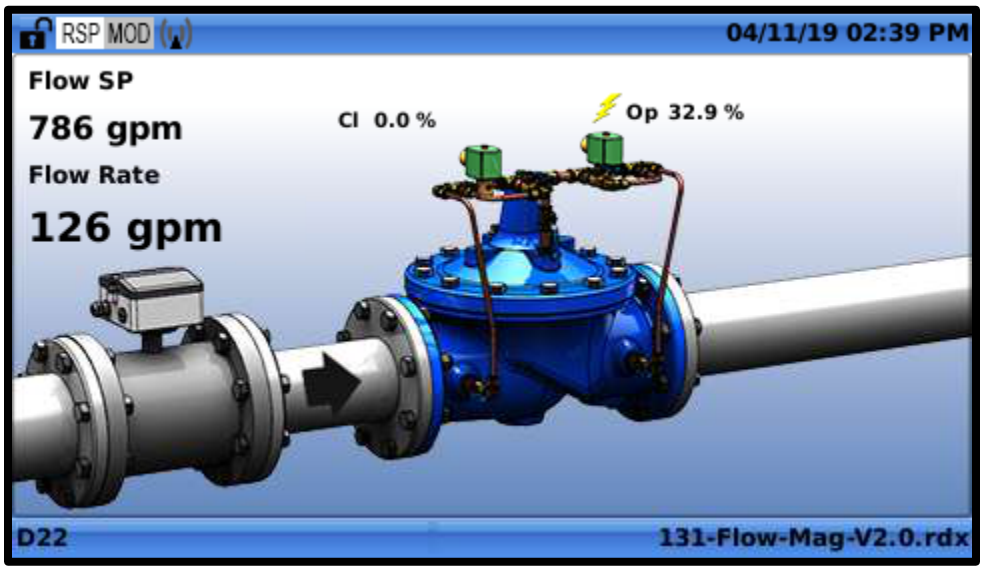


Figure 4.1

When the VC-22D unit is powered on and the boot sequence is completed, the home screen is displayed. The home screen is the starting point to navigate to all other screens.

Various color standards are used and the home screen, and those color standards are described below:

1. **Black** text is used to display inputs, outputs, and variable values that are within normal limits and have no overrides applied.

Figure 4.2

2. **Green** text is used to represent a value that has been assigned as a local set point (LSP) per section 8.1.2.

Figure 4.3

3. **Blue** text is used to represent a value that has been manually overridden per section 8.2 and 8.3.

Figure 4.4

4. **Red** text shows an analog input that is outside of the allowed range (below minimum or above maximum). See section 6.2.9.5 for more information.

Figure 4.5

5. **Orange** text shows a value that is being overridden by an action per section 6.2.5.

Figure 4.6

6. **Grey** text shows a value that is being overridden via Modbus per section 9.

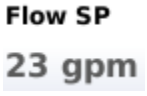


Figure 4.7

Various icons are used on the home screen and title bar. Their meaning is defined below:

1.  - Indicates that the user is logged in and screen protection is disabled
2.  - Indicates that an LSP is applied to a setpoint per section 8.1.2
3.  - Indicates that all inputs are in RSP mode per section 8.1.2
4.  - Indicates action 1 is enabled but not triggered
5.  - Indicates action 1 is enabled and triggered
6.  - Indicates voltage is currently being output to a solenoid

4.2 Navigation Buttons

The VC-22D has five buttons on the faceplate which are used to perform all navigation functions. Their names are shown in **FIGURE 4.8** below:

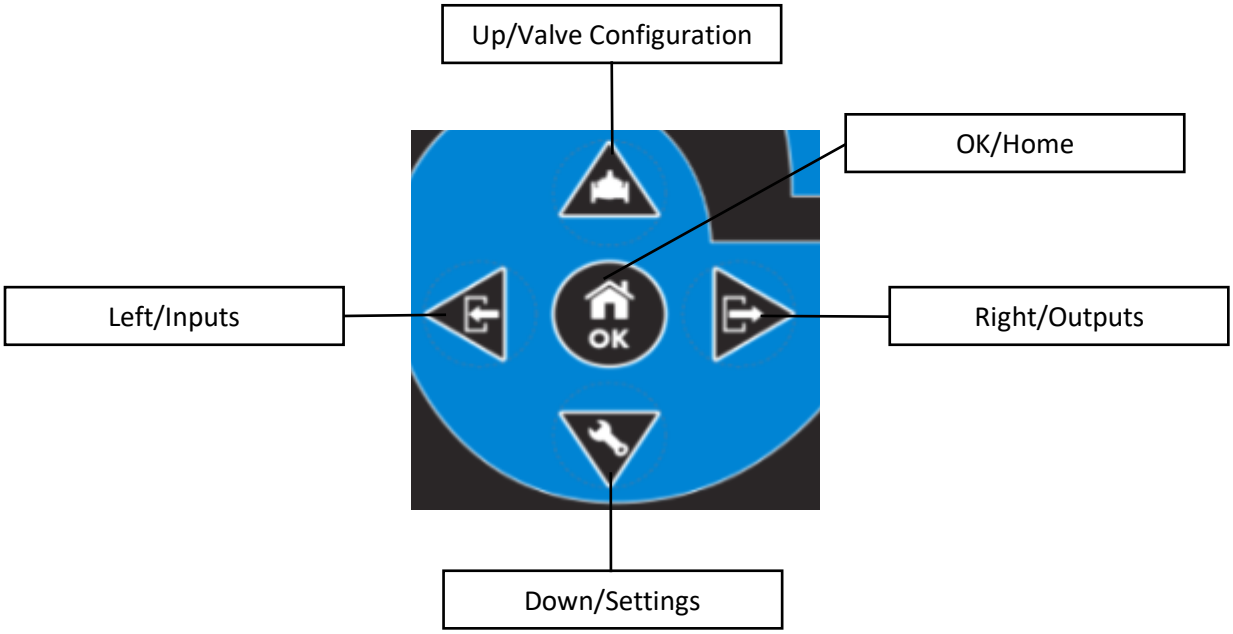


Figure 4.8

There are two types of button clicks, a short click and a long click. To issue a short click, press the button momentarily for less than 1 second. To issue a long click, press and hold the button for more than 1 second. Throughout the remainder of this manual, assume all button presses are short clicks unless otherwise stated. The graphics shown in **FIGURE 4.9** will be used to indicate short and long clicks in images:

Short Click Long Click

Figure 4.9

4.3 Screen Map

This section provides a map depicting how each screen in the VC-22D is accessed. The details of each screen's function are defined in subsequent sections. The map is split into multiple segments to reduce complexity (see **FIGURE 4.10** and **FIGURE 4.11**). The following paragraph describes how the map should be interpreted, and additional examples for clarity are provided at the end of the section.

The map uses dark blue rectangles to represent screens. Each screen's navigation icons are listed underneath the screen and are drawn as white or light blue rectangles. A line connecting two screens indicates that users can navigate from one screen to the other. The button in the middle of the line indicates what must be pressed to navigate to the connected screen.

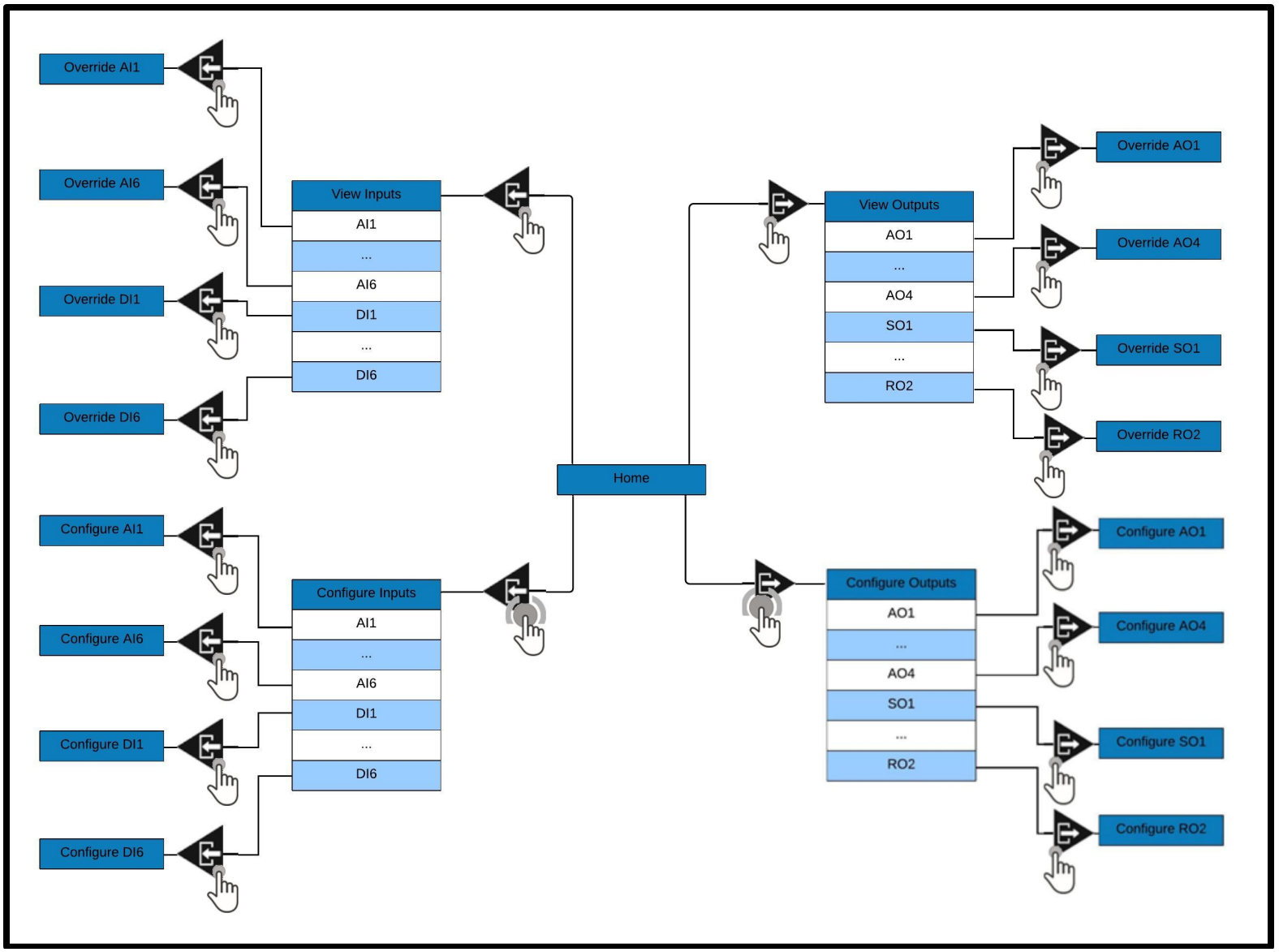

Override AI1
Override AI6
Override DI1
Override DI6
View Inputs
AI1
...
AI6
DI1
...
DI6
Configure AI1
Configure AI6
Configure DI1
Configure DI6
Configure Inputs
AI1
...
AI6
DI1
...
DI6
Home
View Outputs
AO1
...
AO4
SO1
...
RO2
Configure Outputs
AO1
...
AO4
SO1
...
RO2
Override AO1
Override AO4
Override SO1
Override RO2
Configure AO1
Configure AO4
Configure SO1
Configure RO2

Figure 4.10

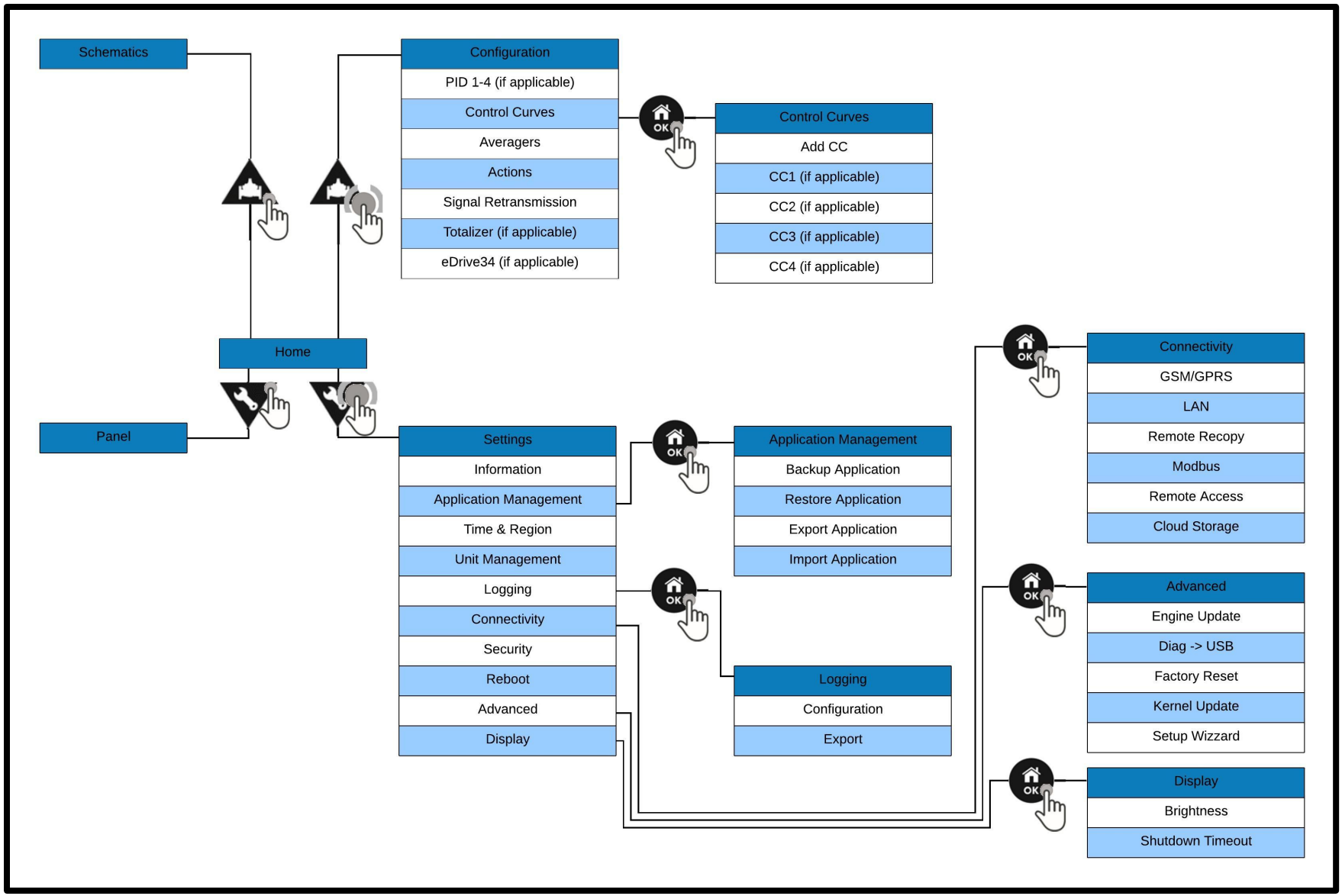

Schematics
Configuration
PID 1-4 (if applicable)
Control Curves
Averagers
Actions
Signal Retransmission
Totalizer (if applicable)
eDrive34 (if applicable)
Control Curves
Add CC
CC1 (if applicable)
CC2 (if applicable)
CC3 (if applicable)
CC4 (if applicable)
Home
Panel
Settings
Information
Application Management
Time & Region
Unit Management
Logging
Connectivity
Security
Reboot
Advanced
Display
Application Management
Backup Application
Restore Application
Export Application
Import Application
Logging
Configuration
Export
Connectivity
GSM/GPRS
LAN
Remote Recopy
Modbus
Remote Access
Cloud Storage
Advanced
Engine Update
Diag -> USB
Factory Reset
Kernel Update
Setup Wizzard
Display
Brightness
Shutdown Timeout

Figure 4.11

4.3.1 Navigation Examples

Below are some quick examples showing how to navigate to different screens using the screen maps from **FIGURE 4.10** and **FIGURE 4.11**. Compare the examples to the screen maps to understand **FIGURE 4.10** and **FIGURE 4.11** better.

4.3.1.1 Override AI2

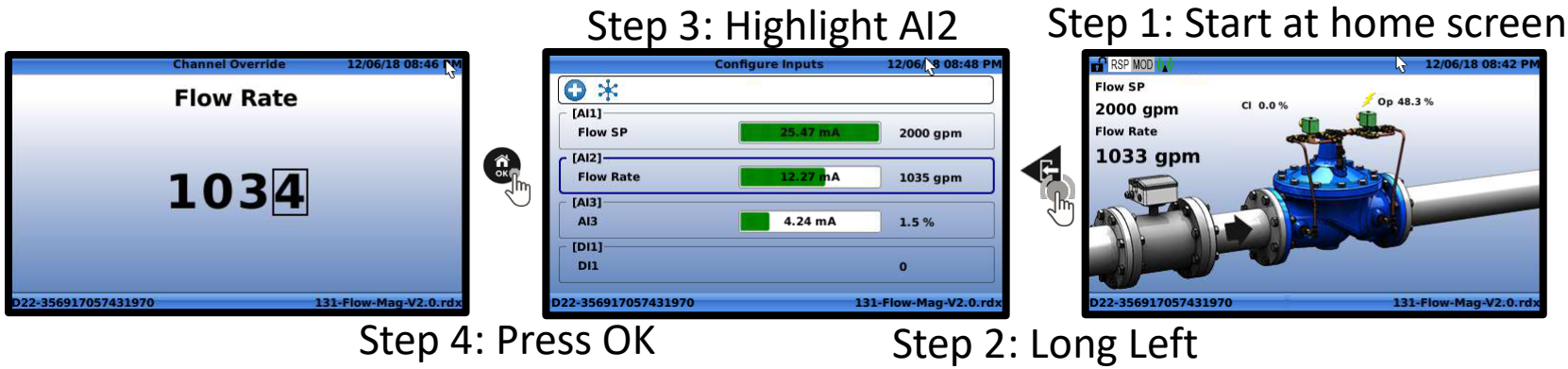


Figure 4.12

4.3.1.2 *Import Application*

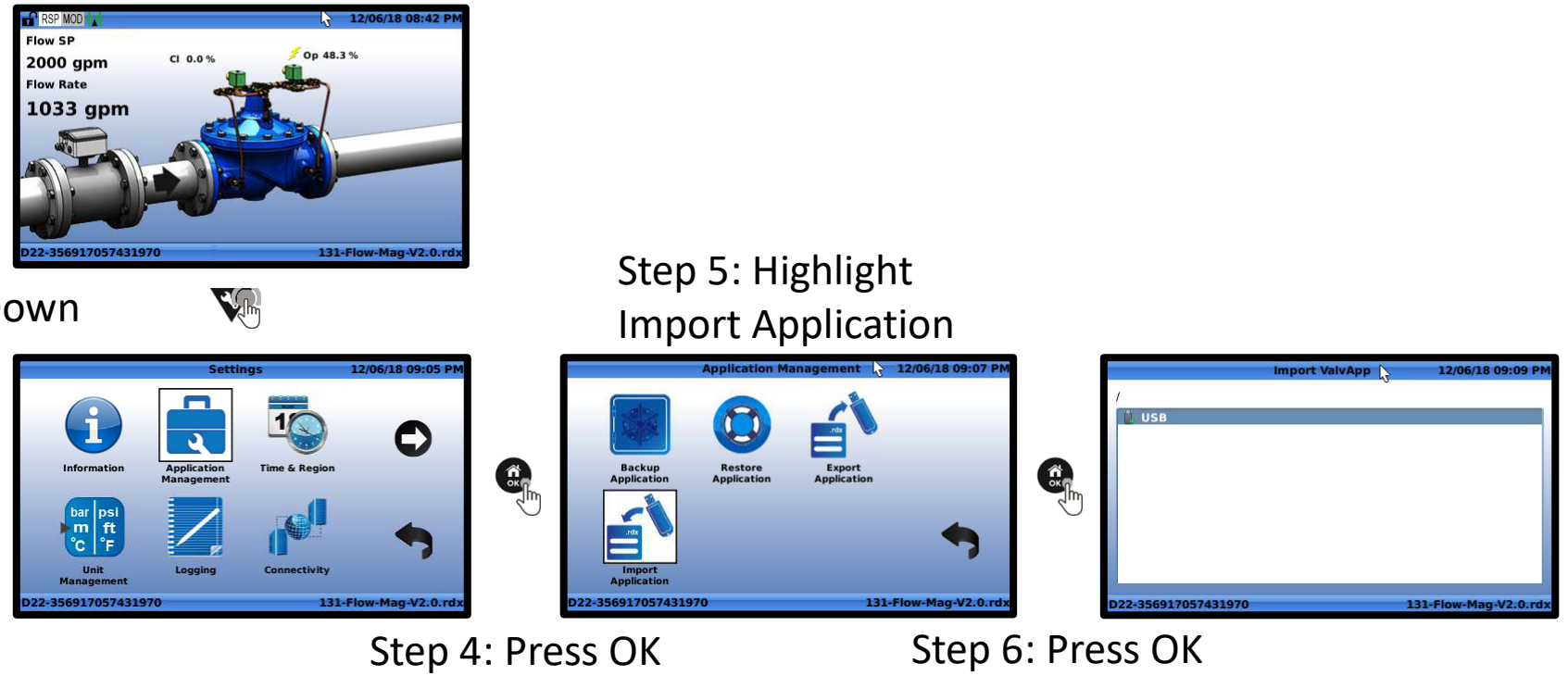


Figure 4.13

4.4 Basics

4.4.1 Go Home

To return to the home screen at any point, perform a long “OK” click. This is referred to as “going home”.

4.4.2 Numeric Entry

Numeric entry fields allow the user to input a numeric value using the navigation keypad. To use a numeric entry field, follow the instructions below:

1. Use the “Up” and “Down” buttons to highlight a numeric entry field on a screen. When the field is highlighted, the background will turn from white to light blue as shown in **FIGURE 4.14**:

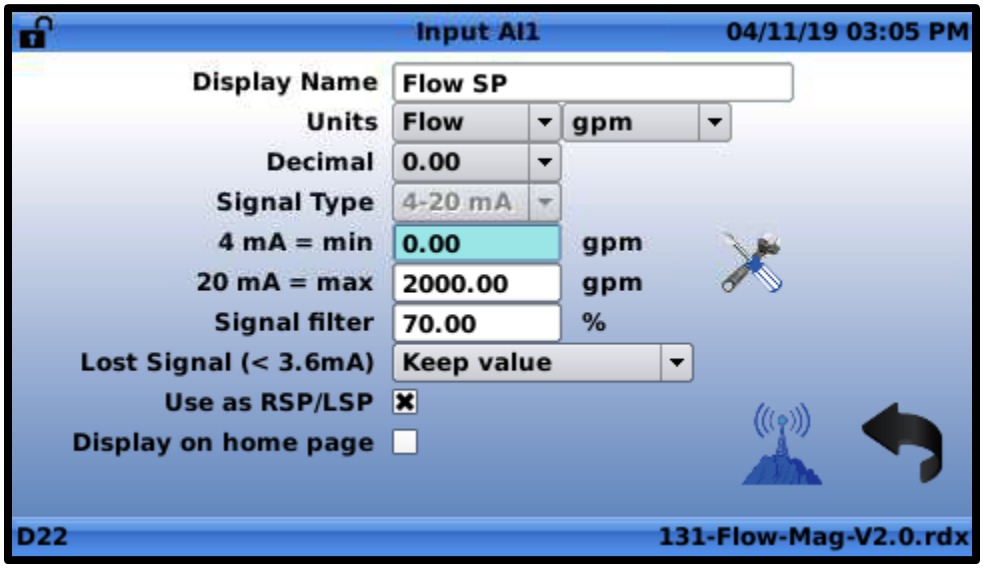


Figure 4.14

2. Press the “OK” button to begin numeric entry. The background will turn red as shown in **FIGURE 4.15**:

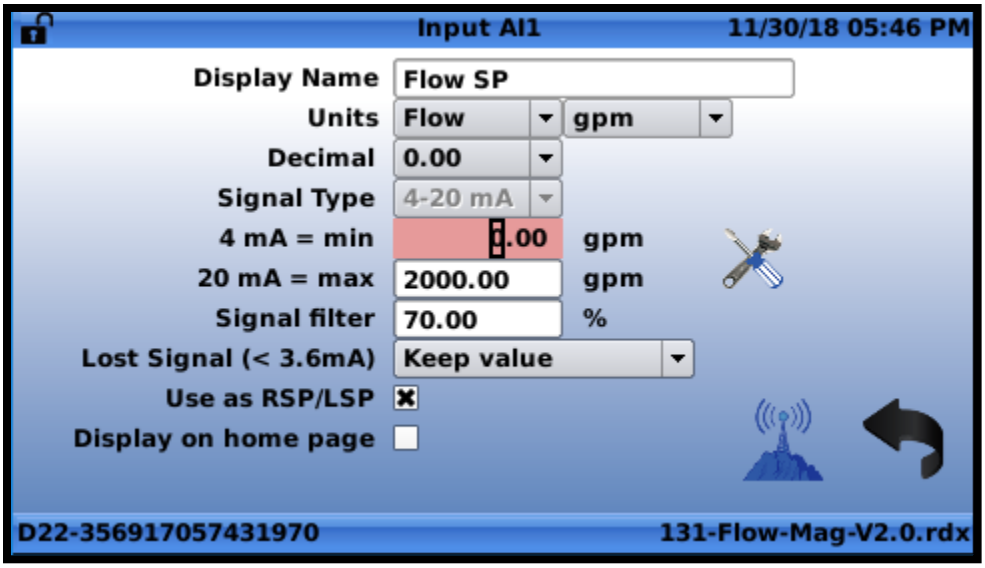


Figure 4.15

3. Use the "Up" and "Down" buttons to increase or decrease the selected digit as shown in **FIGURE 4.16**:

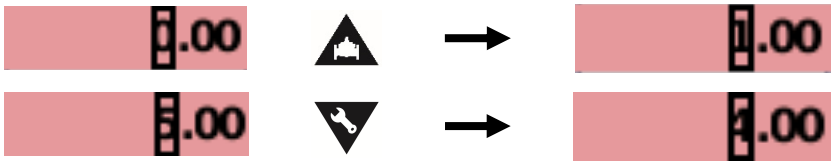


Figure 4.16

4. Use the "Left" and "Right" buttons to select a different digit as shown in **FIGURE 4.17:**

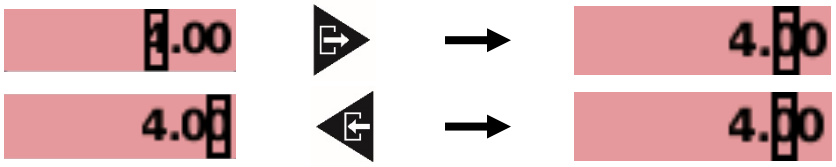


Figure 4.17

5. To add additional digits to the left, use the "Left" button as shown in **FIGURE 4.18**:

Figure 4.18

6. To accept changes, press the "OK" button.

4.4.3 Alpha Numeric Entry

Alpha numeric entry fields allow the user to input text containing letters and numbers using the navigation keypad. To use an alpha numeric entry field, follow the instructions below:

1. Use the “Up” and “Down” buttons to highlight an alpha numeric entry field. When the field is highlighted, the background color will turn from white to light blue as shown in **FIGURE 4.19**:

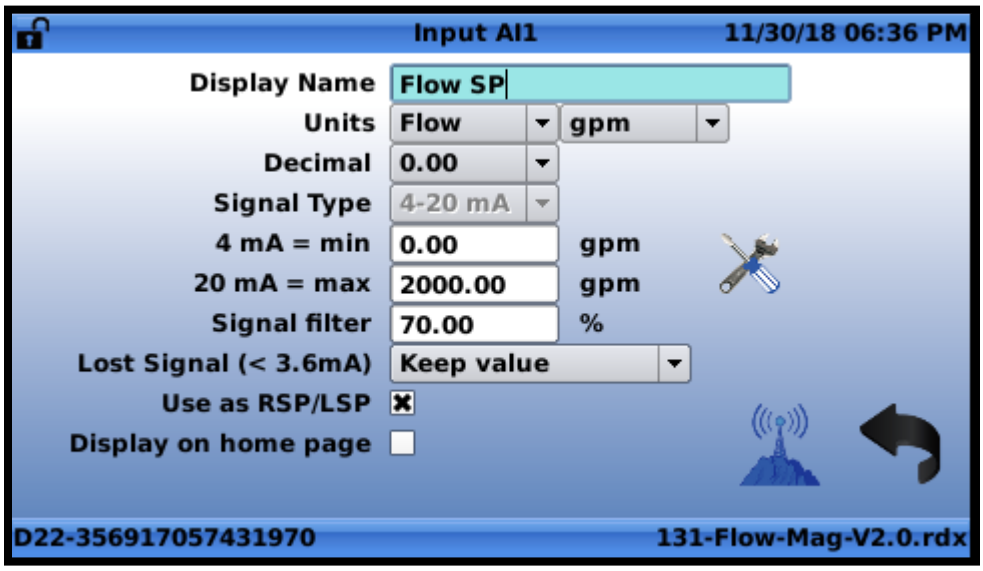


Figure 4.19

2. Press the “OK” button, and a screen keyboard will be displayed as shown in **FIGURE 4.20**:

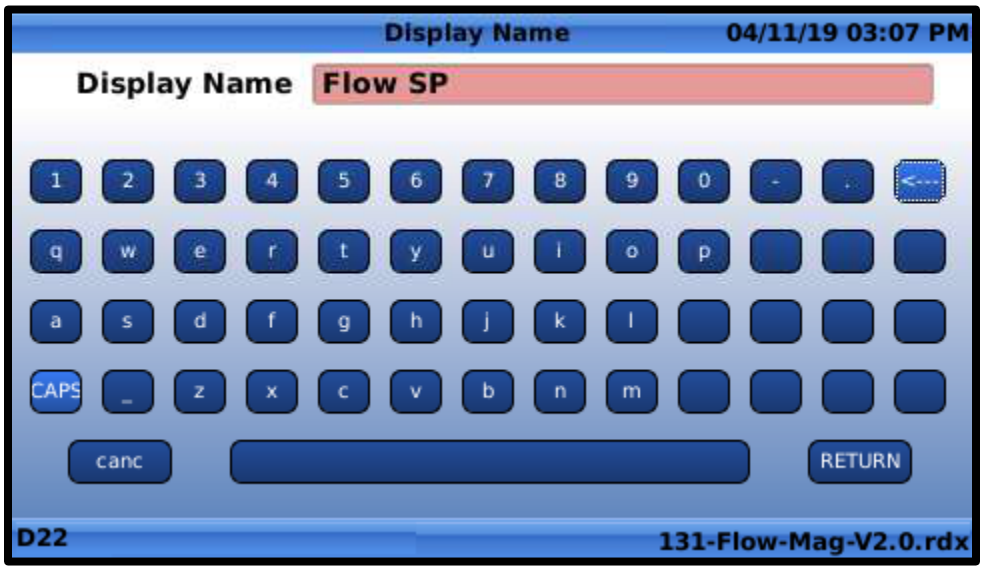


Figure 4.20

3. Use the “Up”, “Down”, “Left”, and “Right” navigation arrows to highlight individual characters on the keyboard. Once the desired character has been highlighted, press the “OK” button to add the letter to the end of the text.
4. To delete the character at the end of the text, highlight the “backspace”  button and press “OK”.

5. To switch between lower case and upper case, highlight the “CAPS” button and press “OK”. When “CAPS” is active, the button text becomes red and alpha characters become CAPITALIZED as shown in **FIGURE 4.21:**

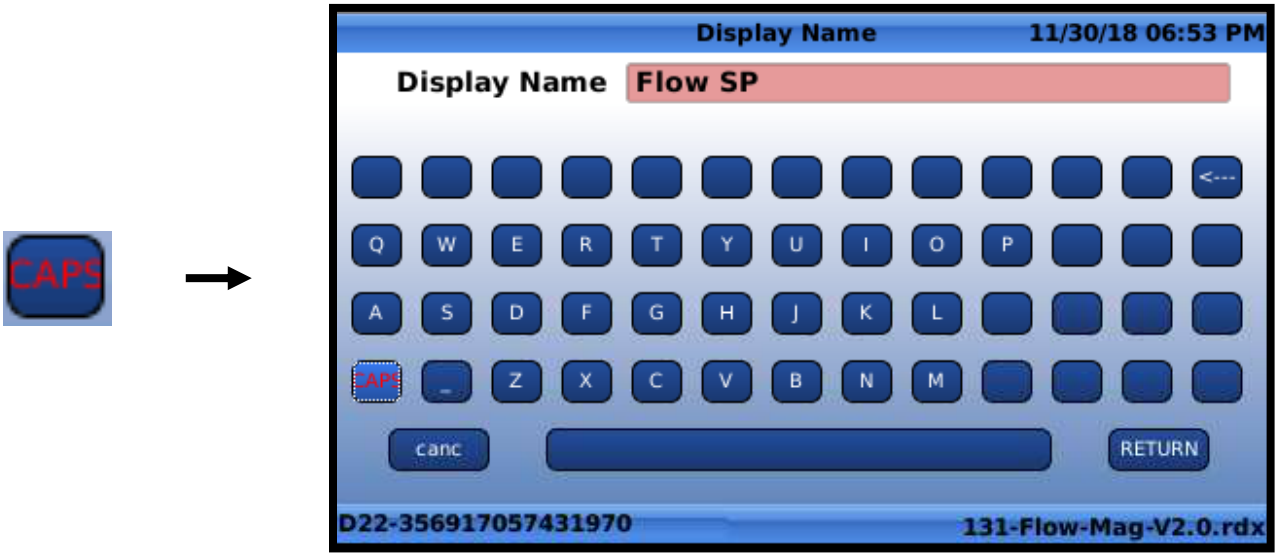


Figure 4.21

6. To accept the text changes that have been entered, highlight the “RETURN” 

button and press “OK”. Alternatively, a long click on the “OK” button will accept the text.
7. To cancel text changes that have been entered, highlight the “CANCEL” 

button and press “OK”.

4.4.4 Drop Down Selection

Drop down fields allow the user to select one item from a list. To operate a drop down field, follow the instructions below:

1. Use the “Up” and “Down” buttons to highlight a drop down field. When the field is highlighted, the background color will turn from light gray to light blue as shown in **FIGURE 4.22:**

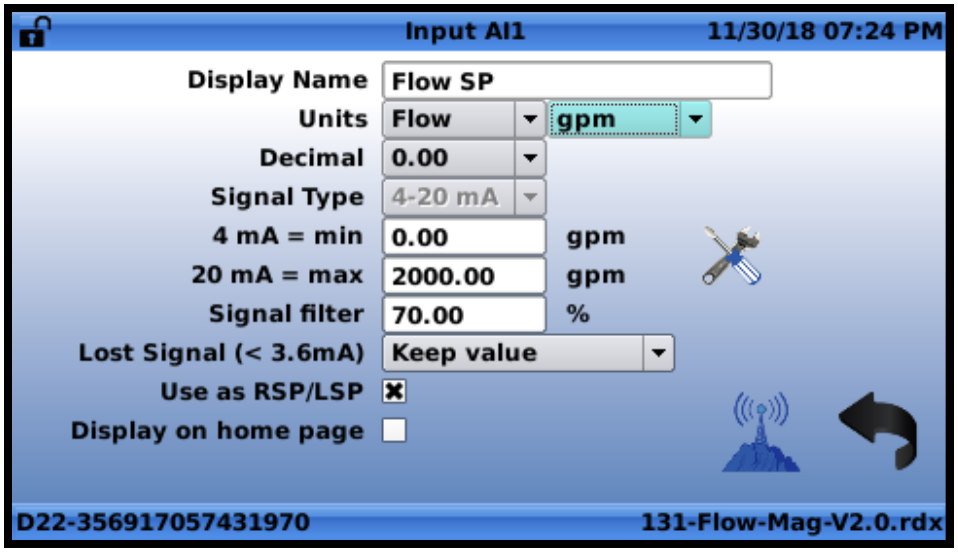


Figure 4.22

2. Press the "OK" button to change the dropdown value. The background will turn red as shown in **FIGURE 4.23**:

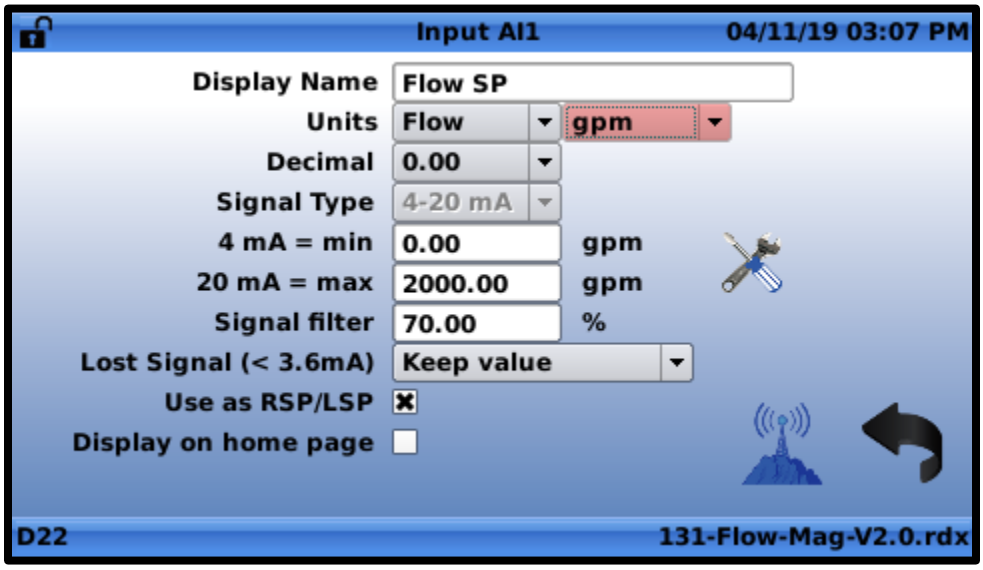


Figure 4.23

3. Use the "Up" and "Down" arrows to navigate up and down the list items as depicted by **FIGURE 4.24**:

Figure 4.24

4. To accept the selection, press the “OK” button. To cancel the selection, long click the “OK” button which will escape to the home screen without storing the change.

4.4.5 Go Back

Configuration pages have a “back arrow” that will take the user back to the previous screen. To use the back arrow, highlight it using the “up” and “down” buttons and then press “OK” per **FIGURE 4.25**.

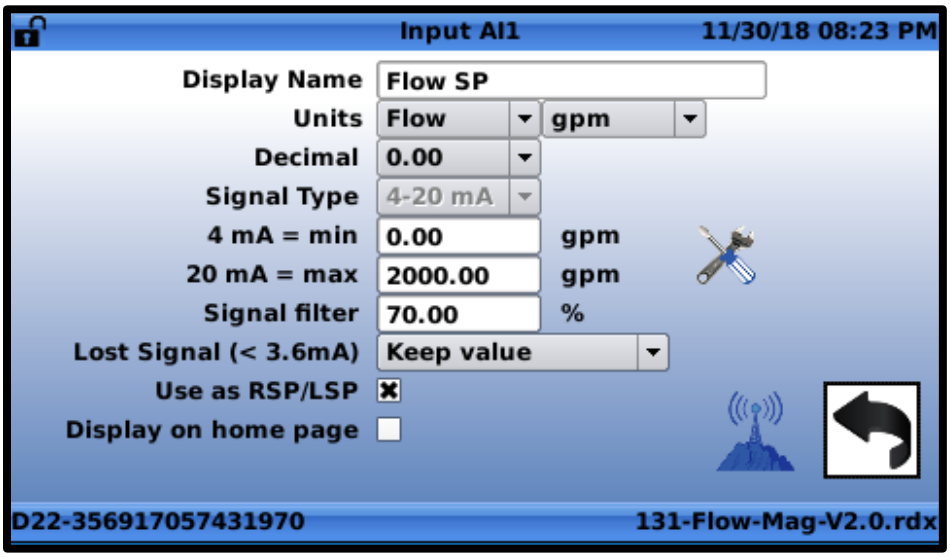


Figure 4.25

4.4.6 File Explorer

The VC-22D has a file explorer that’s used when saving/opening files. The first screen of the file explorer is shown in **FIGURE 4.26** and allows the user to select which storage device to navigate, USB or the FTP.

Figure 4.26

To navigate into a storage device, highlight the storage device and press the right arrow button. A screen displaying the folder structure on the storage device will be opened as shown in **FIGURE 4.27**.

Figure 4.27

To navigate into a folder, highlight the folder and press the right arrow button. A screen showing the contained folders and files will be displayed as shown in **FIGURE 4.28**.

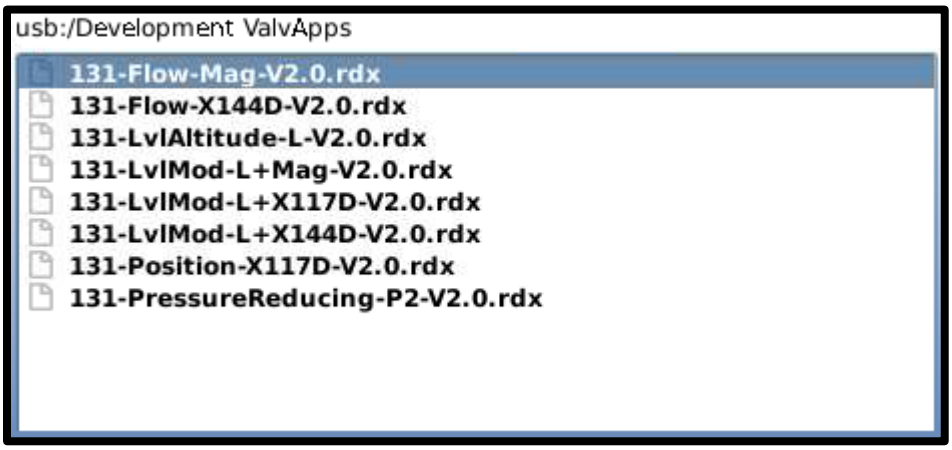


Figure 4.28

Highlight the desired file to open, or if saving, highlight any file. Press the OK button.

5 Initial Power Up

To prepare the VC-22D for use on a particular Cla-Valve application, the user must perform some initial startup steps after powering on a VC-22D for the first time.

5.1 Select a ValvApp

The VC-22D requires a program to control a Cla-Val valve, and this program is called a ValvApp. The VC-22D comes pre-loaded with a standard library of ValvApps. Standard ValvApps are intended to handle typical straightforward Cla-Val valve applications. Appendix A includes a list and description of all standard ValvApps provided in North American VC-22Ds. Review Appendix A and select a ValvApp that fits the needs of your Cla-Valve application. If your Cla-Valve application isn't covered by a standard ValvApp, contact your regional salesman. The Cla-Val factory will work with you to develop a custom ValvApp that fits your needs.

5.2 Loading a ValvApp

5.2.1 Loading a Standard ValveApp

After selecting a ValvApp from the standard library or obtaining a custom ValvApp from the Cla-Val factory, the ValvApp must be loaded into the VC-22D.

To load the ValvApp, follow the procedure below:

1. Power on the VC-22D for the first time and wait for the screen shown in **FIGURE 5.1** to appear.

Figure 5.1

1. If a standard ValvApp will be used, do the following:
    a. Press “left” to load a ValvApp from the built-in library. Wait for the next screen and highlight “North America” as shown in **FIGURE 5.2**. Press “OK”.

Figure 5.2

b. Highlight the desired valve series (131 Series Apps for example) and press “OK” as shown in **FIGURE 5.3**.

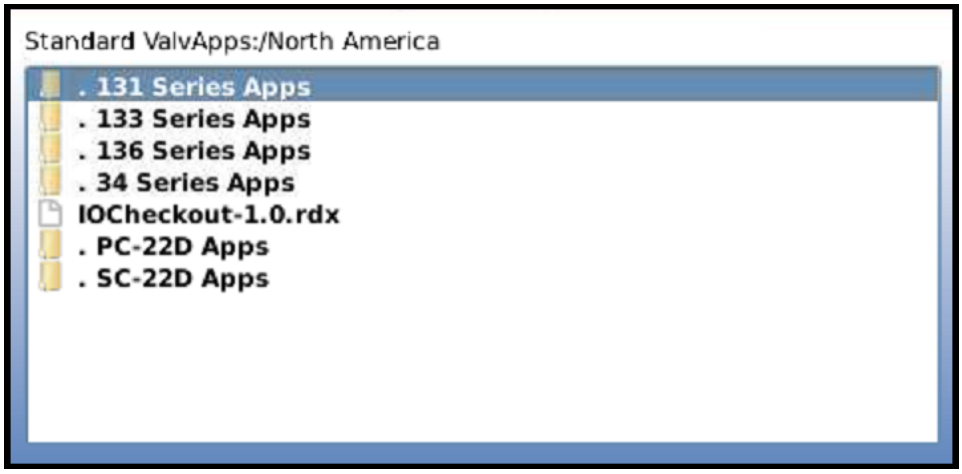


Figure 5.3

a. Highlight the desired valveApp (131-Flow-Mag-V2.1.rdx for example) and press “OK” as shown in **FIGURE 5.3**.

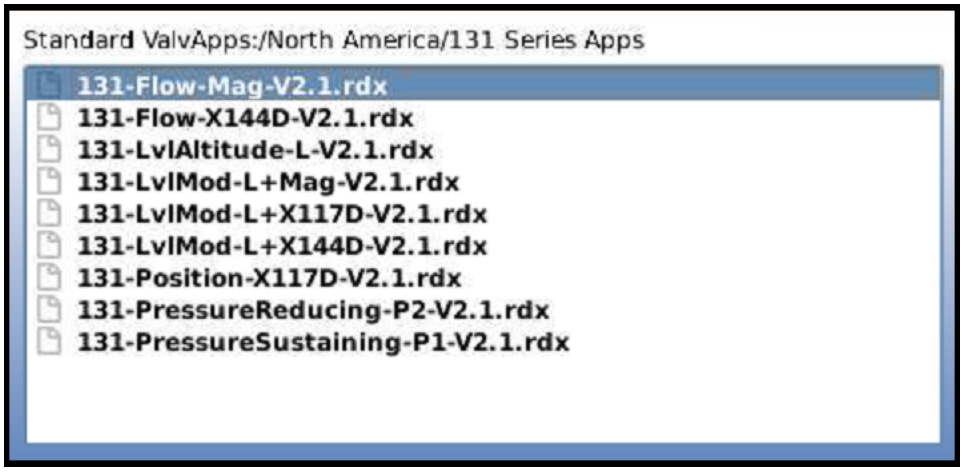


Figure 5.4

b. When prompted for confirmation, highlight “Yes” using navigation arrows and press “OK” as shown in **FIGURE 5.**.

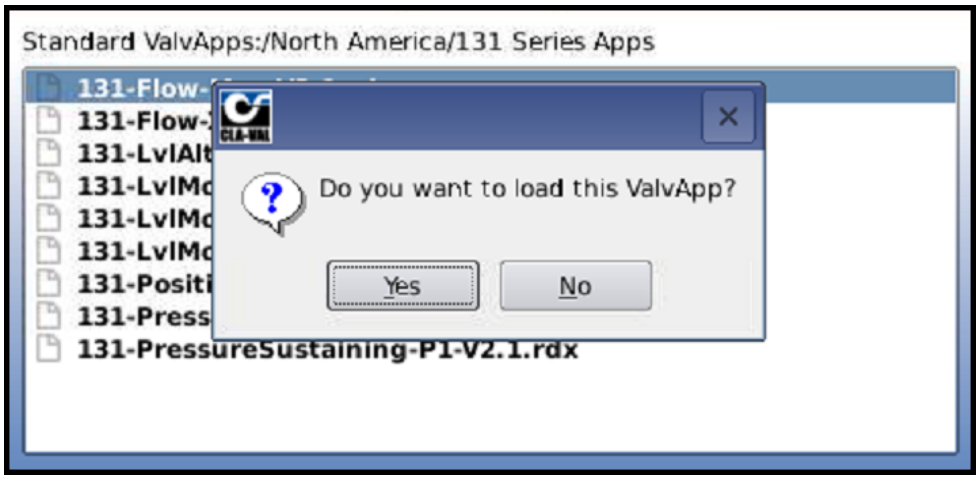


Figure 5.5

c. Press “OK” to restart per **FIGURE 5.**.

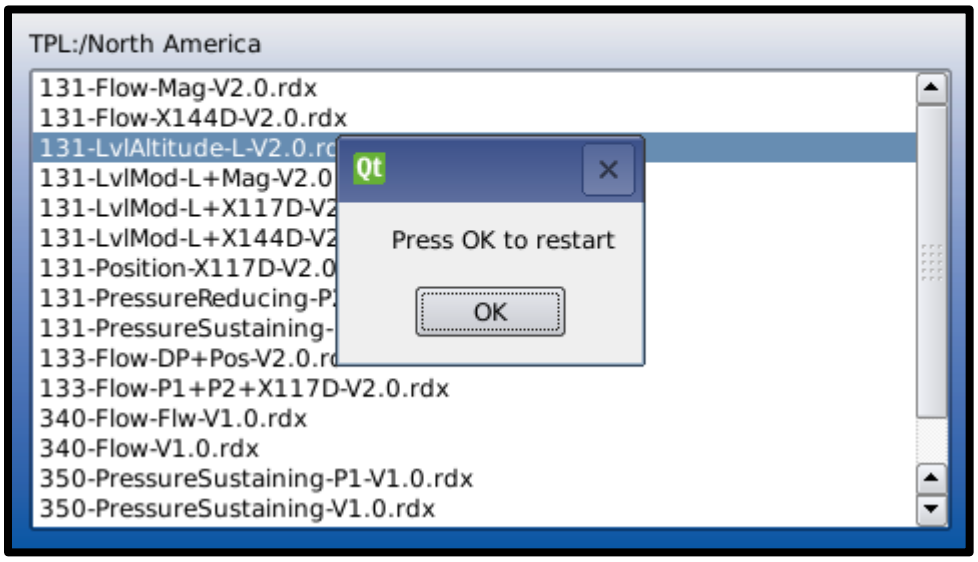


Figure 5.6

5.2.2 Loading a Custom ValveApp

2. If a custom ValvApp will be used, do the following:
    a. Load the custom ValvApp provided by the Cla-Val factory onto a USB thumb drive.
    b. Insert the USB thumb drive into the VC-22D's USB port.
    c. Press "right" to load the ValvApp from the USB thumb drive. Wait for the next screen and highlight the custom ValvApp (131-UpstreamPressure-CSTMR.v.1.0 used for example) as shown in **FIGURE 5.4**. Press "OK".

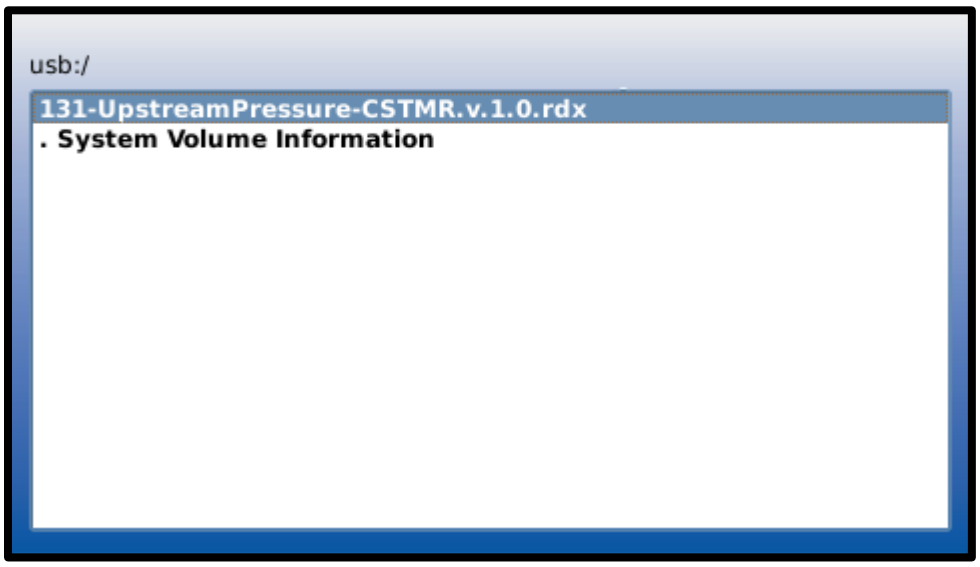


Figure 5.4

    d. When prompted for confirmation, highlight "Yes" using navigation arrows and press "OK" as shown in Figure 5.5.

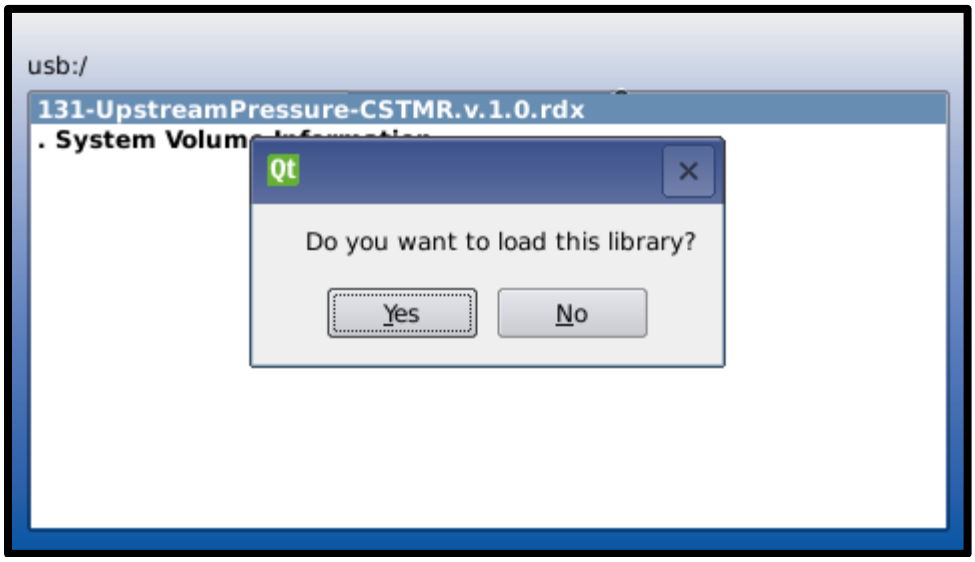


Figure 5.5

e. Press “OK” to restart per **FIGURE 5.6**.

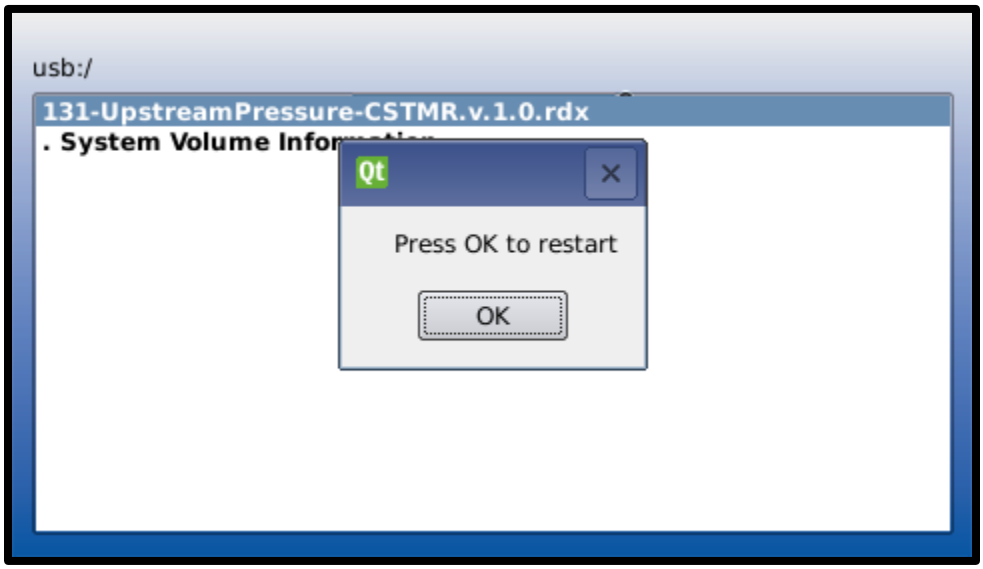


Figure 5.6

5.3 Configuration Wizard

Each time the VC-22D is rebooted, the user is prompted to go through the configuration wizard. The configuration wizard allows the user to quickly configure the VC-22D settings for your specific Cla-Val valve application. Settings include date and time, engineering units, and scale of inputs/outputs. The wizard also includes prompts to test input/outputs and specify the normally open/closed state of solenoids.

Going through the configuration wizard is optional and should only be used with the ValvApps from the standard library. Unless instructed otherwise, do not go through the configuration wizard when using a custom ValvApp. This is because settings have already been adjusted for you in the custom ValvApp and changing these settings could conflict with custom programming.

A description of each configuration wizard screen is provided below.

5.3.1 Introduction Screen

Use this screen to enter the configuration wizard, skip the configuration wizard, or skip and prevent from being prompted in the future.

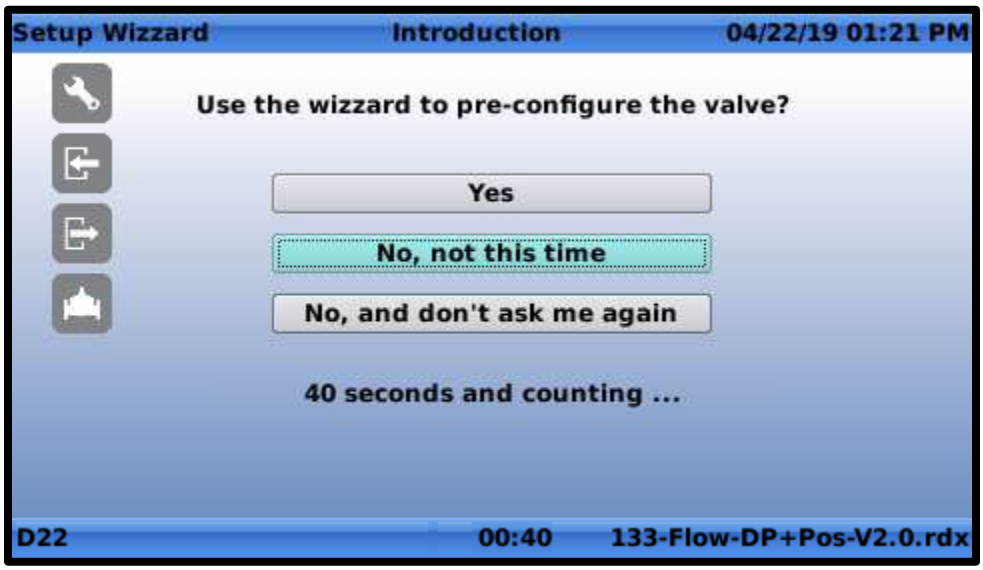


Figure 5.7

5.3.2 Warning Screen

This is an alert to let you know the configuration wizard will change outputs which will likely modulate the valve and affect other connected equipment. Be sure that the valve and other connected equipment is in a safe state before continuing.

DANGER

Configuration wizard will change the VC-22D outputs!

To test outputs, the configuration wizard will change analog outputs from 4mA to 20mA and toggle digital outputs on/off. This will cause connected equipment to change state. It's recommended that the cover on the Cla-Val valve be "locked" using the isolation ball valves before continuing. Take necessary precautions for other connected equipment.

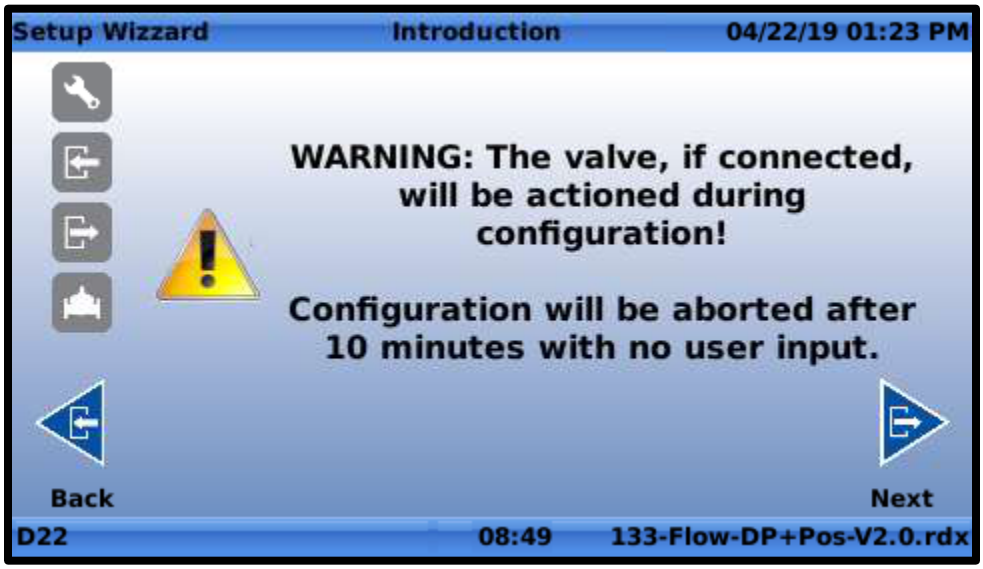


Figure 5.8

5.3.3 Regional Settings

The regional settings allow you to specify location, time zone, and language.

Figure 5.9

5.3.4 Inputs

The setup wizard will dedicate one screen to each input configured in the ValvApp. An example screen for an analog input is shown in **FIGURE 5.10**. The analog input screen can be used to set the 4-20mA scaling, verify the value currently read by the analog input, and what to do if the signal is lost. See section 6.2.9.5 for a detailed description of signal lost behaviors.

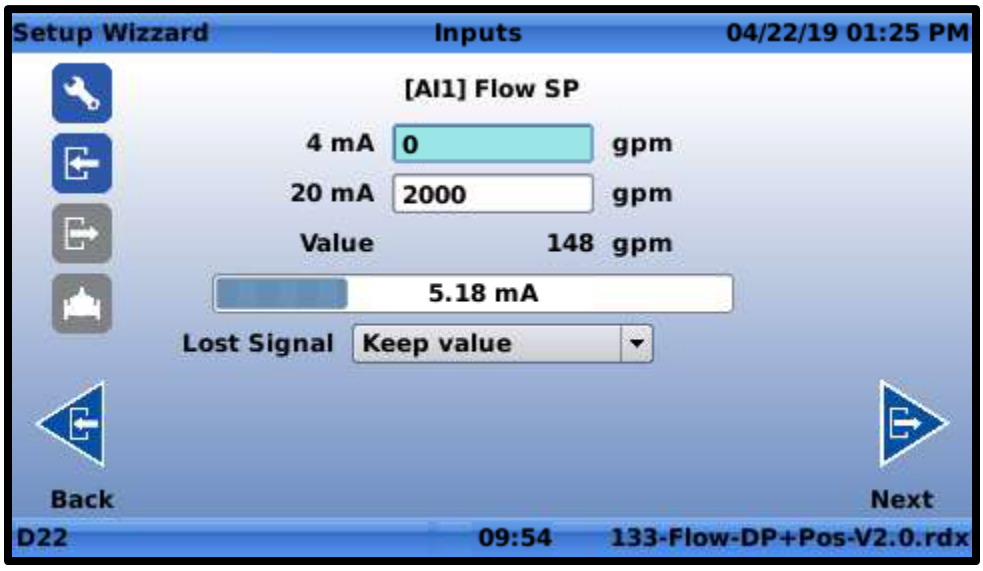


Figure 5.10

The digital input screens can be used to verify the value currently read by a digital input. An example is shown in **FIGURE 5.11**.

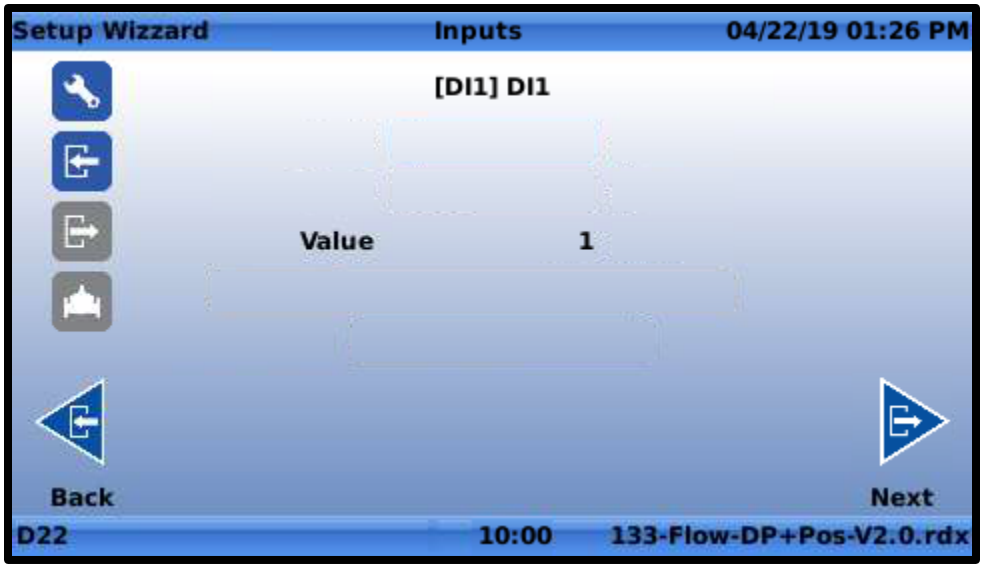


Figure 5.11

5.3.5 Outputs

The setup wizard has two screens for each analog output configured in the ValvApp. The first screen is used for adjusting the 4-20mA scaling as shown in **FIGURE 5.12**.

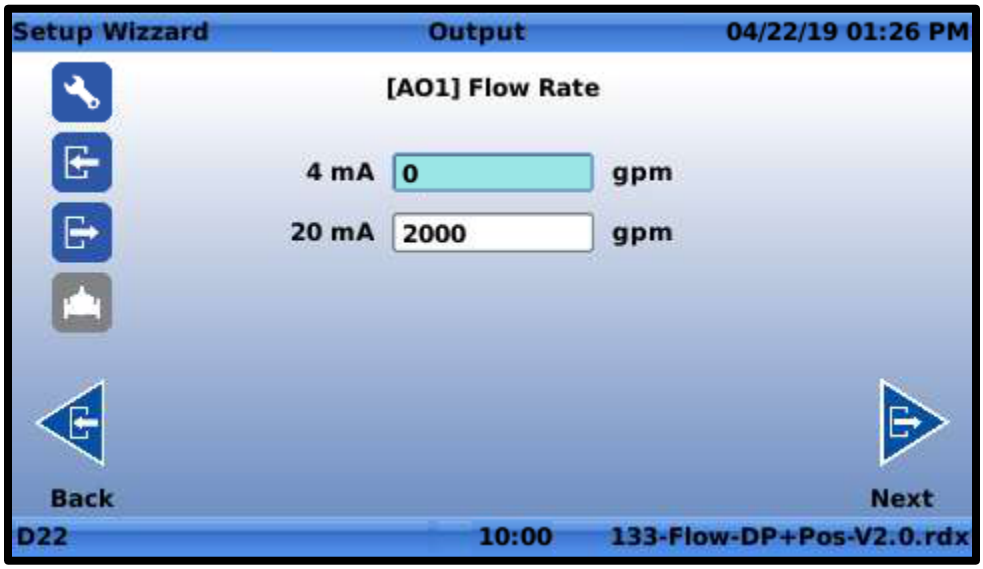


Figure 5.12

The second screen is used for testing the analog output as shown in **FIGURE 5.13**. This screen allows an analog output value to be forced and checked with a multimeter for verification.

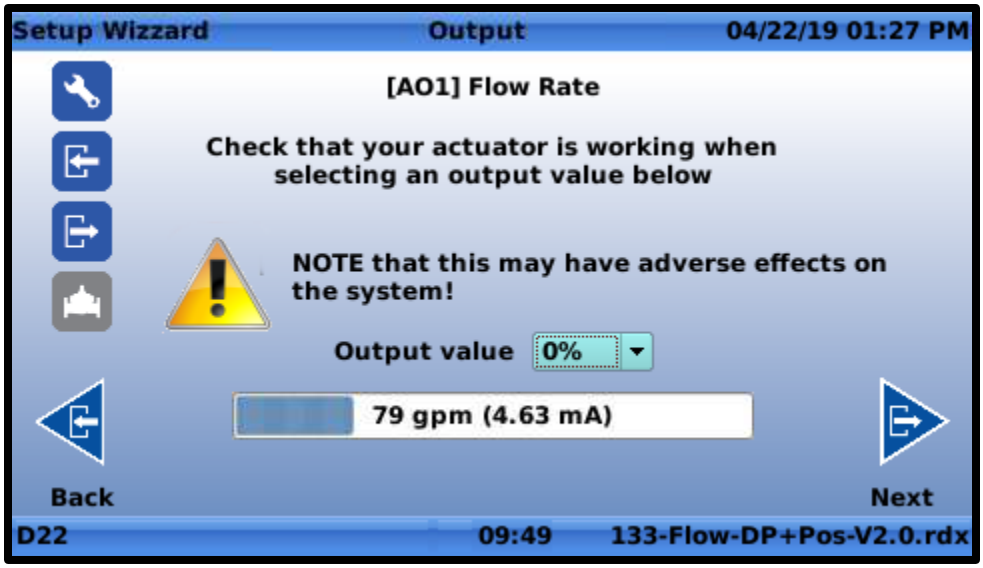


Figure 5.13

The setup wizard also has one screen for each digital output configured in the ValvApp as shown in **FIGURE 5.14**. This screen allows you to toggle the digital output on/off which is helpful when verifying solenoid wiring. When the SO1 output is being tested, the closing solenoid should be clicking open/closed. When the SO2 output is being tested, the opening solenoid should be clicking open/closed. The same test is available for RO1 and RO2 which could be connected to AC solenoids or some other equipment.

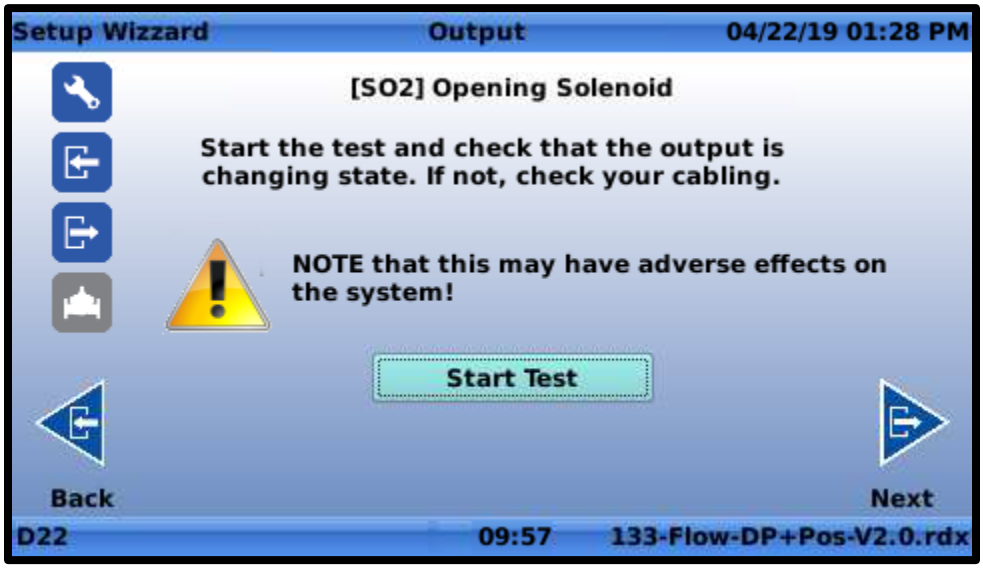


Figure 5.14

5.3.6 Solenoid Configuration

The solenoid configuration screen allows the user to input whether the solenoids are normally opened or normally closed as shown in **FIGURE 5.15**. The VC-22D needs to know the normal state of the solenoid so the PID algorithm understands whether voltage will open or close the solenoid. “NC” means normally closed, and “NO” means normally open. The first two characters before the slash represent the closing

solenoid SO1 normal state, and the second two characters after the slash represent the opening solenoid SO2 normal state.

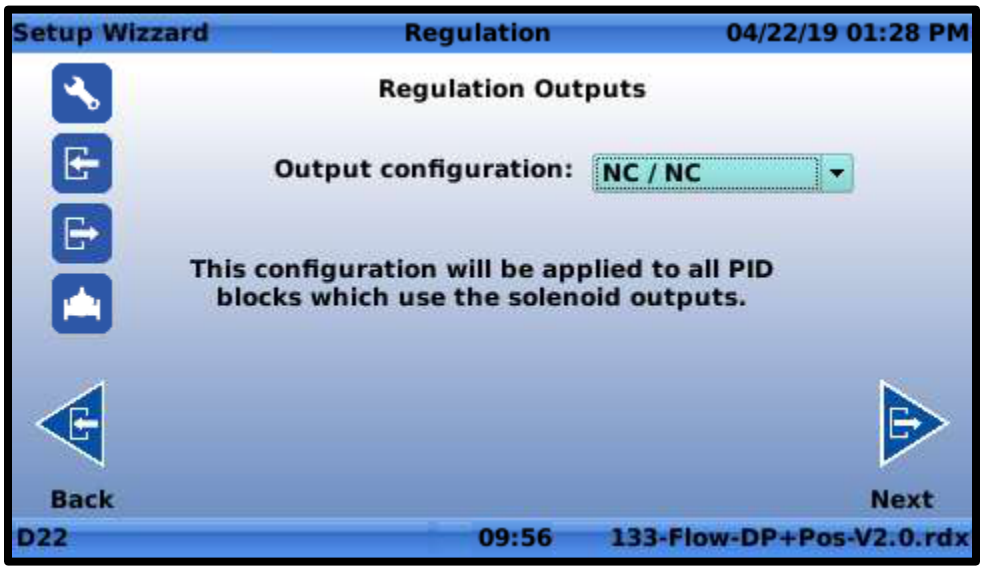


Figure 5.15

5.3.7 DP Metering

If the ValvApp has DP metering enabled, there will be two screens available to configure DP metering settings. The first screen shown in **FIGURE 5.16** is used to input the valve size, body, and seat type so flow rate can be calculated.

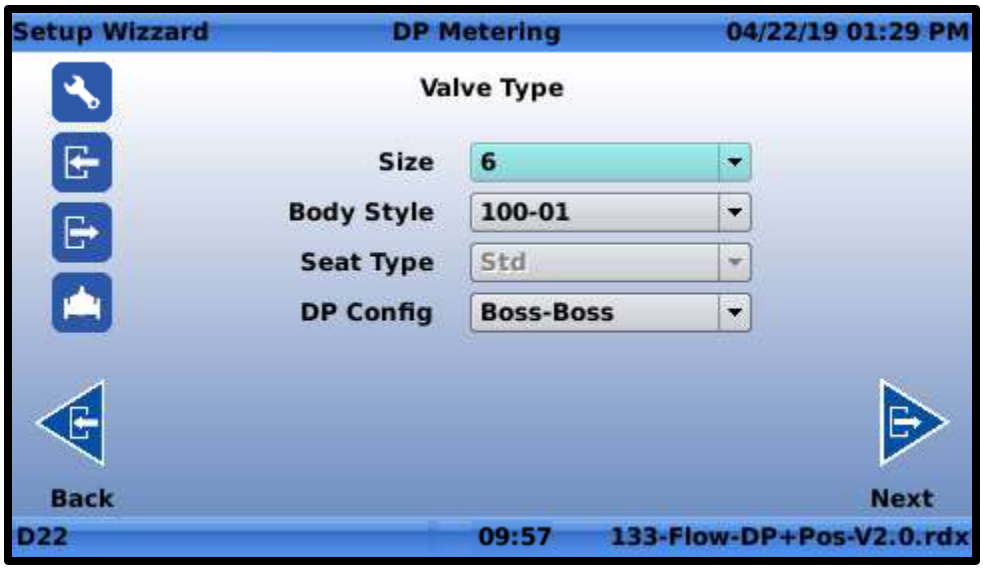


Figure 5.16

The second screen allows the user to specify which variables represent the inlet/outlet pressure and valve position for calculating valve flow. See **FIGURE 5.17**.

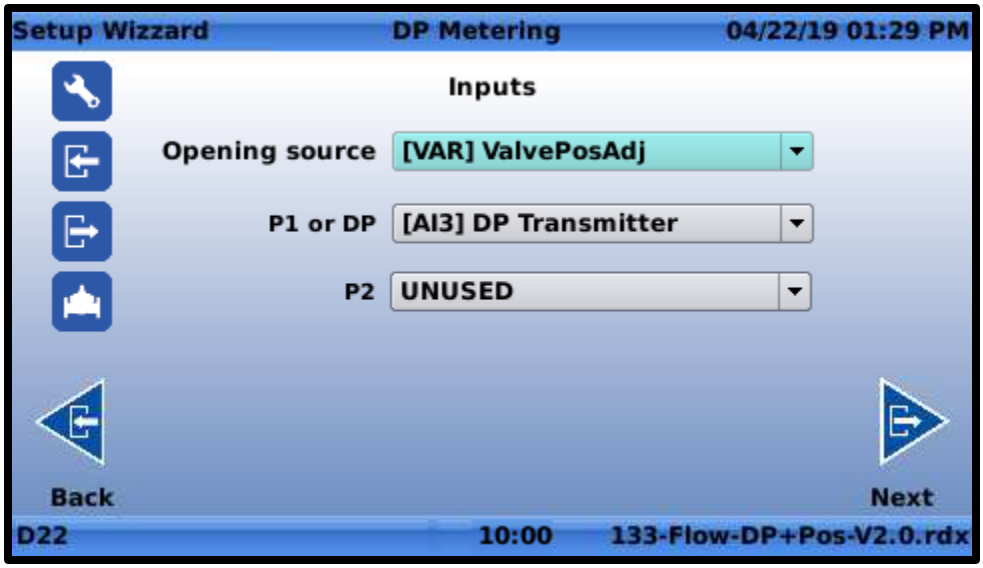


Figure 5.17

For more detailed information on the configuration of DP metering, see section 6.2.1.

5.3.8 Hostname

The hostname screen allows the user to entry a user-friendly name for the VC-22D which will be used in log files and displayed on the bottom left corner of each screen. It's recommended to input a name that uniquely describes the valve being controlled. This is helpful for users so they're aware of which valve is being controlled by the VC-22D.

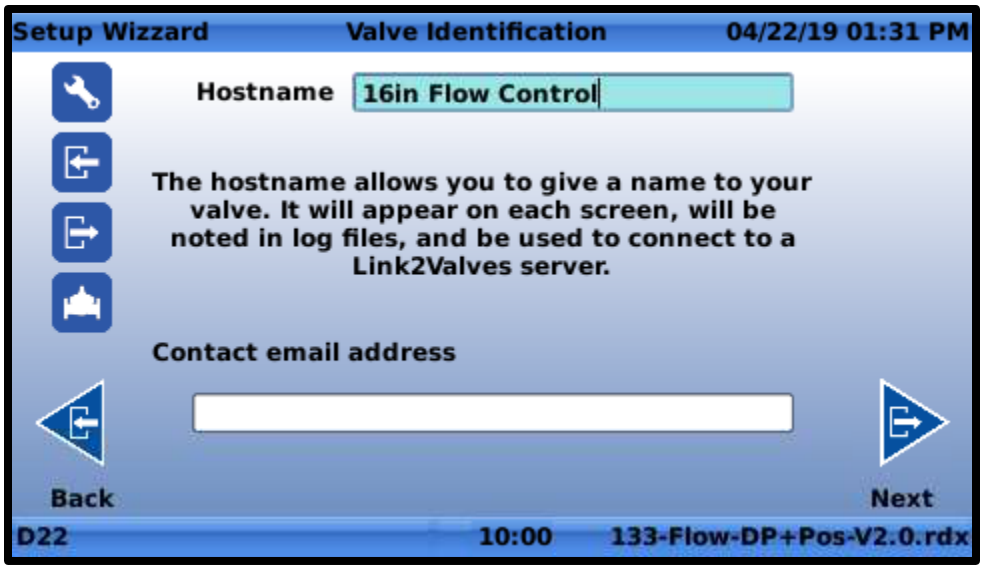


Figure 5.18

6 Setup

The VC-22D's settings are broken into the following four categories:

1. System settings: Accessible via "long down" from the home screen.
2. Valve control settings: Accessible via "long up" from the home screen.
3. Input settings: Accessible via "long left" from the home screen.
4. Output settings: Accessible via "long right" from the home screen.

6.1 System Settings

System settings pertain to the VC-22D's administration. Examples of system settings are time/date, IP address, display brightness, and data logging. These settings do not directly influence the way the valve is controlled, but impact how the VC-22D functions.

6.1.1 VC-22D Information

6.1.1.1 Description

Provides identification information (serial numbers and owner information), version information, system statistics (runtime), and list of pre-loaded ValvApp libraries.

6.1.1.2 Navigation Path

1. Start at the home screen.
2. Long down.
3. Click on "Information".

6.1.1.3 Identification Tab Settings

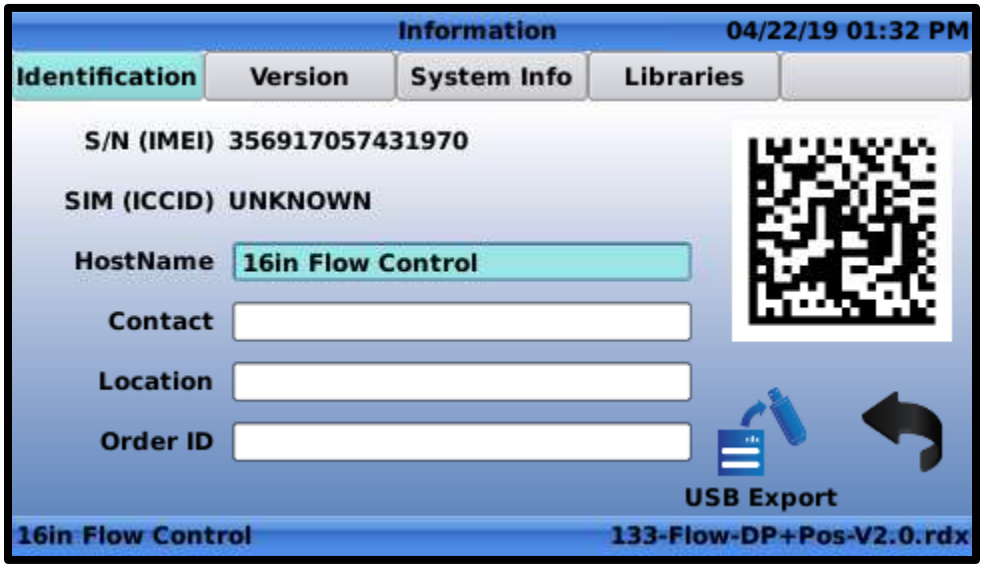


Figure 6.1

S/N (IMEI): Serial number of the VC-22D assigned by Cla-Val during manufacture of device.

SIM (ICCID): ID number of SIM card installed in VC-22D.

Hostname: Name specified by user of VC-22D that is displayed on bottom left corner of every screen and included in log files. It's recommended to input a name that uniquely describes the valve being controlled. This is helpful for users so they're aware of which valve is being controlled by the VC-22D.

Contact: Optional setting to specify name of person to contact in case of service related issue with valve.

Location: Optional setting to specify location valve is installed.

Order ID: Optional setting to specify ID of order placed to obtain VC-22D. This may be useful when an operator is calling for support on the unit.

6.1.1.4 Version Tab Settings

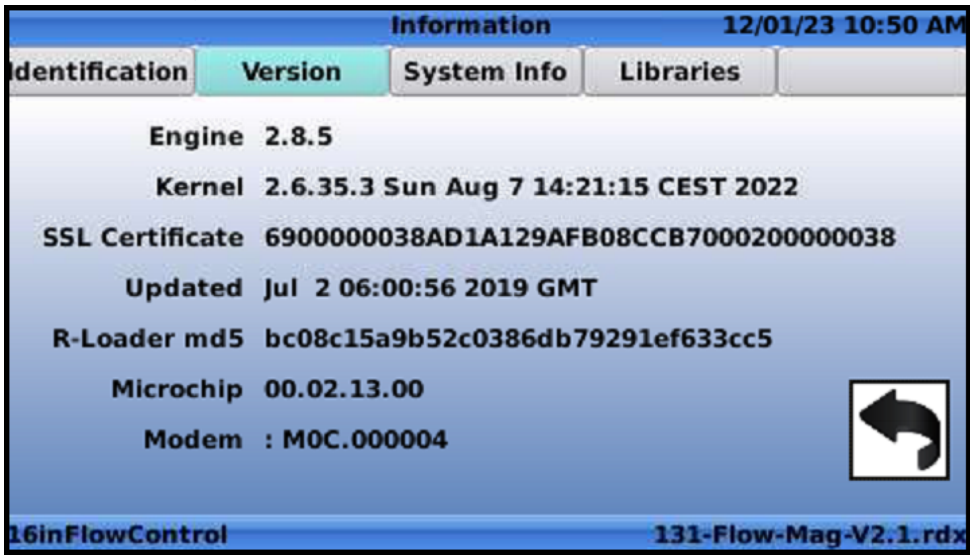


Figure 6.2

Engine: Version of engine (sometimes called firmware) that is installed on the VC-22D. The engine is responsible for running the ValvApp loaded onto the VC-22D. It controls what features are available for the ValvApp to utilize. Prior to configuring a new VC-22D, ensure the latest engine version is installed. Contact your local sales rep for a copy of the latest engine. See section 6.1.20 for an engine update procedure.

Kernel: Version of kernel that is installed on the VC-22D. The kernel is responsible for managing events in the VC-22D. Prior to configuring a new VC-22D, ensure the latest kernel version is installed. Contact your local sales rep for a copy of the latest kernel. See section 6.1.23 for an engine update procedure.

R-Loader md5: Version of software that launches the engine upon VC-22D startup.

Modem: Provides the model number of the cellular modem in the VC-22D. Also provides the version of firmware installed on the modem.

Microchip: Version of the microcontroller responsible for reading and writing to IO terminals.

6.1.1.5 *System Info Tab Settings*

Figure 6.3

Uptime: Duration of time the VC-22D has been powered on since last shutdown.

Load average: The Unix style load average of the CPU at 1 minute, 5 minutes, and 15 minutes after the system started.

RAM usage: Amount of RAM used, amount of RAM free

6.1.1.6 *Libraries Settings*

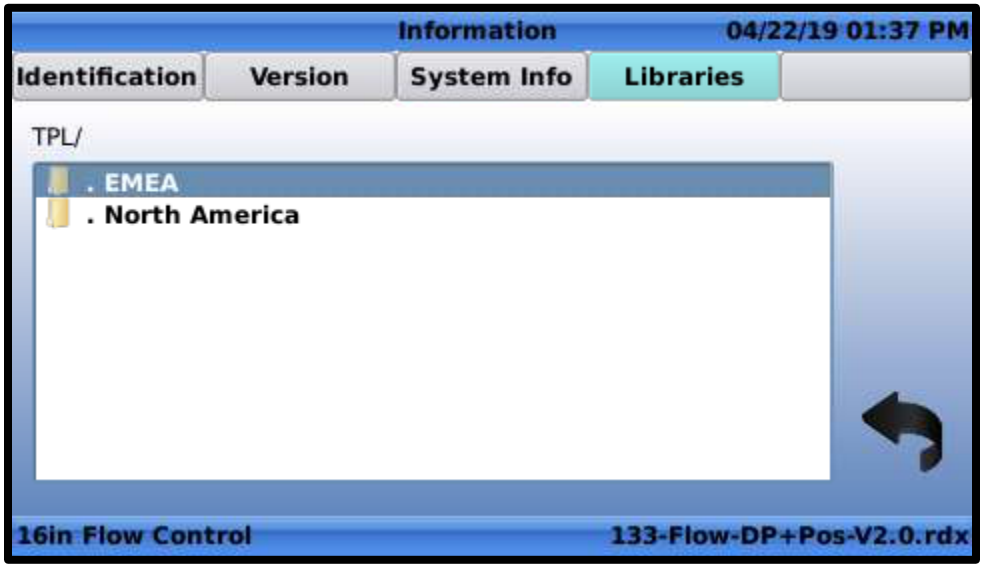


Figure 6.4

The libraries tab shows all of the ValvApps that have been loaded onto the VC-22D. This includes standard ValvApps (located in the EMEA and North America folders) along with custom ValvApps that have been previously uploaded. If a factory reset is performed, the ValvApps shown in this tab can be

reloaded into the VC-22D if you follow the instructions listed in section “5.2 Loading a ValvApp” and “load from library”.

6.1.2 ValvApp Backup

6.1.2.1 Description

Used to schedule automatic backups or take manual backups of the currently loaded ValvApp and store in internal memory.

6.1.2.2 Navigation Path

1. Start at the home screen
2. Long down
3. Click on “Application Management”
4. Click on “Backup Application”

6.1.2.3 Backup Application Settings

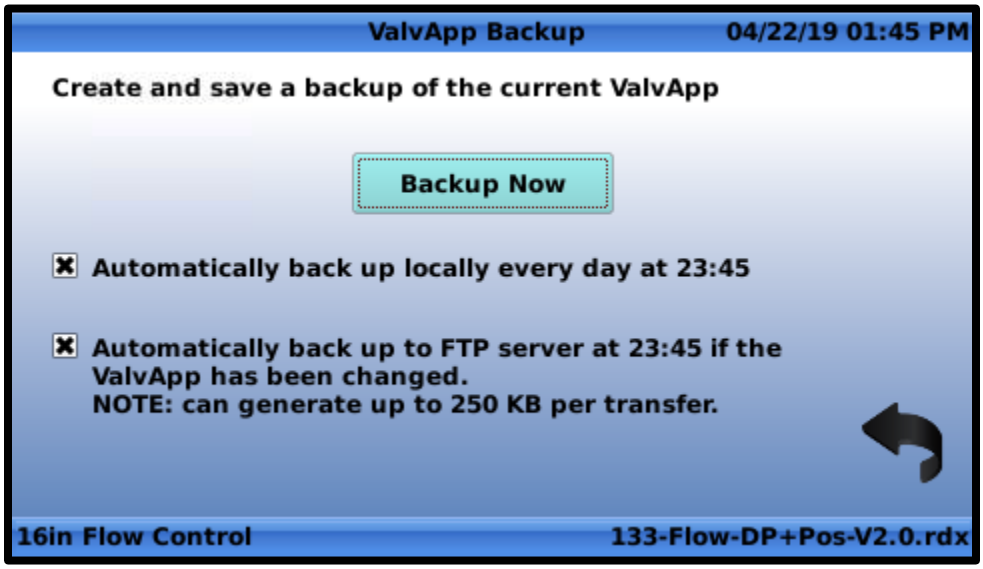


Figure 6.5

Backup Now: Clicking this button will trigger an immediate backup of the ValvApp currently running on the VC-22D. The backup will be stored in the VC-22D’s non-volatile internal memory. Backups in internal memory can be restored later if necessary. See section 6.1.3.

Automatically back up locally every day at 23:45: Checking this box will automatically backup the ValvApp currently running on the VC-22D at 11:45PM every night. The backup will be stored in the VC-22D’s non-volatile internal memory.

Automatically back up to FTP server at 23:45 if the ValvApp has been changed: This box is not applicable in North America, as it requires an FTP connection to Link2Valve. This is a European feature only.

6.1.3 Restore Application

6.1.3.1 Description

Used to restore an application that's been backed up per section 6.1.2 to the VC-22D's internal memory. The restored application automatically becomes the currently running ValvApp.

6.1.3.2 Navigation Path

1. Start at the home screen
2. Long down
3. Click on "Application Management"
4. Click on "Restore Application"

6.1.3.3 Restore Application Settings

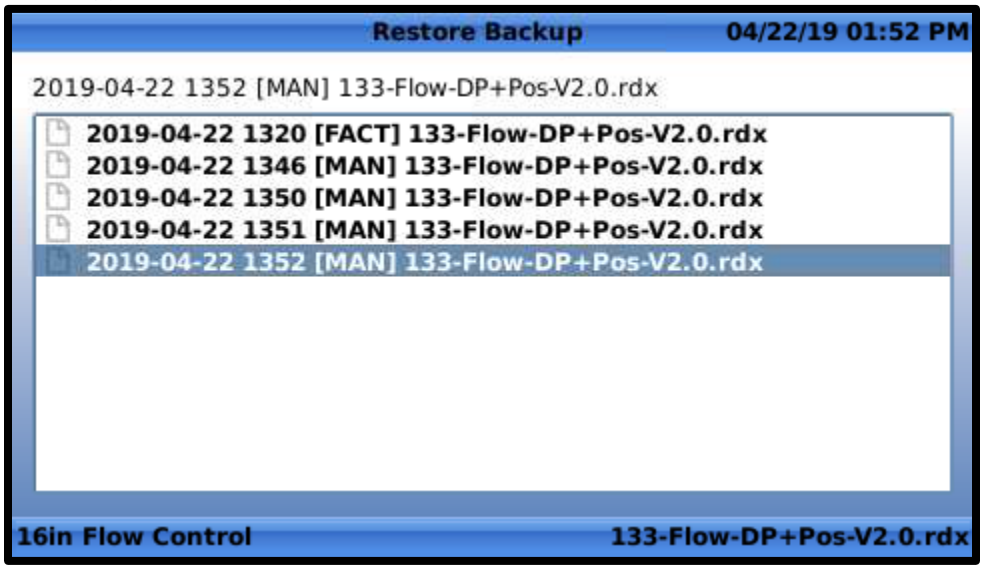


Figure 6.6

Each ValvApp backup is prefixed with a date when the backup was taken. Find the date you wish to rollback too, highlight the corresponding file, and press "OK". After answering yes to confirmation prompts, the VC-22D will reboot and restore the selected ValvApp.

6.1.4 Export Application

6.1.4.1 Description

Exports the currently loaded ValvApp onto a USB thumb drive inserted in the VC-22D's USB port.

6.1.4.2 Navigation Path

1. Start at the home screen
2. Long down
3. Click on "Application Management"
4. Click on "Export Application"

6.1.4.3 Export Application Settings

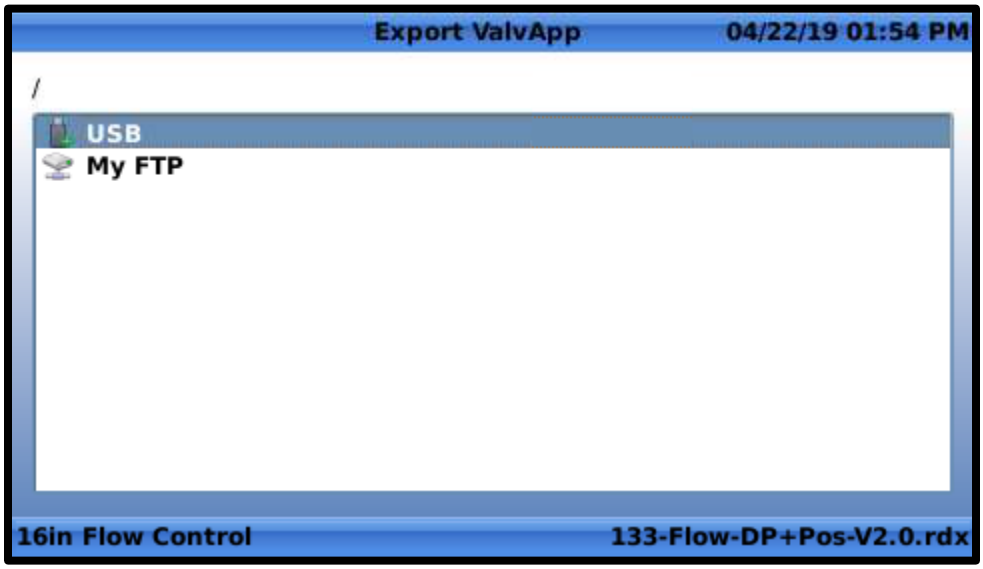


Figure 6.7

USB: Highlighting USB and pressing "OK" will allow the currently loaded ValvApp to be exported to a USB thumb drive inserted in the VC-22D's USB port. The screen shown in **FIGURE 6.8** will appear.

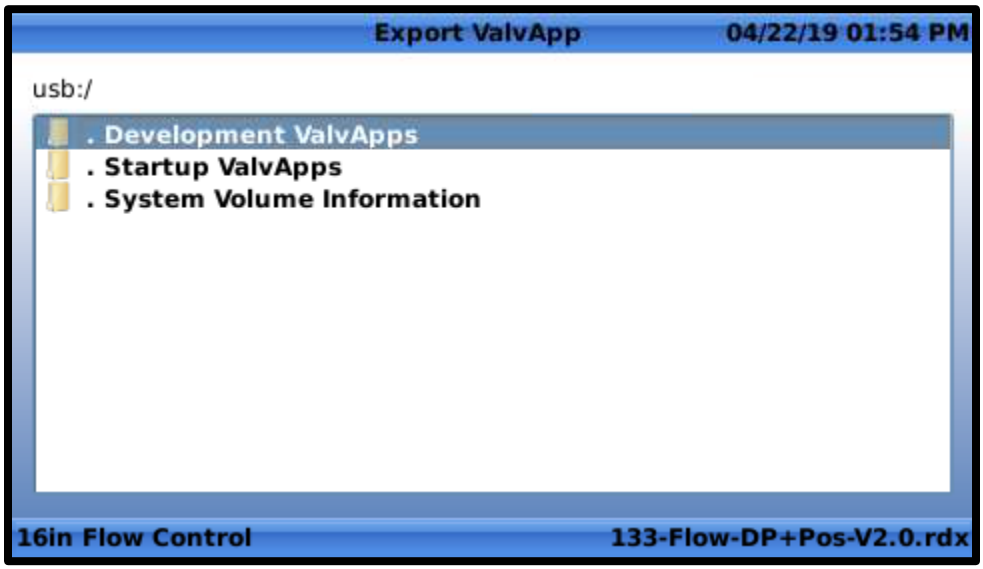


Figure 6.8

The screen in **FIGURE 6.8** shows the contents saved on the inserted USB thumb drive and allows the user to save the ValvApp in a particular folder. In this example the thumb drive has a "Development ValvApps" folder and "Startup ValvApps" folder. The "System Volume Information" folder is a hidden file on the thumb drive which should be ignored. To navigate into a folder, highlight the folder and press the "right" navigation button. Once located in the desired folder, pressing the "OK" navigation button will export the ValvApp to the current location.

My FTP: This box is not applicable in North America, as it requires an FTP connection to Link2Valve. This is a European feature only.

6.1.5 Import Application

6.1.5.1 Description

Imports a ValvApp saved from an inserted USB thumb drive.

6.1.5.2 Navigation Path

1. Start at the home screen
2. Long down
3. Click on “Application Management”
4. Click on “Import Application”

6.1.5.3 Import Application Settings

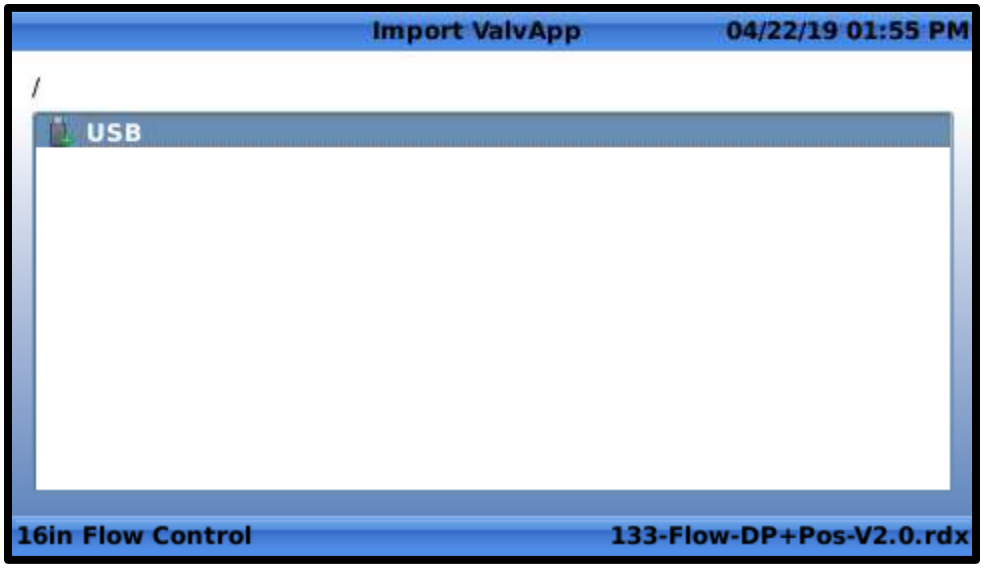


Figure 6.9

Pressing “OK” with “USB” highlighted will open the screen shown in **FIGURE 6.10**. This screen shows the contents saved on the USB thumb drive. Navigate to the folder the ValvApp is stored in by highlighting the folder and pressing the “right” navigation button. Once in the correct folder, highlight the ValvApp and press “OK”. After saying yes to confirmation prompts, the ValvApp will be imported and the VC-22D will be rebooted.

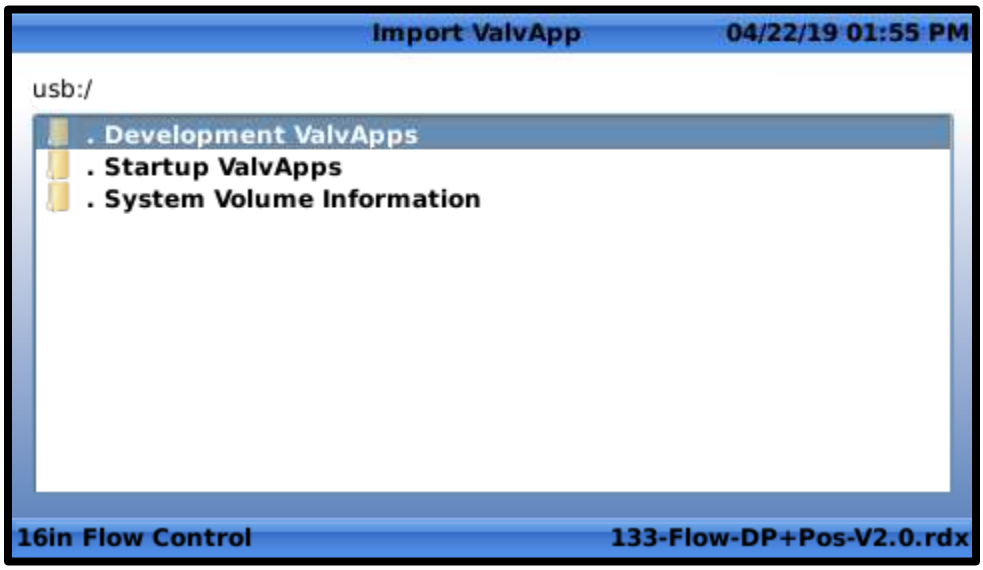


Figure 6.10

6.1.6 Time & Region

6.1.6.1 Description

Used to set the VC-22D’s clock, date, time zone, and language

6.1.6.2 Navigation Path

1. Start at the home screen
2. Long down
3. Click on “Time & Region”

6.1.6.3 *Time Zone Tab Settings*

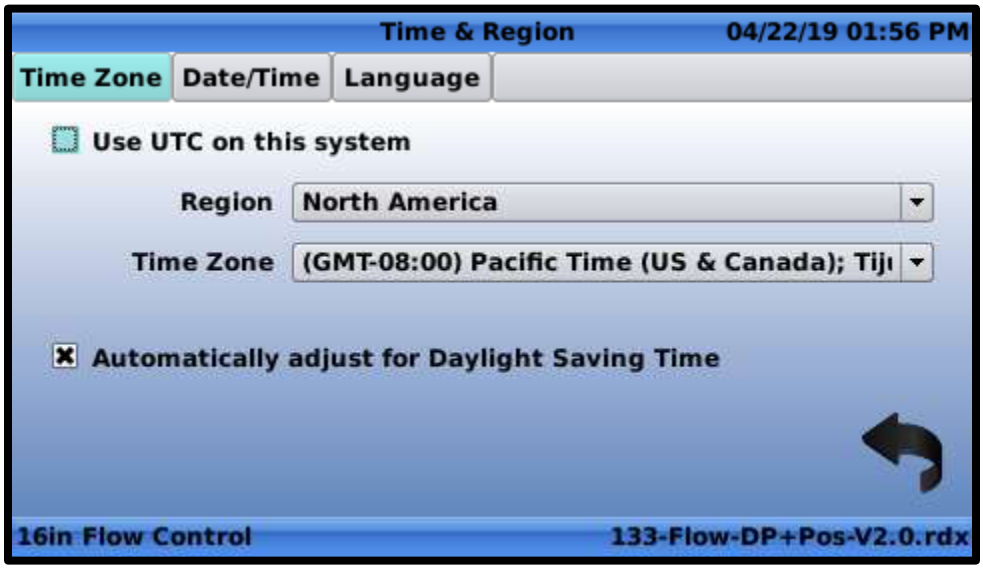


Figure 6.11

Use UTC on this system: If checked, the VC-22D clock will operate on UTC time and not allow a local time zone to be entered.

Region: Stores the region the VC-22D is located in. This determines which time zones may be selected in the "Time Zone" field. Regions available are listed below:

1. Africa
2. Americas (refers South America only)
3. Asia
4. Europe
5. Middle East
6. North America
7. Oceania

Time Zone: Stores the time zone the VC-22D is located in. The following time zones are available for North America. In some cases, there are multiple time zones for the same hours difference from GMT. This is because different time zones have different day light savings rules, so be sure to select the appropriate location in addition to difference from GMT.

1. (GMT-09:00) Alaska
2. (GMT-08:00) Pacific Time (US & Canada)
3. (GMT-07:00) Mountain Tim (US & Canada)
4. (GMT-07:00) Chihuahua, La Pax, Mazatlan
5. (GMT-07:00) Arizona
6. (GMT-06:00) Saskatchewan
7. (GMT-06:00) Guadalajara, Mexico City
8. (GMT-06:00) Central Time (US & Canada)
9. (GMT-05:00) Quintana Roo, Mexico

10. (GMT-05:00) Eastern Time (US & Canada)
11. (GMT-04:00) Atlantic Time (Canada)
12. (GMT-03:00) Newfoundland

Automatically adjust for Daylight Saving Time: The VC-22D has been programmed with the daylight savings calendar for each time zone listed above. If this box is checked, the VC-22D will use the built-in calendar to shift the system clock 1 hour for daylight savings.

6.1.6.4 Date/Time Tab Settings

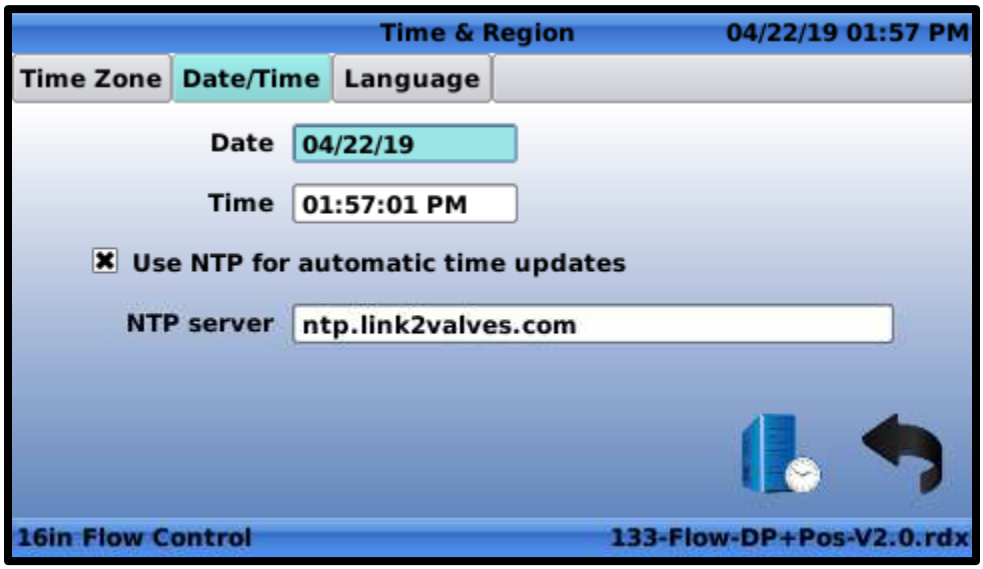


Figure 6.12

Date: Specifies the VC-22D's system date.

Time: Specifies the VC-22D's system time.

Use NTP for automatic time updates: This box is not applicable in North America, as it requires an NTP connection to Link2Valve. This is a European feature only.

NTP server: Specifies an NTP server to have the VC-22D synchronize time with.

Manual NTP sync: (see **FIGURE 6.13**) If clicked, this button forces the VC-22D to immediately synchronize time the specified NTP server.

Figure 6.13

6.1.6.5 *Language Tab Settings*

Figure 6.14

Date/Time Format: Specify the style of Date/Time format that's preferred. The following options exist:

1. USA (MM/DD/YY 12hr (am/pm)
2. UK & Europe (DD/MM/YY 24hr)

UI Language: Specify the language used on the user interface. Options are listed below:

1. English
2. Spanish
3. French

Import Language Pack: (see **FIGURE 6.15**) If clicked, a language pack from a USB thumb drive can be imported which allows a language not included above to be implemented on the user interface.

Figure 6.15

6.1.7 Unit Management

6.1.7.1 *Description*

Used to specify the engineering units for each unit type (e.g. pressure, flow, volume, …) in the VC-22D. This forces the same engineering unit to be applied for a given value type (e.g. all pressure values are in psi, all flow is in gpm, all volume is in gallons, …). **Going through unit management should only be done with the ValvApps from the standard library. Unless instructed otherwise, do not go through the configuration wizard when using a custom ValvApp.** This is because settings have already been adjusted for you in the custom ValvApp, and changing these settings could conflict with custom programming.

6.1.7.2 Unit Management Settings

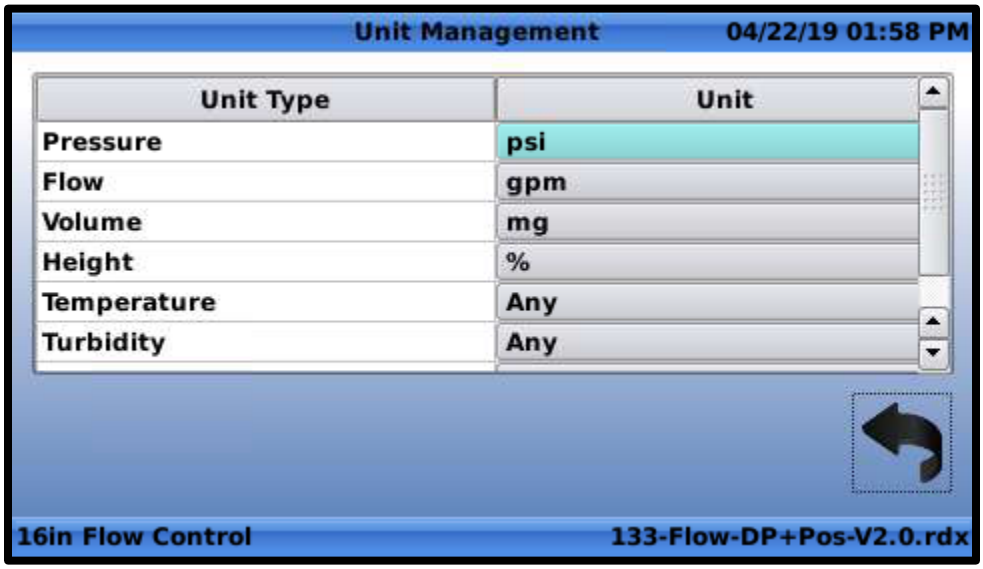


Figure 6.16

Each unit type (pressure, flow, volume, …) that the VC-22D supports is listed on the unit management screen in the left-hand column. The right-hand column specifies the engineering unit associated with the corresponding unit type. To allow different units for a given unit type, set the unit to “Any”. To force a given unit type to a particular unit, select the desired unit.

6.1.8 Configure Logs

6.1.8.1 Description

Used to enable/disable periodic logging of variable values and specify frequency of logging.

6.1.8.2 Navigation Path

1. Start at the home screen
2. Long down
3. Click on “Logging”
4. Click on “Configuration”

6.1.8.3 Logging Configuration Settings

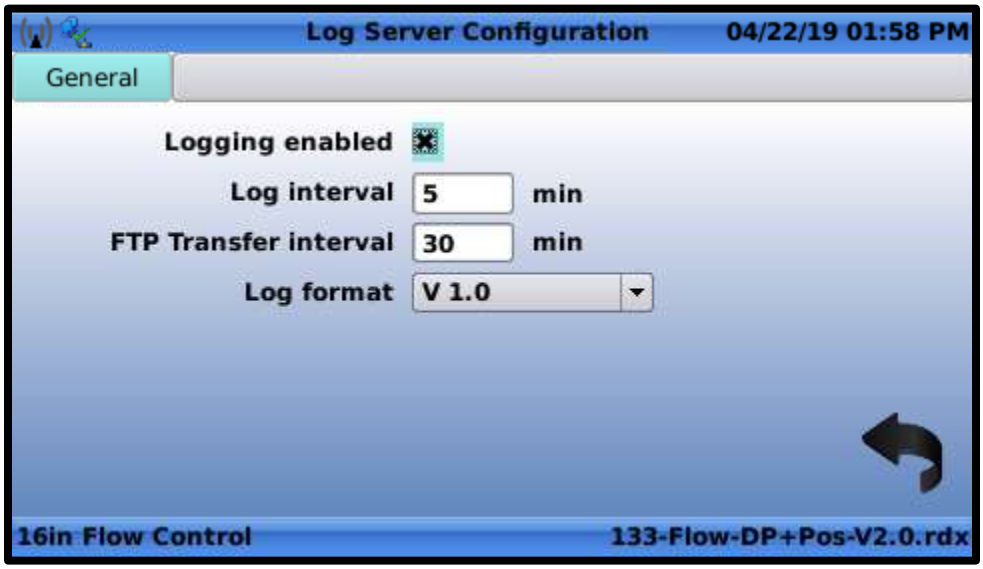


Figure 6.17

Logging enabled: When checked, the VC-22D will write every variable value to a CSV file in memory at the specified logging interval.

Log interval: The number of minutes the VC-22D waits before logging variable values again.

FTP Transfer interval: This setting is not applicable in North America, as it requires an FTP connection to Link2Valve. This is a European feature only.

Log format: Specifies the format of the CSV file the VC-22D will create when logging data. There are two options available:

1. Legacy
2. V 1.0

It's recommended to always use V 1.0 because it provides more information than the legacy format. Do not use legacy unless requested by Cla-Val.

6.1.9 Export Logs

6.1.9.1 Description

Used to export a log file of variable values and a system log file detailing actions, errors, and warnings stored by the VC-22D.

6.1.9.2 Navigation Path

1. Start at the home screen
2. Long down
3. Click on "Logging"
4. Click on "Export"

6.1.9.3 Export Settings

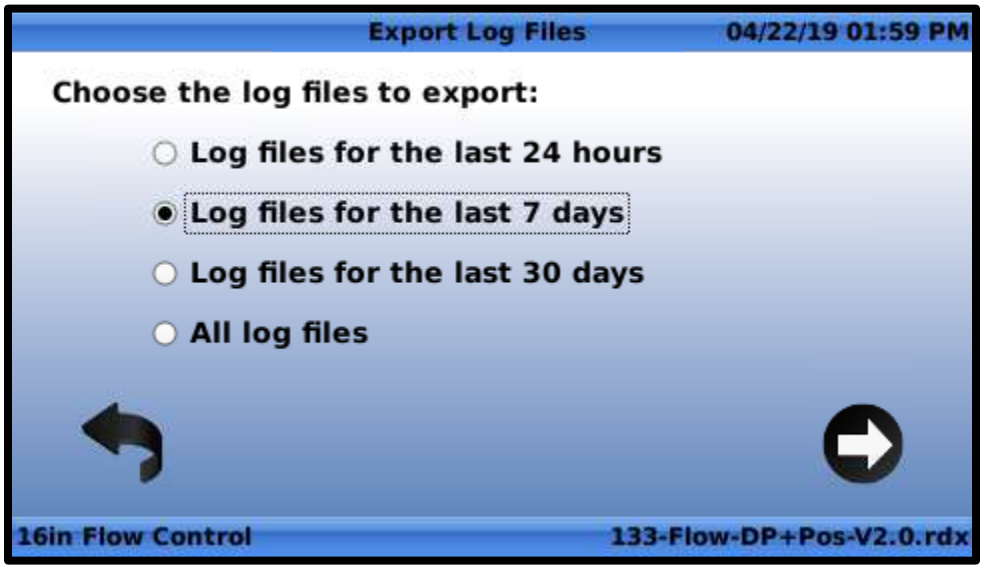


Figure 6.18

This screen specifies how far back in time the exported log files will go. After selecting a duration option, pressing the "OK" button or clicking the right arrow brings up a file explorer which specifies where on the USB thumb drive the log files will be saved.

6.1.10 GSM/GPRS

6.1.10.1 Description

Used to connect the VC-22D controller through GSM/GPRS network through Cla-Val cloud or FTP servers.

6.1.10.2 Navigation Path

1. Start at the home screen
2. Long down
3. Click on "Connectivity"
4. Click on "GSM/GPRS"

6.1.10.3 GSM/GPRS settings

To use cellular network functionality, ensure that a valid SIM card is inserted in the cover part of the electronic controller.

When the "**GSM/GPRS**" icon is selected, as shown below in **FIGURE 6.15.**

The "**GPRS**" Tab provides general information about the cellular network connectivity, the icon shows successful connection between SIM card and the controller, and the icon shows failed cellular connection.

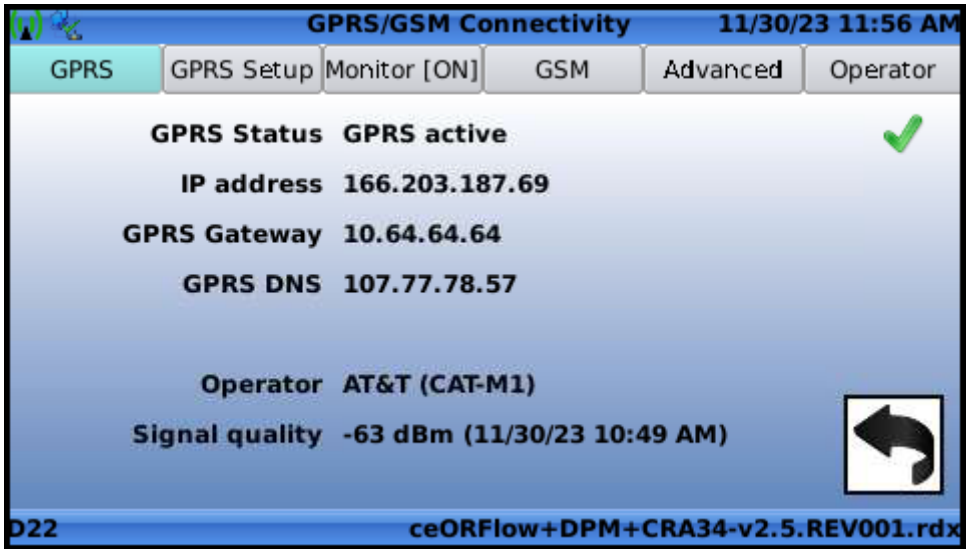


Figure 6.19

The "**GPRS Setup**" tab allows the user to choose between the CLA-VAL cloud servers (default) or custom FTP server as shown in **FIGURE 6.15.**

**note: custom FTP server information is provided via cellular provider of the SIM card.

Figure 6.20

As custom FTP server information fields are filled to setup connection, once refresh button is chosen the following screen shows as in **FIGURE 6.15**

A long click  on the home button  returns to the main menu IP and cancel out the operation.

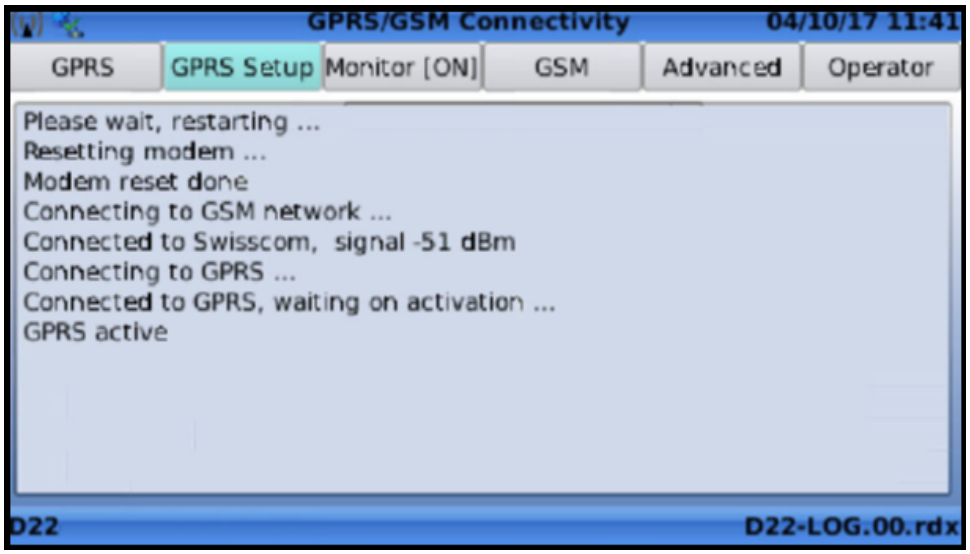


Figure 6.21

The "**Monitor [ON]**" tab allows the user to choose a method of testing the network connection validity and to restart the communication modem as shown in **FIGURE 6.22.**

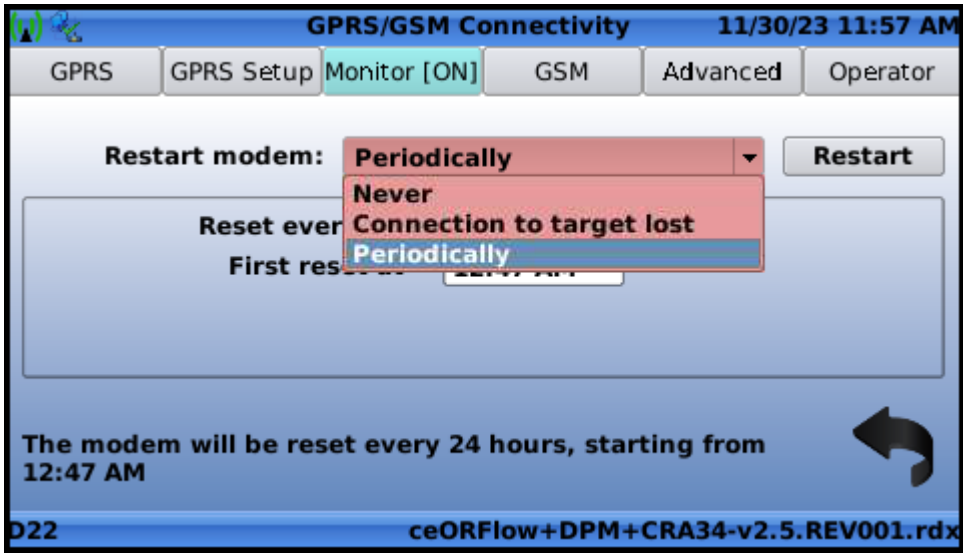


Figure 6.22

The restart modem option are as follows:

1. "**Never**": The Modem will not restart.

2. "**Connection to target lost**": designate a known IP address "ping target" to target the modem to check at a regular interval defined in "interval(min)". if communication fails after a number of unsuccessful attempts defined in "retry count", the communication is considered lost. And the modem will restart.

   **note: make sure that the target is a valid IP address that is constantly active. Use the "test" button to check if connection to target can be made.

3. "**Periodically**": reboot the communication modem periodically as defined in "reset every (h)" field starting at the time set in "First reset at".

"**GSM**": this screen provides information regarding the network signal quality, as shown below in **FIGURE 6.23.**

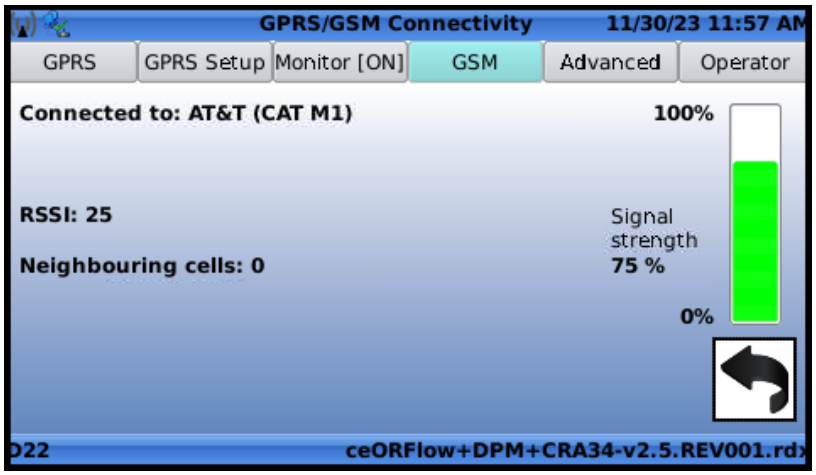


Figure 6.23

"**Advanced**": this screen provides advanced information regarding cellular network connectivity, shown in **FIGURE 6.15**

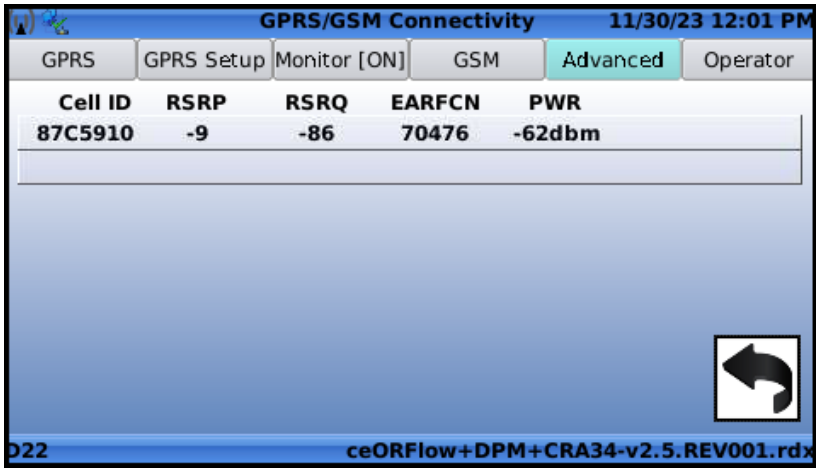


Figure 6.24

"**Operator**": this screen provides a list of operators available in the area, automatic mode means best operator selected by default or select a preferred operator, shown in **FIGURE 6.15**

Figure 6.25

6.1.11 LAN

6.1.11.1 Description

Used to set the IP address, subnet mask, DNS IP address, and gateway address for the VC-22D.

6.1.11.2 Navigation Path

1. Start at the home screen
2. Long down
3. Click on “Connectivity”
4. Click on “LAN”

6.1.11.3 LAN Settings

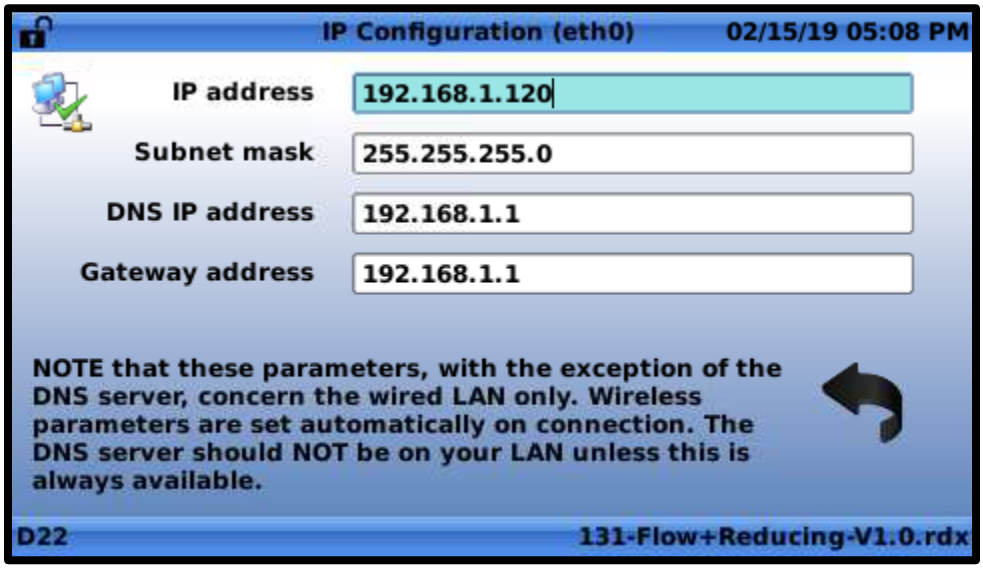


Figure 6.26

IP Address: TCP/IP address of the VC-22D

Subnet mask: Subnet mask of the TCP/IP address

DNS IP address: Address of the DNS server the VC-22D sends requests too

Gateway address: Address of the gateway the VC-22D sends network traffic too that is not on the VC-22D’s subnet

6.1.12 Remote Recopy

6.1.12.1 Description

This setting is not applicable in North America, as it requires a cellular connection. This is a European feature only.

6.1.13 Modbus

6.1.13.1 Description

Used to configure Modbus communication parameters for Modbus TCP/IP, Modbus RS485, and Modbus RS232. Also provides a register map for internal variables.

6.1.13.2 Navigation Path

1. Start at the home screen
2. Long down
3. Click on “Connectivity”
4. Click on “Modbus”

6.1.13.3 General Tab Settings

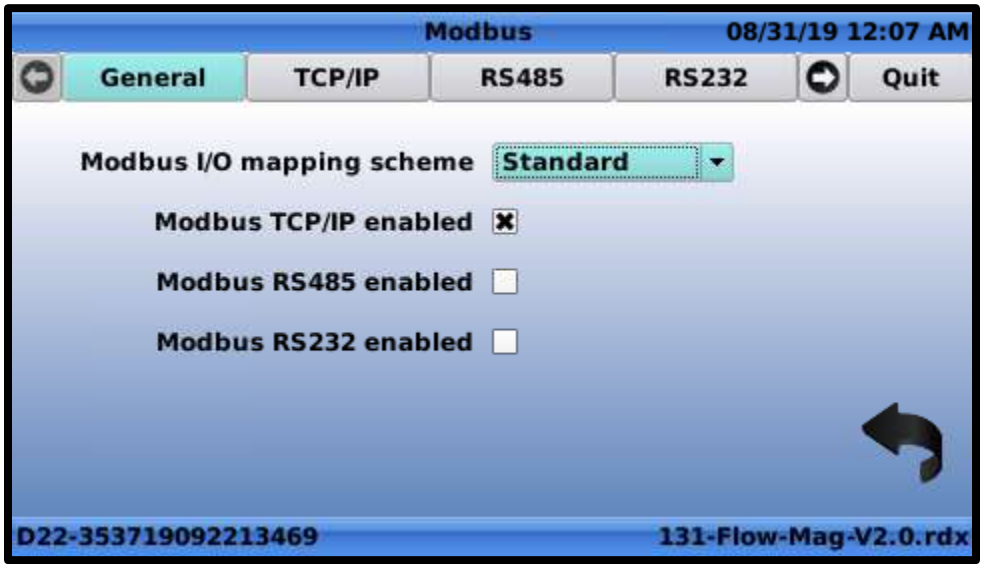


Figure 6.27

Modbus I/O mapping scheme: Specifies whether the VC-22D will use “Standard” or “Cla-Val” Modbus register mapping. “Standard” was introduced in engine 2.5.0 and is the recommend scheme. “Cla-Val” has been left for backwards compatibility. See section 9 for a detailed description of each scheme.

Modbus TCP/IP enabled: Allows VC-22D to receive and respond to Modbus TCP/IP requests.

Modbus RS485 enabled: Allows VC-22D to receive and respond to Modbus RS485 requests.

Modbus RS232 enabled: Allows VC-22D to receive and respond to Modbus RS485 requests.

6.1.13.4 TCP/IP Tab Settings

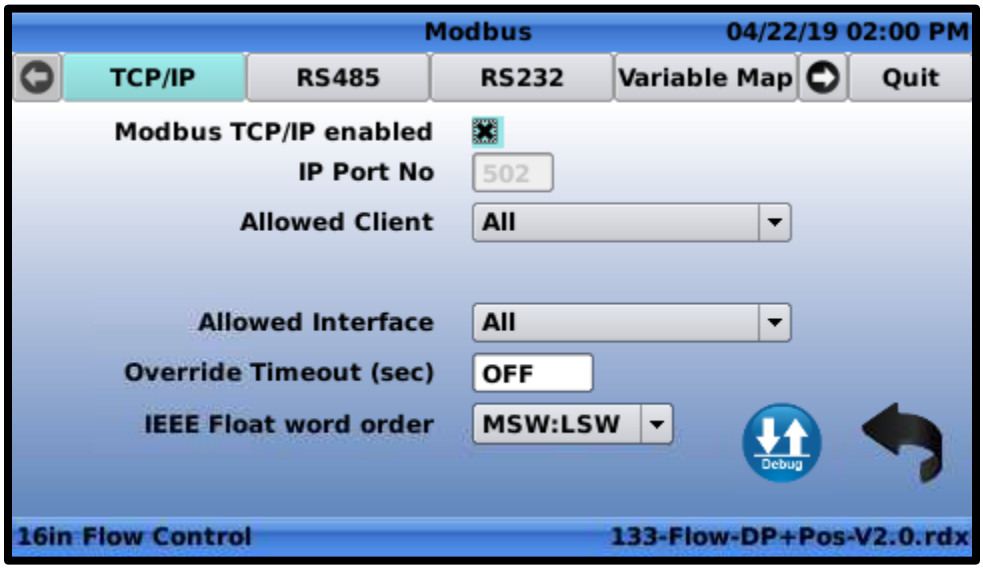


Figure 6.28

Modbus TCP/IP enabled: Allows VC-22D to receive and respond to Modbus TCP/IP requests.

IP Port No: Displays the port that the VC-22D listens for Modbus TCP/IP requests on. This is not user adjustable. Devices communicating to VC-22D must always use port 502.

Allowed Client: Specifies which devices the VC-22D is allowed to listen and respond too via Modbus TCP/IP. This is to prevent unauthorized devices from communicating with VC-22D. The dropdown has three options:

1. **All:** The VC-22D will respond to Modbus requests from any device.
2. **IP Range:** The VC-22D will only respond to Modbus requests that come from devices with an IP address in a specified range. If this option is selected, a text box appears below the setting allowing the user to enter the allowed IP address range as shown in **FIGURE 6.**.

Figure 6.29

3. **Single Client:** The VC-22D will only respond to Modbus requests that come from a device with a user specified IP address. If this option is selected, a text box appears below the setting allowing the user to enter the allowed IP address as shown in **FIGURE 6.**.

Figure 6.30

Allowed Interface: Specifies which physical connection the VC-22D will listen for Modbus requests on. This is to further prevent unauthorized access by restricting the number of communication pathways into the VC-22D. The dropdown has three options:

1. **All:** The VC-22D will listen to and respond to Modbus TCP/IP requests from the cell modem and Ethernet port.
2. **Ethernet:** The VC-22D will listen to and respond to Modbus TCP/IP requests from the Ethernet port only. Requests coming in through the cell modem will be ignored.
3. **GPRS:** The VC-22D will listen to and respond to Modbus TCP/IP requests from the cell modem only. Requests coming in through the Ethernet port will be ignored. This is a European feature only, as the cell modem is not operational in North America.

Override Timeout (sec): The number of seconds the VC-22D will wait without receiving a Modbus TCP/IP request before clearing all Modbus overrides and reverting registers back to original values. See section 9 for more information on the Modbus override. A value of 0 will disable the Override Timeout functionality.

IEEE Float word order: Specifies if the first word in a two word IEEE 754 float is the high ordered word (MSW) or the low ordered word (LSW). This specifies the register "endianness" for IEEE 754 encoded registers.

6.1.13.5 RS485 Tab Settings

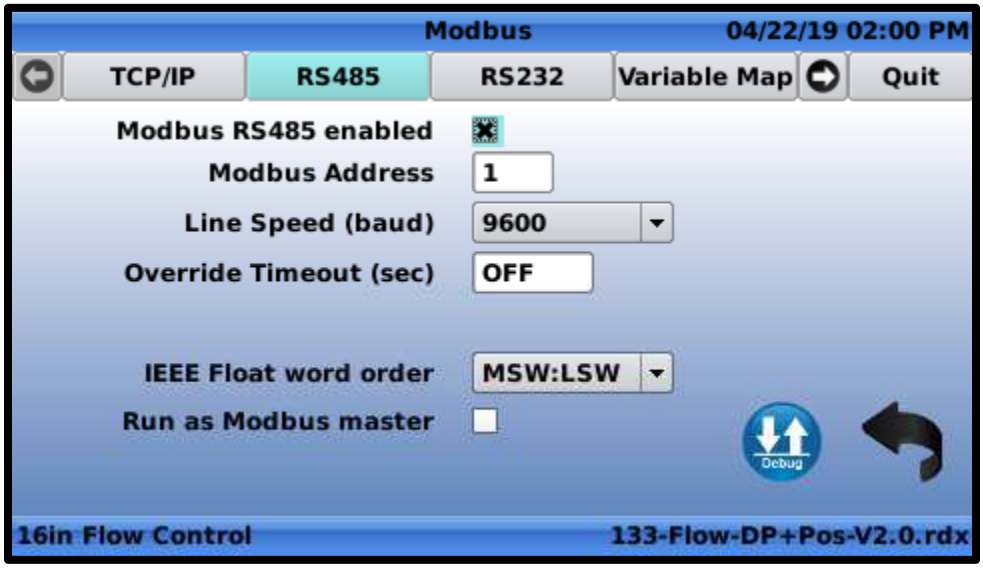


Figure 6.31

Modbus RS485 enabled: Allows VC-22D to receive and respond to Modbus RS485 requests.

Modbus Address: Address that the VC-22D responds to Modbus RS485 requests on.

Line Speed (baud): Baud rate of the VC-22D's RS485 interface. Options are 4800, 9600, 19200, 38400, 57600, and 115200. Note, the VC-22D uses 8 data bits, no parity, 1 stop bit, and no flow control for the remainder of the RS485 serial settings.

Override Timeout (sec): The number of seconds the VC-22D will wait without receiving a Modbus RS485 request before clearing all Modbus overrides and reverting registers back to original values. See section 9 for more information on the Modbus override. A value of 0 will disable the Override Timeout functionality.

IEEE Float word order: Specifies if the first register in a two register IEEE 754 float is the high ordered byte (MSW) or the low ordered byte (LSW). This specifies the register "endianness" for IEEE 754 encoded registers.

Run as Modbus master: When checked, this switches the Modbus RS485 from a server to a client. This is only used when the VC-22D is connected to other Cla-Val products (like the 34 series actuator) via Modbus RS485.

6.1.13.6 RS232 Tab Settings

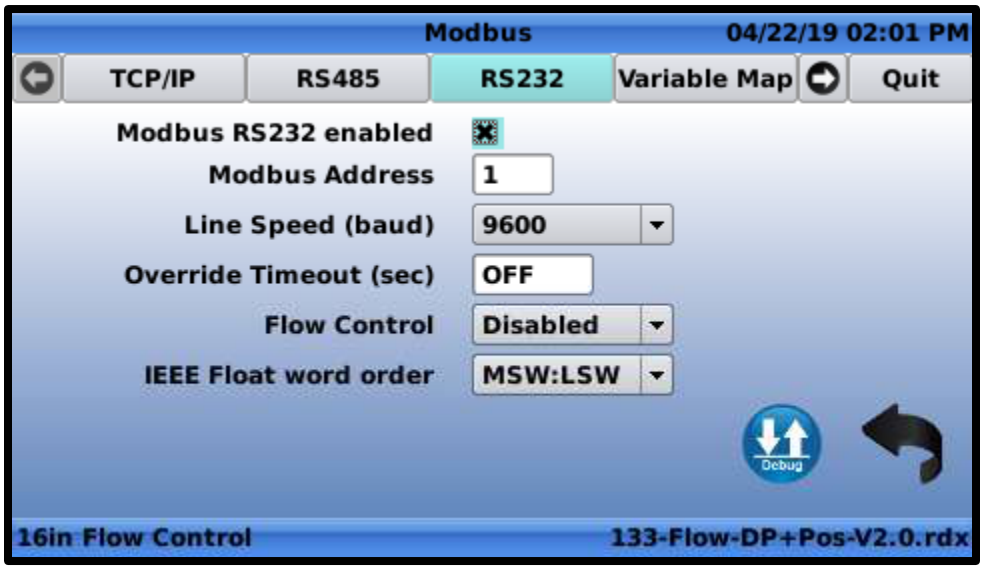


Figure 6.32

Modbus RS232 enabled: Allows VC-22D to receive and respond to Modbus RS232 requests.

Modbus Address: Address that the VC-22D responds to Modbus RS232 requests on.

Line Speed (baud): Baud rate of the VC-22D's RS232 interface. Options are 4800, 9600, 19200, 38400, 57600, and 115200.

Override Timeout (sec): The number of seconds the VC-22D will wait without receiving a Modbus RS485 request before clearing all Modbus overrides and reverting registers back to original values. See section 9 for more information on the Modbus override. A value of 0 will turn off the Override Timeout functionality.

Flow Control: Enables or disables hardware level RTS/CTS hardware control. Note, the VC-22D uses 8 data bits, no parity, and 1 stop bit for the remainder of the RS232 serial settings.

IEEE Float word order: Specifies if the first register in a two register IEEE 754 float is the high ordered byte (MSW) or the low ordered byte (LSW). This specifies the register "endianness" for IEEE 754 encoded registers.

6.1.13.7 Variable Map

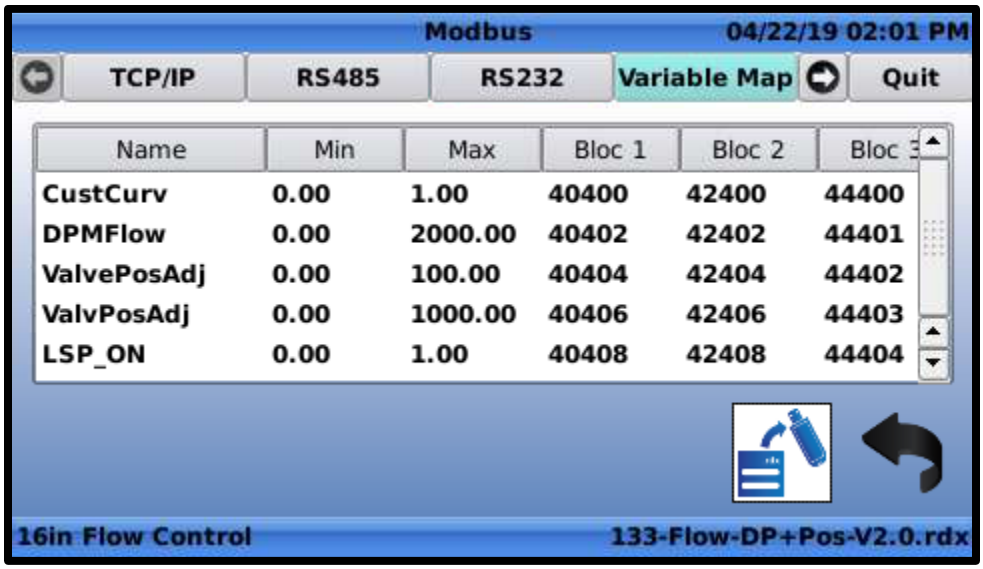


Figure 6.33

The variable provides a read only view of the VC-22Ds variables and corresponding Modbus addresses. Each variable gets a Modbus address in the three Modbus blocks (see section 9 for more information on Modbus blocks). The minimum and maximum value of each variable is also displayed.

6.1.14 Remote Access

6.1.14.1 Description

Used to enable/disable the VNC protocol to the VC-22D. The VNC protocol allows a remote computer (Windows or Linux) to view the VC-22D's display and click buttons on it. This is very similar to Microsoft's Remote Desktop protocol.

6.1.14.2 Navigation Path

1. Start at the home screen
2. Long down
3. Click on "Connectivity"
4. Click on "Remote Access"

6.1.14.3 Remote Access Settings

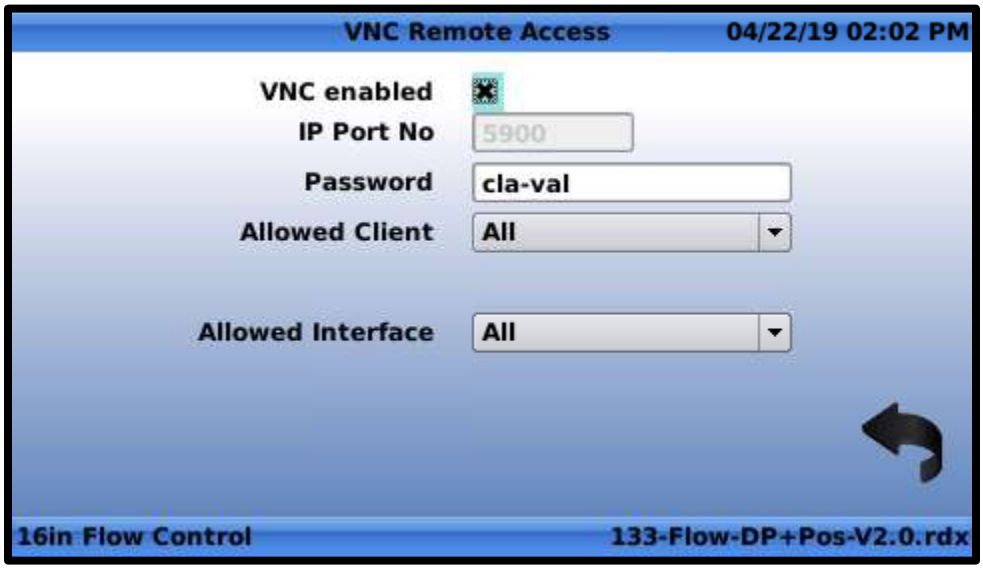


Figure 6.34

VNC enabled: Allows communication to the VC-22D via the VNC protocol.

IP Port No: Specifies the port number the VC-22D listens for VNC traffic on. This port number is fixed at 5900 and cannot be changed by the user.

Password: The password required when establishing a VNC connection to the VC-22D.

Allowed Client: Specifies which devices the VC-22D is allowed to listen and respond too via VNC. This is to prevent unauthorized devices from communicating with VC-22D. The dropdown has three options:

1. **All:** The VC-22D will respond to VNC requests from any device.
2. **IP Range:** The VC-22D will only respond to VNC requests that come from devices with an IP address in a specified range. If this option is selected, a text box appears below the setting allowing the user to enter the allowed IP address range as shown in **FIGURE 6.**.

Figure 6.35

3. **Single Client:** The VC-22D will only respond to VNC requests that come from a device with a user specified IP address. If this option is selected, a text box appears below the setting allowing the user to enter the allowed IP address as shown in **FIGURE 6.**.

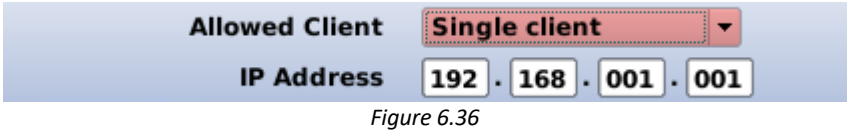


Figure 6.36

Allowed Interface: Specifies which physical connection the VC-22D will listen for Modbus requests on. This is to further prevent unauthorized access by restricting the number of communication pathways into the VC-22D. The dropdown has three options:

1. **All:** The VC-22D will listen to and respond to Modbus TCP/IP requests from the cell modem and Ethernet port.
2. **Ethernet:** The VC-22D will listen to and respond to Modbus TCP/IP requests from the Ethernet port only. Requests coming in through the cell modem will be ignored.
3. **GPRS:** The VC-22D will listen to and respond to Modbus TCP/IP requests from the cell modem only. Requests coming in through the Ethernet port will be ignored. This is a European feature only, as the cell modem is not operational in North America.

6.1.15 Cloud Storage

6.1.15.1 Description

This setting will allow the user to connect to a private FTP server “custom”, or to the CLA-VAL servers (“CLA-VAL link2valves”) or to switch it off, then configure all the settings necessary to access FTP server.

6.1.15.2 Navigation Path

1. Start at the home screen
2. Long down
3. Click on “connectivity”
4. Click on “cloud storage”

If a connection to the CLA-VAL servers is desired, a valid registration email address is required as shown below.

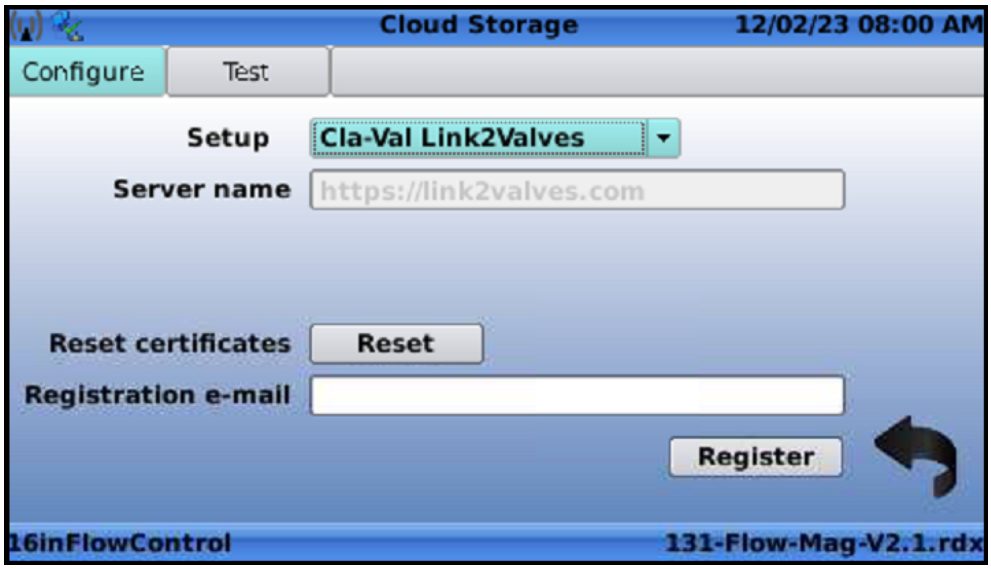


Figure 6.37

To connect to a custom FTP server required fields must be filled with custom FTP server information as shown in figure **FIGURE 6.38.**

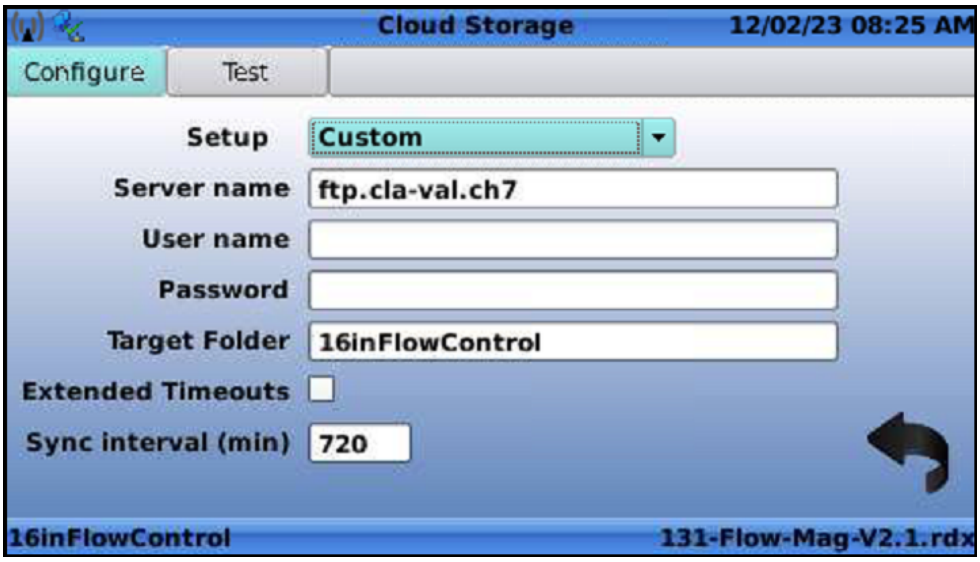


Figure 6.38

"Test" tab allows the user to check the connection to the FTP server setup, click on the  icon to run the test again, as shown in **FIGURE 6.39.**

Figure 6.39

6.1.16 Wireless

6.1.16.1 Description

The wireless capabilities of the VC-22D allow the user to control a wireless LAN that may be broadcasted from the VC-22D with the use of a USB WiFi adapter. Use of the WiFi adapter will allow access to the Web Interface along with a VNC Connection (no Modbus). The wireless LAN capability has been provided to make on-site support and start-up more user friendly but is not intended for operational use. The adapter helps eliminate the need for a long Ethernet cable or use of a laptop in a confined space.

To obtain a USB WiFi adapter for the VC-22D, contact your local Cla-Val sales representative. While there are many USB WiFi adapters available on the market, it's best to obtain one from Cla-Val to ensure the WiFi adapter is compatible with the VC-22D.

The wireless setting will not be visible in the system settings unless the VC-22D was booted with a USB WiFi adapter already plugged in. To ensure the wireless setting is visible, insert the USB WiFi adapter into the VC-22D's USB port, and then, perform a reboot of the VC-22D.

**note: Please ensure VC-22D engine version is 2.8.0 or above (check via long-down from home screen -> Information -> short-right to version tab), refer to section 6.1.20 for engine update.

note: To obtain a USB WiFi adapter for the VC-22D, please order p/n "89611129E DONGLE, VC-22D WIFI**" from the Costa Mesa Factory.

6.1.16.2 Navigation Path

1. Start at the home screen
2. Long down
3. Click on "Connectivity"
4. Click on "Wireless"

6.1.16.3 Wireless Settings

Figure 6.40

WiFi Enabled: Checking this box will allow the VC-22D to broadcast the WiFi signal. If this box is unchecked, the signal will not be broadcast.

WiFi AP Name: Displays the name of the WiFi LAN that will be displayed to other computers browsing local WiFi networks.

**note: the wifi AP Name just takes the controller's name. If it needs to be changed, it can be done starting at the homescreen -> long down -> information -> hostname.

WPA Key: Displays the passcode that's required for another computer to join the WiFi LAN.

IP Address: Displays the IP address of the VC-22D on the WiFi network.

6.1.17 Web Interface

6.1.17.1 Description

Used to enable/disable the web interface for the VC-22D which allows for remote upload/download of files to the VC-22D via a web browser.

6.1.17.2 Navigation Path

1. Start at the home screen
2. Long down
3. Click on "Connectivity"
4. Click on "Web Interface"

6.1.17.3 Web Interface Settings

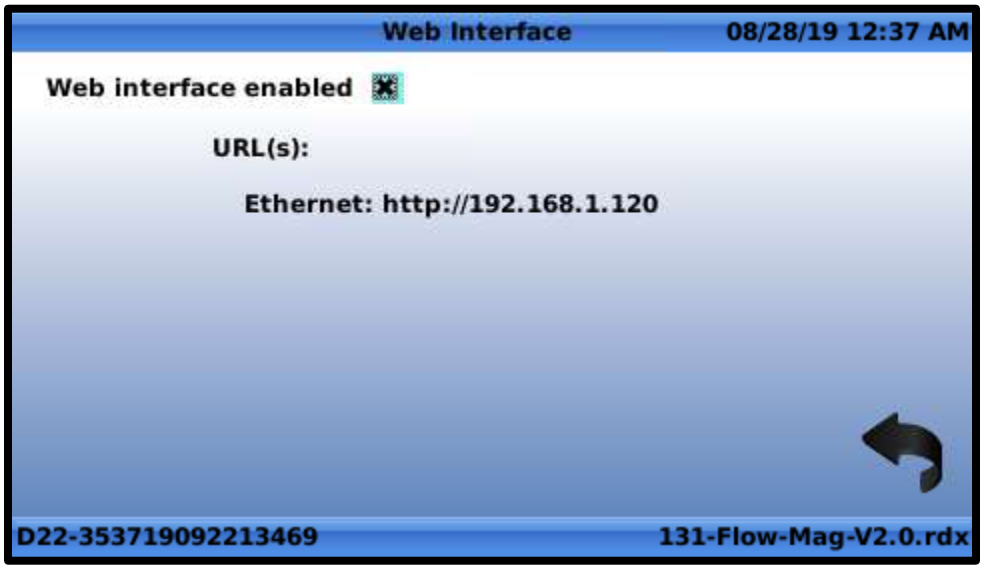


Figure 6.41

Web interface enabled: Checking this box enables the web interface

URL Ethernet: Lists the URL to use for accessing the web interface from a browser

6.1.18 Security

6.1.18.1 Description

Allows the user to specify a password that must be entered to obtain access to critical settings.

6.1.18.2 Navigation Path

1. Start at the home screen
2. Long down
3. Click on “Security”

6.1.18.3 Security Settings

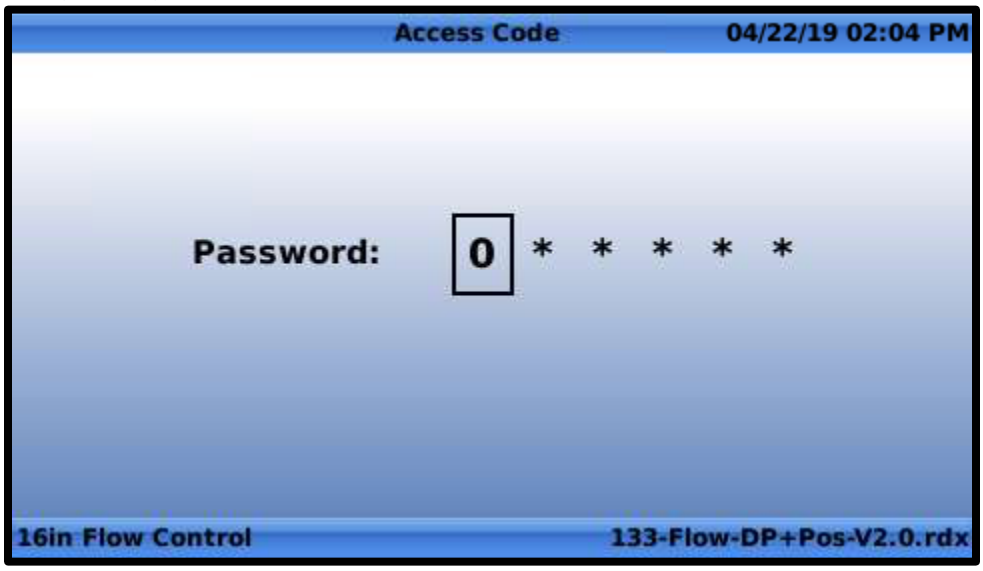


Figure 6.42

This screen allows the user to specify a log in password. By default, no password is set and the user is always considered logged in. After specifying a password, the user will be prompted to login with the password before accessing any of the following screens:

1. System settings (long down)
2. Valve control settings (long up)
3. Input settings (long left)
4. Output settings (long right)

Once logged in, the user will remain logged in until 20 minutes of inactivity. The login status is depicted with a padlock icon on the top bar of the VC-22D’s display (see **FIGURE 6.** below):

Figure 6.43

To remove the password, go to the security settings and enter “000000” as the password.

6.1.19 Reboot

6.1.19.1 Description

Reboots the VC-22D.

6.1.19.2 Navigation Path

1. Start from the home screen
2. Long down
3. Click on “Reboot”

6.1.19.3 Reboot Settings

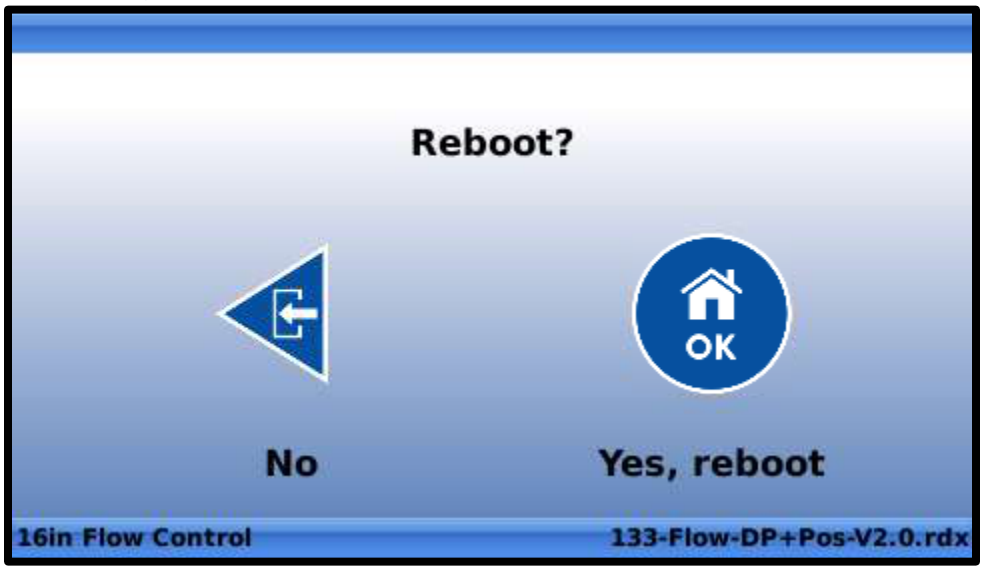


Figure 6.44

The reboot screen will ask for confirmation before initiating the reboot. If you press the left navigation button, the reboot is cancelled. If you press the OK navigation button, the VC-22D is rebooted.

6.1.20 Engine Update

6.1.20.1 Description

Used to update the engine software on the VC-22D and adds any new features attached with every engine.

**note: to check the current version installed on the VC-22D controller, navigate via: start from the home screen -> long down -> information -> short right -> engine.

**note: engine updates should be done in order, to avoid any software malfunction.

Engine order is as follows:

1.7.0, 1.7.1.9, 1.7.2.6, 1.8.0.3, 1.8.1, 1.8.4, 1.9.0, 2.0.0, 2.0.1, 2.1.0, 2.2.0, 2.3.1, 2.4.0, 2.5.0, 2.5.2, 2.6.0, 2.70, 2.8.0, 2.8.2, 2.8.3,2.8.5 (all found in Engine Archive .zip)

**note: Please refer to Cla-Val website for most up to date engine releases.

6.1.20.2 Navigation Path

1. Start at the home screen
2. Long down
3. Click on “Advanced”
4. Click on “Engine Update”

6.1.20.3 Engine Update Settings

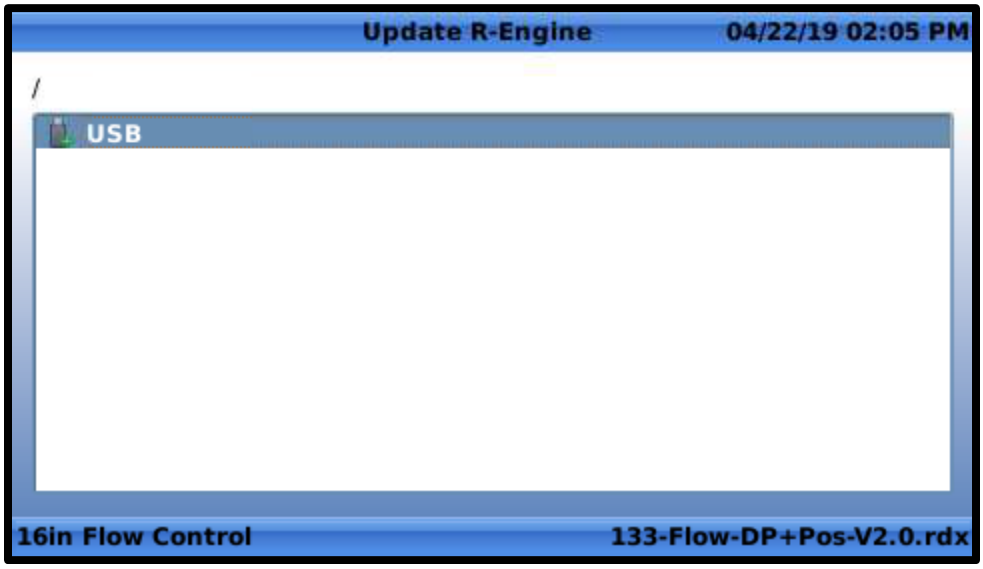


Figure 6.45

The engine update screen shows a file explorer which can be used to navigate to an engine update file. Selecting an engine update file and pressing “OK” will prompt for confirmation. Saying yes to the confirmations will update the engine and reboot the VC-22D.

6.1.21 Diagnostics to USB

6.1.21.1 Description

Used to export log files about the VC-22Ds errors and warnings to a USB thumb drive.

6.1.21.2 Navigation Path

1. Start at the home screen
2. Long down
3. Click on “Advanced”
4. Click on “Diag->USB”

6.1.21.3 Diagnostics to USB Settings

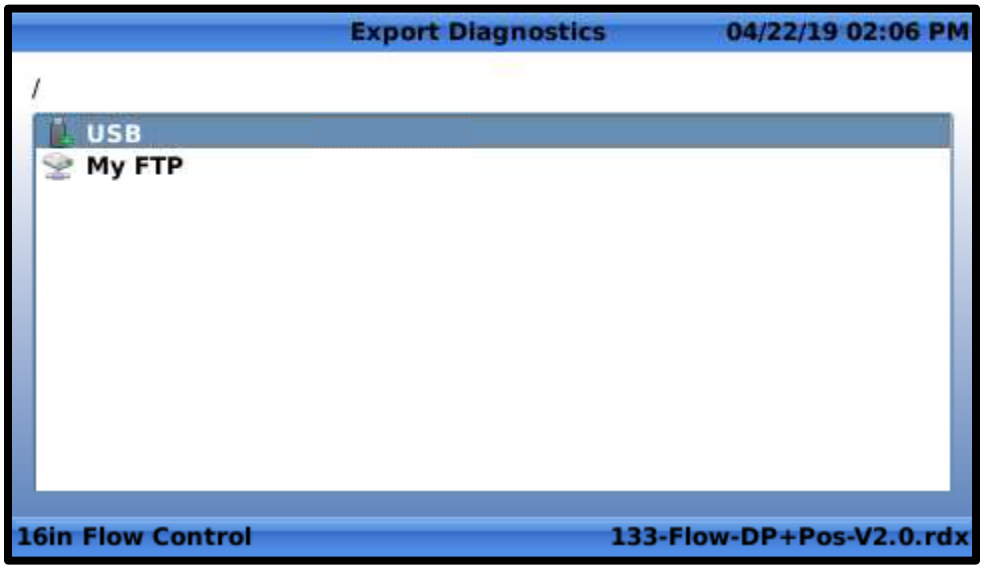


Figure 6.46

The diagnostics to USB screen shows a file explorer that allows the user to select a location to export diagnostic files too. The diagnostic files will include traces of software faults that have occurred.

6.1.22 Factory Reset

6.1.22.1 Description

Used to remove the currently running ValvApp and return all settings in the VC-22D to factory default. The VC-22D will require a new ValvApp to be loaded before it is operational again.

6.1.22.2 Navigation Path

1. Start at the home screen
2. Long down
3. Click on “Advanced”
4. Click on “Factory Reset”

6.1.22.3 Factory Reset Settings

Figure 6.47

The factory reset screen is just a confirmation prompt. Clicking “Yes” will revert the VC-22D back to its factory default state and reboot the controller. Clicking “No” will cancel the factory reset.

6.1.23 Kernel Update

6.1.23.1 Description

Used to update the VC-22D's kernel software.

6.1.23.2 Navigation Path

1. Start at the home screen
2. Long down
3. Click on "Advanced"
4. Click on "Kernel Update"

6.1.23.3 Kernel Update Settings

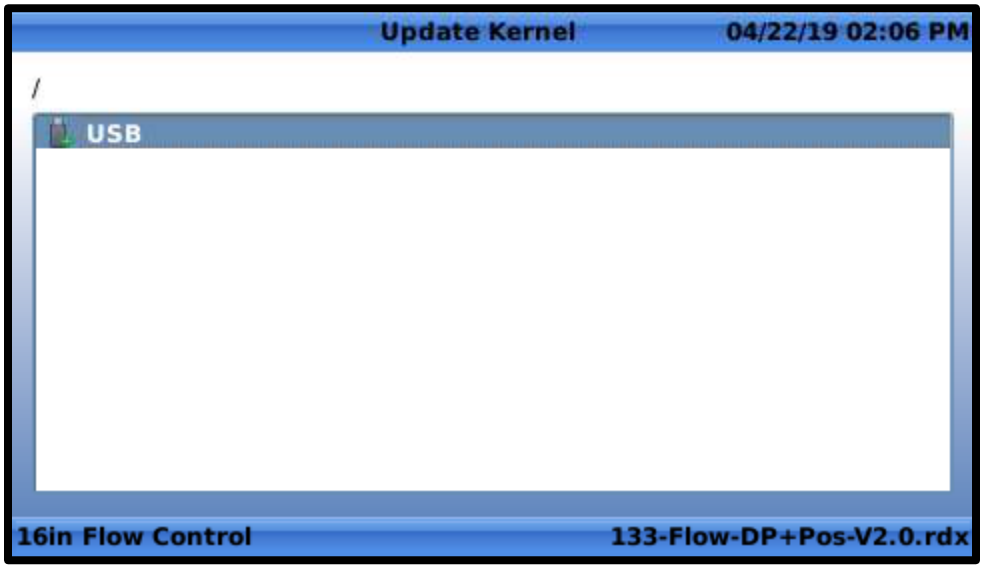


Figure 6.48

The kernel update screen shows a file explorer which can be used to navigate to a kernel update file. Selecting a kernel update file and pressing "OK" will prompt for confirmation. Saying yes to the confirmations will update the kernel and reboot the VC-22D.

6.1.24 Configuration Wizard

6.1.24.1 Description

Launches the configuration wizard. See section 5.3 for more information about the configuration wizard.

6.1.24.2 Navigation Path

1. Start at the home screen
2. Long down
3. Click on "Advanced"
4. Click on "Configuration Wizard"

6.1.24.3 Configuration Wizard Settings

Figure 6.49

The configuration wizard icon opens a prompt which allows the user to run the configuration wizard.

6.1.25 Display Brightness

6.1.25.1 Description

Allows the user to adjust the backlighting on the VC-22D display.

6.1.25.2 Navigation Path

1. Start at the home screen
2. Long down
3. Click on “Display”
4. Click on “Brightness”

6.1.25.3 Display Brightness Settings

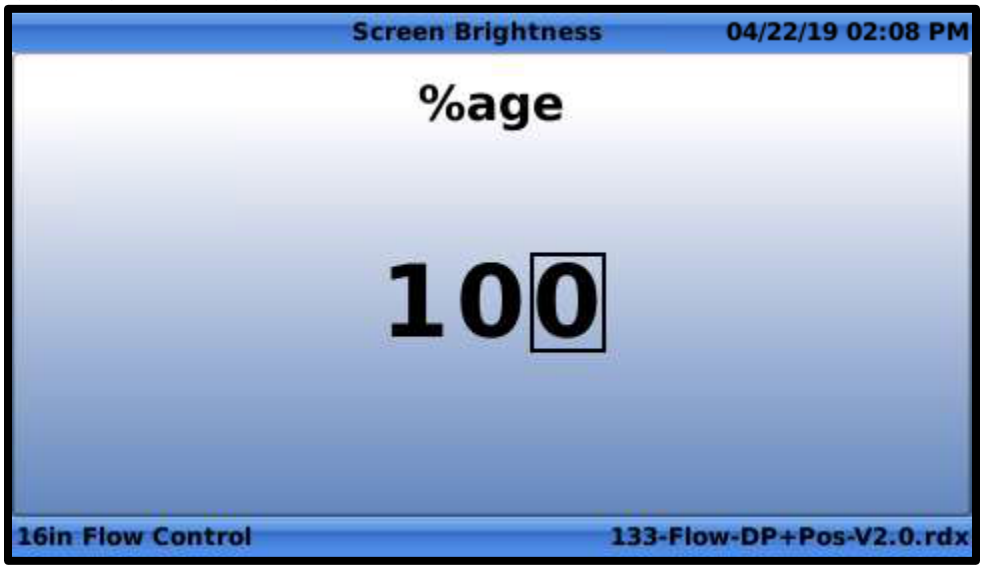


Figure 6.50

The display brightness screen has a single percentage value. Setting 100% increases the display to maximum brightness, setting 0% decreases the display to minimum brightness.

6.1.26 Shutoff Screen

6.1.26.1 Description

Allows the user to specify how long the screen remains on after no navigation keys have been pressed.

6.1.26.2 Navigation Path

1. Start at the home screen
2. Long down
3. Click on “Display”
4. Click on “Shutoff”

6.1.26.3 Shutoff Screen Settings

Figure 6.51

The shutoff screen setting specifies how long the screen will remain on after no navigation keys have been pressed. Setting this value to 0 forces it to remain on indefinitely. By default, the setting is 0.

6.2 Valve Control Settings

Valve control settings impact how the VC-22D operates the valve. Examples of valve control settings are PID gains, actions that trigger outputs based on inputs, and retransmission of input signals.

6.2.1 DP Metering

6.2.1.1 Description

Cla-Val has “CV-Lift” data on our valves which allows the flow rate through the valve to be calculated based on pressure differential and valve position. The “CV-Lift” data changes based on valve size, valve shape, flow direction, and seat type (standard or anti-cavitation).

The VC-22D comes with a preloaded library of CV-Lift data for the most common valves. The DP metering settings allow the user to specify which “CV-Lift” data to use (based on valve size, valve shape, and seat type). It also allows the user to specify which IO points are monitoring pressure differential and valve position.

The DP metering is only enabled in certain ValvApps and cannot be enabled by the user. The user must choose a ValvApp from the standard library that has DP metering enabled or contact a Cla-Val representative to get a custom ValvApp.

Once the ValveApp is loaded to controller whether the app is loaded from a standard library or custom app the controller will pop up a notification to setup the DP Metering configuration at the home screen of the initial start up process of the controller as shown in **FIGURE 6..**

Figure 6.52

6.2.1.2 Navigation Path

1. Start at the home screen
2. Long up
3. Click on “DP Metering”

6.2.1.3 Valve Tab Settings

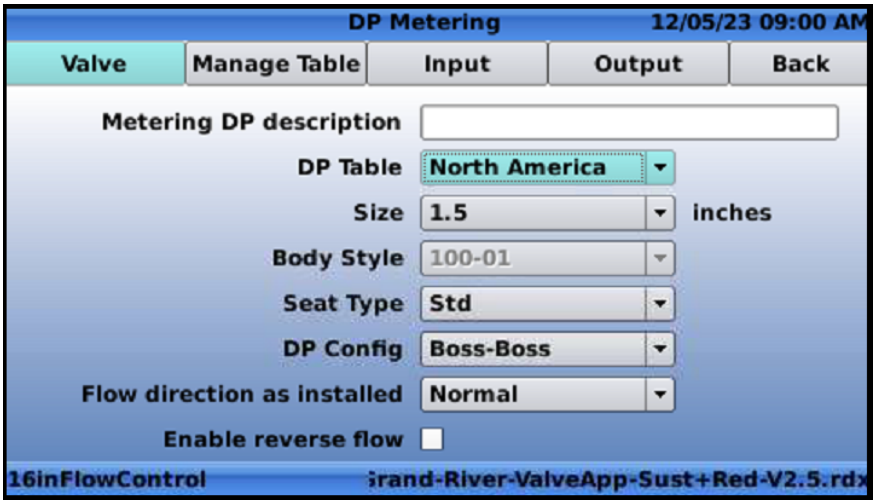


Figure 6.53

Metering DP description: Field to enter a user-friendly description of the DP metering function.

DP Table: Specifies which library the "CV-Lift" data will come from. The options are listed below:

1. **EMEA:** Allows "CV-Lift" data for European valve sizes to be selected on the next tab
2. **North America:** Allows "CV-Lift" data for our North American valve sizes to be selected on the next tab.
3. **Specific:** Allows "CV-Lift" data to be selected for custom valves that have been specially loaded into a custom ValvApp per customer request.

Size: Specifies the valve size. Includes all common valve sizes for Cla-Valve.

Body Style: Specifies the body style. The options are 100-01 (Full Port Globe Valve) and 100-20 (Reduce Port Globe Valve)

Seat Type: Specifies the seat type. Whether it's a standard seat or anti cavitation seat "KO".

DP Config: Specifies whether the pressure is measured at the valve's boss inspection ports or the pipes inspection ports.

Flow direction as installed: Specifies whether the flow direction of the valve is installed in normal or reverse direction.

Enable reverse flow: Configures the ability to calculate flow in reverse flow direction if tab to be selected.

When this box is checked, in the case of a pressure reversal, P2>P1 or negative DP, the VC-22D will automatically switch to the opposite direction curve and continue to calculate flow.

(ie. "Flow direction as installed" is set to Normal, flow calculation will switch to using Reverse curve if P2>P1 or DP is negative).
**note: If a Reverse curve does not exist for the selected valve, a warning screen will pop up and the

Normal direction curve will still be used.

6.2.1.4 Manage Table Settings

Manage table tab settings allows to change and configure and apply contant gain to the current table or the ability to directly edit the current table.

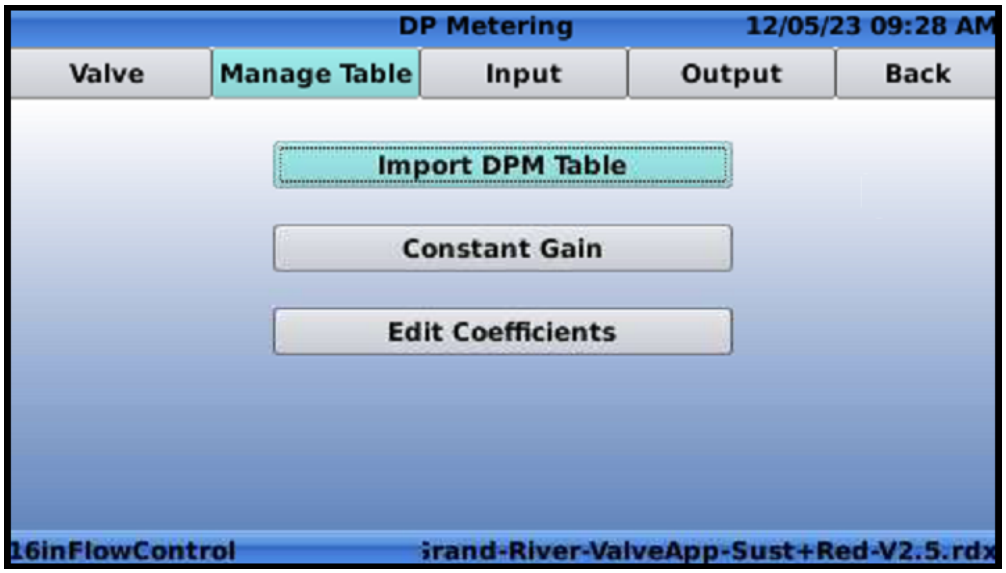


Figure 6.54

Import DPM Table: allows the option to import a new or custom ValveFlow table via USB as shown in **FIGURE 6.**

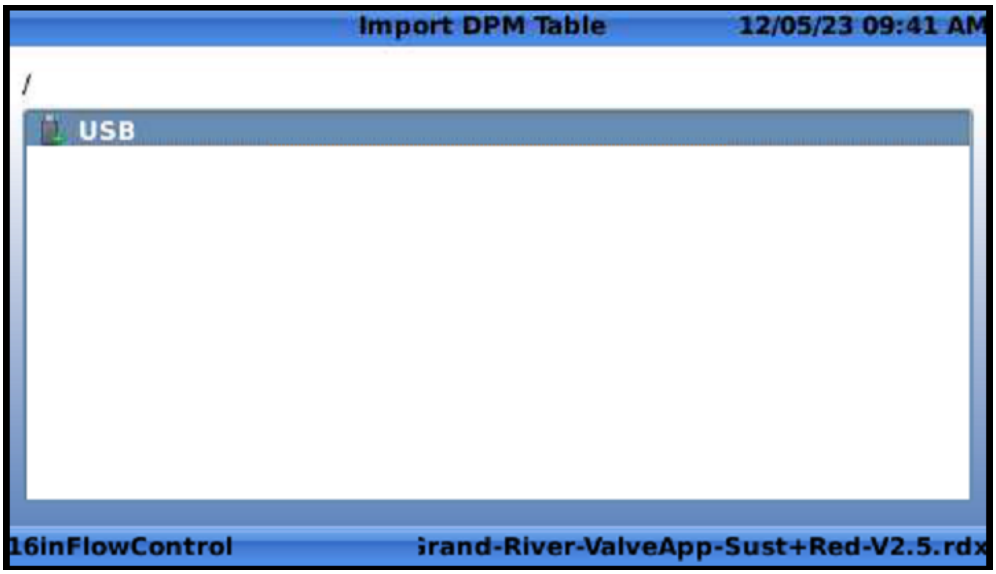


Figure 6.55

Constant Gain: applies a constant gain in which it will be applied to all ValveFlow coefficients for the currently selected valve, if a valve is changed the gain will reset back to 1, shown below in **FIGURE 6.56.**

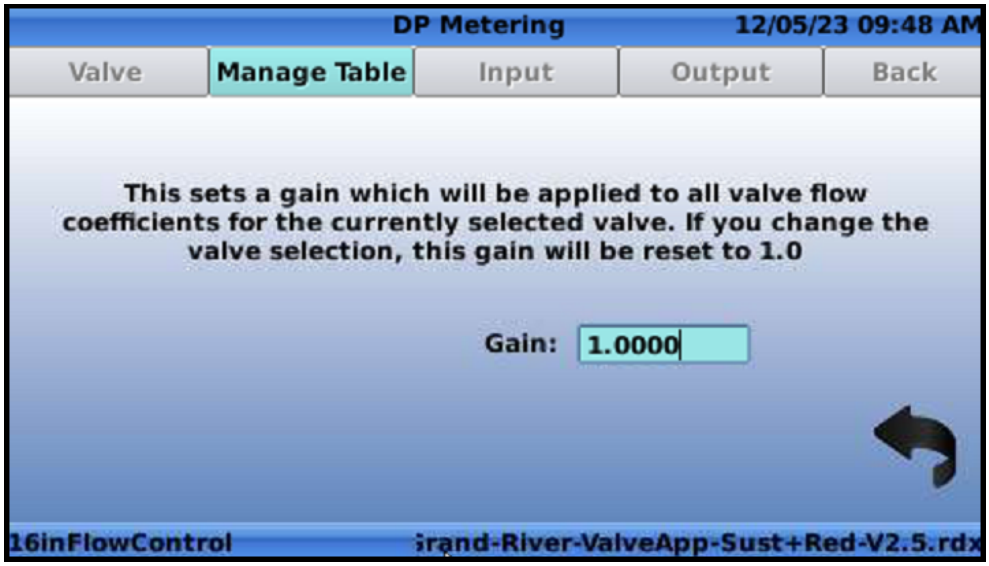


Figure 6.56

Edit coefficients: Specified to generate a custom table directly on the VC-22D by applying a gain to individual points along the curve. You will be able to see current Opening % and calculated flow. If the system is operational, you can either enter a measured flow rate or select a reference flow rate input if used as shown in **FIGURE 6.57.**

Figure 6.57

6.2.1.5 Input Tab Settings

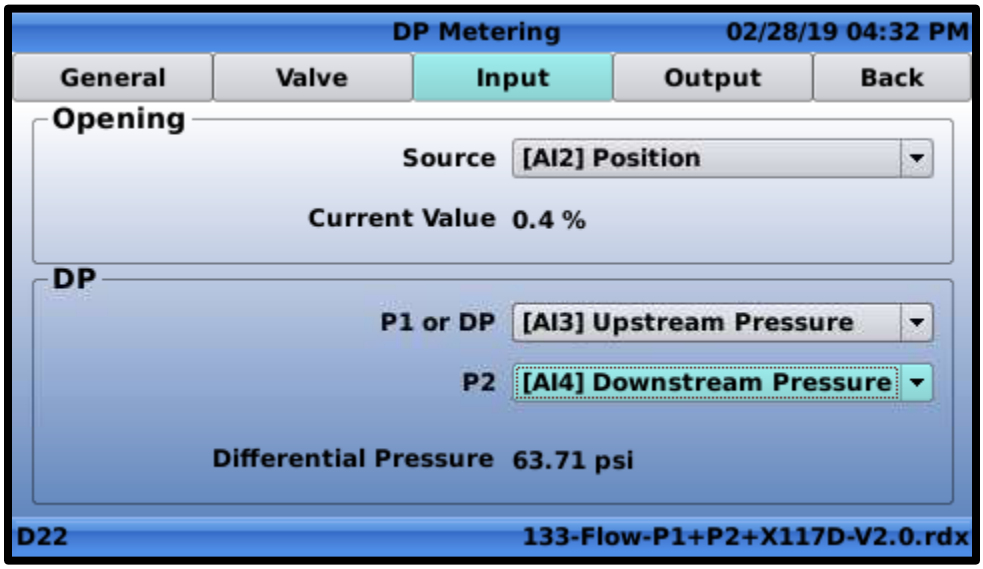


Figure 6.58

Source: Specifies the analog input or interactive variable that reports the valve's position.

P1 or DP: Specifies the analog input or interactive variable that reports the valve's upstream pressure or the differential pressure (inlet pressure – outlet pressure). If the source chosen is a differential pressure, leave the "P2" setting blank.

P2: Specifies the analog input or interactive variable that has the valve's downstream pressure. Leave this field blank if a differential pressure (inlet pressure – outlet pressure) is specified in "P1".

Differential Pressure: Displays the differential pressure being calculated from the "P1 or DP" and "P2" sources.

6.2.1.6 Output Tab Settings

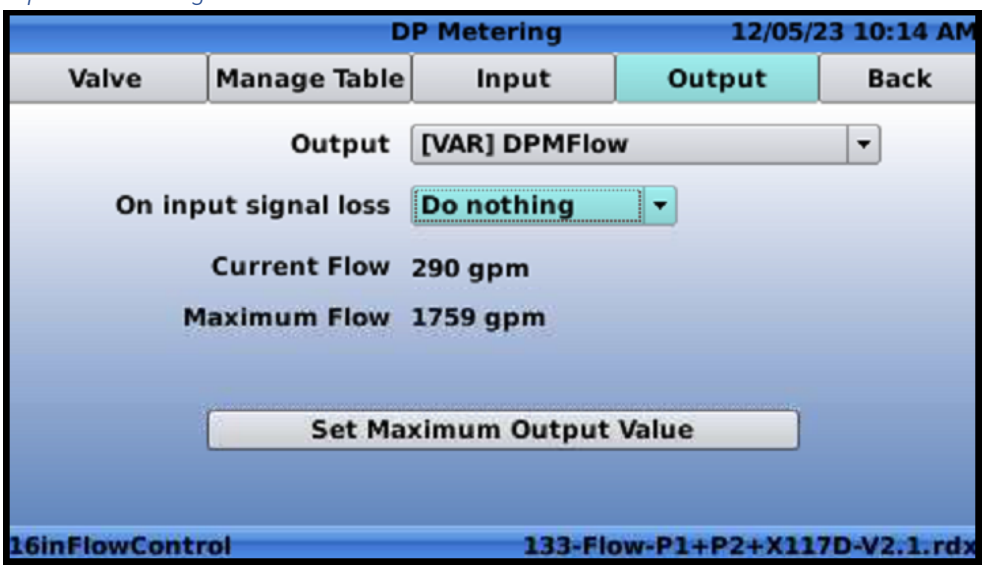


Figure 6.59

Output: Specifies the analog output or interactive variable that DP metering writes calculated flow too.

On Input Signal Loss: Specifies two options of how the controller would react on loss of signal.

1. **Default Value:** Specifies the calculated flow that's outputted when the valve position or pressure values are out of range (i.e. the input wiring is disconnected).
2. **Do Nothing:** signal loss would show up on the home screen of the controller.

Current Flow: Displays the current flow calculated by the DP metering function.

Maximum Flow: Displays the largest possible flow the DP metering function will output.

Set Maximum Output Value: Clicking this button updates the scaling on the output so it's 20mA value is equal to Maximum Flow

6.2.2 PID

6.2.2.1 Description

The VC-22D provides a proportional, integral, and derivative (PID) function which will send output signals to maintain a user specified setpoint.

6.2.2.2 Navigation Path

1. Start at the home screen
2. Long up
3. Click on the PID icon

6.2.2.3 General Tab Settings

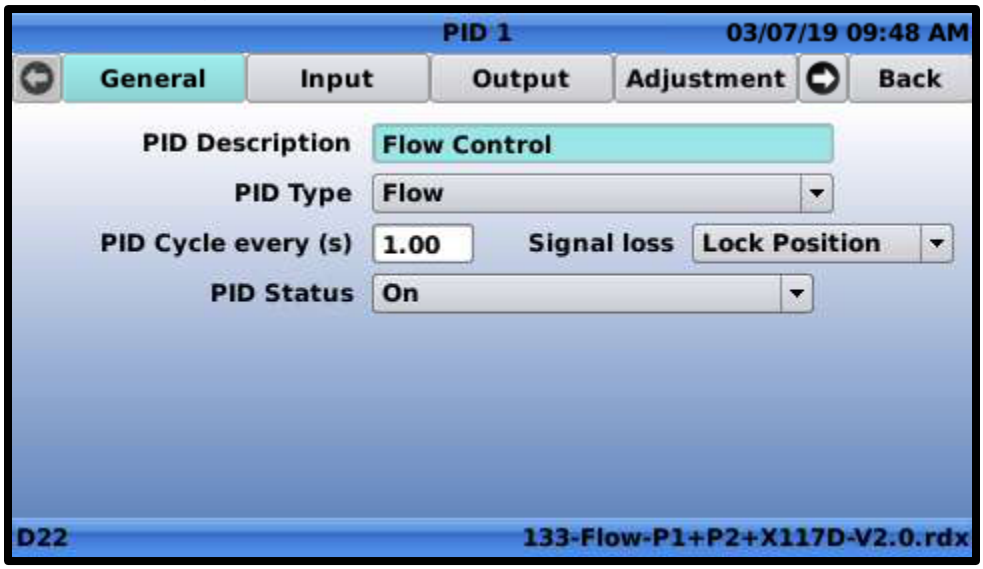


Figure 6.60

PID Description: User friendly description of the PID function. This is useful when multiple PID functions are enabled.

PID Type: Specify what the PID should be controlling. Available options are listed below:

1. Analog (4-20 mA current)
2. Flow
3. Pressure
4. Level
5. % (valve position)

PID Cycle every (s): The number of seconds between each PID cycle. Each time a cycle is executed, the PID function adjusts its outputs to maintain a setpoint. The lower this number, the more frequent output adjustments will be. The default value of 1 second is adequate for almost all circumstances.

Signal loss: Specifies the behavior of the PID function when the setpoint signal or feedback signal is lost (e.g. the 4-20 mA signal is broken, or the Modbus communication fails). The options are listed below:

1. Lock position: Solenoids are closed to trap water on the valve's cover and lock its position
2. No action: PID treats lost signal as a real signal, and continues trying to control valve
3. Open 100%: PID forces solenoids to open valve completely
4. Close 100%: PID forces solenoids to close valve completely

PID Status: Specifies whether the PID is enabled. Allowed options are listed below:

1. Conditional: Specifies that the PID may be enabled/disabled based on the value of a variable
2. On: Forces the PID to always be enabled
3. Off: Forces the PID to always be disabled

6.2.2.4 Input Tab Settings

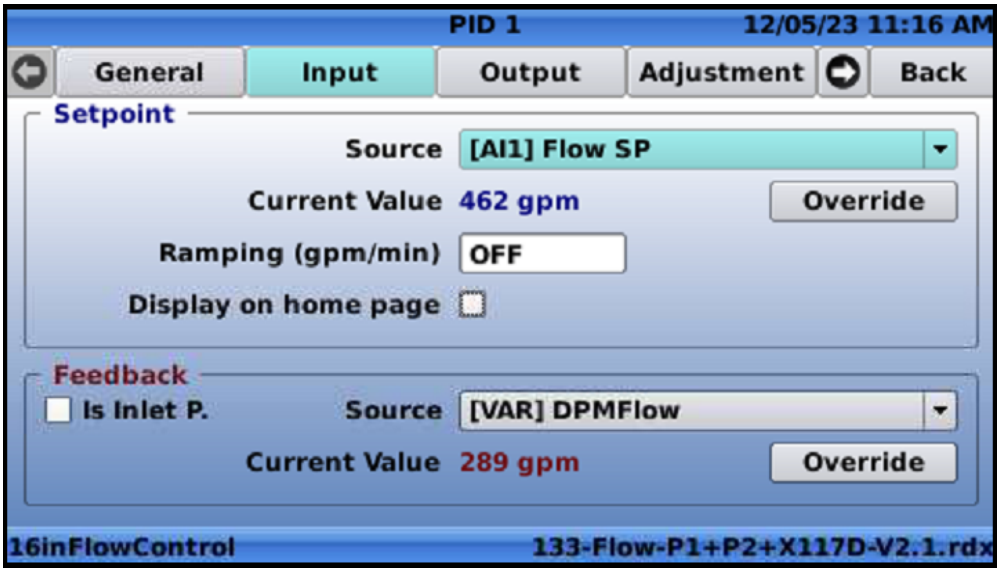


Figure 6.61

Setpoint Source: Specifies the analog input or interactive variable that holds the setpoint value. The setpoint is the target the PID function is controlling too (e.g. the amount of flow desired or the amount of pressure desired.)

Setpoint Current Value: Displays the current value of the selected setpoint.

Setpoint Override: When pressed, allows the user to enter a setpoint value directly without using an analog input or interactive variable.

Setpoint Ramping: Specifies the ramping rate for setpoint changes. If set to off, setpoint ramping is disabled. Use ramping to prevent sudden changes in valve position when the setpoint value is changed abruptly. The larger the ramping value, the slower the valve will respond to setpoint changes. To understand how setpoint ramping works, consider the following example:

> Assume the setpoint value is changed from 2,000 gpm to 1,000 gpm and the ramping is 500 gpm/min. The PID function will gradually change it's internal setpoint from 2,000 gpm to 1,000 gpm over a period of two minutes (i.e. a 1,000 gpm change made at 500 gpm/min takes 2 minutes).

Display on home screen: Allows the display of the ramping value on the home screen to track ramped value.

Feedback Source: Specifies the analog input or variable that holds the feedback value. The feedback is the measured value that the PID function is controlling (e.g. the value from a flowmeter or pressure meter).

Feedback Is Inlet P.: Specifies if the feedback source is an inlet pressure transducer. This tells the PID function to reverse its direction. When unchecked, the PID function will open the valve whenever feedback is below setpoint and close the valve whenever feedback is above setpoint. When checked, the PID function does the opposite. The valve is closed whenever feedback is below setpoint and opened whenever feedback is above setpoint.

Feedback Current Value: Displays the current value of the feedback setpoint.

Feedback Override: When pressed, allows the user to enter a feedback value directly without using an analog input or interactive variable.

6.2.2.5 Output Tab Settings

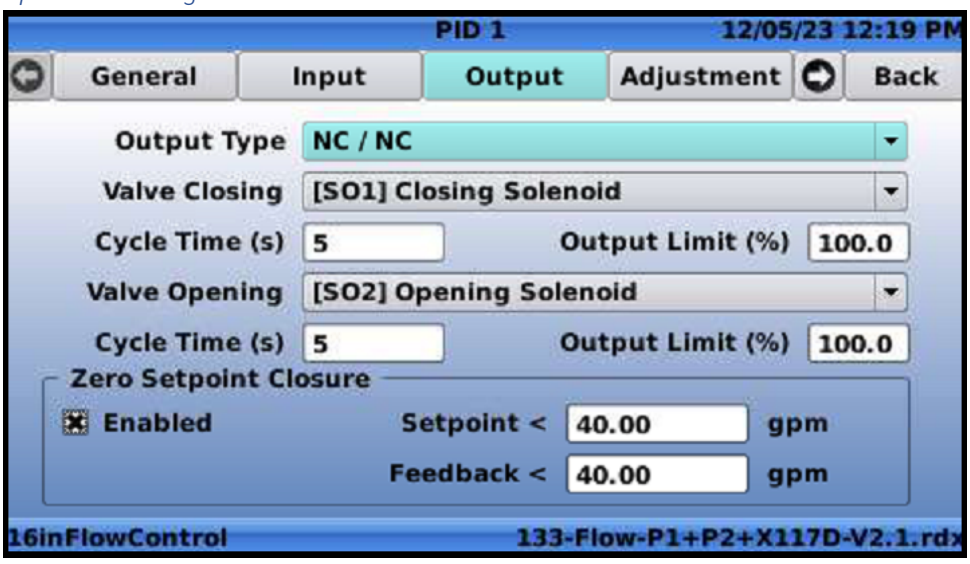


Figure 6.62

The PID function can send outputs in many ways to accommodate various solenoid configurations and non-solenoid controls.

For solenoid configurations, the VC-22D sends pulse width modulation signals. A pulse width modulation signal is a series of repeated cycles. During each cycle, an electrical pulse is sent for a portion of the cycle, and then no signal is sent for the remainder of the cycle.

For non-solenoid controls, the VC-22D can send a 4-20mA signal or write a number to a variable that represents how much valve actuation is required to maintain setpoint.

Output Type: Specifies the type of outputs the PID function will send. The list of available output types is below:

1. **NC / NC:** Send pulse width modulated (PWM) signals to closing and opening solenoids. Assumes both solenoids are normally closed.
2. **NO / NO:** Send PWM signals to closing and opening solenoids. Assumes both solenoids are normally opened.
3. **NO / NC:** Send PWM signals to closing and opening solenoids. Assumes the closing solenoid is normally opened and opening solenoid is normally closed.
4. **NC / NO:** Send PWM signals. Assumes the closing solenoid is normally closed and opening solenoid is normally opened.
5. **Linear 4-20 mA:** Send a 4-20 mA signal to an analog output.
6. **Linear -> VAR:** Send a numerical value to a variable.

If one of the first four options in the list above is specified for output type, then the following configuration parameters are available:

Valve Closing: Specifies the digital output wired to the closing solenoid. Options are SO1, SO2, RO1, or RO2.

Valve Closing Cycle Time: Specifies the number of seconds for a PWM cycle on the closing solenoid. The higher the number, the slower the solenoid is pulsed which results in the valve actuating faster. For almost all applications, the default 5 second cycle time is adequate.

Valve Closing Output Limit: Specifies the max portion of the PWM cycle the closing solenoid may be pulsed for.

Valve Opening: Specifies the digital output wired to the closing solenoid. Options are SO1, SO2, RO1, or RO2.

Valve Opening Cycle Time: Specifies the number of seconds for a PWM cycle on the opening solenoid. The higher the number, the slower the solenoid is pulsed which results in the valve actuating faster. For almost all applications, the default 5 second cycle time is adequate.

Valve Opening Output Limit: Specifies the max portion of the PWM cycle the opening solenoid may be pulsed for.

If “Linear 4-20 mA” option in the output type list is selected, then the following configuration parameters are available:

Figure 6.63

Physical Output: Specifies the analog output channel that the PID function will output a 4-20 mA signal on.

If “Linear -> VAR” option in the output type list is selected, then the following configuration parameters are available:

Figure 6.64

Output: Specifies the variable that the PID function will output a number too.

Zero Setpoint Closure Enabled: Enabled by default, the PID will force the valve to go drip tight closed whenever the setpoint and feedback are less than 2% of full scale. To force the valve to be drip tight closed, the VC-22D will hold the closing solenoid open and the opening solenoid closed.

Zero Setpoint Closure Setpoint: The value that setpoint must be less than for drip tight closure to be activated.

Zero Setpoint Closure Feedback: The value that the feedback must be less than for drip tight closure to be activated.

6.2.2.6 Adjustment Tab Settings

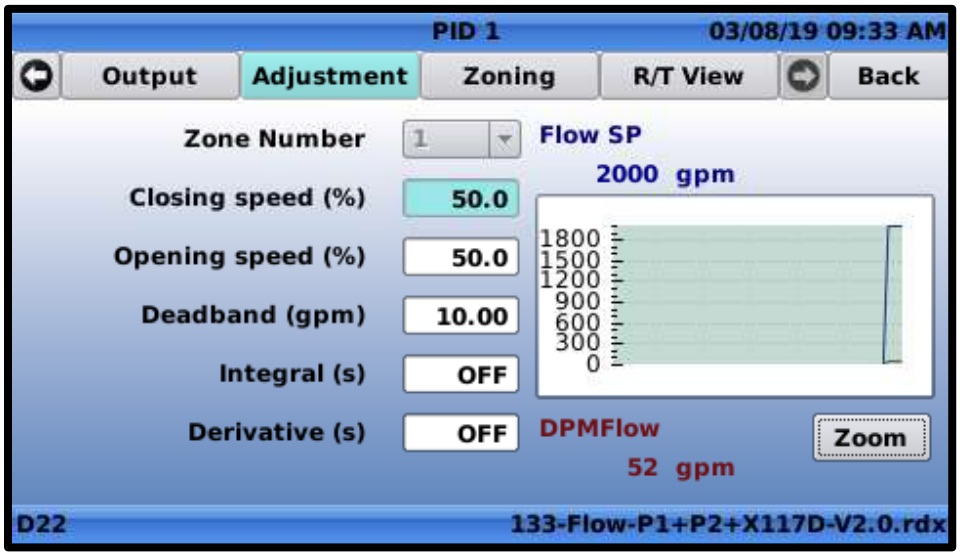


Figure 6.65

Zone Number: Indicates the zone that the remaining parameters are associated with. See section 6.2.2.7 for description of PID zones.

Closing/Opening Speed (%): The PID function has a proportional gain for closing the valve, and a separate proportional gain for opening the valve. The closing proportional gain is calculated from the closing speed. The larger the closing speed, the larger the closing proportional gain. The opening speed works the same way.

Deadband: Specifies the amount of error that's required before the PID loop will pulse solenoids. For example, if the deadband is 10 gpm and the current flow is within 10 gpm of setpoint, then the PID function will keep both solenoids closed to lock water on the cover. This setting prevents the PID from constantly pulsing solenoids when the feedback is close to setpoint and does not require much adjustment anyway.

Integral: Specifies the amount of integral gain the PID function uses. The higher the number, the smaller the integral gain. If integral gain is necessary (which is very unlikely), then start with a high number around 250 and decrease the number as required to increase response.

Derivative: Specifies the derivate gain the PID function uses. The higher the number, the smaller the derivative gain. If derivative gain is necessary (which is very unlikely), then start with a high number around 250 and decrease the number as required to increase response.

6.2.2.7 Zoning Tab Settings

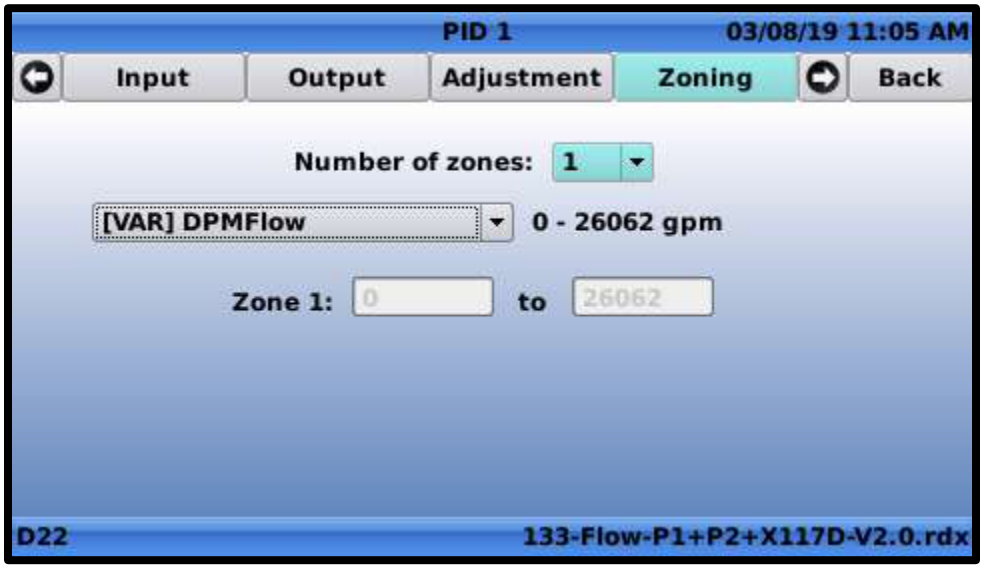


Figure 6.66

The PID function incorporates zoning, which allows the PID parameters to be changed automatically based on a source value (either a variable or input). Up to 4 zones can be created, and each zone is given a range (minimum and maximum value). If the source value is within a zone's range, then the zone is activated. The PID parameters associated with that zone are then used by the PID function.

This capability is used when the PID function needs to actuate the valve more aggressively in certain circumstances, but not others. For instance, sometimes a large valve needs a fast opening speed when

it's position is less than 10% but needs a slow opening speed when it's position is greater than 10%. In this case, two zones could be created that use the valve position as a source. The first zone would have a fast opening speed and would have a range of 0-10%. The second zone would have a slow opening speed and would have a range of 10%-100%.

Number of Zones: Specifies the number of zones the PID function has. Allowed values are 1-4. The number selected here determines the number of zone minimum and maximum text boxes visible below.

Zone Source: Specifies the variable or input for the zone source.

Zone # Minimum Value: Minimum value of zone range

Zone # Maximum Value: Maximum value of zone range

6.2.2.8 R/T View Tab Settings

Figure 6.67

This tab displays a real time graph of the PID's setpoint (blue line), feedback (brown line), output (green line), and error (red line). This tab is useful when analyzing performance of the PID's tuning parameters.

6.2.3 Control Curves

6.2.3.1 Description

The control curves function allows the user to draw a curve on an XY graph which correlates a source value to a destination value. In other words, the control curve takes an input and returns a corresponding output according to a relationship the user specifies.

6.2.3.2 Navigation Path

1. Start at the home screen
2. Long up
3. Click on "Control Curves"
4. Click on an existing control curve, or click on "Add CC"

6.2.3.3 General Tab Settings

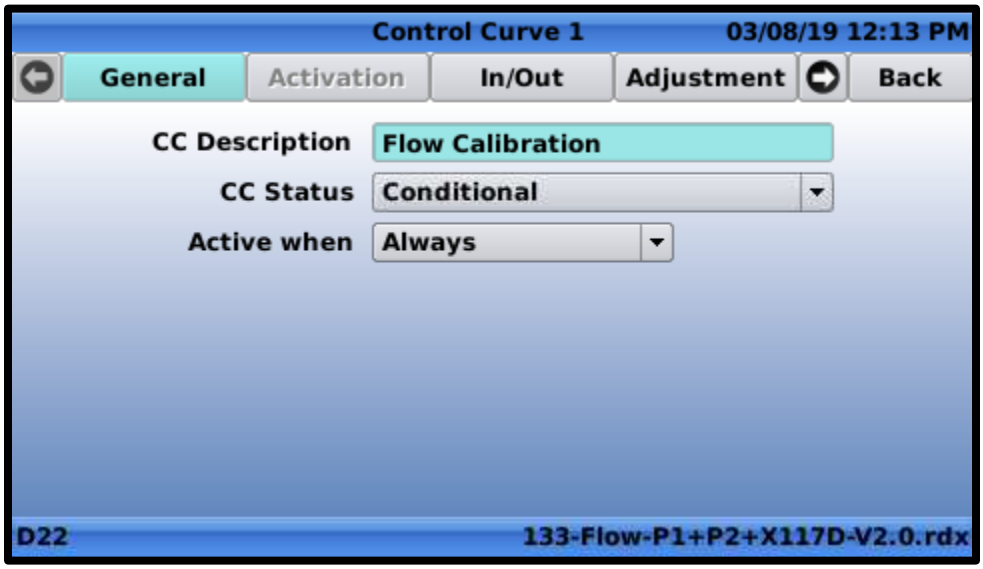


Figure 6.68

CC Description: User friendly description of the control curve

CC Status: Specifies how the control curve will be enabled/disabled. Allowed options are listed below:

1. Conditional: Allows the user to define a condition for enabling the control curve
2. On: Control curve is always enabled
3. Off: Control curve is always disabled
4. Calendar: Allows the user to enable the control curve based off calendar days
5. Period: Allows the user to enable the control curve based off calendar days within a particular date range.

If conditional is specified for CC status, then the following parameter is available:

Active when: Allows the user to define the condition for enabling the control curve. The drop down contains an always option, in which case the control curve is always enabled, and contains a list of all variables.

If a variable from the active when dropdown is selected, the following additional parameters become available:

Figure 6.69

Condition: Specifies a value and how the variable must relate (i.e. =, <, >) to the value for the condition to be true.

6.2.3.4 Activation Tab Settings

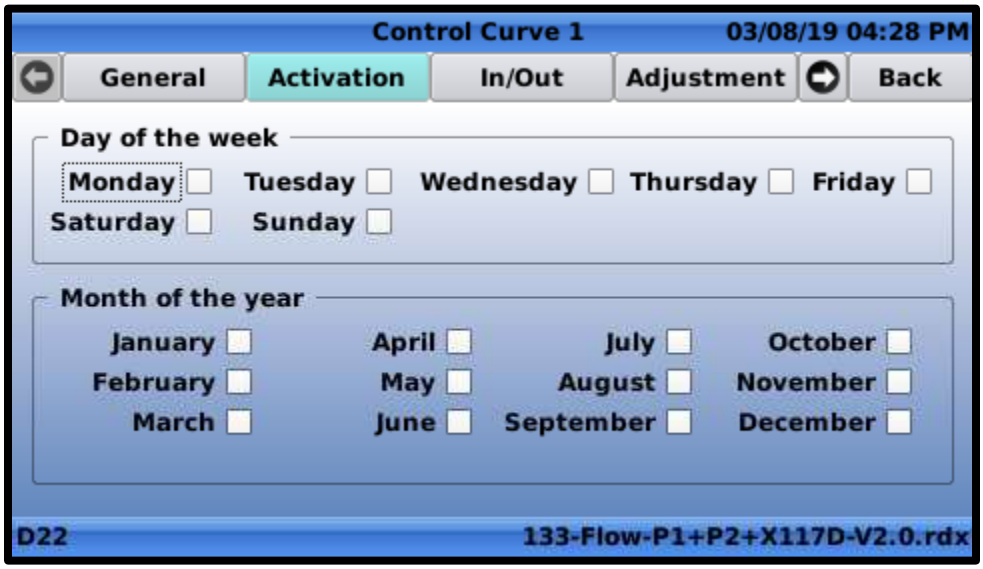


Figure 6.70

The activation tab is only enabled if CC Status is set to “Calendar” or “Period” on the general tab.

Day of the week: Specify the day of the week that control curve will be enabled.

If the CC Status is set to “Calendar”, then the following setting is visible as shown in **FIGURE 6.**.

> **Month of the year:** Specify the month of the year that the control curve will be enabled. (Only visible if CC Status is set to “Calendar”)
>
> Note, for the control curve to be enabled the current date must satisfy both the day of week and month of year conditions.

If the CC Status is set to “Period”, then the following setting is visible as shown in **FIGURE 6.**.

> **Period:** Specify the date range that the control curve will be enabled. (Only visible if CC Status is set to “Period”)
>
> Note, for the control curve to be enabled the current date must satisfy both the day of week and period conditions.

Figure 6.71

6.2.3.5 In/Out Tab Settings

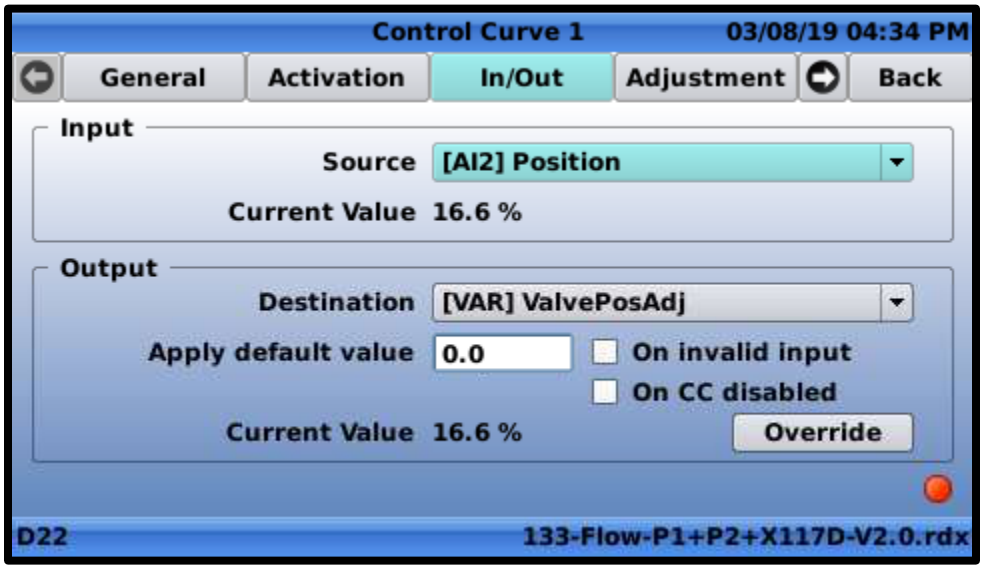


Figure 6.72

Input Source: Specifies the input or variable that will be used to select the destination value.

Input Current Value: Displays the current value of the selected input source.

Output Destination: Specifies the output or variable that will hold the destination value.

Apply default value: If the "On invalid input" checkbox is checked, the specified value will be written to the destination if the input source value is invalid. If the "On CC disabled" checkbox is checked, the specified value will be written to the destination if the control curve is disabled.

Current Value: Displays the current value of the destination.

Override: If pressed, allows the user to specify a value that gets written to the destination regardless of source value.

6.2.3.6 Adjustment Tab Settings

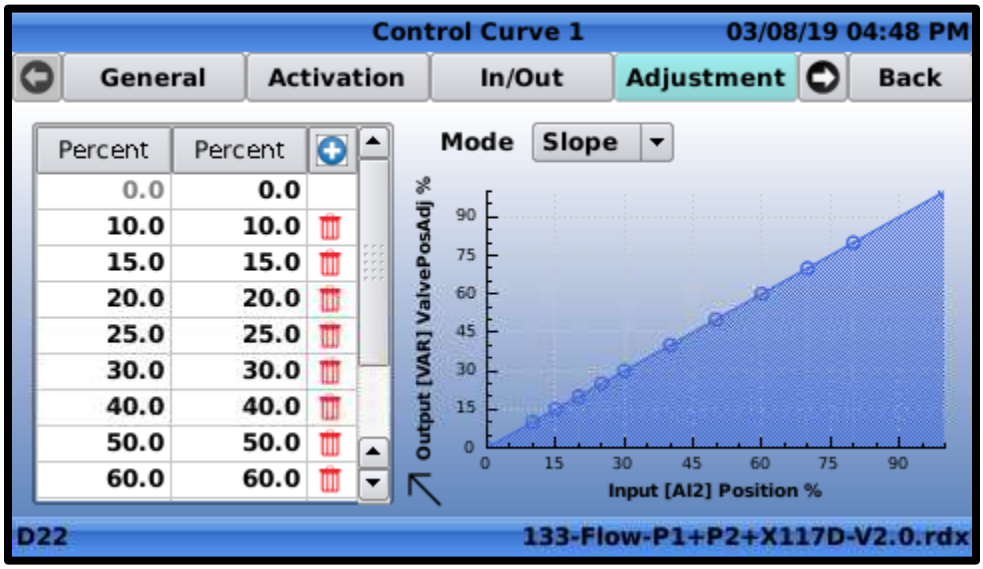


Figure 6.73

This page correlates the source value to a destination value. The left column in the table is the source value, and the right column is the destination value. Pressing the "+" button in the upper right corner of the table adds a new row, and the user can specify a destination value associated with a new source value. Pressing the trash can icon of any row deletes the row. The graph to the right of the table shows the source values on the horizontal axis and the corresponding values on the vertical axis.

Mode: There are two options available, "slope" and "step". If "step" is selected, a linear interpolation is performed to estimate the destination value if source value is between two rows. If "step" is selected, no interpolation is performed. The destination value outputted is from the row that has the source value closest too but lower than the current source value.

6.2.3.7 R/T View Tab Settings

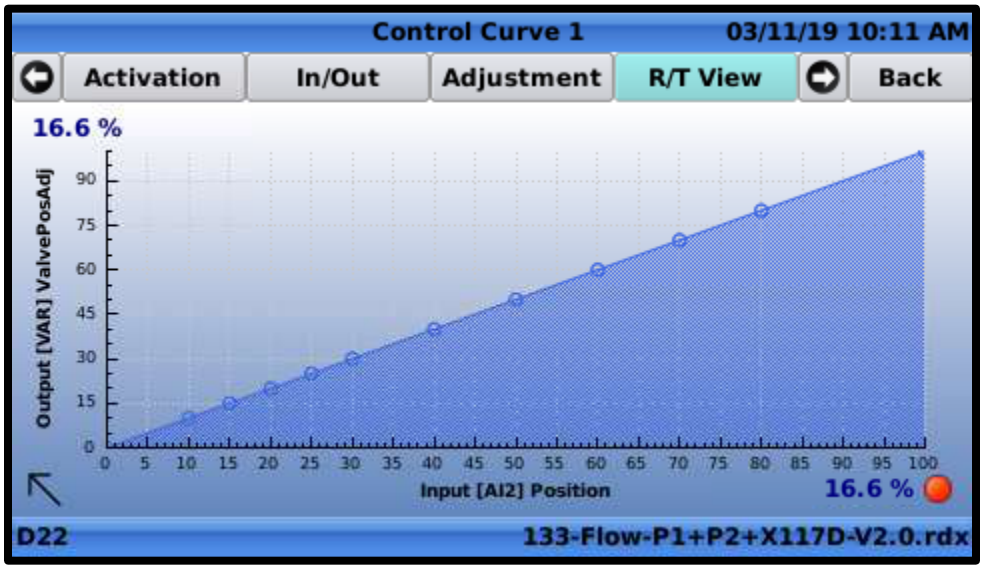


Figure 6.74

The R/T View tab shows a graph with destination values on the vertical axis and source values on the horizontal access. The graph also indicates the current source value and corresponding destination value that is being outputted.

6.2.4 Averagers

6.2.4.1 Description

Takes a moving average of an input/variable and outputs the result to another variable. The time frame of the moving average is user adjustable.

6.2.4.2 Navigation Path

1. Start at the home screen
2. Long up
3. Click on “Averages”
4. Click on “Averager #”

6.2.4.3 Configure Tab Settings

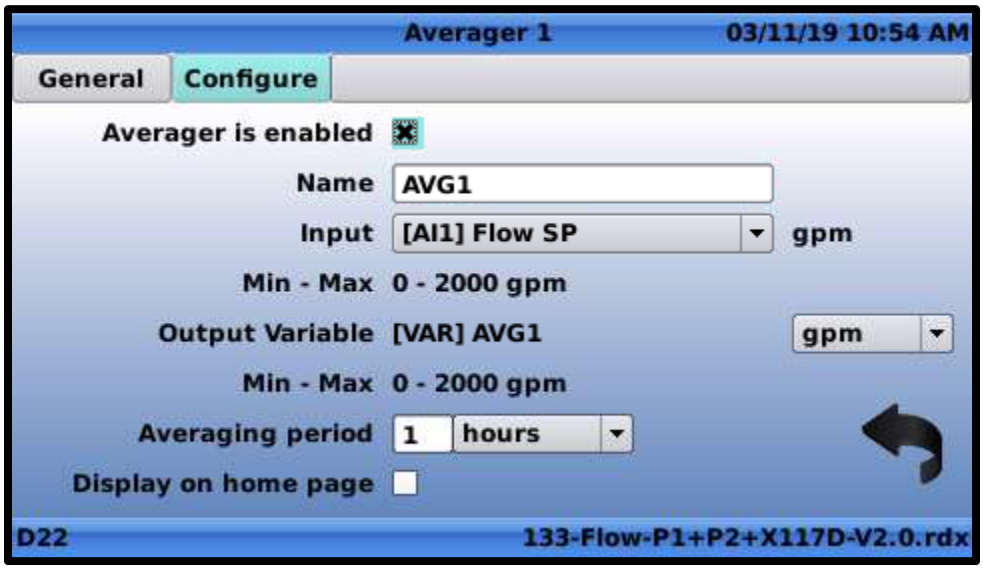


Figure 6.75

Averager is enabled: If checked, an internal variable is created, and the moving average of the specified input is logged to the internal variable.

Name: Specifies the name of the internal variable that holds the moving average.

Input: Specifies the input or variable that is averaged.

Input Min – Max: Displays the minimum and maximum value of the input.

Output Variable: Displays the name of the internal variable that holds the moving average.

Output Units: Units to use when writing average to output variable.

Output Min – Max: Displays the minimum and maximum value of the output.

Averaging Period: Specifies how far back in history the average will be taken over (e.g. If 1 hour is specified, the moving average is always taken over the past 1 hour.)

Display on home page: If checked, the average value will be displayed at the bottom of the home page.

6.2.4.4 General Tab Settings

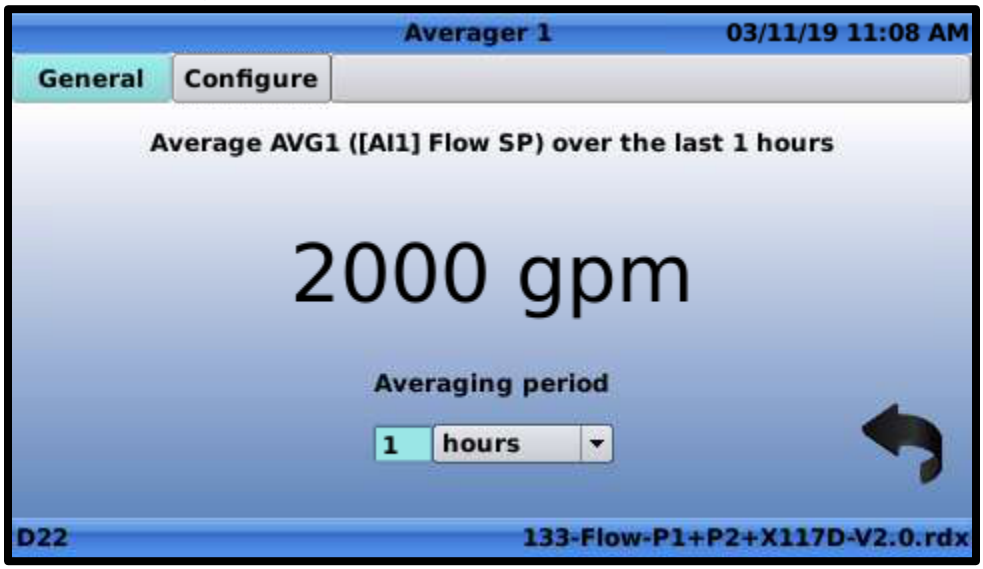


Figure 6.76

The general tab displays the current average and has a shortcut to change the averaging period that available on the configure tab as well. See section 6.2.4.3 for more information.

6.2.5 Actions

6.2.5.1 Description

Actions allow the user to define conditions, and then specify an action the VC-22D will take if the conditions are met. For example, actions can be used to force a solenoid open if a particular analog input is below a certain value.

6.2.5.2 Navigation Path

1. Start at the home screen
2. Long up
3. Click on “!Actions!”

6.2.5.3 Action Settings

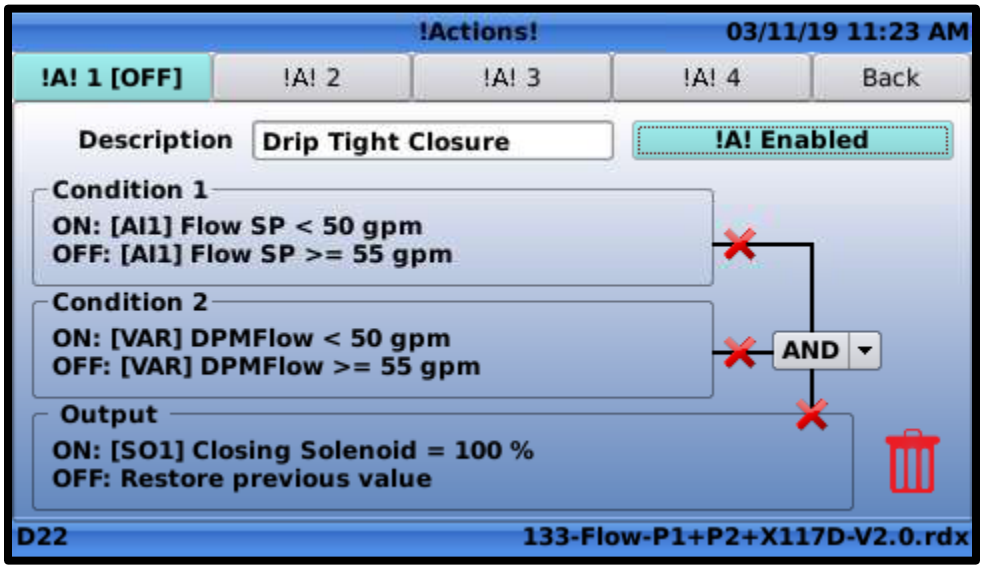


Figure 6.77

There are four action tabs, one for each available action. Each tab has the same configuration parameters described below.

Description: User friendly description of the action

!A! Enabled/Disabled: Clicking this button enables/disables the action. When the action is disabled, it will not write anything to the specified output even if the conditions are met. The button says "!A! Enabled" when the action is enabled and "!A! Disabled" when disabled.

Condition 1/2: Summarizes conditions that trigger the action on or off. When the action is triggered on, it sends a value to a specified output/variable. When the action is triggered off, it stops sending that value. Highlighting the condition and pressing "OK" opens the page described in the section 6.2.5.3.1.

AND/OR: The AND/OR dropdown specifies whether one or both conditions must be true to trigger the action on. If "AND" is selected, both conditions must be true. If "Or" is selected, only one condition must to true.

Output: Specifies what is written to an output or variable when the action is triggered on or off. Highlighting the output and pressing "OK" opens the page described in section 6.2.5.3.2.

6.2.5.3.1 Condition Screen

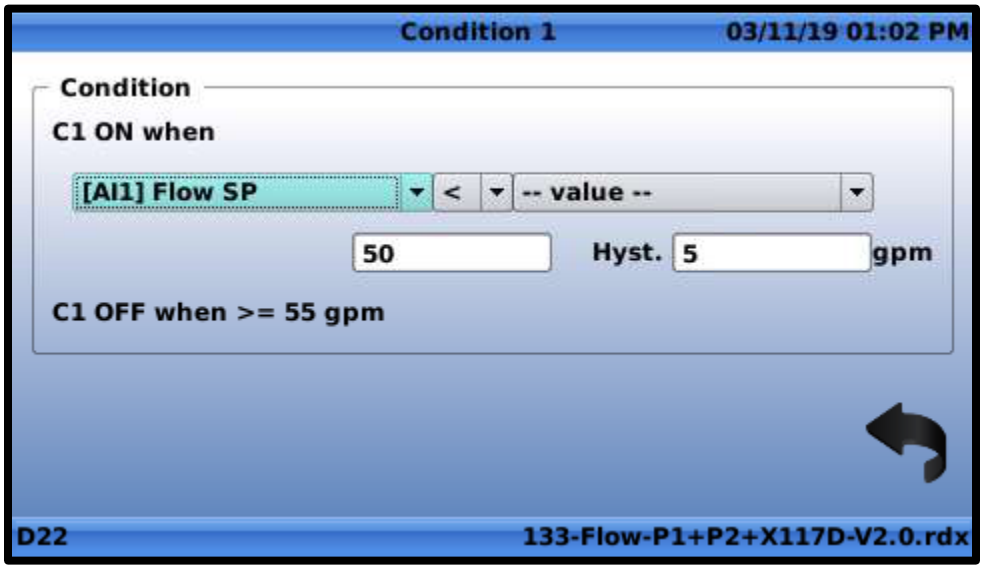


Figure 6.78

This page defines what range of values an input or variable must have for the action to be triggered on/off. The leftmost dropdown specifies the input or variable. The middle dropdown menu specifies whether that value must be greater than, equal too, or less than a comparison value. The rightmost dropdown specifies the source of the comparison value (input, variable, or user specified value). The hysteresis textbox specifies the distance between the "trigger on" value and "trigger off" value. Using a hysteresis prevents the action from being triggered on/off frequently.

If the rightmost dropdown is set to "—value—", then an additional text box appears allowing the user to enter a specified value.

6.2.5.3.2 Output Screen

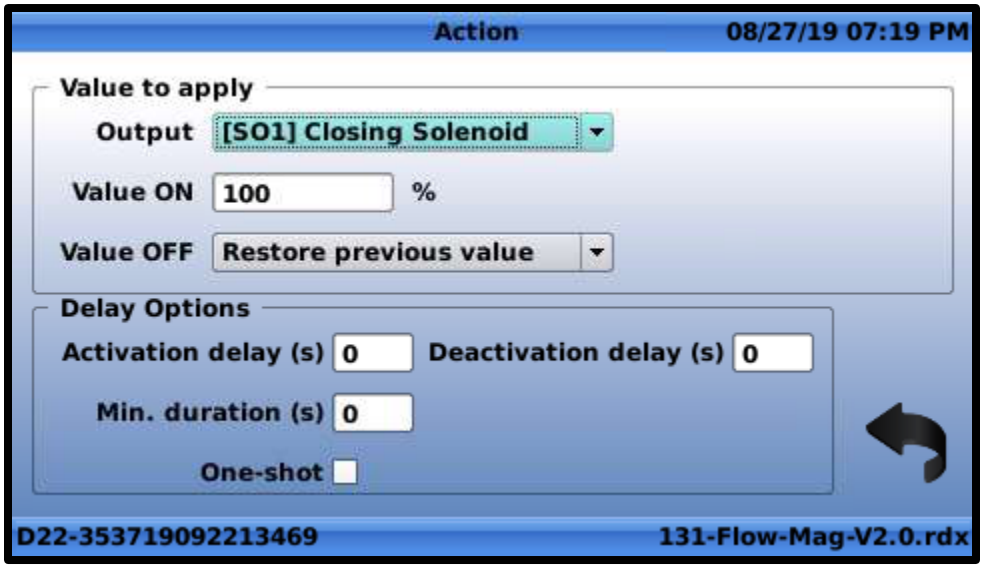


Figure 6.79

Output: Specifies the output or variable that is written too.

Value On: Specifies the value that's written to the output.

Value Off: Specifies what is written when the action is triggered off. There are three options:

1. No action: Output value is left unchanged when action is triggered off
2. Restore previous value: Output is returned to value that held before action was triggered on
3. Set value to: A new textbox appears, and output is set equal to the value in the new textbox when the action is triggered off.

One-Shot: When one-shot is disabled, the action becomes active when the conditions are true and becomes inactive when the conditions are false (after appropriate delays). When one-shot is enabled, the action becomes active when the conditions are true, and then deactivates after a time delay.

When one-shot is disabled, the following settings are visible. See **FIGURE 6.** for a visual depiction of the settings.

Activation Delay: Specifies the number of seconds the conditions must be true before the action will activate.

Deactivation Delay: Specifies the number of seconds the conditions must be false before the action will de-activate.

Min. Duration: Specifies the minimum number of seconds the action will be held on for after it becomes active.

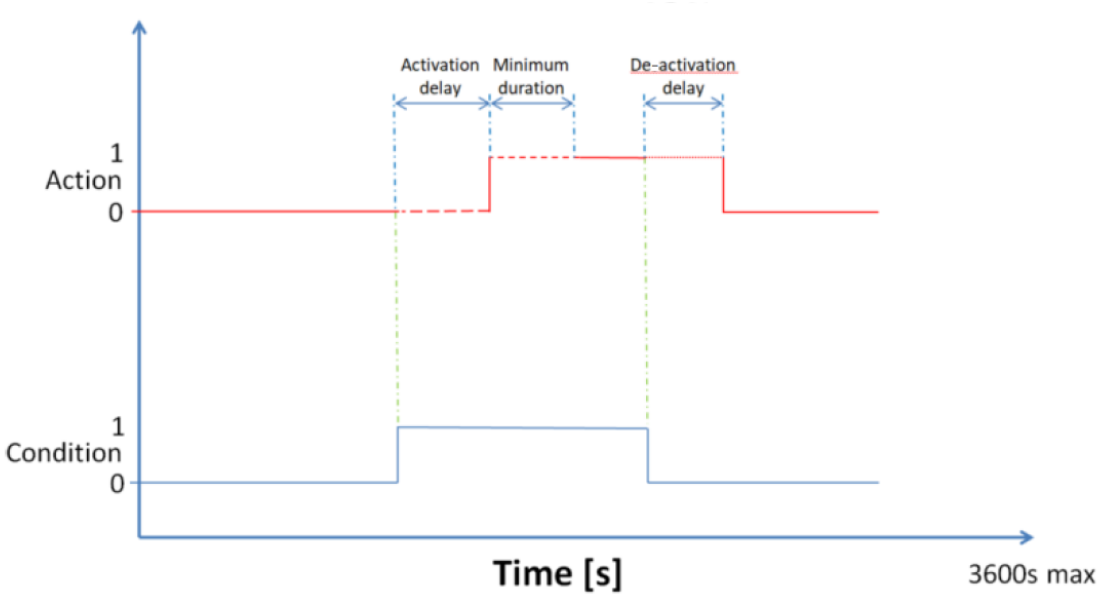


Figure 6.80

When one-shot is enabled, the following delay options are visible. See **FIGURE 6.** for a visual depiction of the settings.

Activation Delay: Setting works the same as when One-Shot box is unchecked.

Duration: Specifies the number of seconds the action will remain active after conditions are met

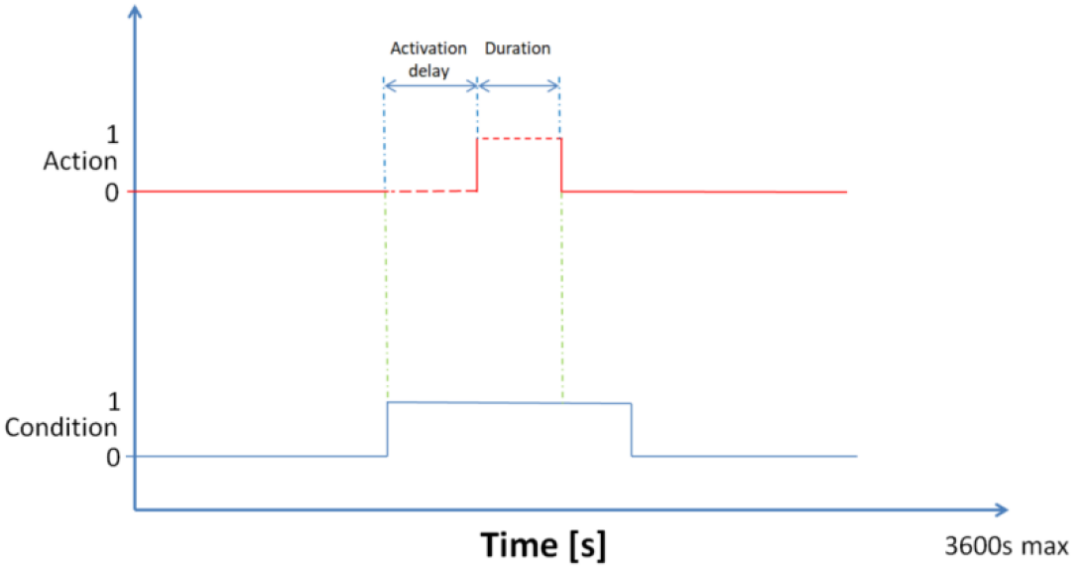


Figure 6.81

6.2.6 Signal Retransmission

6.2.6.1 Description

Signal retransmission reads the value in a specified input or variable and writes it to an analog output.

6.2.6.2 Navigation Path

1. Start at the home screen
2. Long up
3. Click on “Signal Retrans”

6.2.6.3 Signal Retransmission Settings

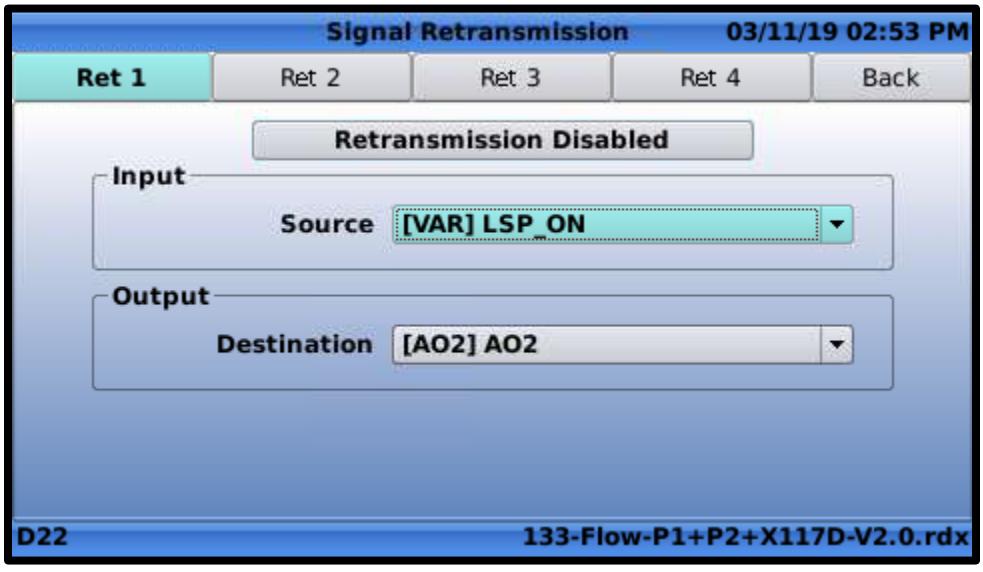


Figure 6.82

There are four signal retransmission tabs, one for each available signal retransmission. Each tab has the same configuration parameters described below.

Retransmission Enabled/Disabled: Clicking this button enables/disables the signal retransmission. When the retransmission is disabled, it will not write anything to the specified output. The button says “Retransmission Disabled” when the action is enabled and “Retransmission Disabled” when disabled.

Input Source: Specifies the input or variable whose value will be sent via an analog output.

Output Destination: Specifies the analog output that will be written too.

6.2.7 Totalizer

6.2.7.1 Description

The totalizer continually tracks the total volume of water that's flowed through the valve by monitoring the current flow rate. The total volume can be outputted to a variable or analog output.

The totalizer function is only enabled in certain ValvApps and can be created by users through the VC-22D controller, the user can choose any standard or custom ValveApp and add a totalizer if required.

6.2.7.2 Navigation Path

1. Start at the home screen
2. Long up
3. Click on "Totalizer #"

6.2.7.3 Totalizer Settings

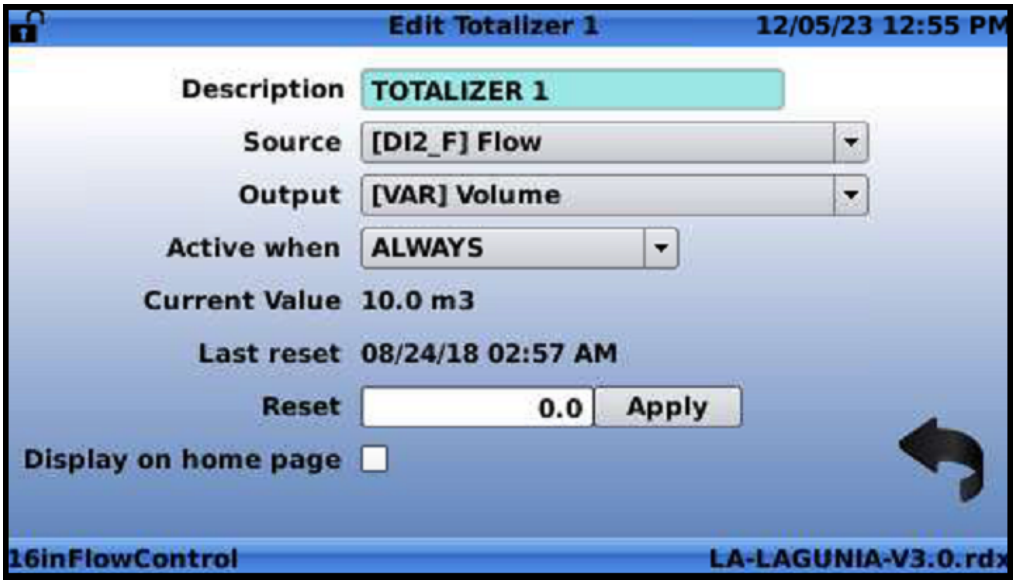


Figure 6.83

Description: User friendly description of the Totalizer

Source: Specifies the analog input or variable that has the current flow rate through the valve

Output: Specifies the variable or analog output that the total volume is written too

Active when: Allows the totalizing function to be paused when a certain condition is met

Current Value: Displays the total volume being written to the output currently

Last reset: Date and time the totalizer was last reset

Reset: Value that the total value will be reset to when the apply button is clicked

Display on Home Screen: Ability to add the totalizer value to home screen

6.2.7.4 Adding a totalizer

The VC-22D allows the ability to add a totalizer using the VC-22D controller in a user-friendly manner, if a standard or custom ValveApp which included a totalizer, user is able to add, edit, remove any created totalizers, as shown below in **FIGURE 6.**

Figure 6.84

**note: If the totalizer is set to be retransmitted, user must ensure that an analog output is added and configured for Volume, refer to section 6.2.10.4.

6.2.8 eDrive34

6.2.8.1 Description

Allows a 34 series actuator to be configured through the VC-22D. The 34 series actuator must be connected to the VC-22D over an RS485 cable. The eDrive34 function in the VC-22D offers the same capabilities of the Windows based eDrive software but does not require a laptop or special orange connecting cable.

The eDrive34 function will only be available in the ValvApp if a 34 series actuator is probably connected to the VC-22D at the time the VC-22D powers on. After the actuator is first connected to the VC-22D, the VC-22D must be rebooted before the eDrive34 function is visible.

6.2.8.2 Navigation

1. Start at the home screen
2. Long up
3. Click on “eDrive32”

6.2.8.3 eDrive34 Settings

See series 34 actuator documentation for eDrive configuration instructions.

6.2.9 Input Settings

6.2.9.1 Description

The input settings show the current electrical signal being received on each analog/digital input and allow configuration changes to be made (e.g. input names, engineering units, and scaling).

6.2.9.2 Navigation Path

1. Start at the home screen
2. Long left

6.2.9.3 Configure Input Settings

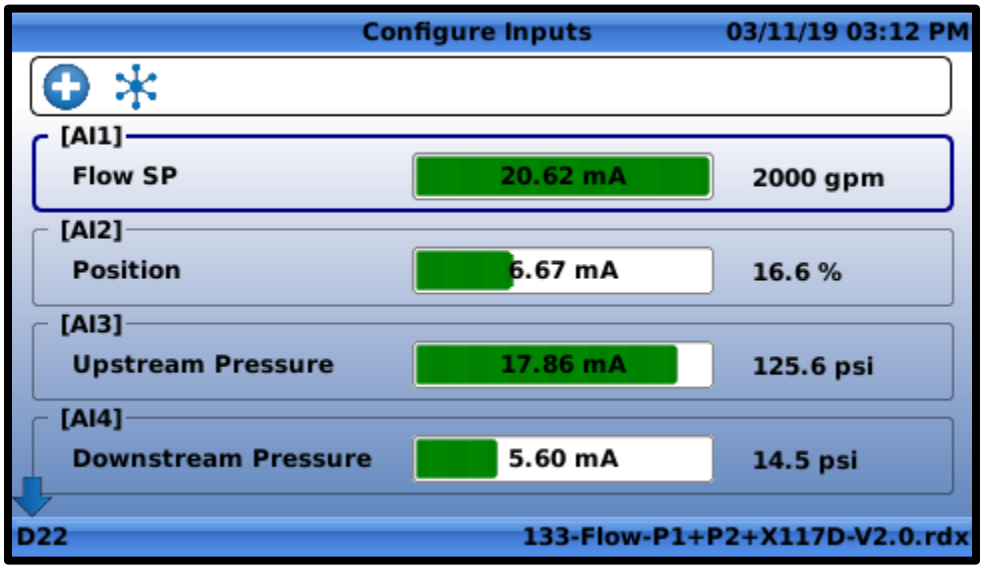


Figure 6.85

The configure inputs screen shows the number of milliamps being received by each analog input. It also shows the engineering value associated with the milliamp signal. Scrolling to the bottom of the page shows the on/off state of each digital input. Pressing short up or down changes which input is highlighted.

Analog Input: Highlighting an analog input as shown in **FIGURE 6.** and pressing short left opens the "configure analog input settings" screen (see section 6.2.9.5).

Figure 6.86

Digital Input: Highlighting a digital input as shown in **FIGURE 6.** and pressing short left opens the "configure digital input settings" screen (see section 6.2.9.6).

Figure 6.87

6.2.9.4 Adding inputs

Clicking the icon shown in **FIGURE 6.** allows the user to add an unused analog/digital input channel. Newly added inputs can be used in places like actions, signal retransmission, remapping, or be displayed on the home screen. When the add input icon is clicked, a new screen appears as shown in **FIGURE 6.**. The screen shows a list of spare analog/digital inputs, and selecting one adds the input to the "configure input settings" screen.

Figure 6.88

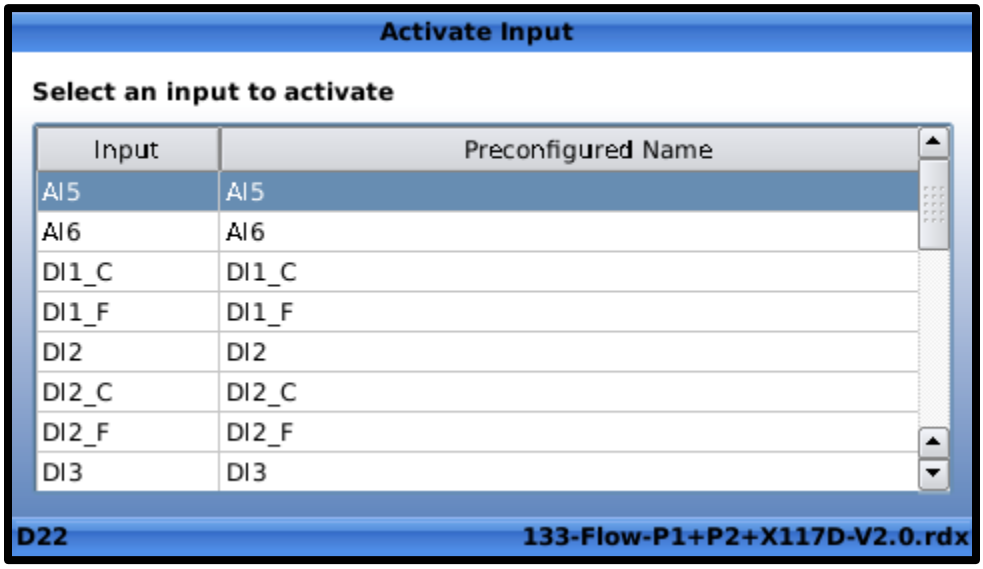


Figure 6.89

Recopy Input: Clicking the icon shown in **FIGURE 6.** allows the user to copy the value of one analog/digital input to another. See section 6.2.9.7.

Figure 6.90

6.2.9.5 *Configure Analog Input*

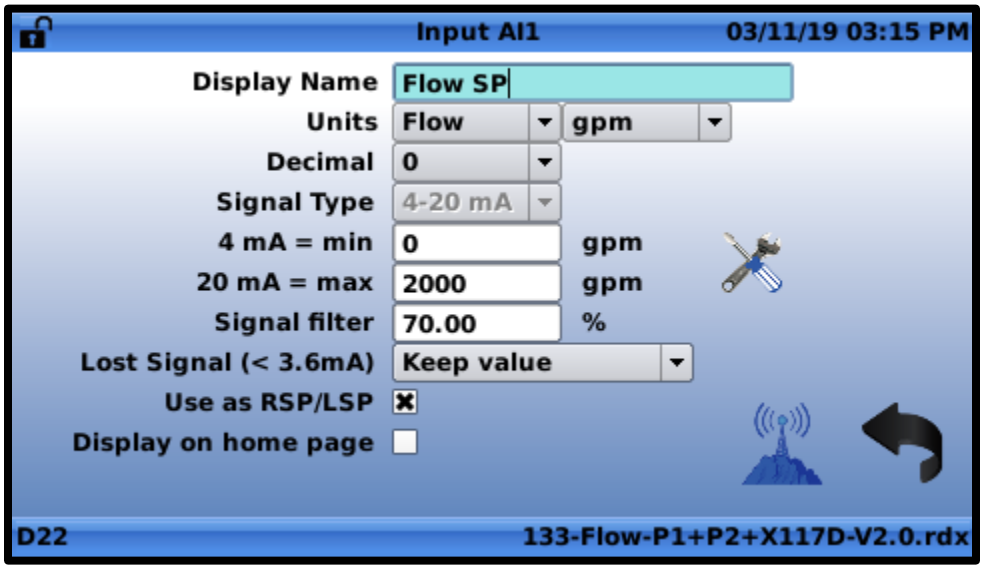


Figure 6.91

Display Name: User friendly name of the analog input

Units: Specifies the engineering units associated with the scaled value

Decimal: Number of decimal places to display on the screen when showing the value of the analog input

Signal Type: Always fixed at 4-20mA. Indicates the following input is for an analog signal.

4 mA = min: Specifies the scaled value that is represented by a 4 mA signal

20 mA = max: Specifies the scaled value that is represented by a 20 mA signal

Signal Filter: Specifies how much noise will be filtered out of the analog signal. The higher the number, the more noise removed. An analog signal with a high filter will change slower as well.

Lost Signal (< 3.6 mA): Specifies what will occur if the analog signal drops below 3.6 mA (which normally occurs if the signal wires are disconnected. The allowed options are:

1. Do nothing: Continue calculating the scaled value based on the milliamp signal. (e.g. If the signal is 3.2 mA, interpolate the scaled value based on the 4 mA min and 20 mA max scaled values.)
2. Keep value: Keep the value that existed in the analog input just before the signal was lost
3. Default value: Revert to a default value. A new textbox appears to the right which allows the user to specify the default value.

Use as RSP/LSP: By checking this box, the analog input becomes a setpoint and the user can then toggle the input between remote setpoint (RSP) and local setpoint (LSP) mode. See section 8.1.2 for a description of RSP/LSP mode.

Display on home page: By checking this box, the value of the analog input will be displayed at the bottom of the home screen.

Checkbox Icon: Clicking the icon shown in **FIGURE 6.92** saves changes and navigates back to the configure inputs screen.

Figure 6.92

Trashcan Icon: Clicking the icon shown in **FIGURE 6.** cancels any changes and navigates back to the configure inputs screen.

Figure 6.93

Configure Remote Recopy: The icon shown in **FIGURE 6.** is not applicable to North America, as it requires a cellular connection. This is a European feature only.

Figure 6.94

Configure min/max milliamps: Clicking the icon shown in **FIGURE 6.** opens the page shown in **FIGURE 6.**.

Figure 6.95

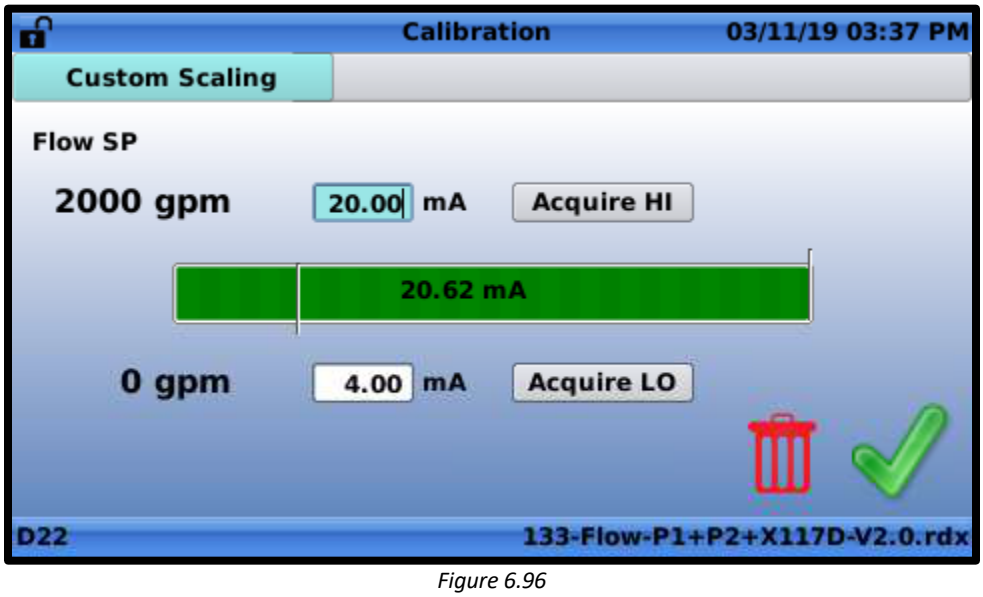


Figure 6.96

The custom scaling screen shown in **FIGURE 6.** allows the minimum and maximum milliamp range to be changed. This is useful for cases when the analog input ranges from 0-25mA instead of 4-20mA. Parameters on the screen are described below:

Max Milliamps: Specifies the maximum allowed milliamps on the analog input.

Acquire HI: Clicking this button reads the current milliamps received on the analog input and writes that value to the Max Milliamps text box.

Minimum Milliamps: Specifies the minimum allowed milliamps on the analog input.

Acquire LO: Clicking this button reads the current milliamps received on the analog input and writes that value to the Min Milliamps text box.

If custom scaling changes are made, the "4 mA = min" field on the configure inputs screen is updated with the new minimum milliamps and the "20 mA = max" field is updated with the new maximum milliamps.

6.2.9.6 Configure Digital Input

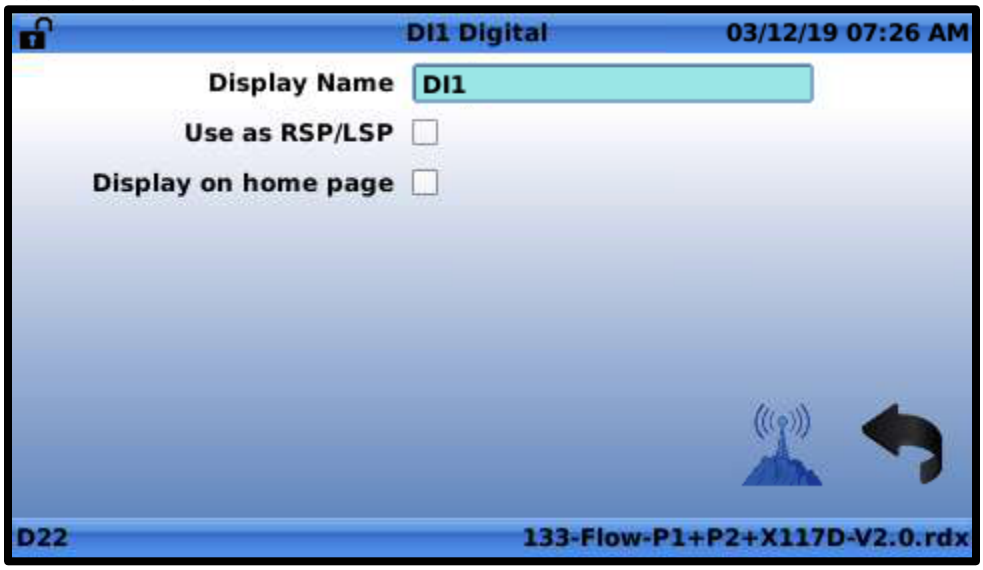


Figure 6.97

Display Name: User friendly description of the digital input.

Use as RSP/LSP: By checking this box, the digital input becomes a setpoint and the user can then toggle the input between remote setpoint (RSP) and local setpoint (LSP) mode. See section 8.1.2 for a description of RSP/LSP mode.

Display on home page: By checking this box, the value of the analog input will be displayed at the bottom of the home screen.

6.2.9.7 Recopy Inputs

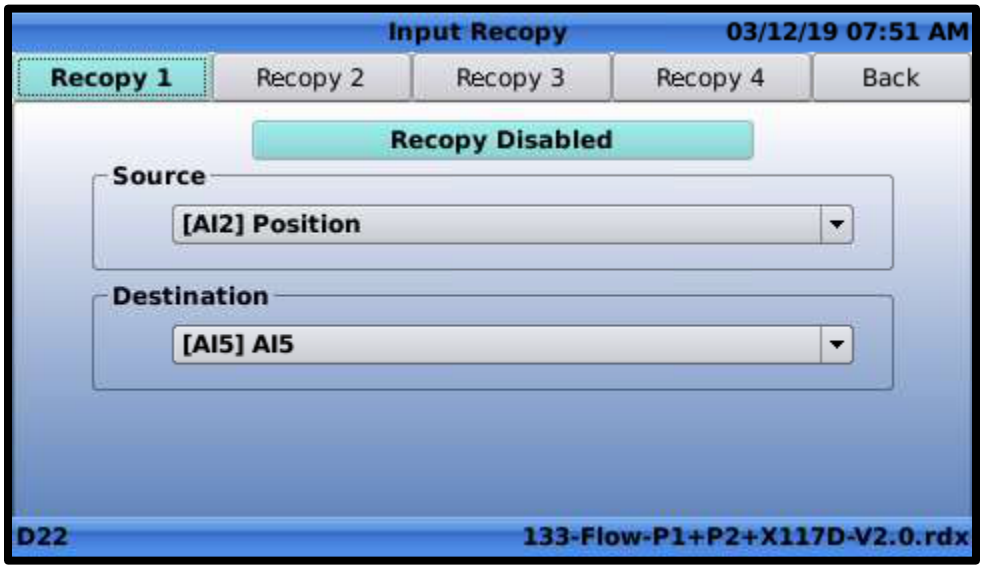


Figure 6.98

Recopy input is used when an input is wired to a channel on the VC-22D that is different than what the ValvApp is expecting (e.g. the position feedback is wired to AI2 but the ValvApp is reading AI5 for position feedback). If it's too difficult to change the wiring, the recopy input feature will allow the user to continually copy the value from AI2 to AI5. There are four tabs on this screen, one for each available remap. Each tab has the same parameters, and a description of each parameter is below:

Recopy Disabled: Clicking this button enables/disables the input remap. When the remap is disabled, it will no longer copy the value of the source input to the destination input. The button says "Recopy Enabled" when it's enabled, and "Recopy Disabled" when it's disabled.

Source: Specifies the source of the value being copied. All inputs are listed in the source dropdown.

Destination: Specifies the destination that the source value is being copied too. Only inputs with the same engineering units and scaling as the source are available in the destination dropdown.

6.2.10 Output Settings

6.2.10.1 Description

The output settings show the current electrical signal being sent on each analog/digital output and allow configuration changes to be made (e.g. output names, engineering units, and scaling).

6.2.10.2 Navigation Path

1. Start at the home screen
2. Long right

6.2.10.3 Configure Output Settings

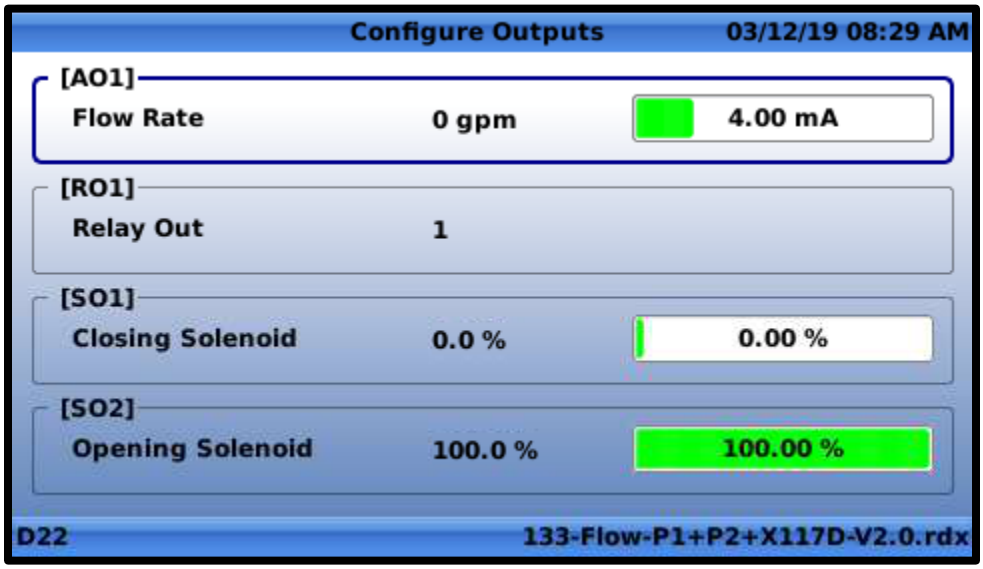


Figure 6.99

The configure outputs screen shows the number of milliamps being sent by each analog output. It also shows the engineering value associated with the milliamp signal. Scrolling to the bottom of the page shows the on/off state of each digital output. Pressing short up or down changes which input is highlighted.

Analog Output: Highlighting an analog output as shown in **FIGURE 6.** and pressing short right opens the "configure analog input settings" screen (see section 6.2.10.5).

Figure 6.100

Digital Output: Highlighting a digital output as shown in **FIGURE 6.** and pressing short right opens the "configure digital output settings" screen (see section 6.2.10.6).

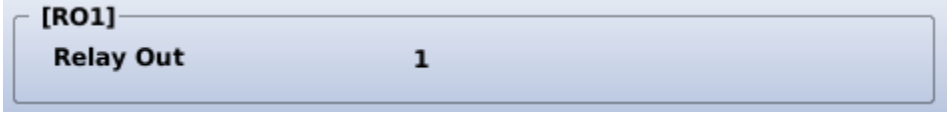


Figure 6.101

6.2.10.4 Adding Outputs

Clicking the shown to the top left of the configure outputs screen in **FIGURE 6.** allows the user to add an unused analog/digital output channel. Newly added outputs can be used in places like actions, signal retransmission, or be displayed on the home screen. When the add output icon is clicked, a new screen appears as shown in **FIGURE 6.**. The screen shows a list of spare analog/digital outputs, and selecting one adds the input to the "Activate Output Setting" screen.

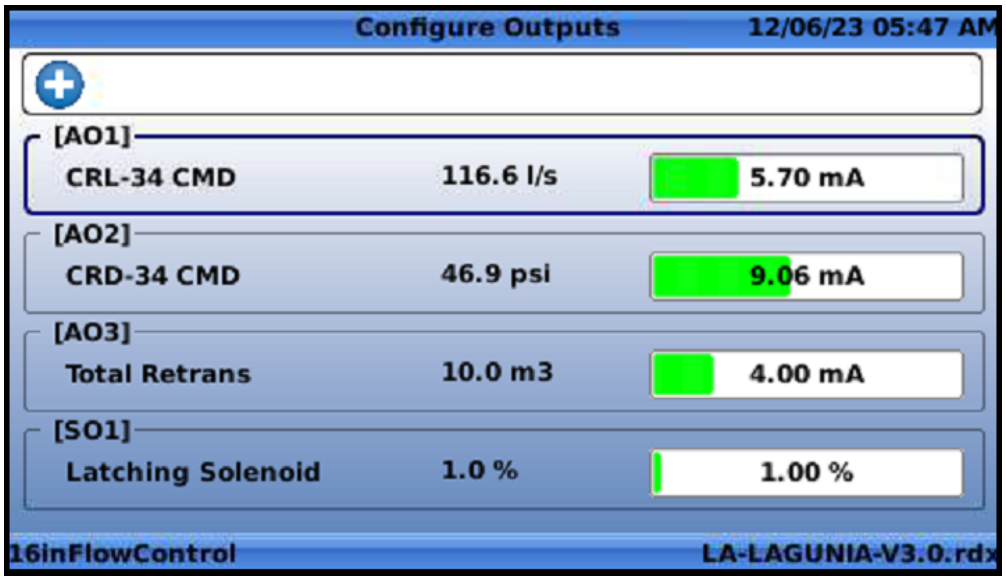


Figure 6.102

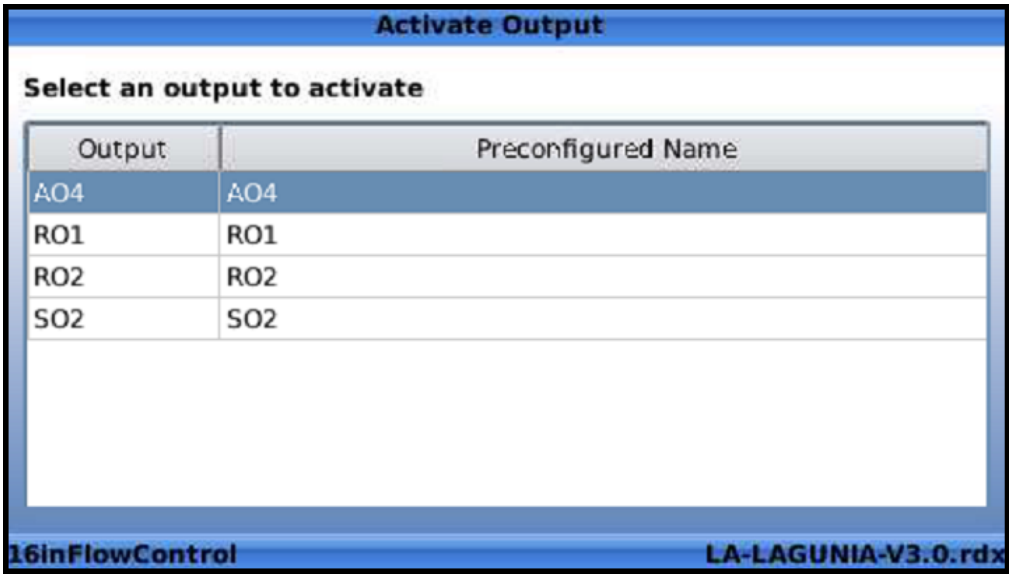


Figure 6.103

**note: once an output is selected and added to controller will refer back to the analog outputs screen in which where the new added output will be showing to be configured.

6.2.10.5 Configure Analog Output

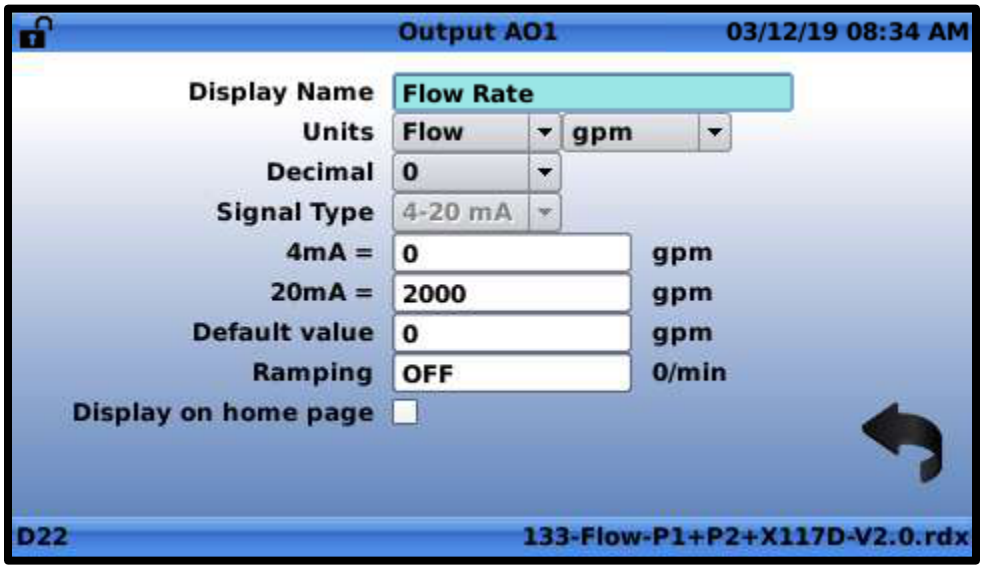


Figure 6.104

Display Name: User friendly name of the analog output

Units: Specifies the engineering units associated with the scaled value

Decimal: Number of decimal places to display on the screen when showing the value of the analog output

Signal Type: Always fixed at 4-20mA. Indicates the following output is for an analog output.

4 mA = min: Specifies the scaled value that is represented by a 4 mA signal

20 mA = max: Specifies the scaled value that is represented by a 20 mA signal

Default value: Specifies the value used for the analog output before the VC-22D writes a value to it.

Ramping: Ramping causes the analog output to gradually change from a previous value to a current value. The ramping number specifies the amount the output will change per minute. A larger number causes the output to change slower. Specifying “Off” or 0 removes all ramping, and the analog output changes from previous value to current value immediately.

Display on home page: By checking this box, the value of the analog output will be displayed at the bottom of the home screen.

6.2.10.6 Configure Digital Output

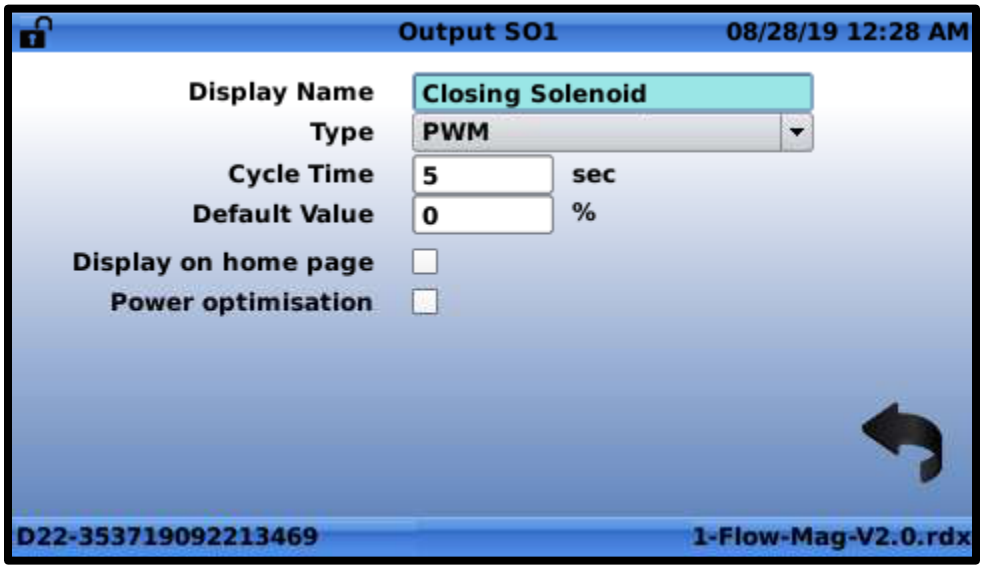


Figure 6.105

Display Name: User friendly description of digital output

Type: Specifies if digital output is on/off or PWM. See section 6.2.2.5 for description of PWM.

1. **Digital output:** changes the digital output to a dry contact in which can be used for a secondary action by the controller.
2. **PWM:** pulse width modulation in which pulses are sent to digital outputs for proper control.
3. **Latching Output (1/0):** send one pulse for a latching output to activate or de-activate a latching solenoid , 1 = 12-24VDC+ , 0 = 12-24VDC-.

Cycle Time: This setting is only available when Type is set to PWM. This specifies the PWM cycle time. See section 6.2.2.5 for more details.

Default Value: Value outputted before VC-22D writes a value to digital output.

Display on home page: By checking this box, the value of the analog output will be displayed at the bottom of the home screen.

Power optimization: When unchecked, the VC-22D will send a continuous high voltage signal whenever the output is active. When checked, the VC-22D will send a continuous high voltage followed by a series of high frequency pulses. This feature is intended to be used when the digital output is connected to a solenoid. The continuous signal actuates the solenoid and then the high frequency pulses maintain the position. This allows less power to be sent to the solenoid which reduces solenoid temperature. By default, the setting is disabled. This feature has only been validated on solenoids attached to Cla-Val's sold in the European market. It is recommended to keep this feature disabled unless told to enable it by a Cla-Val representative.

7 Web Interface

The VC-22D has a web interface which allows for basic administrative tasks like uploading new ValvApps or downloading log files via a web browser. The web interface can be enabled/disabled using the VC-22D display per section 6.1.17.3. The following sub sections detail how to access the web interface and navigate within it.

All information available on the web interface is also available directly via the VC-22D's display. The web interface simply provides an alternative means of accessing/configuring some of the VC-22D settings.

7.1 Access the Web Interface

Connect a computer to the VC-22D via an Ethernet cable. Ensure the computer is on the same IP subnet as the VC-22D (see section 6.1.11.3). Open the computer's internet browser and go to the VC-22D's URL (see section 6.1.17.3).

7.2 Navigating the Web Interface

The VC-22D's web interface consists of a navigation bar on the left hand side that lists each page of the interface. The home page is the "Information" page which is shown in **FIGURE 7.1** and described in a following section.

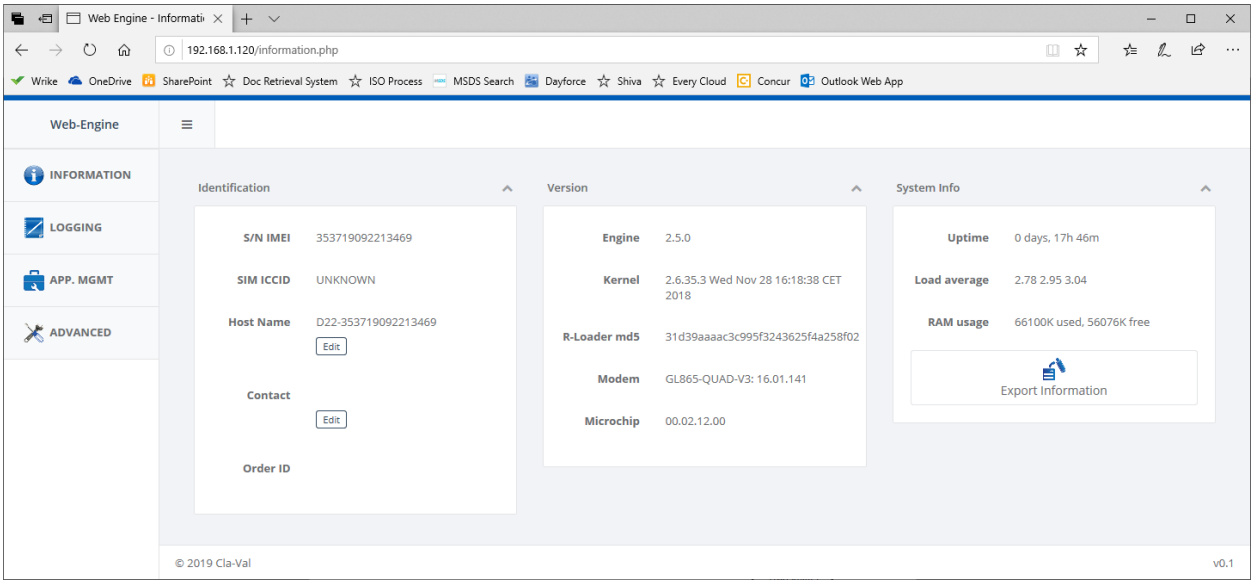


Figure 7.1

7.2.1 Information Page

The "Information" page is shown in **FIGURE 7.1**. It provides general status information about the VC-22D. All information displayed on this page can also be found on the "Information" screen of the VC-22D (see section 6.1.1).

7.2.2 Logging Page

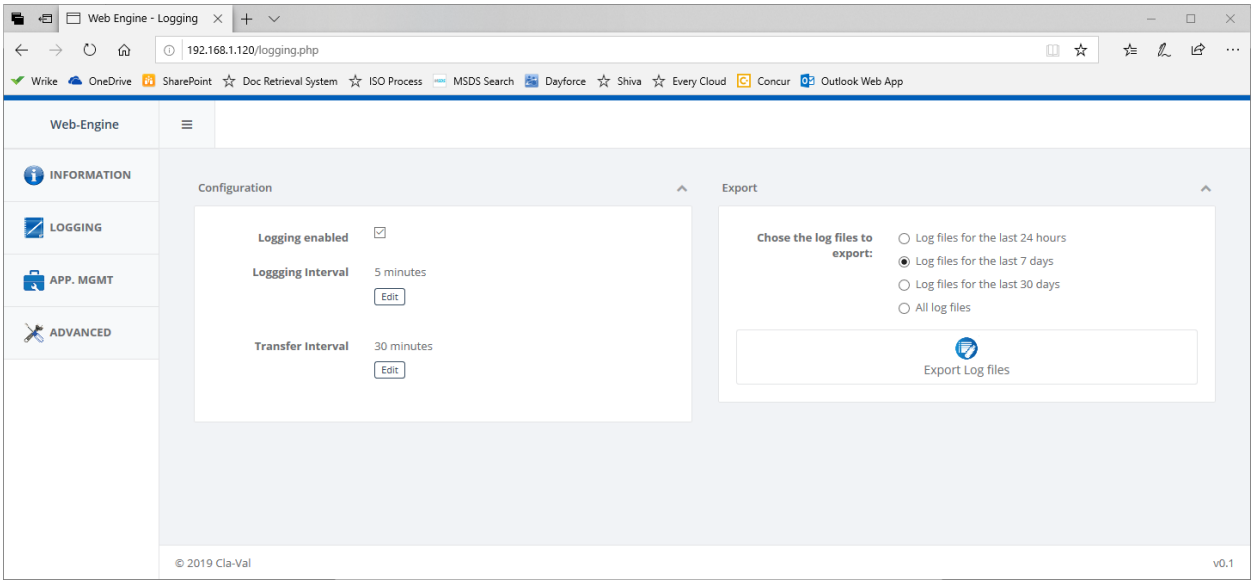


Figure 7.2

The logging page displays the same settings available on the “Configure Logs” screen (see section 6.1.8) and “Export Logs” screen (see section 6.1.9) of the VC-22D display. Logging can be disabled, the frequency of logging can be adjusted, and the log files for a particular time frame can be downloaded from the controller to your computer.

7.2.3 App Management Page

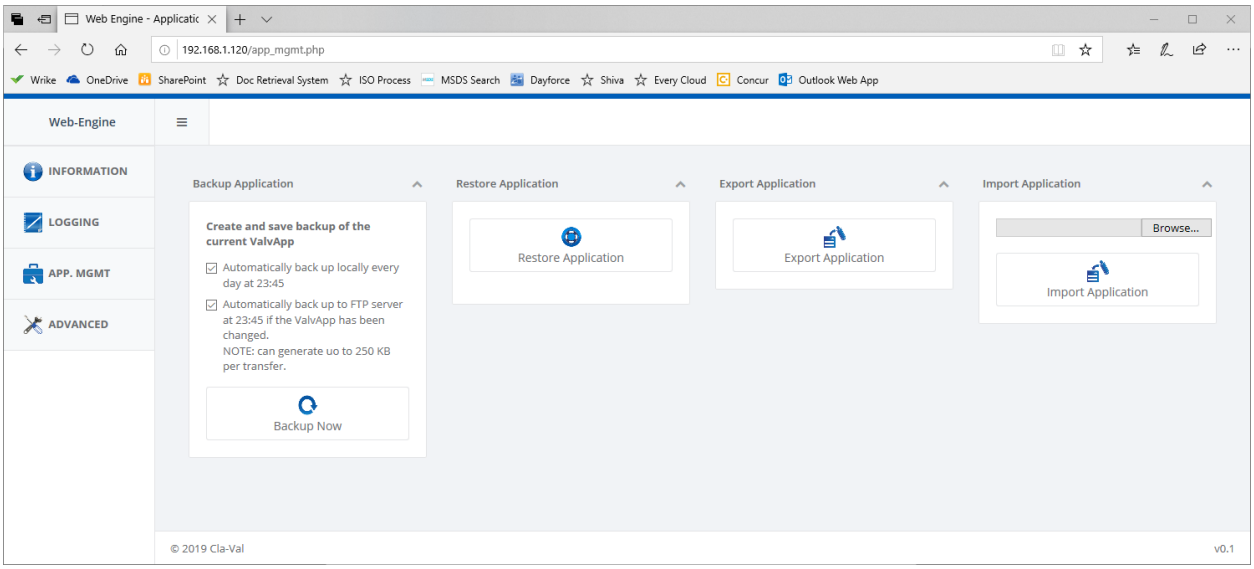


Figure 7.3

The app management page provides the same capabilities available on the backup, restore, export, and import application screens of the VC-22D (see sections 6.1.2 - 6.1.5). The page allows a backup of the current ValvApp to be saved to the VC-22D’s permanent storage. It also allows a ValvApp that’s been

previously backed up in the VC-22D's storage to be restored. Additionally, the current ValvApp can be exported to the computer or imported from the computer.

7.2.4 Advanced Page

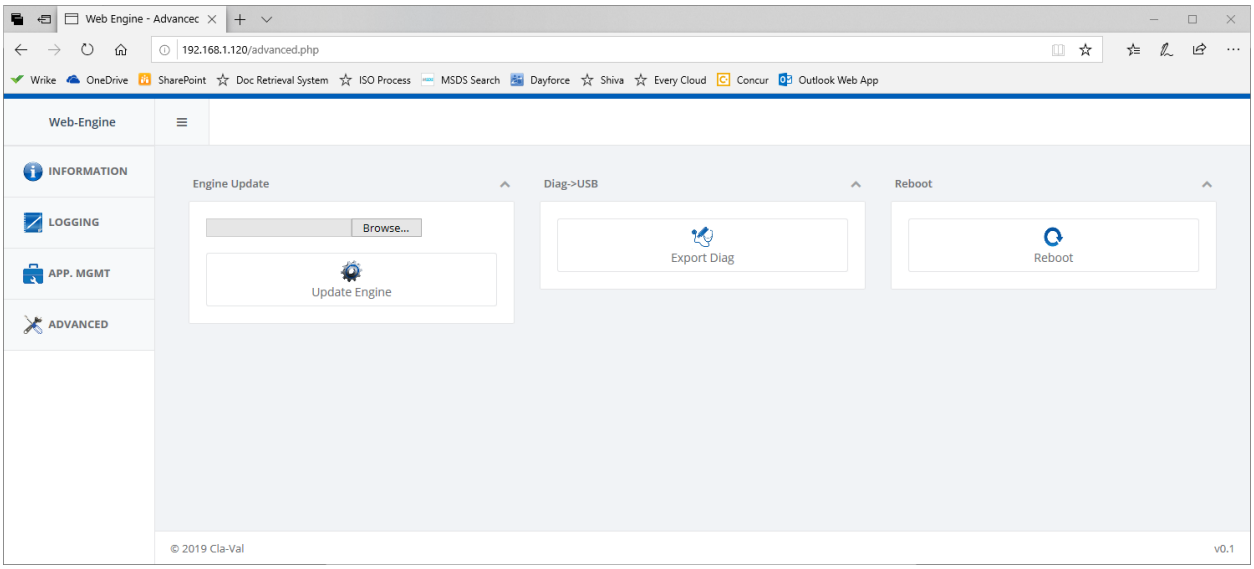


Figure 7.4

The advanced page provides the same capabilities as available on the reboot, engine update, and diagnostics to USB screens of the VC-22D (see sections 6.1.19 - 6.1.21). This page allows for the VC-22D engine to be updated via a file stored on the computer, diagnostics files to be uploaded to the computer, and the VC-22D to be rebooted.

8 Valve Operation

The valve can be fully controlled using just the VC-22D's navigation buttons and display. The following sections described how to do valve control operations like setpoint changes and input/output overrides.

8.1 Setpoint Changes

A setpoint is considered to be any value that the user specifies and the VC-22D uses as a target for valve control. Examples of setpoints include flow rate setpoints, tank level setpoints, valve position setpoints, and downstream/upstream pressure setpoints. Setpoints are what operators specify to ensure the valve operates as required.

Setpoints are stored in the VC-22D as interactive variables, analog inputs, or digital inputs.

8.1.1 Interactive Variable

Interactive variables can be changed locally using the VC-22D display and navigation buttons. To change an interactive variable, do the following:

1. Starting from the home screen, press short down and wait for the interactive variable screen to be displayed as shown in **FIGURE 8.1**.

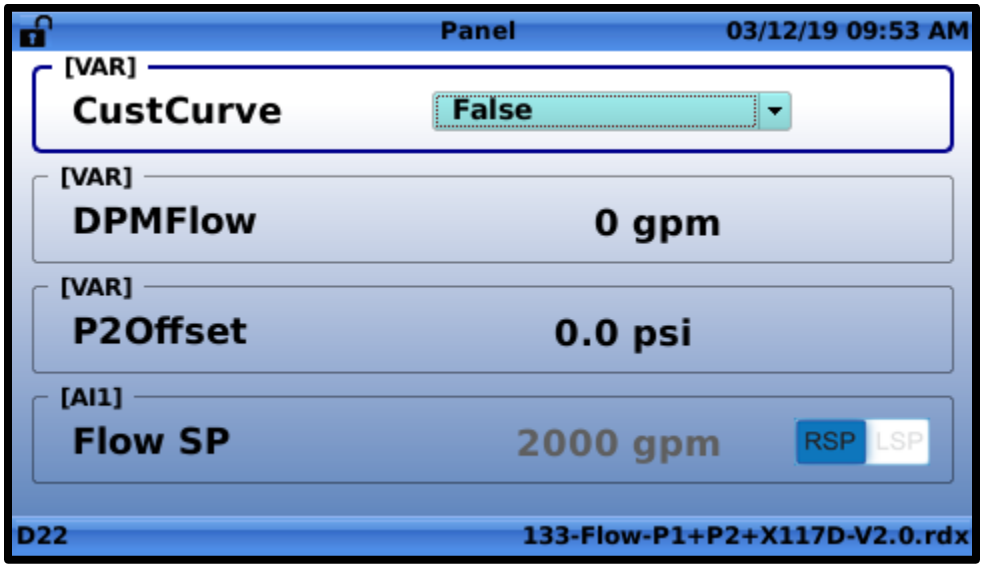


Figure 8.1

2. Highlight the interactive variable to be changed and press “OK”. Enter the desired value as shown in **FIGURE 8.2**.

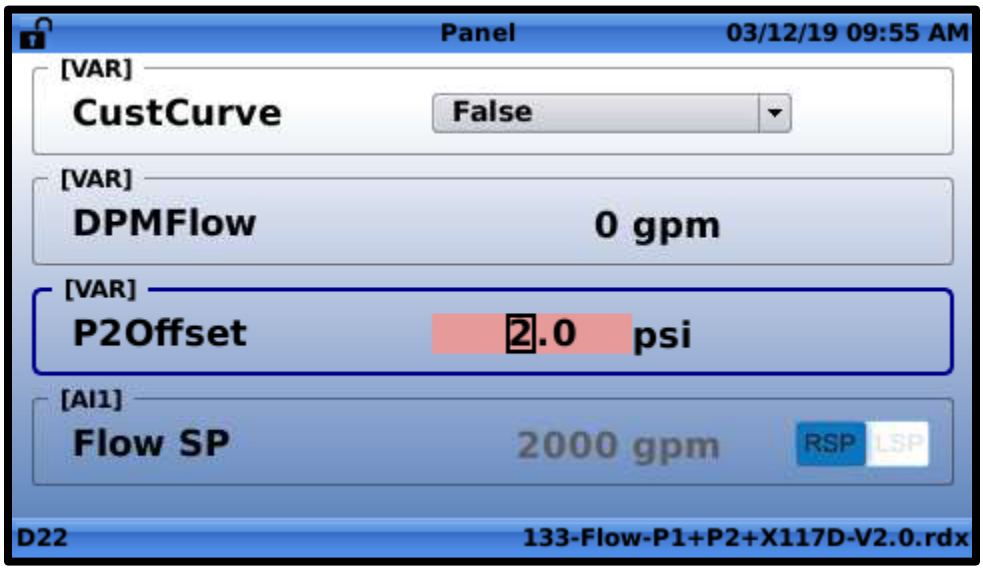


Figure 8.2

8.1.2 Remote/Local Setpoint

If a setpoint is being transmitted remotely as an analog or digital input, it’s useful to be able to override the remote setpoint with a local setpoint. To enable a local override of a remote setpoint, follow the instructions in section 6.2.7 and check “Use as RSP/LSP”. Once this box is checked, the input then gets listed in the interactive variable list and can be changed like an interactive variable. To change a setpoint with RSP/LSP enabled, do the following:

1. Starting from the home screen, press short down and wait for the interactive variable screen to be displayed as shown in **FIGURE 8.3**.

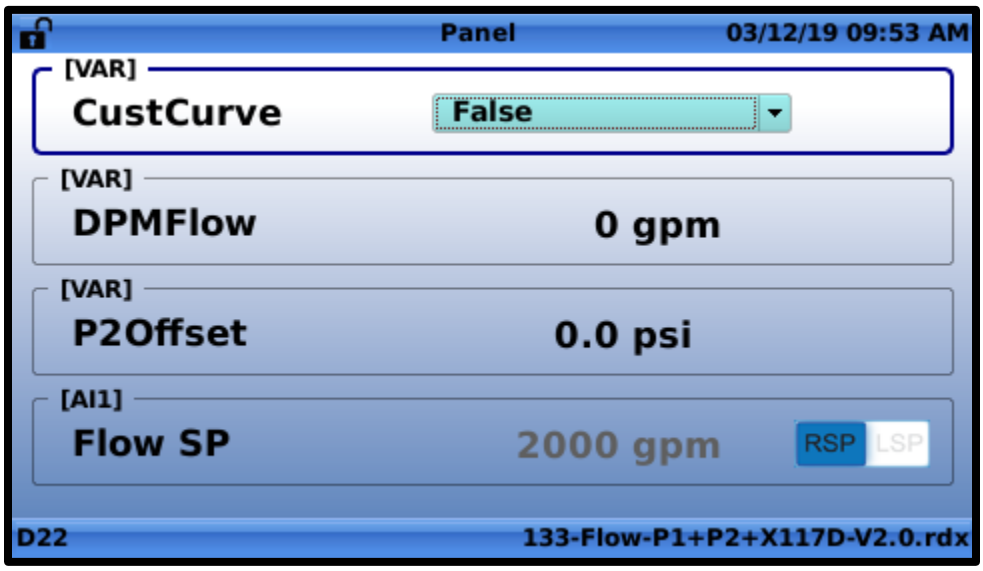


Figure 8.3

2. Use the up and down navigation buttons to highlight the input to be changed as shown in **FIGURE 8.4**.

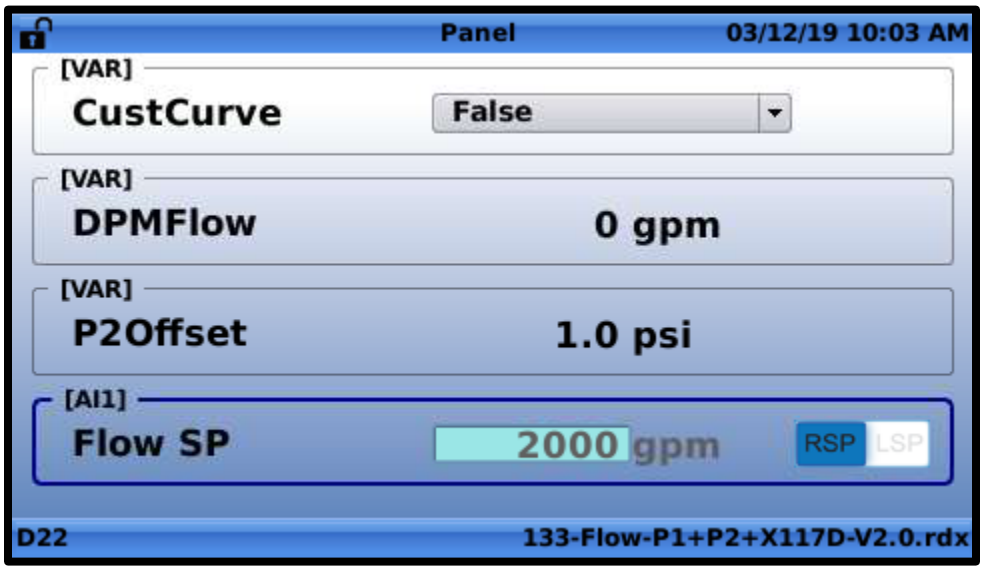


Figure 8.4

3. Use the left and right navigation buttons to highlight the "RSP/LSP" graphic as shown in **FIGURE 8.5**.

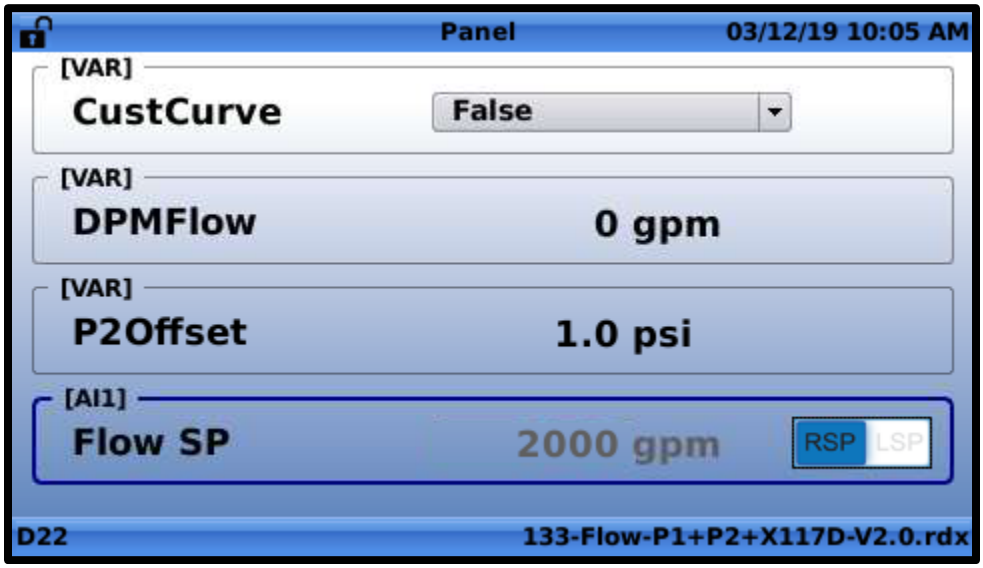


Figure 8.5

4. Press "OK" so the "LSP" is highlighted in green as shown in **FIGURE 8.6**.

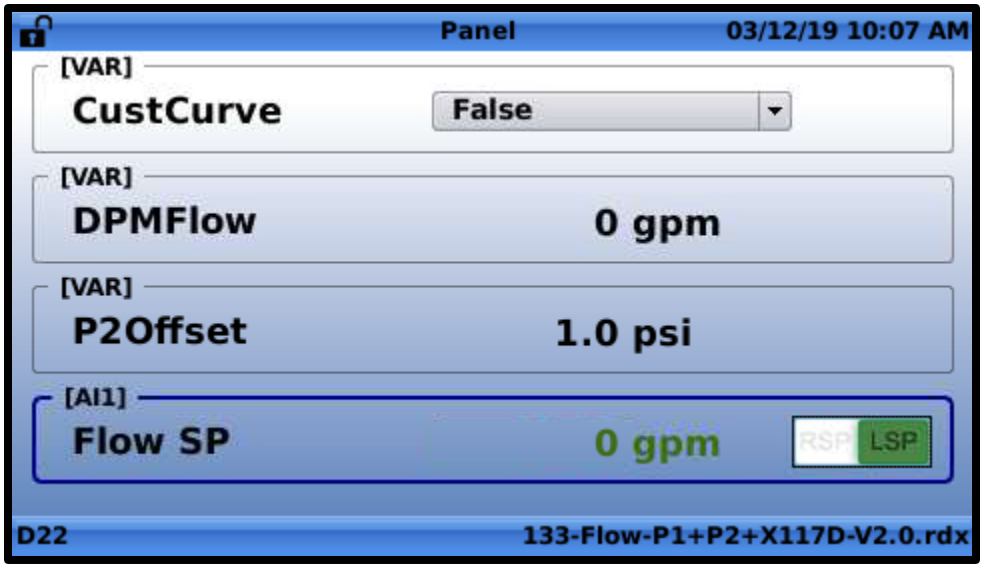


Figure 8.6

5. Use the left and right navigation buttons to highlight the numerical value and press "OK". Enter the desired numerical value as shown in **FIGURE 8.7**.

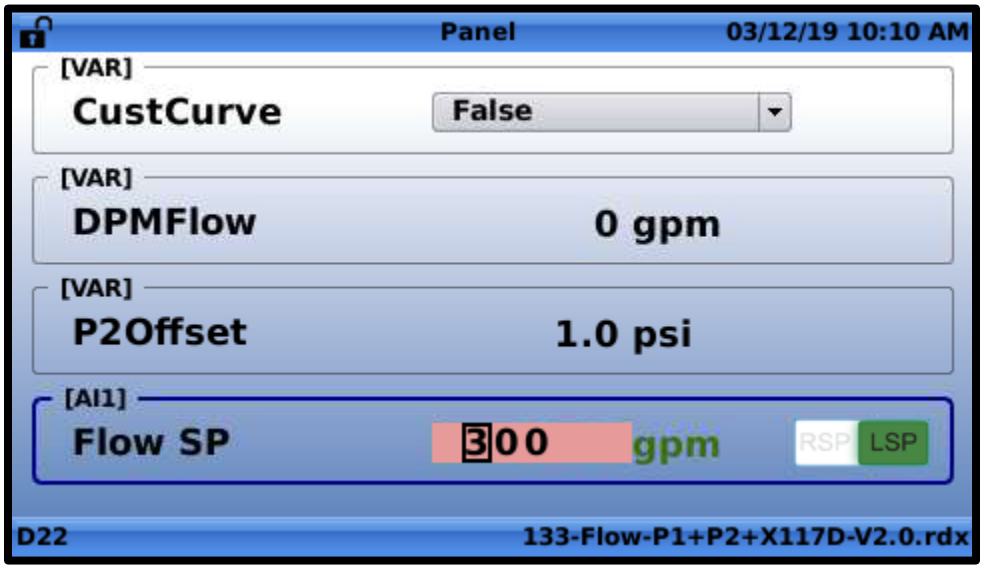


Figure 8.7

To remove the local override, follow the procedure above but change the "RSP/LSP" graphic to "RSP". The value will then revert back to the remote setpoint.

8.2 Local Input Override

At times, it's useful to override an input or output signal going to or from the VC-22D. Overriding inputs is generally needed when a sensor is either malfunctioning or not wired yet, but the valve still needs to be controlled. The user can override an input with an approximate value that should be coming from the sensor.

To override an input, do the following:

1. From the home screen, press short left and wait for the input values screen to appear as shown in **FIGURE 8.8**.

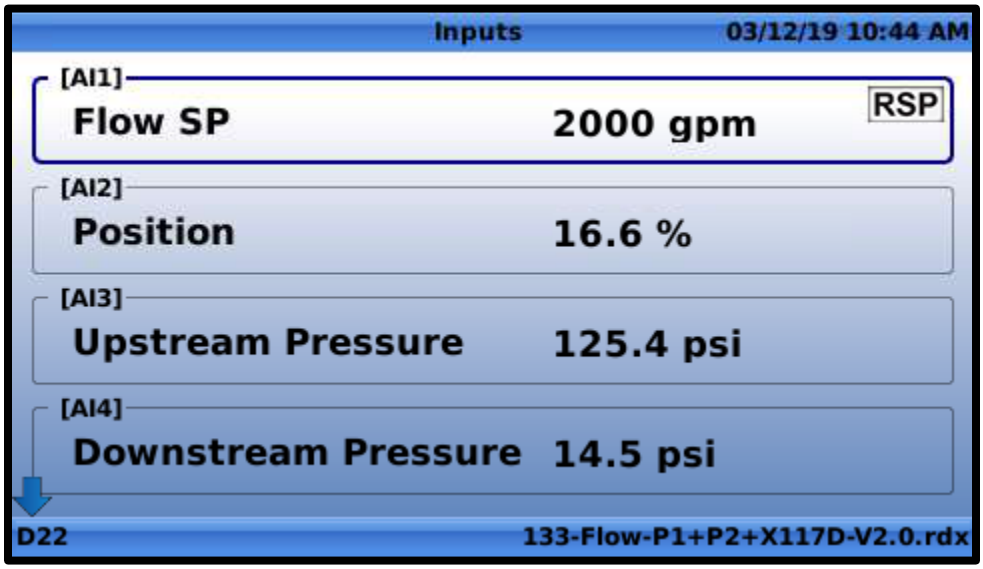


Figure 8.8

2. Use the up and down navigation buttons to highlight the input to be overridden as shown in **FIGURE 8.9**.

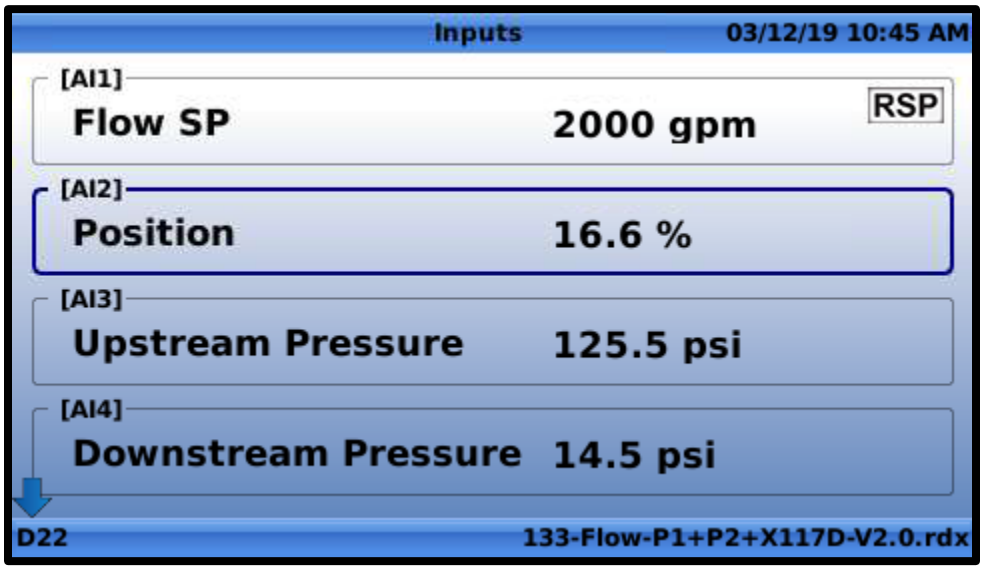


Figure 8.9

3. Press short left and wait for the override screen to appear as shown in **FIGURE 8.10**.

Figure 8.10

4. Press "OK" and input the desired value as shown in **FIGURE 8.11**.

Figure 8.11

5. Press "OK" and wait for the screen shown in **FIGURE 8.12** to be displayed. Confirm the change by pressing "OK" or press the right navigation button to cancel.

Figure 8.12

8.3 Local Output Override

Overriding outputs is typically necessary when testing solenoids on the valve. Outputs are overridden using a similar procedure for inputs. To get to the output values screen, press short right. Then highlight the output to override and press short right again. Reference the input override procedure in section 8.2 for additional instructions.

9 Modbus Interface

The VC-22D has a Modbus server. It supports Modbus TCP/IP and Modbus RTU. The device's Ethernet port can be used for Modbus TCP/IP communications, and the RS232 and RS485 ports are available for Modbus RTU communications. Both Modbus TCP/IP and RTU can be used simultaneously. **However, at no point should the Modbus client send requests to the VC-22D faster than 1 per second. Sending requests faster than 1 per second results in undefined behavior.**

The Modbus registers hold the VC-22D's inputs, outputs, and variable values. It also stores status bits for each IO point that indicate if a 4-20mA sign is out of range, a local override is enabled, an alarm is active, etc. Modbus clients can read these registers to monitor the VC-22D. A client can also place individual inputs and outputs in an override mode, and then overwrite the VC-22D's input/output value. Override mode is beneficial for clients that need to send a setpoint or sensor value to the VC-22D.

The VC-22D Modbus server can operate using one of two mapping schemes, "Standard" or "Cla-Val". "Standard" is the newest scheme and was introduced with engine 2.5.0. It organizes the registers in a way that is consistent with most other industrial control devices. "Cla-Val" is a legacy scheme that was used prior to engine 2.5.0 and has been left as an option in new engines for backwards compatibility. The "standard" scheme is recommended and is enabled by default in new VC-22Ds. VC-22Ds that are upgraded from a previous engine will maintain whatever mode the server was in before the upgrade.

Shown in table below is the VC-22D Modbus addresses map for all inputs/outputs.

**note: For additional Modbus detailed information, please refer to Appendix A.

Modbus	Input	Description	Data Type	Access	I/O Mapping	Comments
40007 Bit 0	AI1	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI1 Input to use Modbus Address43000/43001
40007 Bit 1	AI2	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI2 Input to use Modbus Address43002/43003
40007 Bit 2	AI3	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI3 Input to use Modbus Address43004/43005
40007 Bit 3	AI4	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI4 Input to use Modbus Address43006/43007
40007 Bit 4	AI5	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI5 Input to use Modbus Address43008/43009
40007 Bit 5	AI6	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI6 Input to use Modbus Address43010/43011
40008 Bit 0	DI1	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI1 Input to use Modbus Address 41000
40008 Bit 1	DI2	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI2 Input to use Modbus Address 41001
40008 Bit 2	DI3	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI3 Input to use Modbus Address 41002
40008 Bit 3	DI4	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI4 Input to use Modbus Address 41003
40008 Bit 4	DI5	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI5 Input to use Modbus Address 41004
40008 Bit 5	DI6	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI6 Input to use Modbus Address 41005
41000	DI1	Digital Input	Word	Read/Write	DI1	Register Holds/Reads DI1 Value
41001	DI2	Digital Input	Word	Read/Write	DI2	Register Holds/Reads DI2 Value
41002	DI3	Digital Input	Word	Read/Write	DI3	Register Holds/Reads DI3 Value
41003	DI4	Digital Input	Word	Read/Write	DI4	Register Holds/Reads DI4 Value
41004	DI5	Digital Input	Word	Read/Write	DI5	Register Holds/Reads DI5 Value
41005	DI6	Digital Input	Word	Read/Write	DI6	Register Holds/Reads DI6 Value
41006	SO1	Digital Output	Word	Read	SO1	Monitory Purposes (Optional)
41007	SO2	Digital Output	Word	Read	SO2	Monitory Purposes (Optional)
41008	RO1	Digital Output	Word	Read	SO3	Monitory Purposes (Optional)
41009	RO2	Digital Output	Word	Read	SO4	Monitory Purposes (Optional)
43000/43001	AI1	Analog Input	Int 32	Read/Write	AI1	Register Holds/Reads AI1 Value x100 for Two Implied Decimals
43002/43003	AI2	Analog Input	Int 32	Read/Write	AI2	Register Holds/Reads AI2 Value x100 for Two Implied Decimals
43004/43005	AI3	Analog Input	Int 32	Read/Write	AI3	Register Holds/Reads AI3 Value x100 for Two Implied Decimals
43006/43007	AI4	Analog Input	Int 32	Read/Write	AI4	Register Holds/Reads AI4 Value x100 for Two Implied Decimals
43008/43009	AI5	Analog Input	Int 32	Read/Write	AI5	Register Holds/Reads AI5 Value x100 for Two Implied Decimals
43010/43011	AI6	Analog Input	Int 32	Read/Write	AI6	Register Holds/Reads AI6 Value x100 for Two Implied Decimals
43036/43037	AO1	Analog Output	Int 32	Read	AO1	Monitory - Register Holds AO1 Value x100 for Two Implied Decimals
43038/43039	AO2	Analog Output	Int 32	Read	AO2	Monitory - Register Holds AO2 Value x100 for Two Implied Decimals
43040/43041	AO3	Analog Output	Int 32	Read	AO3	Monitory - Register Holds AO3 Value x100 for Two Implied Decimals
43042/43043	AO4	Analog Output	Int 32	Read	AO4	Monitory - Register Holds AO4 Value x100 for Two Implied Decimals

Table 9.1

10 VC-22D Start-up & Tuning Commissioning Checklist

10.1 Installation Guide

Refer to VC-22D IOM (Appendix C) for field wiring, if a custom ValveApp refer to ValveApp worksheet.

10.1.1 Installation Checklist

Note: Ensure power is OFF to Control Panel and Breakers Flipped to OFF (Green)

- ☐ Verify location of mounted panel according to all local and federal regulations
- ☐ Verify solenoids orientation and voltage
- ☐ Ensure hubs or fittings with the same environmental rating match enclosure used
- ☐ Verify Wiring of solenoid(s) to the panel as required
- ☐ Verify Wiring of transmitter(s) to panel as required
- ☐ Verify Wiring of remote setpoint(s) to panel as required
- ☐ Verify Wiring of retransmission(s) as required
- ☐ Verify Wiring of alarm contact(s) as required
- ☐ Verify that correct terminal wiring connections have been made
- ☐ Confirm incoming power matches panel's designed limit
- ☐ Ensure incoming power is connected to devices using correct polarity
- ☐ Insure Cla-Val Cover is locked
- ☐ Following all local and federal codes, connect the power to the panel

10.2 Start-Up Guide

10.2.1 Control Valve Checklist

- ☐ Ensure control valve installed in a Confined Space Area
- ☐ Ensure control valve installed in proper flow direction
- ☐ Ensure air is bled from main valve cover via bleed screw
- ☐ Isolate any hydraulic bypass present from main valve
- ☐ Ensure proper connections of pilot installed if exists
- ☐ Manually stroke main valve open and closed via by-pass ball valves
- ☐ Adjust any speed controls, restriction fittings if exists based on site conditions
- ☐ Ensure ability to flow water to set hydraulic pilots if exists

10.2.2 Field Connection Checklist

**note: Ensure power is OFF to Control Panel and Breakers Flipped to OFF (Green)

- ☐ Verify power supply wiring to Control Panel power terminals
- ☐ Verify wiring of opening/closing solenoids to open/close solenoid terminals on control panel
- ☐ Verify field sensor(s) wiring to corresponding terminals on control panel
- ☐ Verify setpoint(s) wiring, if exists to terminals on the control panel
- ☐ Verify digital input(s) wiring, if exists to terminals on the control panel
- ☐ Verify alarm(s)/indicator(s), output(s), wiring if exists to terminals on the control panel
- ☐ Restore power & flip breakers ON (Red)
- ☐ Ensure VC-22D power is ON
- ☐ Verify correct ValveApp is installed to VC-22D prior next steps

10.2.3 Solenoid Connections & Setup Checklist

- ☐ Verify valve mounted opening/closing solenoid orientation (NC/NO, etc.)
  - Navigate via: Long up > PID > Output
- ☐ Ensure valve is closed by locking cover in position during testing
- ☐ Verify opening/closing solenoid operation and Setup (Override solenoid(s))
  - Navigate Via: long right > SO1, SO2 > home button > change value
  - Override the value of SO1 via home button click and changing value of SO1 to “50” to energize, an override “0” for SO1 will de-energize the solenoid.
  - Override the value of SO2 via home button click and changing value of SO2 to “50” to energize, an override “0” for SO1 will de-energize the solenoid.
  - Ensure solenoid clicks 50% of the cycle time, E.g: 5 (Sec) Cycle time, Solenoid will energize 2.5 (Sec).
- ☐ Unlock valve cover and verify main valve operation via valve mounted solenoid(s)
  - Navigate Via: long right > SO1, SO2 > home button > change value
  - Override the closing solenoid to “50” and ensure closure of valve
  - Override the opening solenoid to “50” and ensure opening of valve

10.2.4 Sensor Connections & Setup Checklist

- ☐ Verify sensor(s) connections by ensuring signal is being received
  - Navigate Via: Long left > Analog inputs
  - Locate “Analog Inputs”; value(s) should NOT be near zero as there is a signal present. Value should range between 4-20 mA
  - Sensors out of range may show less than 4 mA, verify Dip Switch orientation
- ☐ Verify sensor(s) Calibration zero & Span if other than 4-20 mA to be used
  - Navigate Via: Long left > Analog input > Override value
  - Override input to 4mA, it should be equal to “zero calibration” value
  - Override input to 20 mA, it should be equal to “Span Calibration” value
- ☐ Verify sensor(s) limits and units
  - Navigate Via: Long left > Analog input > Short left
  - Set “4mA = min value”, set to minimum range of sensor
  - Set “20mA = max value”, set to maximum range of sensor
  - Toggle units button till correct units are displayed

10.2.5 Remote Setpoint Connections & Setup Checklist

- ☐ Verify remote sensor(s) connections and ensure signal is being received
  - Navigate Via: Long left > Analog inputs > RSP
  - Confirm correct Scaling of signals
  - Analog signal should not be near zero if signal is present, value should range between 4-20 mA.

- ☐ Verify calibration of remote setpoint(s) zero & Span
    - Navigate Via: Long left > analog inputs > RSP
    - Have remote system send a 4mA signal to VC-22D
    - Locate analog inputs in VC-22D it should be equal to 4 mA
    - Have remote system send a 20mA signal to VC-22D
    - Locate analog inputs in VC-22D it should be equal to 20 mA
    - If not, Send a 4 mA, calibrate low, send 20 mA, Calibrate high.

10.2.6 Set Tuning Parameters Checklist

- ☐ Set tuning parameters to default values as per tuning guide
    - Navigate Via: Long up > PID
- ☐ Verify valve specifications for DP Metering if exists and ensure flow reading
    - Navigate Via: Long up > DP Metering
- ☐ Ensure tuning parameters adjusted per tuning guide
- ☐ Perform process control checkout
    - Control main valve via remote setpoint
    - Allow main value to reach setpoint within +/- deadband
- ☐ Verify actions enable current conditions and set correct outputs
    - Navigate Via: Long up > Actions > Enable/Disable
- ☐ Verify valve specifications for DP Metering if exists and ensure flow reading
    - Navigate Via: Long up > DP Metering > Valve
- ☐ Verify valve modulates in correct direction when Feedback > Setpoint & Feedback > Setpoint
- ☐ Verify drip tight closure is correct If flow control application exists
- ☐ Verify all contingencies, “How should the valve react in loss of signal”

10.2.7 Transmitter Configuration sheet

Transmitter configuration					
Transmitter:		Transmitter:		Transmitter:	
Analog Zero		Analog Zero		Analog Zero	
Analog Span		Analog Span		Analog Span	
Max Limit		Max Limit		Max Limit	
Min Limit		Min Limit		Min Limit	
Units		Units		Units	
Transmitter:		Transmitter:		Transmitter:	
Analog Zero		Analog Zero		Analog Zero	
Analog Span		Analog Span		Analog Span	
Max Limit		Max Limit		Max Limit	
Min Limit		Min Limit		Min Limit	
Units		Units		Units	
Control Configuration					
Process control		Process control		Process control	
Closing speed		Closing speed		Closing speed	
Opening speed		Opening speed		Opening speed	
Deadband		Deadband		Deadband	
SO1 Cycle time		SO1 Cycle time		SO1 Cycle time	
Output Limit %		Output Limit %		Output Limit %	
SO2 Cycle time		SO2 Cycle time		SO2 Cycle time	
Output Limit %		Output Limit %		Output Limit %	

Setup Configuration			
Opening solenoid orientation	Normally Closed	Normally Open	
Closing solenoid orientation	Normally Closed	Normally Open	
Failure Mode	Fail open	Fail Closed	Fail Last

10.3 PID Tuning Guide

10.3.1 PID Control

Cla-Val Controller "VC-22D" uses proportional–integral–derivative controller (PID), a control loop mechanism employing feedback, A PID controller continuously calculates an error value as the difference between a desired setpoint (SP) and a measured Process Variable (PV), and applies correction based on proportional, integral, and derivative terms.

Proper tuning of a PID Controller will steadily and precisely drive the (PV) towards the (SP), with least amount of overshoot over the Setpoint.

Note that Too high Proportional Gain will cause overshoot, and too low Proportional Gain will cause a slow response to the Valve.

The following table presents proportional Gain Values and the equivalent closing and opening percentage "%" in the VC-22D PID control.

Navigate Via: Long up > PID > Adjustment > Closing speed (%)/Opening speed (%).
The VC-22D mostly requires Proportional value tuning while integral and derivative are rarely used.

Percentage P	Gain P
25	.413
50	1
70	1.976
75	2.425
80	3.08
85	4.143
87	4.762
88	5.11
90	6.35
91	6.97
92	7.87
93	9.29
94	10.309
95	12.93

Table 10.1 Proportional % VS Proportional Gain.

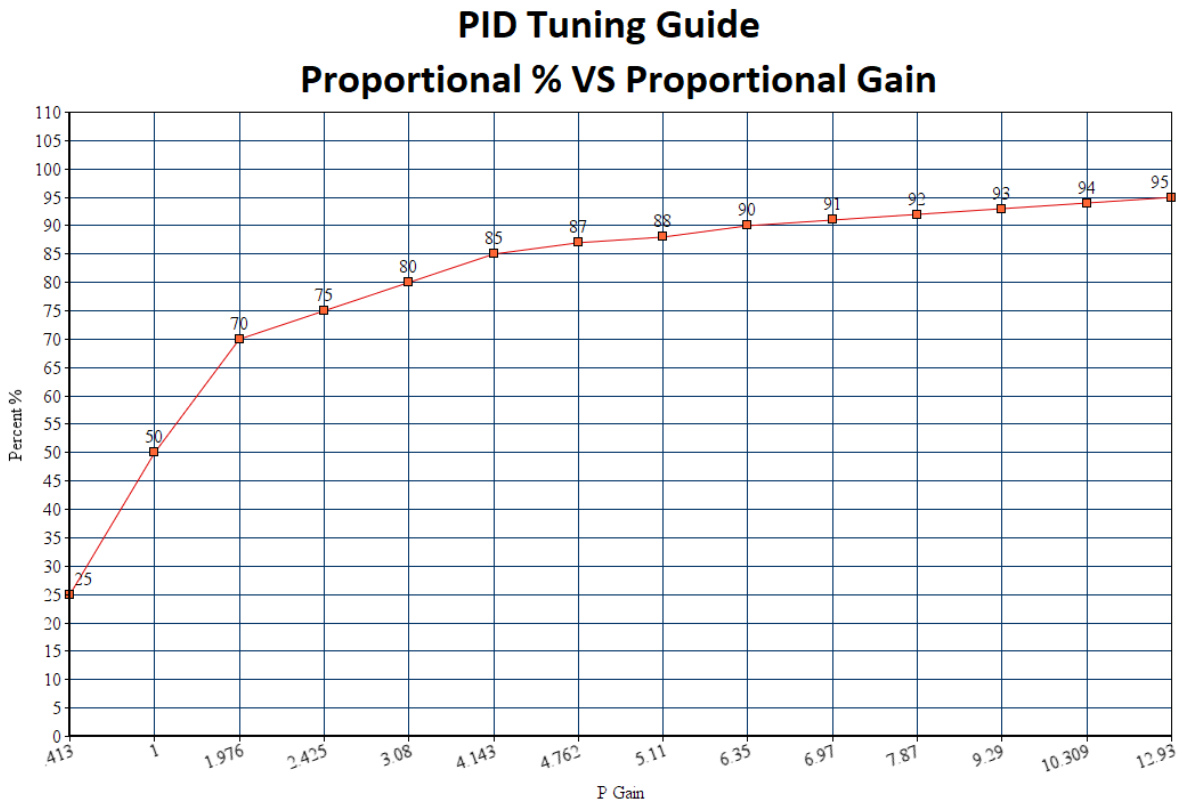


Figure 1. Proportional % VS Proportional Gain.

10.3.2 Deadband Tuning

Deadband can be used in control systems to prevent oscillation or repeated activation / deactivation cycles as shown in figure [2], tuning a deadband is very important to prevent continuous pulsing to the solenoids which will reduce the solenoid life cycle.

For example: If Setpoint (SP): 50, and Deadband: 5, controller will settle for setpoint at a process value between 45 and 55.

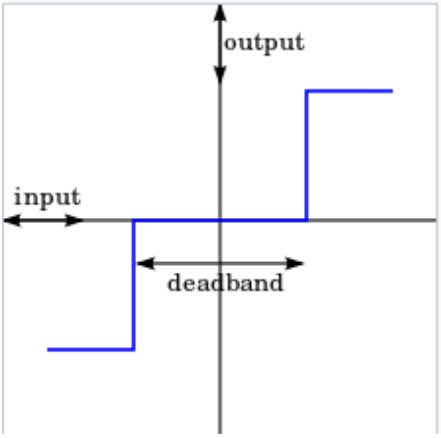


Figure 2. Deadband.

10.3.3 Cycle Time

Solenoids are controlled by VC-22D using Pulse Width Modulation “PWM”, and the solenoid is controlled based on a fixed cycle time.

Adjusting the cycle time will result in faster/slower opening/closing of the valve, the smaller the cycle time the better.

For example: If cycle time is: 5 sec , and solenoid energized at :50%, on time will be 2.5 sec and off time will be 2.5sec.

10.3.4 PID Tuning Table

Shown in table [2], the default and proper values of PID tuning configuration for each valve size,

Default PID Values:				
Valve Size (in/mm)	Closing Speed (%)	Opening Speed (%)	Deadband (%)	Cycle time (Sec)
1/25	50	50	3	2
1.25/32	50	50	3	2
1.5/40	50	50	3	2
2/50	50	50	3	2
2.5/65	50	50	3	2
3/80	50	50	3	2
4/100	75	75	5	5
6/150	75	75	5	5
8/200	75	75	5	5
10/250	75	75	5	5
12/300	75	75	5	5
14/350	75	75	5	5
16/400	75	75	5	7
18/450	85	85	5	7
20/500	85	85	5	7
24/600	87	87	5	7
30/650	87	87	5	7
36/900	87	87	5	7

Table 2. PID tuning Default values.

**note: If valve shows a slow response start with increasing closing and opening speeds.

**note: Increasing of Closing Speed and opening Speed can be in 5% increments, e.g.: 50,55, 60, etc.

**note: If after increasing closing and opening speeds, valve still shows slow response, set closing and opening speeds to default values according to table above and increment Cycle time by 1 (sec) increments, e.g.: 5, 6, 7, etc.

**note: If Valve is too fast start by decreasing closing and opening speeds by 5% decrements, e.g.: 75, 70, 65, etc.

**note: If after decreasing closing and opening speeds, valve is faster than expected, set closing and opening speeds to default values according to the table above and decrease cycle time by 1 (sec), e.g.: 5, 4, 3, etc.

**note: Smaller Deadband values will keep pulsing both solenoids which will cause damage to solenoids and shorten lifecycle.

10.4 Non-Conformances

**note: Any Non-conformances must be filled in the following table:

Non-Conformances			
NC Number	Description	Corrected	Corrected by
		☐	
		☐	
		☐	
		☐	
		☐	
		☐	
		☐	
		☐	
		☐	

By signing below, the inspector signifies that:

1. The inspection is complete
2. All non-conformances, if any, have been corrected
3. Wiring matches engineering drawings

Control Panel Serial Number	
Job Site Reference	
Name	
Date	
Signature	

Appendix A: Modbus Standard Mode

Per the Modbus specification, the Modbus registers are broken into four primary tables:

1. 0x registers (Coil Table)
2. 1x registers (Discrete Input Table)
3. 3x registers (Analog Input Table)
4. 4x registers (Holding Table)

A.1 0x Registers (Coil Table)

The coils table provides the energized status of each digital output on the VC-22D. The following table describes the supported Modbus function codes and registers for the coils table:

Supported Function Codes			
• 01 Read Coils			
Starting Register	Function	Data Type	Access
00000	SO1 Value	Bit	Read Only
00001	SO2 Value	Bit	Read Only
00002	RO1 Value	Bit	Read Only
00003	RO2 Value	Bit	Read Only

Digital outputs may be configured in digital mode or PWM mode, and that effects the value stored in the corresponding register. See section 6.2.10.6 for a description of digital mode and PWM mode. When the output is in digital mode, a register value of 1 means the output is energized, and a register value of 0 means the output is de-energized. When the output is in PWM mode, a register value of 1 means the output is sending a PWM signal greater than 0, and a register value of 0 means the output is de-energized.

A.2 1x Registers (Discrete Input Table)

The discrete inputs table indicates the signal being received by each digital input. The following table describes the supported Modbus function codes and registers for the discrete inputs table:

Supported Function Codes			
• 02 Read Discrete Inputs			
Starting Register	Function	Data Type	Access
10000	DI1 Value	Bit	Read Only
10001	DI2 Value	Bit	Read Only
10002	DI3 Value	Bit	Read Only
10003	DI4 Value	Bit	Read Only
10004	DI5 Value	Bit	Read Only
10005	DI6 Value	Bit	Read Only

A register value of 1 means the digital input is detecting a closed circuit. A register value of 0 means the digital input is detecting an open circuit.

A.3 3x Registers (Analog Input Table)

The input table indicates the analog signal being received by each digital input. The following table describes the supported Modbus function codes and registers for the analog inputs table:

Supported Function Codes			
• 04 Read Input Register			
Starting Register	Function	Data Type	Access
30000	AI1 Value	Float	Read Only
30002	AI2 Value	Float	Read Only
30004	AI3 Value	Float	Read Only
30006	AI4 Value	Float	Read Only
30008	AI5 Value	Float	Read Only
30010	AI6 Value	Float	Read Only
30012	DI1_C Value	Float	Read Only
30014	DI2_C Value	Float	Read Only
30016	DI3_C Value	Float	Read Only
30018	DI4_C Value	Float	Read Only
30020	DI5_C Value	Float	Read Only
30022	DI6_C Value	Float	Read Only
30024	DI1_F Value	Float	Read Only
30026	DI2_F Value	Float	Read Only
30028	DI3_F Value	Float	Read Only
30030	DI4_F Value	Float	Read Only
30032	DI5_F Value	Float	Read Only
30034	DI6_F Value	Float	Read Only

The value stored in the registers is identical to the engineering value displayed on the VC-22D display. The value will be scaled, filtered, and any overrides will be applied. If a loss of signal exists, the loss of signal value will be stored in the registers.

A.4 4x Registers (Holding Table)

The holding table contains registers that provide status information about inputs and outputs, allow Modbus override values to be written to inputs and outputs, and allow ValvApp specific variables to be modified. The following table describes the supported Modbus function codes and registers for the holding table:

Supported Function Calls
• 03 Read Holding Registers • 06 Write Single Registers

- 16 Write Multiple Registers

Starting Register	Info	
40000	Function	Analog input out of range (OOR) status
	Data Type	Word
	Access	Read Only
	Description	Each bit represents out of range status of an analog input. 1 means OOR active, 0 means OOR inactive. Bit 0 = AI1 OOR Status Bit 1 = AI2 OOR Status … Bit 5 = AI6 OOR Status Bits 6-15 are unused and always 0
40001	Function	Digital counter input out of range (OOR) status
	Data Type	Word
	Access	Read Only
	Description	Each bit represents out of range status of a digital counter input. 1 means OOR active, 0 means OOR inactive. Bit 0 = DI1_C OOR Status Bit 1 = DI2_C OOR Status … Bit 5 = DI6_C OOR Status Bits 6-15 are unused and always 0
40002	Function	Digital frequency input out of range (OOR) status
	Data Type	Word
	Access	Read Only
	Description	Each bit represents out of range status of a digital frequency input. 1 means OOR active, 0 means OOR inactive. Bit 0 = DI1_F OOR Status Bit 1 = DI2_F OOR Status … Bit 5 = DI6_F OOR Status Bits 6-15 are unused and always 0
40003	Function	Analog input local override (LOVR) status
	Data Type	Word
	Access	Read Only

	Description	Each bit represents LOVR status of an analog input. 1 means LOVR active, 0 means LOVR inactive. Bit 0 = AI1 OOR Status Bit 1 = AI2 OOR Status … Bit 5 = AI6 OOR Status Bits 6-15 are unused and always 0
40004	Function	Digital input local override (LOVR) status
	Data Type	Word
	Access	Read Only
	Description	Each bit represents LOVR status of a digital input. 1 means LOVR active, 0 means LOVR inactive. Bit 0 = DI1 OOR Status Bit 1 = DI2 OOR Status … Bit 5 = DI6 OOR Status Bits 6-15 are unused and always 0
40005	Function	Digital counter input local override (LOVR) status
	Data Type	Word
	Access	Read Only
	Description	Each bit represents LOVR status of a digital counter input. 1 means LOVR active, 0 means LOVR inactive. Bit 0 = DI1_C OOR Status Bit 1 = DI2_C OOR Status … Bit 5 = DI6_C OOR Status Bits 6-15 are unused and always 0
40006	Function	Digital frequency input local override (LOVR) status
	Data Type	Word
	Access	Read Only
	Description	Each bit represents LOVR status of a digital frequency input. 1 means LOVR active, 0 means LOVR inactive. Bit 0 = DI1_F OOR Status Bit 1 = DI2_F OOR Status … Bit 5 = DI6_F OOR Status Bits 6-15 are unused and always 0
40007	Function	Analog input Modbus override command
	Data Type	Word
	Access	Read-Write

	Description	Each bit represents Modbus override command of an analog input. 1 means override active, 0 means override inactive. Bit 0 = AI1 Override Status Bit 1 = AI2 Override Status … Bit 5 = AI6 Override Status Bits 6-15 are unused and always 0
40008	Function	Digital input Modbus override command
	Data Type	Word
	Access	Read-Write
	Description	Each bit represents Modbus override command of a digital input. 1 means override active, 0 means override inactive. Bit 0 = DI1 Override Status Bit 1 = DI2 Override Status … Bit 5 = DI6 Override Status Bits 6-15 are unused and always 0
40009	Function	Digital counter input Modbus override command
	Data Type	Word
	Access	Read-Write
	Description	Each bit represents Modbus override command of a digital counter input. 1 means override active, 0 means override inactive. Bit 0 = DI1_C Override Status Bit 1 = DI2_C Override Status … Bit 5 = DI6_C Override Status Bits 6-15 are unused and always 0
40010	Function	Digital frequency input Modbus override command
	Data Type	Word
	Access	Read-Write
	Description	Each bit represents Modbus override command of a digital frequency input. 1 means override active, 0 means override inactive. Bit 0 = DI1_F Override Status Bit 1 = DI2_F Override Status … Bit 5 = DI6_F Override Status Bits 6-15 are unused and always 0
40011	Function	Analog output local override (LOVR) status
	Data Type	Word
	Access	Read Only

	Description	Each bit represents LOVR status of an analog output. 1 means LOVR active, 0 means LOVR inactive. Bit 0 = AO1 OOR Status Bit 1 = AO2 OOR Status Bit 2 = AO3 OOR Status Bit 3 = AO4 OOR Status Bits 4-15 are unused and always 0
40012	Function	Digital output local override (LOVR) status
	Data Type	Word
	Access	Read Only
	Description	Each bit represents LOVR status of a digital output. 1 means LOVR active, 0 means LOVR inactive. Bit 0 = SO1 OOR Status Bit 1 = SO2 OOR Status Bit 2 = RO1 OOR Status Bit 3 = RO2 OOR Status Bits 4-15 are unused and always 0
40013	Function	Analog output alarm status
	Data Type	Word
	Access	Read Only
	Description	Each bit represents alarm status of an analog output. 1 means alarm active, 0 means alarm inactive. Bit 0 = AO1 Alarm Status Bit 1 = AO2 Alarm Status Bit 2 = AO3 Alarm Status Bit 3 = AO4 Alarm Status Bits 4-15 are unused and always 0
40014	Function	Digital output alarm status
	Data Type	Word
	Access	Read Only
	Description	Each bit represents alarm status of a digital output. 1 means alarm active, 0 means alarm inactive. Bit 0 = SO1 Alarm Status Bit 1 = SO2 Alarm Status Bit 2 = RO1 Alarm Status Bit 3 = RO2 Alarm Status Bits 4-15 are unused and always 0
40015	Function	Analog output recopy status
	Data Type	Word
	Access	Read Only

	Description	Each bit represents recopy status of an analog output. 1 means recopy active, 0 means recopy inactive. Bit 0 = AO1 Recopy Status Bit 1 = AO2 Recopy Status Bit 2 = AO3 Recopy Status Bit 3 = AO4 Recopy Status Bits 4-15 are unused and always 0
40016	Function	Digital output recopy status
	Data Type	Word
	Access	Read Only
	Description	Each bit represents recopy status of a digital output. 1 means recopy active, 0 means recopy inactive. Bit 0 = SO1 Recopy Status Bit 1 = SO2 Recopy Status Bit 2 = RO1 Recopy Status Bit 3 = RO2 Recopy Status Bits 4-15 are unused and always 0
40017	Function	Analog output Modbus override command
	Data Type	Word
	Access	Read-Write
	Description	Each bit represents Modbus override command of an analog output. 1 means override active, 0 means override inactive. Bit 0 = AO1 Override Status Bit 1 = AO2 Override Status Bit 2 = AO3 Override Status Bit 3 = AO4 Override Status Bits 4-15 are unused and always 0
40018	Function	Digital output Modbus override command
	Data Type	Word
	Access	Read-Write
	Description	Each bit represents Modbus override command of a digital output. 1 means override active, 0 means override inactive. Bit 0 = SO1 Override Status Bit 1 = SO2 Override Status Bit 2 = RO1 Override Status Bit 3 = RO2 Override Status Bits 4-15 are unused and always 0
41000	Function	DI1 Modbus Override Value (Discrete)
	Data Type	Word
	Access	Read-Write

	Description	This register is only used when channel is configured in discrete on/off mode. If channel is configured for PWM, any values written to this register are ignored.
41001	Function	DI2 Modbus Override Value (Discrete)
	Data Type	Word
	Access	Read-Write
	Description	This register is only used when channel is configured in discrete on/off mode. If channel is configured for PWM, any values written to this register are ignored.
41002	Function	DI3 Modbus Override Value (Discrete)
	Data Type	Word
	Access	Read-Write
	Description	This register is only used when channel is configured in discrete on/off mode. If channel is configured for PWM, any values written to this register are ignored.
41003	Function	DI4 Modbus Override Value (Discrete)
	Data Type	Word
	Access	Read-Write
	Description	This register is only used when channel is configured in discrete on/off mode. If channel is configured for PWM, any values written to this register are ignored.
41004	Function	DI5 Modbus Override Value (Discrete)
	Data Type	Word
	Access	Read-Write
	Description	This register is only used when channel is configured in discrete on/off mode. If channel is configured for PWM, any values written to this register are ignored.
41005	Function	DI6 Modbus Override Value (Discrete)
	Data Type	Word
	Access	Read-Write
	Description	This register is only used when channel is configured in discrete on/off mode. If channel is configured for PWM, any values written to this register are ignored.
41006	Function	SO1 Modbus Override Value (Discrete)
	Data Type	Word
	Access	Read-Write

	Description	This register is only used when channel is configured in discrete on/off mode. If channel is configured for PWM, any values written to this register are ignored.
41007	Function	SO2 Modbus Override Value (Discrete)
	Data Type	Word
	Access	Read-Write
	Description	This register is only used when channel is configured in discrete on/off mode. If channel is configured for PWM, any values written to this register are ignored.
41008	Function	RO1 Modbus Override Value (Discrete)
	Data Type	Word
	Access	Read-Write
	Description	This register is only used when channel is configured in discrete on/off mode. If channel is configured for PWM, any values written to this register are ignored.
41009	Function	RO2 Modbus Override Value (Discrete)
	Data Type	Word
	Access	Read-Write
	Description	This register is only used when channel is configured in discrete on/off mode. If channel is configured for PWM, any values written to this register are ignored.
42000	Function	AI1 Modbus Override Value
	Data Type	Float
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
42002	Function	AI2 Modbus Override Value
	Data Type	Float
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
42004	Function	AI3 Modbus Override Value

	Data Type	Float
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
42006	Function	AI4 Modbus Override Value
	Data Type	Float
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
42008	Function	AI5 Modbus Override Value
	Data Type	Float
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
42010	Function	AI6 Modbus Override Value
	Data Type	Float
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
42012	Function	DI1_C Modbus Override Value
	Data Type	Float
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.

42014	Function	DI2_C Modbus Override Value
	Data Type	Float
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
42016	Function	DI3_C Modbus Override Value
	Data Type	Float
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
42018	Function	DI4_C Modbus Override Value
	Data Type	Float
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
42020	Function	DI5_C Modbus Override Value
	Data Type	Float
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
42022	Function	DI6_C Modbus Override Value
	Data Type	Float
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be

		ignored. Reads will provide the scaled hardwired signal value.
42024	Function	DI1_F Modbus Override Value
	Data Type	Float
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
42026	Function	DI2_F Modbus Override Value
	Data Type	Float
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
42028	Function	DI3_F Modbus Override Value
	Data Type	Float
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
42030	Function	DI4_F Modbus Override Value
	Data Type	Float
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
42032	Function	DI5_F Modbus Override Value
	Data Type	Float
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus

		override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
42034	Function	DI6_F Modbus Override Value
	Data Type	Float
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
42036	Function	AO1 Modbus Override Value
	Data Type	Float
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
42038	Function	AO2 Modbus Override Value
	Data Type	Float
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
42040	Function	AO3 Modbus Override Value
	Data Type	Float
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
42042	Function	AO4 Modbus Override Value
	Data Type	Float
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of

		hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
42044	Function	SO1 Modbus Override Value (PWM)
	Data Type	Float
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
42046	Function	SO2 Modbus Override Value (PWM)
	Data Type	Float
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
42048	Function	RO1 Modbus Override Value (PWM)
	Data Type	Float
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
42050	Function	RO2 Modbus Override Value (PWM)
	Data Type	Float
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
42052	Function	Vbatt Battery Level
	Data Type	Float
	Access	Read Only

	Description	Provides the voltage of the VC-22D's internal battery.
42052 – 42499: Unused, always 0		
42500	Function	VAR 1
	Data Type	Float
	Access	Read-Write
	Description	Allows the value of the corresponding ValvApp variable to be read or written too.
42502	Function	VAR 2
	Data Type	Float
	Access	Read-Write
	Description	Allows the value of the corresponding ValvApp variable to be read or written too.
…		
42998	Function	VAR N
	Data Type	Float
	Access	Read-Write
	Description	Allows the value of the corresponding ValvApp variable to be read or written too.
43000	Function	AI1 Modbus Override Value
	Data Type	Integer
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
43002	Function	AI2 Modbus Override Value
	Data Type	Integer
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
43004	Function	AI3 Modbus Override Value
	Data Type	Integer
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus

		override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
43006	Function	AI4 Modbus Override Value
	Data Type	Integer
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
43008	Function	AI5 Modbus Override Value
	Data Type	Integer
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
43010	Function	AI6 Modbus Override Value
	Data Type	Integer
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
43012	Function	DI1_C Modbus Override Value
	Data Type	Integer
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
43014	Function	DI2_C Modbus Override Value
	Data Type	Integer
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of

		hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
43016	Function	DI3_C Modbus Override Value
	Data Type	Integer
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
43018	Function	DI4_C Modbus Override Value
	Data Type	Integer
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
43020	Function	DI5_C Modbus Override Value
	Data Type	Integer
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
43022	Function	DI6_C Modbus Override Value
	Data Type	Integer
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
43024	Function	DI1_F Modbus Override Value
	Data Type	Integer
	Access	Read-Write

	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
43026	Function	DI2_F Modbus Override Value
	Data Type	Integer
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
43028	Function	DI3_F Modbus Override Value
	Data Type	Integer
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
43030	Function	DI4_F Modbus Override Value
	Data Type	Integer
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
43032	Function	DI5_F Modbus Override Value
	Data Type	Integer
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
43034	Function	DI6_F Modbus Override Value
	Data Type	Integer

	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
43036	Function	AO1 Modbus Override Value
	Data Type	Integer
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
43038	Function	AO2 Modbus Override Value
	Data Type	Integer
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
43040	Function	AO3 Modbus Override Value
	Data Type	Integer
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
43042	Function	AO4 Modbus Override Value
	Data Type	Integer
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
43044	Function	SO1 Modbus Override Value (PWM)

	Data Type	Integer
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
43046	Function	SO2 Modbus Override Value (PWM)
	Data Type	Integer
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
43048	Function	RO1 Modbus Override Value (PWM)
	Data Type	Integer
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
43050	Function	RO2 Modbus Override Value (PWM)
	Data Type	Integer
	Access	Read-Write
	Description	If corresponding Modbus override bit is set to 1, VC-22D will use this register value instead of hardwired signal. If corresponding Modbus override is set to 0, writes to the register will be ignored. Reads will provide the scaled hardwired signal value.
43052	Function	Vbatt Battery Level
	Data Type	Integer
	Access	Read Only
	Description	Provides the voltage of the VC-22D's internal battery.
43054-43499: Unused, always 0		
43500	Function	VAR 1
	Data Type	Integer
	Access	Read-Write

	Description	Allows the value of the corresponding ValvApp variable to be read or written too.
43502	Function	VAR 2
	Data Type	Integer
	Access	Read-Write
	Description	Allows the value of the corresponding ValvApp variable to be read or written too.
…		
43998	Function	VAR N
	Data Type	Integer
	Access	Read-Write
	Description	Allows the value of the corresponding ValvApp variable to be read or written too.

A.5 Modbus Override

The VC-22D includes a Modbus override capability for inputs and outputs. An external device can put a particular input or output into Modbus override. When an input is in Modbus override, the ValvApp reads a Modbus override value instead of the input channel. When an output is in Modbus override, the output sends a Modbus override value instead of what the ValvApp dictates.

To put an input or output channel in Modbus override, the Modbus override command bit must be turned on. Each channel has its own override command bit stored in the 4x holding table. Once the channel is in Modbus override, an override value must be written. Each channel has its own Modbus override value register in the 4x holding table as well. The addresses for the override command bits and override value registers can be found in the table in section A.4.

For the sake of clarity, consider an example. If an external device is attempting to override the analog input 3 channel, the following steps must be performed:

1. Turn on Modbus override bit for AI3
    a. Use function code 6 to write value 4 to register 40007
2. Write Modbus override value for AI3
    a. If sending a float is preferred, use function code 16 to write the override value to registers 42004-42005
    b. If sending an integer is preferred, use function code 16 to write the override value to registers 43004-43005

To disable the Modbus override for a channel, turn off the Modbus override command bit. The Modbus override value register will then revert back to the value physically measured on the channel for inputs, or the value the ValvApp dictates for outputs.

A.6 Data Types

The VC-22D supports four different data types when storing values in Modbus registers.

A.6.1 Bit

The bit data type represents a single on/off value as a 0 or 1.

A.6.2 Word

The word data type holds 16 bits in a single register.

A.6.3 Float

The float data type is used to hold numeric values with decimal places. The value is encoded in Modbus registers per the IEEE 754 32 bit standard. Because floats require 32 bits, the value is stored in two adjacent registers. The most significant bits are stored in the lower addressed register and the least significant bits are stored in the higher addressed register (i.e. Motorola format).

A.6.4 Integer

The integer data type is used to hold numeric values without decimal places. The value is encoded in Modbus registers using a signed 32 bit integer standard. The 32 bits are stored in two adjacent registers, with the most significant bits stored in the lower addressed register and the least significant bits stored in the higher addressed register (i.e. Motorola format).

Because integers cannot encode decimal points directly, an implied decimal point has included in every integer register. When the VC-22D stores a value in a Modbus register using the integer data type, it always multiples the number by 10. For example, the number 123.4 is stored as 1234. When reading a value from a Modbus register, the client should always divide the number by 10 first.

A.7 Cla-Val Mode (Legacy)

This section describes interfacing with the Modbus server in the VC-22D when operating in the “Cla-Val” scheme. This is a legacy scheme and is not recommended for use with new VC-22D installations. The new “Standard” scheme was introduced in engine version 2.5.0 and the “Cla-Val” scheme continues to be included in new engine releases for backwards compatibility.

The “Cla-Val” scheme has three sets of registers that store the same values but in slightly different ways. The first set is called “Base” and holds all information as IEEE 754 floats. The second set is called “Topkapi” and holds all information as IEEE 754 floats, but the Modbus override works slightly different. The final section is called “Topkapi-Integer” and works just like “Topkapi” but stores information as 16 bit integers.

A.8 Modbus Base Registers

The Modbus base registers start at 40000 and go to 40311. When reading/writing to Modbus base registers, the following function codes are supported:

- 03: Read multiple holding registers
- 16: Write multiple holding registers

Each IO point uses 3 Modbus registers. The first register is the status/control word, and the second two registers are the IO point value.

A.8.1 Register Map

The table below depicts every Modbus register in the base set.

Starting Register	Value		Data Type
40000	AI1	Status/Control	Word
40001		Scaled Input Value	IEEE 754
40003	AI2	Status/Control	Word
40004		Scaled Input Value	IEEE 754
40006	AI3	Status/Control	Word
40007		Scaled Input Value	IEEE 754
40009	AI4	Status/Control	Word
40010		Input Value (Scaled)	IEEE 754
40012	AI5	Status/Control	Word
40013		Input Value (Scaled)	IEEE 754
40015	AI6	Status/Control	Word
40016		Input Value (Scaled)	IEEE 754
40018-40099	Unused (Read as all zeros)		
40100	DI1 (Digital State 1/0)	Status/Control	Word
40101		Input Value (0=Off, 1=On)	IEEE 754
40103	DI1_C (Counter Value)	Status/Control	Word
40104		Input Value (Scaled)	IEEE 754
40106	DI1_F (Counter Value/time span)	Status/Control	Word
40107		Input Value (Scaled)	IEEE 754
40109	DI2 (Digital State 1/0)	Status/Control	Word
40110		Input Value (0=Off, 1=On)	IEEE 754
40112	DI2_C (Counter Value)	Status/Control	Word
40113		Input Value (Scaled)	IEEE 754
40115	DI2_F (Counter Value/time span)	Status/Control	Word
40116		Input Value (Scaled)	IEEE 754
40118	DI3 (Digital State 1/0)	Status/Control	Word
40119		Input Value (0=Off, 1=On)	IEEE 754
40121	DI3_C (Counter Value)	Status/Control	Word
40122		Input Value (Scaled)	IEEE 754
40124	DI3_F (Counter Value/time span)	Status/Control	Word
40125		Input Value (Scaled)	IEEE 754
40127	DI4 (Digital State 1/0)	Status/Control	Word
40128		Input Value (0=Off, 1=On)	IEEE 754
40130	DI4_C (Counter Value)	Status/Control	Word
40131		Input Value (Scaled)	IEEE 754
40133	DI4_F (Counter Value/time span)	Status/Control	Word
40134		Input Value (Scaled)	IEEE 754
40136	DI5 (Digital State 1/0)	Status/Control	Word
40137		Input Value (0=Off, 1=On)	IEEE 754

Starting Register	Value		Data Type
40139	DI5_C (Counter Value)	Status/Control	Word
40140		Input Value (Scaled)	IEEE 754
40142	DI5_F (Counter Value/time span)	Status/Control	Word
40143		Input Value (Scaled)	IEEE 754
40145	DI6 (Digital State 1/0)	Status/Control	Word
40146		Input Value (0=Off, 1=On)	IEEE 754
40148	DI6_C (Counter Value)	Status/Control	Word
40149		Input Value (Scaled)	IEEE 754
40151	DI6_F (Counter Value/time span)	Status/Control	Word
40152		Input Value (Scaled)	IEEE 754
40154-40199	Unused (Read as zero)		
40200	AO1	Status/Control	Word
40201		Input Value (Scaled)	IEEE 754
40203	AO2	Status/Control	Word
40204		Input Value (Scaled)	IEEE 754
40206	AO3	Status/Control	Word
40207		Input Value (Scaled)	IEEE 754
40209	AO4	Status/Control	Word
40210		Input Value (Scaled)	IEEE 754
40212-40299	Unused (Read as all zeros)		
40300	SO1	Status/Control	Word
40302		Input Value (PWM: Scaled 0-100% Digital: 0=Off, 1=On)	IEEE 754
40303	SO2	Status/Control	Word
40305		Input Value (PWM: Scaled 0-100% Digital: 0=Off, 1=On)	IEEE 754
40306	RO1	Status/Control	Word
40308		Input Value (PWM: Scaled 0-100% Digital: 0=Off, 1=On)	IEEE 754
40309	RO2	Status/Control	Word
40311		Input Value (PWM: Scaled 0-100% Digital: 0=Off, 1=On)	IEEE 754

A.8.2 Status Control Word

Each bit in the status/control word holds status information about the IO point, or allows an override to be applied. See the table below for a definition of each bit:

Bit #	Description	Applicability	Access
0	Signal lost or out of range	AI's and DI_F's only	Read Only
1	Local override applied (see section 8.2 and 8.3)	All IO points	Read Only
2	Action active (see section 6.2.5)	AO's, SO's, and RO's only	Read Only
3	Retrans active (see section 6.2.6)	AO's, SO's, and RO's only	Read Only
4	Not used, always 0		
5	Not used, always 0		
6	Not used, always 0		
7	Not used, always 0		
8	Not used, always 0		
9	Not used, always 0		
10	Not used, always 0		
11	Not used, always 0		
12	Not used, always 0		
13	Not used, always 0		
14	Clear Modbus override	All IO points	Write Only
15	Activate Modbus override	All IO points	Read/Write

Table 10.1

Some of the bits in **TABLE 10.1** are not applicable for all IO points (e.g. bit 0 only is relevant for AI's and DI_F's). The bit will always be zero when it's not applicable to the current IO point.

A.8.3 IO Point Value

The second 2 registers hold the value for the IO point as an IEEE 754 float. The most significant byte is stored in the lower addressed register (i.e. Motorola format). The IO point value is read only when the Modbus override is off and read/write when the Modbus override is on.

The IO point value stored in the Modbus registers is identical to the value displayed on the VC-22D display. The value will be scaled, filtered, and any overrides will be applied. If a loss of signal exists, the loss of signal value will be stored in the IO point value registers.

A.8.4 Modbus Override

To enable the Modbus override for a particular IO point, one simultaneous transaction must write a 1 to bit 15 of the status/control word and write an override value to the IO point value registers. This is done by issuing Modbus function code 16 with values for the status/control word and IO point value as follows:

- Status/Control Word = 32768 (that's 1000 0000 0000 0000 in binary)
- IO Point Value = Override value encoded as IEEE 754 float

Each time a new override value is issued, bit 15 of the status/control word must be set to 1 again. If an override value is issued without setting bit 15 to 1, the override will not be applied.

To disable the Modbus override, a 0 must be written to bit 15 of the status/control word. The IO point value register will then revert back to the current value measured on the IO channel.

A.9 Modbus Topkapi Registers

The Modbus Topkapi registers start at 42000 and go to 42307. When reading/writing to Modbus Topkapi registers, the following function codes are supported:

- 03: Read multiple holding registers
- 06: Write single register
- 16: Write multiple holding registers

Each IO point uses at least 2 Modbus registers. The first register is the status/control word, and the remaining registers are the IO point value.

A.9.1 Register Map

The table below depicts every Modbus register in the Topkapi set.

Starting Register	Value		Data Type
42000	AI1	Status/Control	Word
42001		Scaled Input Value	IEEE 754
42003	AI2	Status/Control	Word
42004		Scaled Input Value	IEEE 754
42006	AI3	Status/Control	Word
42007		Scaled Input Value	IEEE 754
42009	AI4	Status/Control	Word
42010		Input Value (Scaled)	IEEE 754
42012	AI5	Status/Control	Word
42013		Input Value (Scaled)	IEEE 754
42015	AI6	Status/Control	Word
42016		Input Value (Scaled)	IEEE 754
42018-42099	Unused (Read as all zeros)		
42100	DI1 (Digital State 1/0)	Status/Control	Word
42101		Input Value (0=Off, 1=On)	Integer 16
42102	DI2 (Digital State 1/0)	Status/Control	Word
42103		Input Value (0=Off, 1=On)	Integer 16
42104	DI3 (Digital State 1/0)	Status/Control	Word
42105		Input Value (0=Off, 1=On)	Integer 16
42106	DI4 (Digital State 1/0)	Status/Control	Word
42107		Input Value (0=Off, 1=On)	Integer 16
42108	DI5 (Digital State 1/0)	Status/Control	Word
42109		Input Value (0=Off, 1=On)	Integer 16
42110	DI6 (Digital State 1/0)	Status/Control	Word
42111		Input Value (0=Off, 1=On)	Integer 16
42112-42119	Unused (read as all zeros)		
42120	DI1_C	Status/Control	Word

Starting Register	Value		Data Type
42121	(Counter Value)	Input Value (Scaled)	IEEE 754
42123	DI2_C (Counter Value)	Status/Control	Word
42124		Input Value (Scaled)	IEEE 754
42126	DI3_C (Counter Value)	Status/Control	Word
42127		Input Value (Scaled)	IEEE 754
42129	DI4_C (Counter Value)	Status/Control	Word
42130		Input Value (Scaled)	IEEE 754
42132	DI5_C (Counter Value)	Status/Control	Word
42133		Input Value (Scaled)	IEEE 754
42135	DI6_C (Counter Value)	Status/Control	Word
42136		Input Value (Scaled)	IEEE 754
42138-42139	Unused (read as all zeros)		
42140	DI1_F (Counter Value/time span)	Status/Control	Word
42141		Input Value (Scaled)	IEEE 754
42143	DI2_F (Counter Value/time span)	Status/Control	Word
42144		Input Value (Scaled)	IEEE 754
42146	DI3_F (Counter Value/time span)	Status/Control	Word
42147		Input Value (Scaled)	IEEE 754
42149	DI4_F (Counter Value/time span)	Status/Control	Word
42150		Input Value (Scaled)	IEEE 754
42152	DI5_F (Counter Value/time span)	Status/Control	Word
42153		Input Value (Scaled)	IEEE 754
42155	DI6_F (Counter Value/time span)	Status/Control	Word
42156		Input Value (Scaled)	IEEE 754
42158-42199	Unused (Read as zero)		
42200	AO1	Status/Control	Word
42201		Input Value (Scaled)	IEEE 754
42203	AO2	Status/Control	Word
42204		Input Value (Scaled)	IEEE 754
42206	AO3	Status/Control	Word
42207		Input Value (Scaled)	IEEE 754
42209	AO4	Status/Control	Word
42210		Input Value (Scaled)	IEEE 754
42212-42299	Unused (Read as all zeros)		
42300	SO1	Status/Control	Word
42301		Input Value (PWM: Scaled 0-100% Digital: 0=Off, 1=On)	Integer 16
42302	SO2	Status/Control	Word

Starting Register	Value		Data Type
42303		Input Value (PWM: Scaled 0-100% Digital: 0=Off, 1=On)	Integer 16
42304	RO1	Status/Control	Word
42305		Input Value (PWM: Scaled 0-100% Digital: 0=Off, 1=On)	Integer 16
42306	RO2	Status/Control	Word
42307		Input Value (PWM: Scaled 0-100% Digital: 0=Off, 1=On)	Integer 16
42308-42399	Unused (Read as all zeros)		

A.9.2 Status Control Word

Each bit in the status/control word holds status information about the IO point, or allows an override to be applied. See the table below for a definition of each bit:

Bit #	Description	Applicability	Access
0	Modbus override active	All IO points	Read/Write
1	Signal lost/out of range	AI's and DI_F's only	Read Only
2	Local override applied	All IO points	Read Only
3	Alarm active	AO's, SO's, and RO's only	Read Only
4	Recopy active	AO's, SO's, and RO's only	Read Only
5	Not used, always 0		
6	Not used, always 0		
7	Not used, always 0		
8	Not used, always 0		
9	Not used, always 0		
10	Not used, always 0		
11	Not used, always 0		
12	Not used, always 0		
13	Not used, always 0		
14	Not used, always 0		
15	Not used, always 0		

Table 10.2

Some of the bits in **TABLE 10.2** are not applicable for all IO points (e.g. bit 1 only is relevant for AI's and DI_F's). The bit will always be zero when it's not applicable to the current IO point.

A.9.3 IO Point Value

The remaining registers hold the value for the IO point. AI's, AO's, DI_F's, and DI_C's use 2 registers and store the value as an IEEE 754 float. The most significant byte is stored in the lower addressed register

(i.e. Motorola format). DI's, SO's, and RO's use 1 register and store the value as a word. The IO point value is read only when the Modbus override is off and read/write when the Modbus override is on.

The IO point value stored in the Modbus registers is identical to the value displayed on the VC-22D display. The value will be scaled, filtered, and any overrides will be applied. If a loss of signal exists, the loss of signal value will be stored in the IO point value registers.

A.9.4 Modbus Override

To enable the Modbus override for a particular IO point, a 1 must be written to bit 0 of the status/control word. The VC-22D will then accept override values written to the IO point value register. This is different from the base Modbus registers because a 1 does not need to be written to the override bit every time a new override value is issued.

The Modbus override can be enabled using function code 06 or 16 that writes 1 to the status/control word. An override value can then be written to the IO point value register in the same write or subsequent writes.

To disable the Modbus override, write a 0 to bit 0 of the status/control word. The IO point value register will then revert back to the value physically measured on the IO channel.

A.10 Modbus Topkapi Integer Registers

The Modbus Topkapi registers use two ranges of addresses. The first range starts at 42300 and goes to 42399, and the second range starts at 44000 and goes to 44299. When reading/writing to Modbus Topkapi registers, the following function codes are supported:

- 03: Read multiple holding registers
- 06: Write single register
- 16: Write multiple holding registers

Each IO point uses 2 Modbus registers. The first register is the status/control word and the second register is the IO point value stored as a 16-bit integer.

A.10.1 Register Map

The table below depicts every Modbus register in the Topkapi set.

Starting Register	Value		Data Type
44000	AI1	Status/Control	Word
44001		Scaled Input Value	Integer 16
44003	AI2	Status/Control	Word
44004		Scaled Input Value	Integer 16
44006	AI3	Status/Control	Word
44007		Scaled Input Value	Integer 16
44009	AI4	Status/Control	Word
44010		Input Value (Scaled)	Integer 16
44012	AI5	Status/Control	Word
44013		Input Value (Scaled)	Integer 16

Starting Register	Value		Data Type
44015	AI6	Status/Control	Word
44016		Input Value (Scaled)	Integer 16
44018-44099	Unused (Read as all zeros)		
44100	DI1 (Digital State 1/0)	Status/Control	Word
44101		Input Value (0=Off, 1=On)	Integer 16
44102	DI2 (Digital State 1/0)	Status/Control	Word
44103		Input Value (0=Off, 1=On)	Integer 16
44104	DI3 (Digital State 1/0)	Status/Control	Word
44105		Input Value (0=Off, 1=On)	Integer 16
44106	DI4 (Digital State 1/0)	Status/Control	Word
44107		Input Value (0=Off, 1=On)	Integer 16
44108	DI5 (Digital State 1/0)	Status/Control	Word
44109		Input Value (0=Off, 1=On)	Integer 16
44110	DI6 (Digital State 1/0)	Status/Control	Word
44111		Input Value (0=Off, 1=On)	Integer 16
44112-44119	Unused (read as all zeros)		
44120	DI1_C (Counter Value)	Status/Control	Word
44121		Input Value (Scaled)	Integer 16
44123	DI2_C (Counter Value)	Status/Control	Word
44124		Input Value (Scaled)	Integer 16
44126	DI3_C (Counter Value)	Status/Control	Word
44127		Input Value (Scaled)	Integer 16
44129	DI4_C (Counter Value)	Status/Control	Word
44130		Input Value (Scaled)	Integer 16
44132	DI5_C (Counter Value)	Status/Control	Word
44133		Input Value (Scaled)	Integer 16
44135	DI6_C (Counter Value)	Status/Control	Word
44136		Input Value (Scaled)	Integer 16
44138-44139	Unused (read as all zeros)		
44140	DI1_F (Counter Value/time span)	Status/Control	Word
44141		Input Value (Scaled)	Integer 16
44143	DI2_F (Counter Value/time span)	Status/Control	Word
44144		Input Value (Scaled)	Integer 16
44146	DI3_F (Counter Value/time span)	Status/Control	Word
44147		Input Value (Scaled)	Integer 16
44149	DI4_F (Counter Value/time span)	Status/Control	Word
44150		Input Value (Scaled)	Integer 16
44152	DI5_F (Counter Value/time span)	Status/Control	Word
44153		Input Value (Scaled)	Integer 16

Starting Register	Value		Data Type
44155	DI6_F (Counter Value/time span)	Status/Control	Word
44156		Input Value (Scaled)	Integer 16
44158-44199	Unused (Read as zero)		
44200	AO1	Status/Control	Word
44201		Input Value (Scaled)	Integer 16
44203	AO2	Status/Control	Word
44204		Input Value (Scaled)	Integer 16
44206	AO3	Status/Control	Word
44207		Input Value (Scaled)	Integer 16
44209	AO4	Status/Control	Word
44210		Input Value (Scaled)	Integer 16
44212-44299	Unused (Read as all zeros)		
42300	SO1	Status/Control	Word
42301		Input Value (PWM: Scaled 0-100% Digital: 0=Off, 1=On)	Integer 16
42302	SO2	Status/Control	Word
42303		Input Value (PWM: Scaled 0-100% Digital: 0=Off, 1=On)	Integer 16
42304	RO1	Status/Control	Word
42305		Input Value (PWM: Scaled 0-100% Digital: 0=Off, 1=On)	Integer 16
42306	RO2	Status/Control	Word
42307		Input Value (PWM: Scaled 0-100% Digital: 0=Off, 1=On)	Integer 16
42308-42399	Unused (Read as all zeros)		

A.10.2 Status Control Word

Each bit in the status/control word holds status information about the IO point, or allows an override to be applied. See the table below for a definition of each bit:

Bit #	Description	Applicability	Access
0	Modbus override active	All IO points	Read/Write
1	Signal lost/out of range	AI's and DI_F's only	Read Only
2	Local override applied	All IO points	Read Only
3	Alarm active	AO's, SO's, and RO's only	Read Only
4	Recopy active	AO's, SO's, and RO's only	Read Only
5	Not used, always 0		
6	Not used, always 0		
7	Not used, always 0		
8	Not used, always 0		
9	Not used, always 0		
10	Not used, always 0		
11	Not used, always 0		
12	Not used, always 0		
13	Not used, always 0		
14	Not used, always 0		
15	Not used, always 0		

Table 10.3

Some of the bits in **TABLE 10.2** are not applicable for all IO points (e.g. bit 1 only is relevant for AI's and DI_F's). The bit will always be zero when it's not applicable to the current IO point.

A.10.3 IO Point Value

The second register holds the value for the IO point. Any decimal places in the IO point will be stored using an implied decimal place in the IO point register. For example, if the variable has 2 decimal places and the number for the IO point is 96.52, then the register will have value 9652. If the variable has 1 decimal place and the number of the IO point is 12.3, then the register will have value 123. See section 6.2.9.5 to configure number of decimal places associated with the IO point. The IO point value is read only when the Modbus override is off and read/write when the Modbus override is on.

The IO point value stored in the Modbus register is identical to the value displayed on the VC-22D display. The value will be scaled, filtered, and any overrides will be applied. If a loss of signal exists, the loss of signal value will be stored in the IO point value register.

A.10.4 Modbus Override

To enable the Modbus override for a particular IO point, a 1 must be written to bit 0 of the status/control word. The VC-22D will then accept override values written to the IO point value register. This is different from the base Modbus registers because a 1 does not need to be written to the override bit every time a new override value is issued.

The Modbus override can be enabled using function code 06 or 16 that writes 1 to the status/control word. An override value can then be written to the IO point value register in the same write or subsequent writes.

To disable the Modbus override, write a 0 to bit 0 of the status/control word. The IO point value register will then revert back to the value physically measured on the IO channel.

Appendix B: Standard ValvApp Library List

The VC-22D comes with a standard library containing 17 ValvApps. The table below lists each standard ValvApp and includes a brief description. Appendix B includes a worksheet for each ValvApp which details each IO point and programming logic for the ValvApp. Appendix C includes an electrical wiring diagram for each ValvApp.

When looking for a standard ValvApp, first review the description of each ValvApp and find one that seems appropriate to your Cla-Valve application (pressure reducing, pressure sustaining, flow control, …). Then, review the ValvApp's worksheet and electrical schematic for the ValvApp you chose. Make sure the ValvApp worksheet and electrical drawing include the same IO points that your Cla-Valve application has, and make sure the logic fits your needs.

Name	Description
131-Flow-Mag-V2.1	Valve Series: 131 Maintains a flow rate based on user entered setpoint. ValvApp requires an analog input from a flowmeter. The home screen graphically shows flowmeter as a mag meter upstream of the valve. *Note: This is the same ValvApp as 131-Flow-X144D-V2.0, but graphics show mag meter instead of X144D flowmeter.*
131-Flow-X144D-V2.1	Valve Series: 131 Maintains a flow rate based on user entered setpoint. ValvApp requires an analog input from a flowmeter. The home screen graphically shows an X144D flowmeter inserted into the valve's sensing port. *Note: This is the same ValvApp as 131-Flow-Mag-V2.0, but graphics show X144D flowmeter instead of mag meter.*
131-LvlAltitude-L-V2.1	Valve Series: 131 Controls a fill valve to maintain tank level. If tank level is above a user entered setpoint, the valve goes full closed. If the tank level is below a user entered setpoint, the valve goes full open. This ValvApp requires an analog input from a level transducer.

131-LvlMod-L+Mag-V2.1	Valve Series: 131 Controls a fill valve to maintain tank level. If tank level is above a user entered setpoint, the valve goes full closed. If the tank level is below a user entered setpoint, the valve maintains a flow rate into the tank. As the tank level drops, the flow rate is increased. ValvApp requires analog inputs from a level transducer and flowmeter. The home screen graphically shows flowmeter as a mag meter upstream of the valve. *Note: This is the same ValvApp as 131-LvlMod-L+X144D-V2.0, but graphics show X144D flowmeter instead of mag meter.*
131-LvlMod-L+X117D-V2.1	Valve Series: 131 Controls a fill valve to maintain tank level. If tank level is above a user entered setpoint, the valve goes full closed. If the tank level is below a user entered setpoint, the valve is opened to a certain position to fill the tank. As the tank level drops, the valve position will be increased. ValvApp requires a level transducer analog input and position transmitter analog input.
131-LvlMod-L+X144D-V2.1	Valve Series: 131 Controls a fill valve to maintain tank level. If tank level is above a user entered setpoint, the valve goes full closed. If the tank level is below a user entered setpoint, the valve is modulated to maintain a flow rate into the tank. The emptier the tank, the higher the flow rate used to fill the tank. ValvApp requires a level transducer analog input and flowmeter analog input. The home screen graphically shows an X144D flowmeter inserted into the valve's sensing port. *Note: This is the same ValvApp as 131-LvlMod-L+Mag-V2.0, but graphics show X144D flowmeter instead of mag meter.*
131-Position-X117D-V2.1	Valve Series: 131 Maintains a valve position specified by a user setpoint. ValvApp requires a position transmitter analog input.
131-PressureReducing-P2-V2.1	Valve Series: 131 Reduces the downstream pressure to match a user setpoint. ValvApp requires a downstream pressure transmitter analog input.
131-PressureSustaining-P1-V2.1	Valve Series: 131 Sustains an upstream pressure to match a user setpoint. ValvApp requires an upstream pressure transmitter analog input.

133-Flow-DP+Pos-V2.1	Valve Series: 133 Calculates the flow rate based on the valves differential pressure and position. Modulates the valve to maintain a user entered flowrate setpoint. ValvApp requires analog inputs from a DP meter and position transmitter.
133-Flow-P1+P2+X117D-V2.1	Valve Series: 133 Calculates the flow rate based on the valves differential pressure and position. Modulates the valve to maintain a user entered flowrate setpoint. ValvApp requires analog inputs from an upstream pressure transmitter, downstream pressure transmitter, and position transmitter.
136-LvlAltitude+HLLL-Switch-V2.1	Valve Series: 136 Provides water level control in a tank based for a single solenoid valve using a high-level limit switch and low-level limit switch.
136-LvlAltitude-OnOff-V2.1	Valve Series: 136 Provides a standard altitude control in a tank for a single solenoid valve using a analog level transmitter.
340-Flow-Flw-V2.1	Valve Series: 340 Actuates a motor operated pilot which modulates a valve to maintain a flow rate. The flow rate is a user adjustable setpoint. ValvApp requires analog inputs from the motor's position feedback and flowmeter. The flowmeter is not used for control, only for monitoring.
340-Flow-V2.1	Valve Series: 340 Actuates a motor operated pilot which modulates a valve to maintain a flow rate. The flow rate is a user adjustable setpoint. ValvApp requires an analog input from the motor's position feedback.
350-PressureSustaining-P1-V2.1	Valve Series: 350 Actuates a motor operated pilot which modulates a valve to sustain an upstream pressure. The upstream pressure is a user adjustable setpoint. ValvApp requires analog inputs from the motor position feedback and upstream pressure transmitter. The upstream pressure transmitter is not user for control, only monitoring.
350-PressureSustaining-V2.1	Valve Series: 350 Actuates a motor operated pilot which modulates a valve to sustain an upstream pressure. The upstream pressure is a user adjustable setpoint. ValvApp requires an analog input from the motor position

	feedback. The upstream pressure transmitter is not user for control, only monitoring.
390-PressureReducing-P2-V2.1	Valve Series: 390 Actuates a motor operated pilot which modulates a valve to reduce a downstream pressure. The downstream pressure is a user adjustable setpoint. ValvApp requires analog inputs from the motor position feedback and downstream pressure transmitter. The downstream pressure transmitter is not user for control, only monitoring.
390-PressureReducing-V2.1	Valve Series: 390 Actuates a motor operated pilot which modulates a valve to reduce a downstream pressure. The downstream pressure is a user adjustable setpoint. ValvApp requires an analog input from the motor position feedback.

Appendix C: Standard ValvApp Worksheets

C.1 131-Flow-Mag-V2.0 or 131-Flow-X144D-V2.1

VC-22D ValvApp™ Worksheet

This worksheet is intended for the configuration of ValvApps™ used in the VC-22D Valve Controller. From the information provided below, Cla-Val will determine whether a standard ValvApp™ should be used or if a custom ValvApp™ is required. Additionally, this worksheet acts as a check list during commissioning to verify all parameters have been correctly configured in the VC-22D Valve Controller. Once this worksheet is completed, please return to your Cla-Val representative for approval. If a custom ValvApp is required and approved, a custom wiring diagram and ValvApp™ will be created and emailed to you. Please verify all *Required fields have been filled out prior to submittal.

Information — Reset Form — Configuration: VC-22D

*Project Name	N/A	*Today's Date	12/19/22
*Cla-Val Representive	N/A	Project Completion Date	
Control Valve Model Number (if known)	131	Customer Approval Signature	

Valve Regulation *(If more than 2 PID's are required, specify in logic on page 2)*

☑ PID 1 - Valve Regulation	*Solenoid Config	NC / NC (P.F. Lock)	☐ PID 2 - Valve Regulation	PID Selection Mode	
*Control Type	Flow	*Signal Loss	Lock Valve	Control Type		Signal Loss	
Deadband (+/-)		Ramping		Deadband (+/-)		Ramping	

DP Metering (133 Valve)

☐ *DP Metering* — Pressure Measurement: ◉ P1+P2 ○ DPT — Output

Size | Body Style | Seat | Units | Output Scaling

Totalizer

☐ *Totalizer* — Reset | Units | Ouput | Output Scaling

Analog Inputs (4-20mA) *6 Available*

	Name	Units	Scaling 4mA =	Scaling 20mA =	Signal Powered by Controller	Decimal
☑ *Analog Input #1* (Typically reserved for control setpoint signal)	Flow SP	gpm	0 gpm	2,000 gpm	☐	0
☑ *Analog Input #2* (Typically reserved for control feedback signal)	Flow Rate	gpm	0 gpm	2,000 gpm	☑	0
☐ *Analog Input #3*					☐	
☐ *Analog Input #4*					☐	
☐ *Analog Input #5*					☐	
☐ *Analog Input #6*					☐	

Digital Inputs *6 Available*

☐ *Digital Input 1* Name / Purpose	☐ *Digital Input 2* Name / Purpose	☐ *Digital Input 3* Name / Purpose
☐ *Digital Input 4* Name / Purpose	☐ *Digital Input 5* Name / Purpose	☐ *Digital Input 6* Name / Purpose

 Control • Power • Information • Communication Page 1 of 3

Form Rev. 4

Analog Outputs (4-20mA) *Note: Analog Outputs are sourced with controller power.*

☐ *Analog Output #1*
Name | Units | Scaling: 4mA = | 20mA = | Decimal

☐ *Analog Output #2*
Name | Units | Scaling: 4mA = | 20mA = | Decimal

☐ *Analog Output #3*
Name | Units | Scaling: 4mA = | 20mA = | Decimal

☐ *Analog Output #4*
Name | Units | Scaling: 4mA = | 20mA = | Decimal

Solenoid Outputs

☑ **Solenoid Output #1 (SO1)*
Name: Close Solenoid
Default: Closing Solenoid

☑ *Solenoid Output #2 (SO2)*
Name: Open Solenoid
Default: Opening Solenoid

Note: *SO1 and SO2 are a powered solid state output typically reserved for solenoids used on a 131 or 133 series valve. The output can be configured as PWM (default) or Discrete ON/OFF. If configured as discrete, a value of 0 represents an open circuit, and 1 a closed circuit.*

Relay Output

☐ *Relay Output #1 (RO1)*
Name

☐ *Relay Output #2 (RO2)*
Name

Note: *RO1 and RO2 are configured as dry contact mechanical relays typically used for alarms. These outputs are configured as Discrete ON/OFF, a value of 0 represents an open circuit, and 1 a closed circuit.*

Actions/Alarms

☐ *Action #1*
Name | Describe
Additional Comments

☐ *Action #2*
Name | Describe
Additional Comments

☐ *Action #3*
Name | Describe
Additional Comments

☐ *Action #4*
Name | Describe
Additional Comments

Communication

☐ **GSM/GPRS** ☐ **Modbus TCP/IP** ☐ **Modbus RTU (RS485/RS232)**

Note: *See ModBus specification page for register mapping and implementation. Refer to manual for more details.*

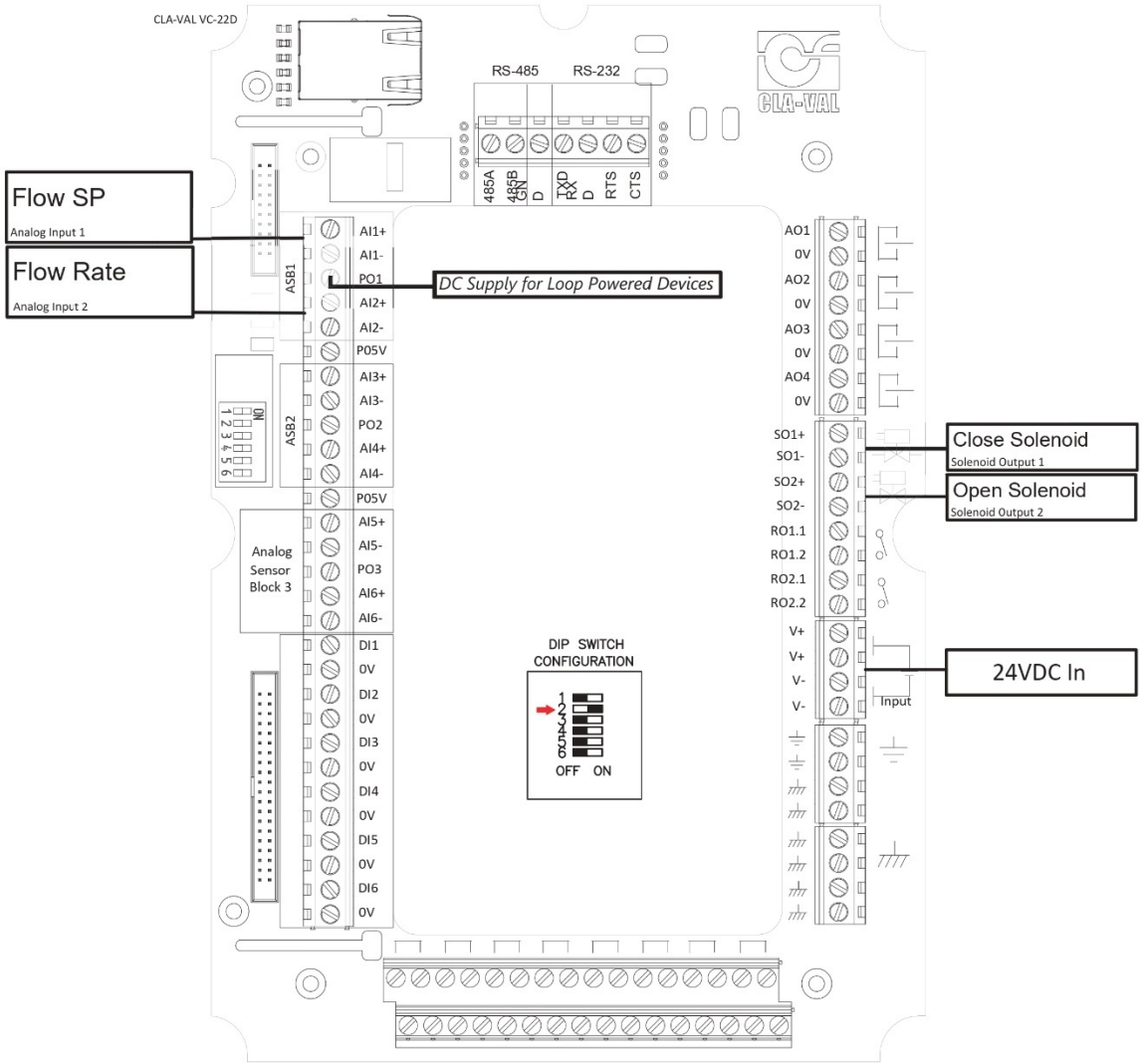
***Control Logic** (*Please specify all control logic using sketches, diagrams, etc. Attach additional sheets if necessary*)

This ValvApp provides a standard flow control function for a 131 series valve. If the flow rises above the SP, the valve will modulate closed. If the flow drops below the SP, the valve will modulate open.

DI1 and AI3 have been added into this program, even though they are currently not used for anything. These serve as spare IO points so additional functionality can be added in the field by landing signal cables on these IO points and configuring actions in the VC-22D.

 Control • Power • Information • Communication Page 2 of 3

* This is only to give an idea of where wires will be landed. Does not account for number of wires and Loop or Field powered. Please refer to **Electrical Wiring** section of VC-22D IOM for help wiring loop or field powered devices.



Cla-Val VC-22D Modbus Addresses

Project Name: N/A
Date:

Modbus	Input	Description	Data Type	Access	I/O Mapping	Comments
40007 Bit 0	Flow SP	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI1 Input to use Modbus Address 43000/43001
40007 Bit 1	Flow Rate	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI2 Input to use Modbus Address 43002/43003
40007 Bit 2	Spare	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI3 Input to use Modbus Address 43004/43005
40007 Bit 3	- -	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI4 Input to use Modbus Address 43006/43007
40007 Bit 4	- -	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI5 Input to use Modbus Address 43008/43009
40007 Bit 5	- -	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI6 Input to use Modbus Address 43010/43011
40008 Bit 0	Spare	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI1 Input to use Modbus Address 41000
40008 Bit 1	- -	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI2 Input to use Modbus Address 41001
40008 Bit 2	- -	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI3 Input to use Modbus Address 41002
40008 Bit 3	- -	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI4 Input to use Modbus Address 41003
40008 Bit 4	- -	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI5 Input to use Modbus Address 41004
40008 Bit 5	- -	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI6 Input to use Modbus Address 41005
41000	Spare	Digital Input	Word	Read/Write	DI1	Register Holds/Reads DI1 Value
41001	- -	Digital Input	Word	Read/Write	DI2	Register Holds/Reads DI2 Value
41002	- -	Digital Input	Word	Read/Write	DI3	Register Holds/Reads DI3 Value
41003	- -	Digital Input	Word	Read/Write	DI4	Register Holds/Reads DI4 Value
41004	- -	Digital Input	Word	Read/Write	DI5	Register Holds/Reads DI5 Value
41005	- -	Digital Input	Word	Read/Write	DI6	Register Holds/Reads DI6 Value
41006	Close Solenoid	Digital Output	Word	Read	S01	Monitory Purposes (Optional)
41007	Open Solenoid	Digital Output	Word	Read	S02	Monitory Purposes (Optional)
41008	- -	Digital Output	Word	Read	R01	Monitory Purposes (Optional)
41009	- -	Digital Output	Word	Read	R02	Monitory Purposes (Optional)
43000/43001	Flow SP	Analog Input	Int 32	Read/Write	AI1	Register Holds/Reads AI1 Value x100 for Two Implied Decimals
43002/43003	Flow Rate	Analog Input	Int 32	Read/Write	AI2	Register Holds/Reads AI2 Value x100 for Two Implied Decimals
43004/43005	Spare	Analog Input	Int 32	Read/Write	AI3	Register Holds/Reads AI3 Value x100 for Two Implied Decimals
43006/43007	- -	Analog Input	Int 32	Read/Write	AI4	Register Holds/Reads AI4 Value x100 for Two Implied Decimals
43008/43009	- -	Analog Input	Int 32	Read/Write	AI5	Register Holds/Reads AI5 Value x100 for Two Implied Decimals
43010/43011	- -	Analog Input	Int 32	Read/Write	AI6	Register Holds/Reads AI6 Value x100 for Two Implied Decimals
43036/43037	- -	Analog Output	Int 32	Read	AO1	Monitory Purposes (Optional) - Register Holds AO1 Value x100 for Two Implied Decimals
43038/43039	- -	Analog Output	Int 32	Read	AO2	Monitory Purposes (Optional) - Register Holds AO2 Value x100 for Two Implied Decimals
43040/43041	- -	Analog Output	Int 32	Read	AO3	Monitory Purposes (Optional) - Register Holds AO3 Value x100 for Two Implied Decimals
43042/43043	- -	Analog Output	Int 32	Read	AO4	Monitory Purposes (Optional) - Register Holds AO4 Value x100 for Two Implied Decimals

***Additional ModBus information can be found in the manual.

C.2 131-LvlAltitude-L-V2.1

VC-22D ValvApp™ Worksheet

This worksheet is intended for the configuration of ValvApps™ used in the VC-22D Valve Controller. From the information provided below, Cla-Val will determine whether a standard ValvApp™ should be used or if a custom ValvApp™ is required. Additionally, this worksheet acts as a check list during commissioning to verify all parameters have been correctly configured in the VC-22D Valve Controller. Once this worksheet is completed, please return to your Cla-Val representative for approval. If a custom ValvApp is required and approved, a custom wiring diagram and ValvApp™ will be created and emailed to you. Please verify all *Required fields have been filled out prior to submittal.

Information — Reset Form — Configuration: VC-22D

*Project Name	N/A	*Today's Date	12/19/22
*Cla-Val Representive	N/A	Project Completion Date	
Control Valve Model Number (if known)	131	Customer Approval Signature	

Valve Regulation *(If more than 2 PID's are required, specify in logic on page 2)*

☑ PID 1 - Valve Regulation	*Solenoid Config	NC / NC (P.F. Lock)	☐ PID 2 - Valve Regulation	PID Selection Mode			
*Control Type	Level - Altitude	*Signal Loss	Lock Valve	Control Type		Signal Loss	
Deadband (+/-)		Ramping		Deadband (+/-)		Ramping	

DP Metering (133 Valve)

☐ *DP Metering*	Pressure Measurement	◉ P1+P2 ○ DPT				Output	
Size		Body Style		Seat		Units	Output Scaling

Totalizer

☐ *Totalizer*	Reset		Units	Ouput	Output Scaling

Analog Inputs (4-20mA) *6 Available*

☑ *Analog Input #1* *(Typically reserved for control setpoint signal)*	Name: Level Setpoint	Units: ft	Scaling	4mA = 0 ft	20mA = 20 ft	☐ Signal Powered by Controller	Decimal: 0.00
☑ *Analog Input #2* *(Typically reserved for control feedback signal)*	Name: Level	Units: ft	Scaling	4mA = 0 ft	20mA = 20 ft	☑ Signal Powered by Controller	Decimal: 0.00
☐ *Analog Input #3*	Name:	Units:	Scaling	4mA =	20mA =	☐ Signal Powered by Controller	Decimal:
☐ *Analog Input #4*	Name:	Units:	Scaling	4mA =	20mA =	☐ Signal Powered by Controller	Decimal:
☐ *Analog Input #5*	Name:	Units:	Scaling	4mA =	20mA =	☐ Signal Powered by Controller	Decimal:
☐ *Analog Input #6*	Name:	Units:	Scaling	4mA =	20mA =	☐ Signal Powered by Controller	Decimal:

Digital Inputs *6 Available*

☐ *Digital Input 1* Name:	☐ *Digital Input 2* Name:	☐ *Digital Input 3* Name:
Purpose:	Purpose:	Purpose:
☐ *Digital Input 4* Name:	☐ *Digital Input 5* Name:	☐ *Digital Input 6* Name:
Purpose:	Purpose:	Purpose:

 Control • Power • Information • Communication Page 1 of 3

Form Rev. 4

Analog Outputs (4-20mA) *Note: Analog Outputs are sourced with controller power.*

☐ *Analog Output #1*
Name | Units | Scaling: 4mA = | 20mA = | Decimal

☐ *Analog Output #2*
Name | Units | Scaling: 4mA = | 20mA = | Decimal

☐ *Analog Output #3*
Name | Units | Scaling: 4mA = | 20mA = | Decimal

☐ *Analog Output #4*
Name | Units | Scaling: 4mA = | 20mA = | Decimal

Solenoid Outputs

☑ **Solenoid Output #1 (SO1)*
Name: Close Solenoid
Default: Closing Solenoid

☑ *Solenoid Output #2 (SO2)*
Name: Open Solenoid
Default: Opening Solenoid

Note: *SO1 and SO2 are a powered solid state output typically reserved for solenoids used on a 131 or 133 series valve. The output can be configured as PWM (default) or Discrete ON/OFF. If configured as discrete, a value of 0 represents an open circuit, and 1 a closed circuit.*

Relay Output

☐ *Relay Output #1 (RO1)*
Name

☐ *Relay Output #2 (RO2)*
Name

Note: *RO1 and RO2 are configured as dry contact mechanical relays typically used for alarms. These outputs are configured as Discrete ON/OFF, a value of 0 represents an open circuit, and 1 a closed circuit.*

Actions/Alarms

☐ *Action #1*
Name | Describe
Additional Comments

☐ *Action #2*
Name | Describe
Additional Comments

☐ *Action #3*
Name | Describe
Additional Comments

☐ *Action #4*
Name | Describe
Additional Comments

Communication

☐ **GSM/GPRS** ☐ **Modbus TCP/IP** ☐ **Modbus RTU (RS485/RS232)**

Note: *See ModBus specification page for register mapping and implementation. Refer to manual for more details.*

***Control Logic** (*Please specify all control logic using sketches, diagrams, etc. Attach additional sheets if necessary*)

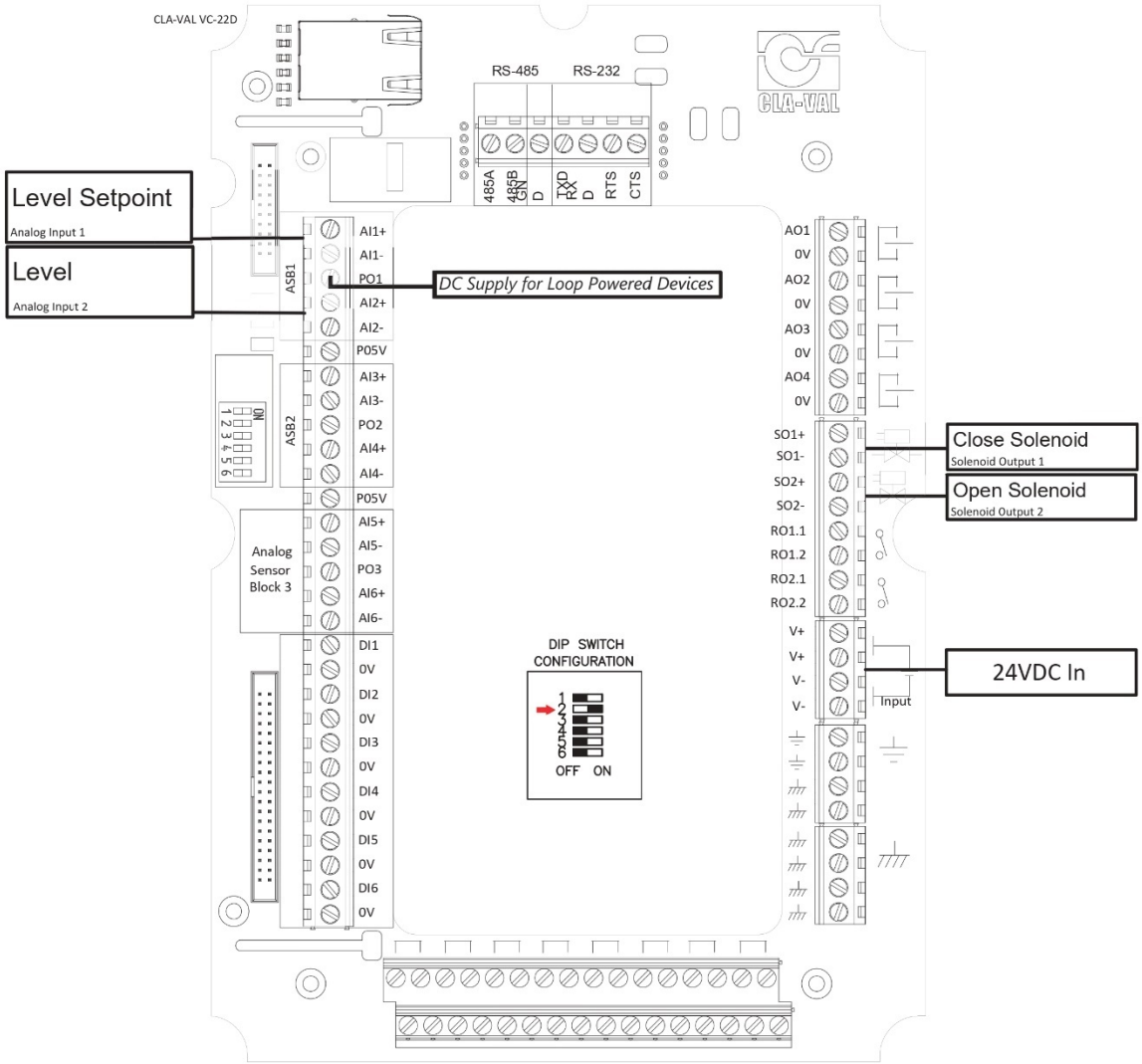
This ValvApp provides standard level altitude control. If the level is above a high setpoint, the valve goes full closed. If the level is below a low setpoint, the valve goes full open.

DI1 and AI3 have been added into this program, even though they are currently not used for anything. These serve as spare IO points so additional functionality can be added in the field by landing signal cables on these IO points and configuring actions in the VC-22D.

This ValvApp provides interactive variables to switch solenoids between NC and NO.

 Control • Power • Information • Communication Page 2 of 3

* This is only to give an idea of where wires will be landed. Does not account for number of wires and Loop or Field powered. Please refer to **Electrical Wiring** section of VC-22D IOM for help wiring loop or field powered devices.



Cla-Val VC-22D Modbus Addresses

Project Name: N/A
Date:

Modbus	Input	Description	Data Type	Access	I/O Mapping	Comments
40007 Bit 0	Level Setpoint	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI1 Input to use Modbus Address 43000/43001
40007 Bit 1	Level	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI2 Input to use Modbus Address 43002/43003
40007 Bit 2	Spare	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI3 Input to use Modbus Address 43004/43005
40007 Bit 3	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI4 Input to use Modbus Address 43006/43007
40007 Bit 4	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI5 Input to use Modbus Address 43008/43009
40007 Bit 5	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI6 Input to use Modbus Address 43010/43011
40008 Bit 0	Spare	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI1 Input to use Modbus Address 41000
40008 Bit 1	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI2 Input to use Modbus Address 41001
40008 Bit 2	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI3 Input to use Modbus Address 41002
40008 Bit 3	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI4 Input to use Modbus Address 41003
40008 Bit 4	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI5 Input to use Modbus Address 41004
40008 Bit 5	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI6 Input to use Modbus Address 41005
41000	Spare	Digital Input	Word	Read/Write	DI1	Register Holds/Reads DI1 Value
41001	--	Digital Input	Word	Read/Write	DI2	Register Holds/Reads DI2 Value
41002	--	Digital Input	Word	Read/Write	DI3	Register Holds/Reads DI3 Value
41003	--	Digital Input	Word	Read/Write	DI4	Register Holds/Reads DI4 Value
41004	--	Digital Input	Word	Read/Write	DI5	Register Holds/Reads DI5 Value
41005	--	Digital Input	Word	Read/Write	DI6	Register Holds/Reads DI6 Value
41006	Close Solenoid	Digital Output	Word	Read	S01	Monitory Purposes (Optional)
41007	Open Solenoid	Digital Output	Word	Read	S02	Monitory Purposes (Optional)
41008	--	Digital Output	Word	Read	R01	Monitory Purposes (Optional)
41009	--	Digital Output	Word	Read	R02	Monitory Purposes (Optional)
43000/43001	Level Setpoint	Analog Input	Int 32	Read/Write	AI1	Register Holds/Reads AI1 Value x100 for Two Implied Decimals
43002/43003	Level	Analog Input	Int 32	Read/Write	AI2	Register Holds/Reads AI2 Value x100 for Two Implied Decimals
43004/43005	Spare	Analog Input	Int 32	Read/Write	AI3	Register Holds/Reads AI3 Value x100 for Two Implied Decimals
43006/43007	--	Analog Input	Int 32	Read/Write	AI4	Register Holds/Reads AI4 Value x100 for Two Implied Decimals
43008/43009	--	Analog Input	Int 32	Read/Write	AI5	Register Holds/Reads AI5 Value x100 for Two Implied Decimals
43010/43011	--	Analog Input	Int 32	Read/Write	AI6	Register Holds/Reads AI6 Value x100 for Two Implied Decimals
43036/43037	--	Analog Output	Int 32	Read	AO1	Monitory Purposes (Optional) - Register Holds AO1 Value x100 for Two Implied Decimals
43038/43039	--	Analog Output	Int 32	Read	AO2	Monitory Purposes (Optional) - Register Holds AO2 Value x100 for Two Implied Decimals
43040/43041	--	Analog Output	Int 32	Read	AO3	Monitory Purposes (Optional) - Register Holds AO3 Value x100 for Two Implied Decimals
43042/43043	--	Analog Output	Int 32	Read	AO4	Monitory Purposes (Optional) - Register Holds AO4 Value x100 for Two Implied Decimals

***Additional ModBus information can be found in the manual.

C.3 131-LvlMod-L+Mag-V2.0 or 131-LvlMod-L+144D-V2.1

VC-22D ValvApp™ Worksheet

This worksheet is intended for the configuration of ValvApps™ used in the VC-22D Valve Controller. From the information provided below, Cla-Val will determine whether a standard ValvApp™ should be used or if a custom ValvApp™ is required. Additionally, this worksheet acts as a check list during commissioning to verify all parameters have been correctly configured in the VC-22D Valve Controller. Once this worksheet is completed, please return to your Cla-Val representative for approval. If a custom ValvApp is required and approved, a custom wiring diagram and ValvApp™ will be created and emailed to you. Please verify all *Required fields have been filled out prior to submittal.

Information — Reset Form — Configuration: VC-22D

*Project Name	N/A	*Today's Date	12/19/22
*Cla-Val Representive	N/A	Project Completion Date	
Control Valve Model Number (if known)	131	Customer Approval Signature	

Valve Regulation *(If more than 2 PID's are required, specify in logic on page 2)*

☑ PID 1 - Valve Regulation	*Solenoid Config	NC / NC (P.F. Lock)	☐ PID 2 - Valve Regulation	PID Selection Mode	
*Control Type	Level - Modulating	*Signal Loss	Lock Valve	Control Type		Signal Loss	
Deadband (+/-)		Ramping		Deadband (+/-)		Ramping	

DP Metering (133 Valve)

☐ *DP Metering* — Pressure Measurement: ◉ P1+P2 ○ DPT — Output

Size | Body Style | Seat | Units | Output Scaling

Totalizer

☐ *Totalizer* — Reset | Units | Ouput | Output Scaling

Analog Inputs (4-20mA) *6 Available*

	Name	Units	Scaling	4mA =	20mA =	Decimal	Signal Powered by Controller
☑ *Analog Input #1* (Typically reserved for control setpoint signal)	Level Shutoff SP	ft		0 ft	20 ft	0.00	☐
☑ *Analog Input #2* (Typically reserved for control feedback signal)	Level	ft		0 ft	20 ft	0.00	☑
☑ *Analog Input #3*	Flow Rate	gpm		0 gpm	2,000 gpm	0	☑
☐ *Analog Input #4*							☐
☐ *Analog Input #5*							☐
☐ *Analog Input #6*							☐

Digital Inputs *6 Available*

☐ *Digital Input 1* Name / Purpose	☐ *Digital Input 2* Name / Purpose	☐ *Digital Input 3* Name / Purpose
☐ *Digital Input 4* Name / Purpose	☐ *Digital Input 5* Name / Purpose	☐ *Digital Input 6* Name / Purpose

 Control • Power • Information • Communication Page 1 of 3

Form Rev. 4

Analog Outputs (4-20mA) *Note: Analog Outputs are sourced with controller power.*

☐ *Analog Output #1*
Name | Units | Scaling: 4mA = | 20mA = | Decimal

☐ *Analog Output #2*
Name | Units | Scaling: 4mA = | 20mA = | Decimal

☐ *Analog Output #3*
Name | Units | Scaling: 4mA = | 20mA = | Decimal

☐ *Analog Output #4*
Name | Units | Scaling: 4mA = | 20mA = | Decimal

Solenoid Outputs

☑ **Solenoid Output #1 (SO1)*
Name: Close Solenoid
Default: Closing Solenoid

☑ *Solenoid Output #2 (SO2)*
Name: Open Solenoid
Default: Opening Solenoid

Note: *SO1 and SO2 are a powered solid state output typically reserved for solenoids used on a 131 or 133 series valve. The output can be configured as PWM (default) or Discrete ON/OFF. If configured as discrete, a value of 0 represents an open circuit, and 1 a closed circuit.*

Relay Output

☐ *Relay Output #1 (RO1)*
Name

☐ *Relay Output #2 (RO2)*
Name

Note: *RO1 and RO2 are configured as dry contact mechanical relays typically used for alarms. These outputs are configured as Discrete ON/OFF, a value of 0 represents an open circuit, and 1 a closed circuit.*

Actions/Alarms

☐ *Action #1*
Name | Describe
Additional Comments

☐ *Action #2*
Name | Describe
Additional Comments

☐ *Action #3*
Name | Describe
Additional Comments

☐ *Action #4*
Name | Describe
Additional Comments

Communication

☐ **GSM/GPRS** ☐ **Modbus TCP/IP** ☐ **Modbus RTU (RS485/RS232)**

Note: *See ModBus specification page for register mapping and implementation. Refer to manual for more details.*

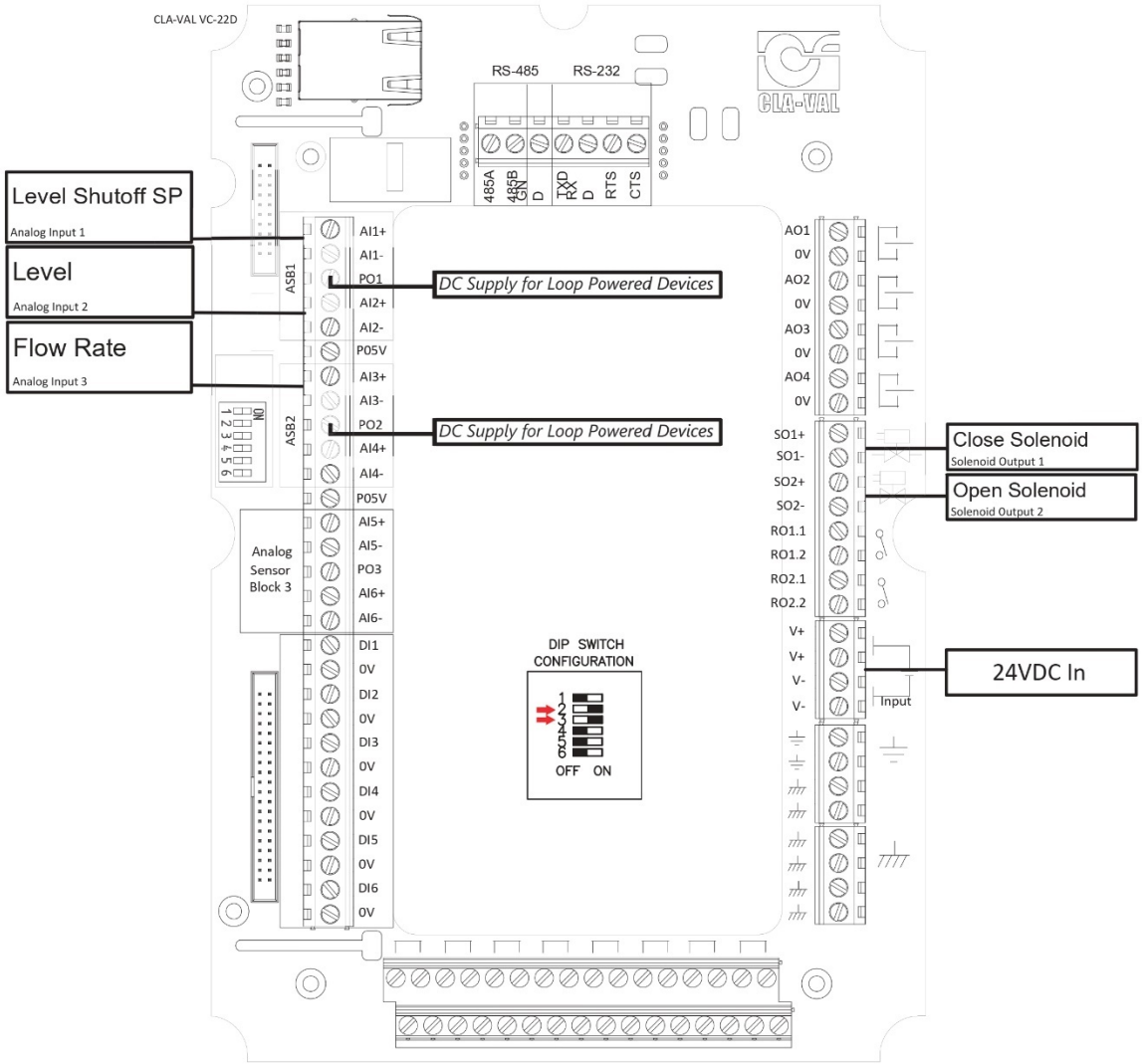
***Control Logic** (*Please specify all control logic using sketches, diagrams, etc. Attach additional sheets if necessary*)

This ValvApp provides standard level altitude control. If the level is above a high setpoint, the valve goes full closed. If the level is below the high setpoint, the valve controls flow into the tank. The flow rate is directly proportional to the difference between current level and high setpoint. A maximum flow rate setpoint has been included which can be adjusted in the field to prevent the flow from exceeding a certain value regardless of how empty the tank is. A minimum flow rate setpoint has been incldued which can be adjusted in the field to prevent the flow from getting extremely small as the level approaches the high setpoint.

DI1 has been added into this program, even though they are currently not used for anything. This serves as a spare IO point so additional functionality can be added in the field by landing signal cables on this IO point and configuring actions in the VC-22D.

 Control • Power • Information • Communication Page 2 of 3

* This is only to give an idea of where wires will be landed. Does not account for number of wires and Loop or Field powered. Please refer to **Electrical Wiring** section of VC-22D IOM for help wiring loop or field powered devices.



Cla-Val VC-22D Modbus Addresses

Project Name: N/A
Date:

Modbus	Input	Description	Data Type	Access	I/O Mapping	Comments
40007 Bit 0	Level Shutoff SP	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI1 Input to use Modbus Address 43000/43001
40007 Bit 1	Level	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI2 Input to use Modbus Address 43002/43003
40007 Bit 2	Flow Rate	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI3 Input to use Modbus Address 43004/43005
40007 Bit 3	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI4 Input to use Modbus Address 43006/43007
40007 Bit 4	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI5 Input to use Modbus Address 43008/43009
40007 Bit 5	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI6 Input to use Modbus Address 43010/43011
40008 Bit 0	Spare	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI1 Input to use Modbus Address 41000
40008 Bit 1	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI2 Input to use Modbus Address 41001
40008 Bit 2	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI3 Input to use Modbus Address 41002
40008 Bit 3	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI4 Input to use Modbus Address 41003
40008 Bit 4	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI5 Input to use Modbus Address 41004
40008 Bit 5	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI6 Input to use Modbus Address 41005
41000	Spare	Digital Input	Word	Read/Write	DI1	Register Holds/Reads DI1 Value
41001	--	Digital Input	Word	Read/Write	DI2	Register Holds/Reads DI2 Value
41002	--	Digital Input	Word	Read/Write	DI3	Register Holds/Reads DI3 Value
41003	--	Digital Input	Word	Read/Write	DI4	Register Holds/Reads DI4 Value
41004	--	Digital Input	Word	Read/Write	DI5	Register Holds/Reads DI5 Value
41005	--	Digital Input	Word	Read/Write	DI6	Register Holds/Reads DI6 Value
41006	Close Solenoid	Digital Output	Word	Read	S01	Monitory Purposes (Optional)
41007	Open Solenoid	Digital Output	Word	Read	S02	Monitory Purposes (Optional)
41008	--	Digital Output	Word	Read	R01	Monitory Purposes (Optional)
41009	--	Digital Output	Word	Read	R02	Monitory Purposes (Optional)
43000/43001	Level Shutoff SP	Analog Input	Int 32	Read/Write	AI1	Register Holds/Reads AI1 Value x100 for Two Implied Decimals
43002/43003	Level	Analog Input	Int 32	Read/Write	AI2	Register Holds/Reads AI2 Value x100 for Two Implied Decimals
43004/43005	Flow Rate	Analog Input	Int 32	Read/Write	AI3	Register Holds/Reads AI3 Value x100 for Two Implied Decimals
43006/43007	--	Analog Input	Int 32	Read/Write	AI4	Register Holds/Reads AI4 Value x100 for Two Implied Decimals
43008/43009	--	Analog Input	Int 32	Read/Write	AI5	Register Holds/Reads AI5 Value x100 for Two Implied Decimals
43010/43011	--	Analog Input	Int 32	Read/Write	AI6	Register Holds/Reads AI6 Value x100 for Two Implied Decimals
43036/43037	--	Analog Output	Int 32	Read	AO1	Monitory Purposes (Optional) - Register Holds AO1 Value x100 for Two Implied Decimals
43038/43039	--	Analog Output	Int 32	Read	AO2	Monitory Purposes (Optional) - Register Holds AO2 Value x100 for Two Implied Decimals
43040/43041	--	Analog Output	Int 32	Read	AO3	Monitory Purposes (Optional) - Register Holds AO3 Value x100 for Two Implied Decimals
43042/43043	--	Analog Output	Int 32	Read	AO4	Monitory Purposes (Optional) - Register Holds AO4 Value x100 for Two Implied Decimals

***Additional ModBus information can be found in the manual.

Control • Power • Information • Communication
ModBus Register Mapping

C.4 131-LvlMod-L+X117D-V2.1

VC-22D ValvApp™ Worksheet

This worksheet is intended for the configuration of ValvApps™ used in the VC-22D Valve Controller. From the information provided below, Cla-Val will determine whether a standard ValvApp™ should be used or if a custom ValvApp™ is required. Additionally, this worksheet acts as a check list during commissioning to verify all parameters have been correctly configured in the VC-22D Valve Controller. Once this worksheet is completed, please return to your Cla-Val representative for approval. If a custom ValvApp is required and approved, a custom wiring diagram and ValvApp™ will be created and emailed to you. Please verify all *Required fields have been filled out prior to submittal.

Information — Reset Form — Configuration: VC-22D

*Project Name	N/A	*Today's Date	12/19/22
*Cla-Val Representive	N/A	Project Completion Date	
Control Valve Model Number (if known)	131	Customer Approval Signature	

Valve Regulation *(If more than 2 PID's are required, specify in logic on page 2)*

☑ PID 1 - Valve Regulation	*Solenoid Config	NC / NC (P.F. Lock)	☐ PID 2 - Valve Regulation	PID Selection Mode	
*Control Type	Level - Modulating	*Signal Loss	Lock Valve	Control Type		Signal Loss	
Deadband (+/-)		Ramping		Deadband (+/-)		Ramping	

DP Metering (133 Valve)

☐ *DP Metering* — Pressure Measurement: ◉ P1+P2 ○ DPT — Output

Size | Body Style | Seat | Units | Output Scaling

Totalizer

☐ *Totalizer* — Reset | Units | Ouput | Output Scaling

Analog Inputs (4-20mA) *6 Available*

	Name	Units	Scaling 4mA =	20mA =	Signal Powered by Controller	Decimal
☑ *Analog Input #1* (Typically reserved for control setpoint signal)	Level Shutoff SP	ft	0 ft	20 ft	☐	0.00
☑ *Analog Input #2* (Typically reserved for control feedback signal)	Level	ft	0 ft	20 ft	☑	0.00
☑ *Analog Input #3*	Position	%	0 %	100 %	☑	0.0
☐ *Analog Input #4*					☐	
☐ *Analog Input #5*					☐	
☐ *Analog Input #6*					☐	

Digital Inputs *6 Available*

☐ *Digital Input 1* Name / Purpose	☐ *Digital Input 2* Name / Purpose	☐ *Digital Input 3* Name / Purpose
☐ *Digital Input 4* Name / Purpose	☐ *Digital Input 5* Name / Purpose	☐ *Digital Input 6* Name / Purpose

 Control • Power • Information • Communication Page 1 of 3

Form Rev. 4

Analog Outputs (4-20mA) *Note: Analog Outputs are sourced with controller power.*

☐ *Analog Output #1*
Name | Units | Scaling: 4mA = | 20mA = | Decimal

☐ *Analog Output #2*
Name | Units | Scaling: 4mA = | 20mA = | Decimal

☐ *Analog Output #3*
Name | Units | Scaling: 4mA = | 20mA = | Decimal

☐ *Analog Output #4*
Name | Units | Scaling: 4mA = | 20mA = | Decimal

Solenoid Outputs

☑ **Solenoid Output #1 (SO1)*
Name: Close Solenoid
Default: Closing Solenoid

☑ *Solenoid Output #2 (SO2)*
Name: Open Solenoid
Default: Opening Solenoid

Note: *SO1 and SO2 are a powered solid state output typically reserved for solenoids used on a 131 or 133 series valve. The output can be configured as PWM (default) or Discrete ON/OFF. If configured as discrete, a value of 0 represents an open circuit, and 1 a closed circuit.*

Relay Output

☐ *Relay Output #1 (RO1)*
Name

☐ *Relay Output #2 (RO2)*
Name

Note: *RO1 and RO2 are configured as dry contact mechanical relays typically used for alarms. These outputs are configured as Discrete ON/OFF, a value of 0 represents an open circuit, and 1 a closed circuit.*

Actions/Alarms

☐ *Action #1*
Name | Describe
Additional Comments

☐ *Action #2*
Name | Describe
Additional Comments

☐ *Action #3*
Name | Describe
Additional Comments

☐ *Action #4*
Name | Describe
Additional Comments

Communication

☐ **GSM/GPRS** ☐ **Modbus TCP/IP** ☐ **Modbus RTU (RS485/RS232)**

Note: *See ModBus specification page for register mapping and implementation. Refer to manual for more details.*

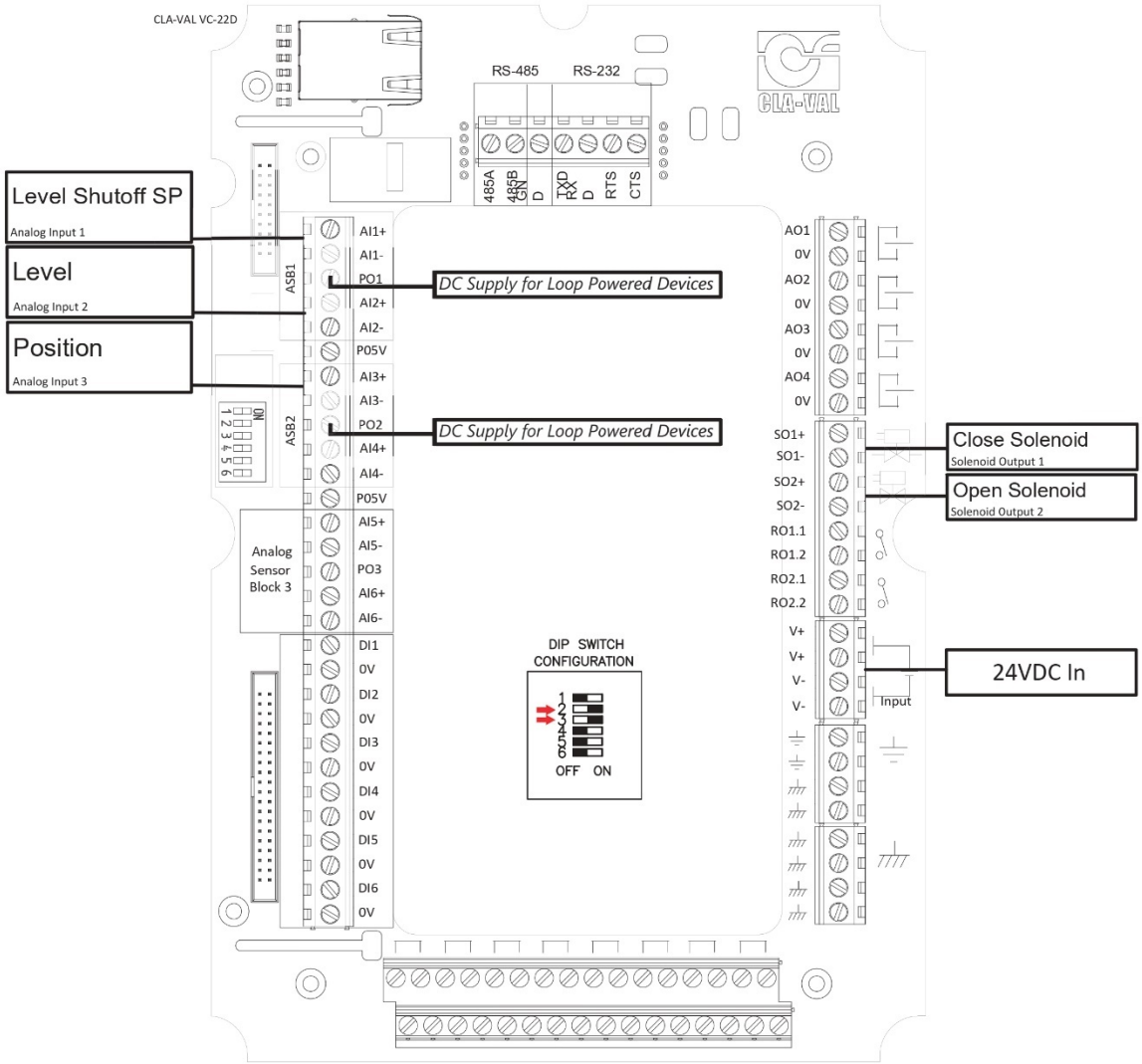
***Control Logic** (*Please specify all control logic using sketches, diagrams, etc. Attach additional sheets if necessary*)

This ValvApp provides standard level altitude control. If the level is above a high setpoint, the valve goes full closed. If the level is below the high setpoint, the valve allows flow into the tank. The position is directly proportional to the difference between current level and high setpoint. A maximum position setpoint has been included which can be adjusted in the field to prevent the position from exceeding a certain value regardless of how empty the tank is. A minimum position setpoint has been incldued which can be adjusted in the field to prevent the position from getting extremely small as the level approaches the high setpoint.

DI1 has been added into this program, even though they are currently not used for anything. This serves as a spare IO point so additional functionality can be added in the field by landing signal cables on this IO point and configuring actions in the VC-22D.

 Control • Power • Information • Communication Page 2 of 3

* This is only to give an idea of where wires will be landed. Does not account for number of wires and Loop or Field powered. Please refer to **Electrical Wiring** section of VC-22D IOM for help wiring loop or field powered devices.



Cla-Val VC-22D Modbus Addresses

Project Name: N/A
Date:

Modbus	Input	Description	Data Type	Access	I/O Mapping	Comments
40007 Bit 0	Level Shutoff SP	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI1 Input to use Modbus Address 43000/43001
40007 Bit 1	Level	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI2 Input to use Modbus Address 43002/43003
40007 Bit 2	Position	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI3 Input to use Modbus Address 43004/43005
40007 Bit 3	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI4 Input to use Modbus Address 43006/43007
40007 Bit 4	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI5 Input to use Modbus Address 43008/43009
40007 Bit 5	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI6 Input to use Modbus Address 43010/43011
40008 Bit 0	Spare	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI1 Input to use Modbus Address 41000
40008 Bit 1	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI2 Input to use Modbus Address 41001
40008 Bit 2	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI3 Input to use Modbus Address 41002
40008 Bit 3	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI4 Input to use Modbus Address 41003
40008 Bit 4	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI5 Input to use Modbus Address 41004
40008 Bit 5	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI6 Input to use Modbus Address 41005
41000	Spare	Digital Input	Word	Read/Write	DI1	Register Holds/Reads DI1 Value
41001	--	Digital Input	Word	Read/Write	DI2	Register Holds/Reads DI2 Value
41002	--	Digital Input	Word	Read/Write	DI3	Register Holds/Reads DI3 Value
41003	--	Digital Input	Word	Read/Write	DI4	Register Holds/Reads DI4 Value
41004	--	Digital Input	Word	Read/Write	DI5	Register Holds/Reads DI5 Value
41005	--	Digital Input	Word	Read/Write	DI6	Register Holds/Reads DI6 Value
41006	Close Solenoid	Digital Output	Word	Read	S01	Monitory Purposes (Optional)
41007	Open Solenoid	Digital Output	Word	Read	S02	Monitory Purposes (Optional)
41008	--	Digital Output	Word	Read	R01	Monitory Purposes (Optional)
41009	--	Digital Output	Word	Read	R02	Monitory Purposes (Optional)
43000/43001	Level Shutoff SP	Analog Input	Int 32	Read/Write	AI1	Register Holds/Reads AI1 Value x100 for Two Implied Decimals
43002/43003	Level	Analog Input	Int 32	Read/Write	AI2	Register Holds/Reads AI2 Value x100 for Two Implied Decimals
43004/43005	Position	Analog Input	Int 32	Read/Write	AI3	Register Holds/Reads AI3 Value x100 for Two Implied Decimals
43006/43007	--	Analog Input	Int 32	Read/Write	AI4	Register Holds/Reads AI4 Value x100 for Two Implied Decimals
43008/43009	--	Analog Input	Int 32	Read/Write	AI5	Register Holds/Reads AI5 Value x100 for Two Implied Decimals
43010/43011	--	Analog Input	Int 32	Read/Write	AI6	Register Holds/Reads AI6 Value x100 for Two Implied Decimals
43036/43037	--	Analog Output	Int 32	Read	AO1	Monitory Purposes (Optional) - Register Holds AO1 Value x100 for Two Implied Decimals
43038/43039	--	Analog Output	Int 32	Read	AO2	Monitory Purposes (Optional) - Register Holds AO2 Value x100 for Two Implied Decimals
43040/43041	--	Analog Output	Int 32	Read	AO3	Monitory Purposes (Optional) - Register Holds AO3 Value x100 for Two Implied Decimals
43042/43043	--	Analog Output	Int 32	Read	AO4	Monitory Purposes (Optional) - Register Holds AO4 Value x100 for Two Implied Decimals

***Additional ModBus information can be found in the manual.

C.5 131-Position-X117D-V2.1

VC-22D ValvApp™ Worksheet

This worksheet is intended for the configuration of ValvApps™ used in the VC-22D Valve Controller. From the information provided below, Cla-Val will determine whether a standard ValvApp™ should be used or if a custom ValvApp™ is required. Additionally, this worksheet acts as a check list during commissioning to verify all parameters have been correctly configured in the VC-22D Valve Controller. Once this worksheet is completed, please return to your Cla-Val representative for approval. If a custom ValvApp is required and approved, a custom wiring diagram and ValvApp™ will be created and emailed to you. Please verify all *Required fields have been filled out prior to submittal.

Information — Reset Form — Configuration: VC-22D

*Project Name	N/A	*Today's Date	12/19/22
*Cla-Val Representive	N/A	Project Completion Date	
Control Valve Model Number (if known)	131	Customer Approval Signature	

Valve Regulation *(If more than 2 PID's are required, specify in logic on page 2)*

☑ PID 1 - Valve Regulation	*Solenoid Config	NC / NC (P.F. Lock)	☐ PID 2 - Valve Regulation	PID Selection Mode			
*Control Type	Valve Position	*Signal Loss	Lock Valve	Control Type		Signal Loss	
Deadband (+/-)		Ramping		Deadband (+/-)		Ramping	

DP Metering (133 Valve)

☐ *DP Metering*	Pressure Measurement	◉ P1+P2 ○ DPT				Output	
Size		Body Style		Seat		Units	Output Scaling

Totalizer

☐ *Totalizer*	Reset		Units	Ouput	Output Scaling

Analog Inputs (4-20mA) *6 Available*

			Scaling				
☑ *Analog Input #1* *(Typically reserved for control setpoint signal)*	Name: Position SP	Units: %	4mA = 0 %	20mA = 100 %	☐ Signal Powered by Controller	Decimal: 0.0
☑ *Analog Input #2* *(Typically reserved for control feedback signal)*	Name: Position	Units: %	4mA = 0 %	20mA = 100 %	☑ Signal Powered by Controller	Decimal: 0.0
☐ *Analog Input #3*	Name:	Units:	4mA =	20mA =	☐ Signal Powered by Controller	Decimal:
☐ *Analog Input #4*	Name:	Units:	4mA =	20mA =	☐ Signal Powered by Controller	Decimal:
☐ *Analog Input #5*	Name:	Units:	4mA =	20mA =	☐ Signal Powered by Controller	Decimal:
☐ *Analog Input #6*	Name:	Units:	4mA =	20mA =	☐ Signal Powered by Controller	Decimal:

Digital Inputs *6 Available*

☐ *Digital Input 1* Name: Purpose:	☐ *Digital Input 2* Name: Purpose:	☐ *Digital Input 3* Name: Purpose:
☐ *Digital Input 4* Name: Purpose:	☐ *Digital Input 5* Name: Purpose:	☐ *Digital Input 6* Name: Purpose:

 Control • Power • Information • Communication

Form Rev. 4

Analog Outputs (4-20mA) *Note: Analog Outputs are sourced with controller power.*

☐ *Analog Output #1*
Name | Units | Scaling: 4mA = | 20mA = | Decimal

☐ *Analog Output #2*
Name | Units | Scaling: 4mA = | 20mA = | Decimal

☐ *Analog Output #3*
Name | Units | Scaling: 4mA = | 20mA = | Decimal

☐ *Analog Output #4*
Name | Units | Scaling: 4mA = | 20mA = | Decimal

Solenoid Outputs

☑ **Solenoid Output #1 (SO1)*
Name: Close Solenoid
Default: Closing Solenoid

☑ *Solenoid Output #2 (SO2)*
Name: Open Solenoid
Default: Opening Solenoid

Note: *SO1 and SO2 are a powered solid state output typically reserved for solenoids used on a 131 or 133 series valve. The output can be configured as PWM (default) or Discrete ON/OFF. If configured as discrete, a value of 0 represents an open circuit, and 1 a closed circuit.*

Relay Output

☐ *Relay Output #1 (RO1)*
Name

☐ *Relay Output #2 (RO2)*
Name

Note: *RO1 and RO2 are configured as dry contact mechanical relays typically used for alarms. These outputs are configured as Discrete ON/OFF, a value of 0 represents an open circuit, and 1 a closed circuit.*

Actions/Alarms

☐ *Action #1*
Name | Describe
Additional Comments

☐ *Action #2*
Name | Describe
Additional Comments

☐ *Action #3*
Name | Describe
Additional Comments

☐ *Action #4*
Name | Describe
Additional Comments

Communication

☐ **GSM/GPRS** ☐ **Modbus TCP/IP** ☐ **Modbus RTU (RS485/RS232)**

Note: *See ModBus specification page for register mapping and implementation. Refer to manual for more details.*

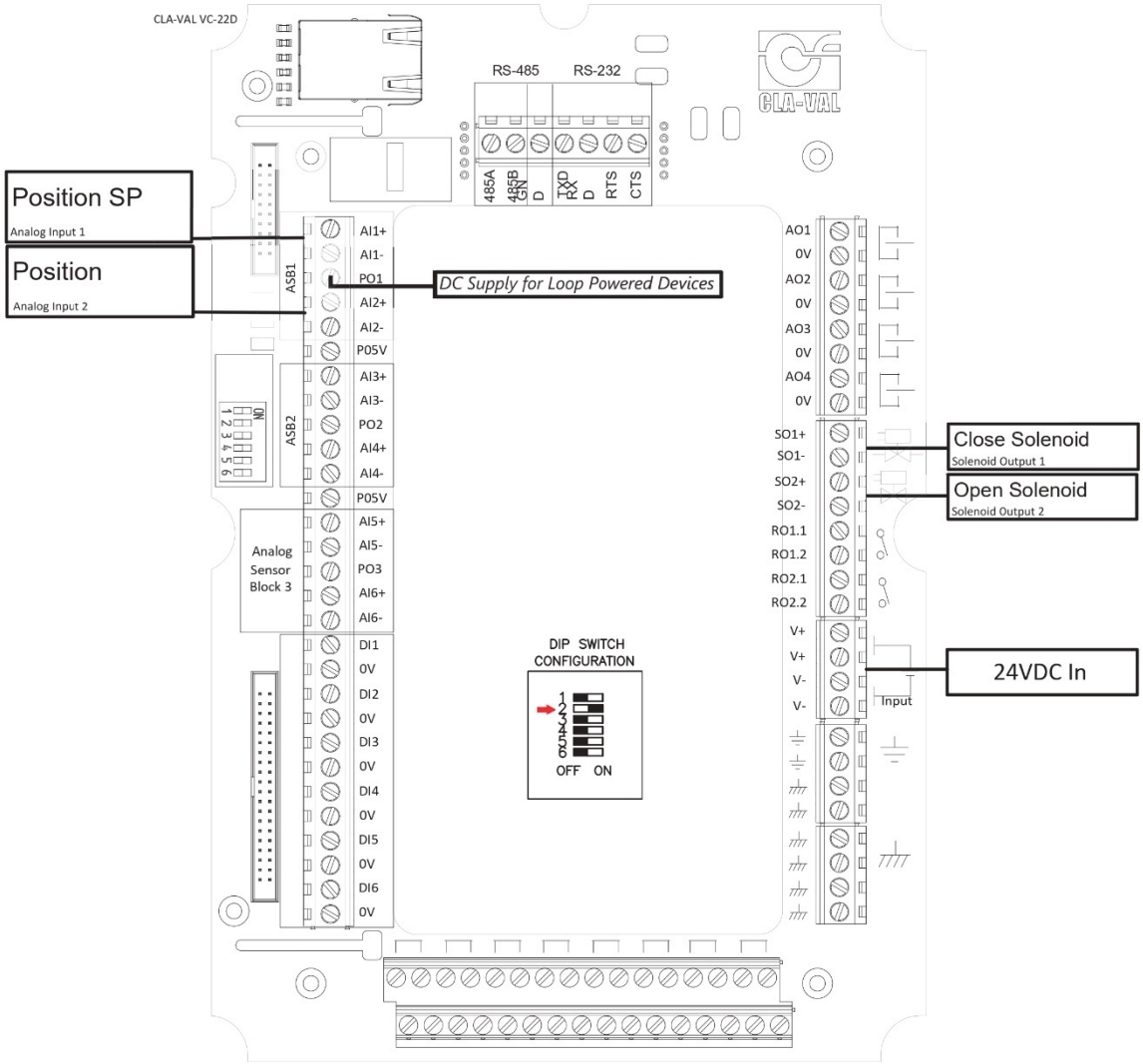
***Control Logic** (*Please specify all control logic using sketches, diagrams, etc. Attach additional sheets if necessary*)

This ValvApp provides a standard position control function for a 131 series valve. If the position rises above the SP, the valve will modulate closed. If the position drops below the SP, the valve will modulate open.

DI1 and AI3 have been added into this program, even though they are currently not used for anything. These serve as spare IO points so additional functionality can be added in the field by landing signal cables on these IO points and configuring actions in the VC-22D.

 Control • Power • Information • Communication Page 2 of 3

* This is only to give an idea of where wires will be landed. Does not account for number of wires and Loop or Field powered. Please refer to **Electrical Wiring** section of VC-22D IOM for help wiring loop or field powered devices.



Cla-Val VC-22D Modbus Addresses

Project Name: N/A
Date:

Modbus	Input	Description	Data Type	Access	I/O Mapping	Comments
40007 Bit 0	Position SP	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI1 Input to use Modbus Address 43000/43001
40007 Bit 1	Position	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI2 Input to use Modbus Address 43002/43003
40007 Bit 2	Spare	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI3 Input to use Modbus Address 43004/43005
40007 Bit 3	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI4 Input to use Modbus Address 43006/43007
40007 Bit 4	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI5 Input to use Modbus Address 43008/43009
40007 Bit 5	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI6 Input to use Modbus Address 43010/43011
40008 Bit 0	Spare	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI1 Input to use Modbus Address 41000
40008 Bit 1	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI2 Input to use Modbus Address 41001
40008 Bit 2	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI3 Input to use Modbus Address 41002
40008 Bit 3	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI4 Input to use Modbus Address 41003
40008 Bit 4	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI5 Input to use Modbus Address 41004
40008 Bit 5	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI6 Input to use Modbus Address 41005
41000	Spare	Digital Input	Word	Read/Write	DI1	Register Holds/Reads DI1 Value
41001	--	Digital Input	Word	Read/Write	DI2	Register Holds/Reads DI2 Value
41002	--	Digital Input	Word	Read/Write	DI3	Register Holds/Reads DI3 Value
41003	--	Digital Input	Word	Read/Write	DI4	Register Holds/Reads DI4 Value
41004	--	Digital Input	Word	Read/Write	DI5	Register Holds/Reads DI5 Value
41005	--	Digital Input	Word	Read/Write	DI6	Register Holds/Reads DI6 Value
41006	Close Solenoid	Digital Output	Word	Read	S01	Monitory Purposes (Optional)
41007	Open Solenoid	Digital Output	Word	Read	S02	Monitory Purposes (Optional)
41008	--	Digital Output	Word	Read	R01	Monitory Purposes (Optional)
41009	--	Digital Output	Word	Read	R02	Monitory Purposes (Optional)
43000/43001	Position SP	Analog Input	Int 32	Read/Write	AI1	Register Holds/Reads AI1 Value x100 for Two Implied Decimals
43002/43003	Position	Analog Input	Int 32	Read/Write	AI2	Register Holds/Reads AI2 Value x100 for Two Implied Decimals
43004/43005	Spare	Analog Input	Int 32	Read/Write	AI3	Register Holds/Reads AI3 Value x100 for Two Implied Decimals
43006/43007	--	Analog Input	Int 32	Read/Write	AI4	Register Holds/Reads AI4 Value x100 for Two Implied Decimals
43008/43009	--	Analog Input	Int 32	Read/Write	AI5	Register Holds/Reads AI5 Value x100 for Two Implied Decimals
43010/43011	--	Analog Input	Int 32	Read/Write	AI6	Register Holds/Reads AI6 Value x100 for Two Implied Decimals
43036/43037	--	Analog Output	Int 32	Read	AO1	Monitory Purposes (Optional) - Register Holds AO1 Value x100 for Two Implied Decimals
43038/43039	--	Analog Output	Int 32	Read	AO2	Monitory Purposes (Optional) - Register Holds AO2 Value x100 for Two Implied Decimals
43040/43041	--	Analog Output	Int 32	Read	AO3	Monitory Purposes (Optional) - Register Holds AO3 Value x100 for Two Implied Decimals
43042/43043	--	Analog Output	Int 32	Read	AO4	Monitory Purposes (Optional) - Register Holds AO4 Value x100 for Two Implied Decimals

***Additional ModBus information can be found in the manual.

C.6 131-PressureReducing-P2-V2.1

VC-22D ValvApp™ Worksheet

This worksheet is intended for the configuration of ValvApps™ used in the VC-22D Valve Controller. From the information provided below, Cla-Val will determine whether a standard ValvApp™ should be used or if a custom ValvApp™ is required. Additionally, this worksheet acts as a check list during commissioning to verify all parameters have been correctly configured in the VC-22D Valve Controller. Once this worksheet is completed, please return to your Cla-Val representative for approval. If a custom ValvApp is required and approved, a custom wiring diagram and ValvApp™ will be created and emailed to you. Please verify all *Required fields have been filled out prior to submittal.

Information — Reset Form — Configuration: VC-22D

*Project Name	N/A	*Today's Date	12/19/22
*Cla-Val Representive	N/A	Project Completion Date	
Control Valve Model Number (if known)	131	Customer Approval Signature	

Valve Regulation *(If more than 2 PID's are required, specify in logic on page 2)*

☑ PID 1 - Valve Regulation	*Solenoid Config	NC / NC (P.F. Lock)	☐ PID 2 - Valve Regulation	PID Selection Mode			
*Control Type	Pressure Reducing	*Signal Loss	Lock Valve	Control Type		Signal Loss	
Deadband (+/-)		Ramping		Deadband (+/-)		Ramping	

DP Metering (133 Valve)

☐ *DP Metering*	Pressure Measurement	◉ P1+P2 ○ DPT				Output	
Size		Body Style		Seat		Units	Output Scaling

Totalizer

☐ *Totalizer*	Reset		Units	Ouput	Output Scaling

Analog Inputs (4-20mA) *6 Available*

☑ *Analog Input #1 (Typically reserved for control setpoint signal)*	Name: Pressure Reducing SP	Units: psi	Scaling	☐ Signal Powered by Controller	4mA = 0 psi	20mA = 290 psi	Decimal: 0.0
☑ *Analog Input #2 (Typically reserved for control feedback signal)*	Name: Downstream Pressure	Units: psi	Scaling	☑ Signal Powered by Controller	4mA = 0 psi	20mA = 290 psi	Decimal: 0.0
☐ *Analog Input #3*	Name:	Units:	Scaling	☐ Signal Powered by Controller	4mA =	20mA =	Decimal:
☐ *Analog Input #4*	Name:	Units:	Scaling	☐ Signal Powered by Controller	4mA =	20mA =	Decimal:
☐ *Analog Input #5*	Name:	Units:	Scaling	☐ Signal Powered by Controller	4mA =	20mA =	Decimal:
☐ *Analog Input #6*	Name:	Units:	Scaling	☐ Signal Powered by Controller	4mA =	20mA =	Decimal:

Digital Inputs *6 Available*

☐ *Digital Input 1* Name: Purpose:	☐ *Digital Input 2* Name: Purpose:	☐ *Digital Input 3* Name: Purpose:
☐ *Digital Input 4* Name: Purpose:	☐ *Digital Input 5* Name: Purpose:	☐ *Digital Input 6* Name: Purpose:

 Control • Power • Information • Communication

Form Rev. 4

Analog Outputs (4-20mA) *Note: Analog Outputs are sourced with controller power.*

☐ *Analog Output #1*
Name | Units | Scaling: 4mA = | 20mA = | Decimal

☐ *Analog Output #2*
Name | Units | Scaling: 4mA = | 20mA = | Decimal

☐ *Analog Output #3*
Name | Units | Scaling: 4mA = | 20mA = | Decimal

☐ *Analog Output #4*
Name | Units | Scaling: 4mA = | 20mA = | Decimal

Solenoid Outputs

☑ *****Solenoid Output #1 (SO1)*
Name: Close Solenoid
Default: Closing Solenoid

☑ *Solenoid Output #2 (SO2)*
Name: Open Solenoid
Default: Opening Solenoid

Note: *SO1 and SO2 are a powered solid state output typically reserved for solenoids used on a 131 or 133 series valve. The output can be configured as PWM (default) or Discrete ON/OFF. If configured as discrete, a value of 0 represents an open circuit, and 1 a closed circuit.*

Relay Output

☐ *Relay Output #1 (RO1)*
Name

☐ *Relay Output #2 (RO2)*
Name

Note: *RO1 and RO2 are configured as dry contact mechanical relays typically used for alarms. These outputs are configured as Discrete ON/OFF, a value of 0 represents an open circuit, and 1 a closed circuit.*

Actions/Alarms

☐ *Action #1*
Name | Describe
Additional Comments

☐ *Action #2*
Name | Describe
Additional Comments

☐ *Action #3*
Name | Describe
Additional Comments

☐ *Action #4*
Name | Describe
Additional Comments

Communication

☐ **GSM/GPRS** ☐ **Modbus TCP/IP** ☐ **Modbus RTU (RS485/RS232)**

Note: *See ModBus specification page for register mapping and implementation. Refer to manual for more details.*

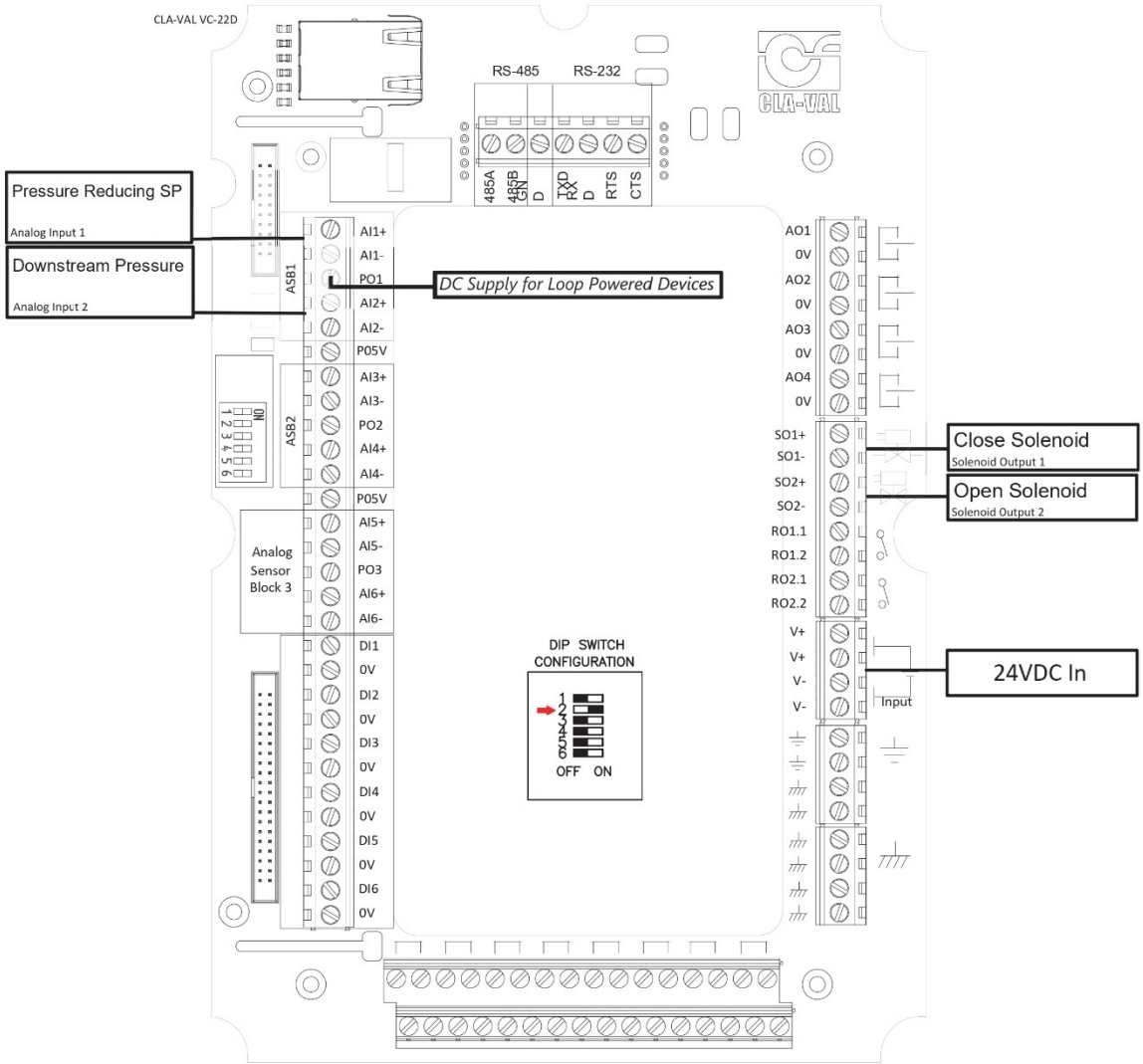
***Control Logic** (*Please specify all control logic using sketches, diagrams, etc. Attach additional sheets if necessary*)

This ValvApp provides a standard pressure reduction function for a 131 series valve. If the outlet pressure rises above the SP, the valve will modulate closed. If the outlet pressure drops below the SP, the valve will modulate open.

DI1 and AI3 have been added into this program, even though they are currently not used for anything. These serve as spare IO points so additional functionality can be added in the field by landing signal cables on these IO points and configuring actions in the VC-22D.

 Control • Power • Information • Communication Page 2 of 3

* This is only to give an idea of where wires will be landed. Does not account for number of wires and Loop or Field powered. Please refer to **Electrical Wiring** section of VC-22D IOM for help wiring loop or field powered devices.



Cla-Val VC-22D Modbus Addresses

Project Name: N/A
Date:

Modbus	Input	Description	Data Type	Access	I/O Mapping	Comments
40007 Bit 0	Pressure Reducing SP	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI1 Input to use Modbus Address 43000/43001
40007 Bit 1	Downstream Pressure	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI2 Input to use Modbus Address 43002/43003
40007 Bit 2	Spare	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI3 Input to use Modbus Address 43004/43005
40007 Bit 3	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI4 Input to use Modbus Address 43006/43007
40007 Bit 4	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI5 Input to use Modbus Address 43008/43009
40007 Bit 5	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI6 Input to use Modbus Address 43010/43011
40008 Bit 0	Spare	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI1 Input to use Modbus Address 41000
40008 Bit 1	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI2 Input to use Modbus Address 41001
40008 Bit 2	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI3 Input to use Modbus Address 41002
40008 Bit 3	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI4 Input to use Modbus Address 41003
40008 Bit 4	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI5 Input to use Modbus Address 41004
40008 Bit 5	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI6 Input to use Modbus Address 41005
41000	Spare	Digital Input	Word	Read/Write	DI1	Register Holds/Reads DI1 Value
41001	--	Digital Input	Word	Read/Write	DI2	Register Holds/Reads DI2 Value
41002	--	Digital Input	Word	Read/Write	DI3	Register Holds/Reads DI3 Value
41003	--	Digital Input	Word	Read/Write	DI4	Register Holds/Reads DI4 Value
41004	--	Digital Input	Word	Read/Write	DI5	Register Holds/Reads DI5 Value
41005	--	Digital Input	Word	Read/Write	DI6	Register Holds/Reads DI6 Value
41006	Close Solenoid	Digital Output	Word	Read	S01	Monitory Purposes (Optional)
41007	Open Solenoid	Digital Output	Word	Read	S02	Monitory Purposes (Optional)
41008	--	Digital Output	Word	Read	R01	Monitory Purposes (Optional)
41009	--	Digital Output	Word	Read	R02	Monitory Purposes (Optional)
43000/43001	Pressure Reducing SP	Analog Input	Int 32	Read/Write	AI1	Register Holds/Reads AI1 Value x100 for Two Implied Decimals
43002/43003	Downstream Pressure	Analog Input	Int 32	Read/Write	AI2	Register Holds/Reads AI2 Value x100 for Two Implied Decimals
43004/43005	Spare	Analog Input	Int 32	Read/Write	AI3	Register Holds/Reads AI3 Value x100 for Two Implied Decimals
43006/43007	--	Analog Input	Int 32	Read/Write	AI4	Register Holds/Reads AI4 Value x100 for Two Implied Decimals
43008/43009	--	Analog Input	Int 32	Read/Write	AI5	Register Holds/Reads AI5 Value x100 for Two Implied Decimals
43010/43011	--	Analog Input	Int 32	Read/Write	AI6	Register Holds/Reads AI6 Value x100 for Two Implied Decimals
43036/43037	--	Analog Output	Int 32	Read	AO1	Monitory Purposes (Optional) - Register Holds AO1 Value x100 for Two Implied Decimals
43038/43039	--	Analog Output	Int 32	Read	AO2	Monitory Purposes (Optional) - Register Holds AO2 Value x100 for Two Implied Decimals
43040/43041	--	Analog Output	Int 32	Read	AO3	Monitory Purposes (Optional) - Register Holds AO3 Value x100 for Two Implied Decimals
43042/43043	--	Analog Output	Int 32	Read	AO4	Monitory Purposes (Optional) - Register Holds AO4 Value x100 for Two Implied Decimals

***Additional ModBus information can be found in the manual.

C.7 131-PressureSustaining-P1-V2.1

VC-22D ValvApp™ Worksheet

This worksheet is intended for the configuration of ValvApps™ used in the VC-22D Valve Controller. From the information provided below, Cla-Val will determine whether a standard ValvApp™ should be used or if a custom ValvApp™ is required. Additionally, this worksheet acts as a check list during commissioning to verify all parameters have been correctly configured in the VC-22D Valve Controller. Once this worksheet is completed, please return to your Cla-Val representative for approval. If a custom ValvApp is required and approved, a custom wiring diagram and ValvApp™ will be created and emailed to you. Please verify all *Required fields have been filled out prior to submittal.

Information — Reset Form — Configuration: VC-22D

*Project Name	N/A	*Today's Date	12/19/22
*Cla-Val Representive	N/A	Project Completion Date	
Control Valve Model Number (if known)	131	Customer Approval Signature	

Valve Regulation *(If more than 2 PID's are required, specify in logic on page 2)*

☑ PID 1 - Valve Regulation	*Solenoid Config	NC / NC (P.F. Lock)	☐ PID 2 - Valve Regulation	PID Selection Mode			
*Control Type	Pressure Sustaining	*Signal Loss	Lock Valve	Control Type		Signal Loss	
Deadband (+/-)		Ramping		Deadband (+/-)		Ramping	

DP Metering (133 Valve)

☐ *DP Metering*	Pressure Measurement	◉ P1+P2 ○ DPT				Output	
Size		Body Style		Seat		Units	Output Scaling

Totalizer

☐ *Totalizer*	Reset		Units	Ouput	Output Scaling

Analog Inputs (4-20mA) *6 Available*

☑ *Analog Input #1 (Typically reserved for control setpoint signal)*	Name	Pressure Sustaining SP	Units	psi	Scaling	4mA = 0 psi	20mA = 290 psi	Decimal 0.0
☑ *Analog Input #2 (Typically reserved for control feedback signal)*	Name	Upstream Pressure	Units	psi	Scaling	4mA = 0 psi	20mA = 290 psi	Decimal 0.0
☐ *Analog Input #3*	Name		Units		Scaling	4mA =	20mA =	Decimal
☐ *Analog Input #4*	Name		Units		Scaling	4mA =	20mA =	Decimal
☐ *Analog Input #5*	Name		Units		Scaling	4mA =	20mA =	Decimal
☐ *Analog Input #6*	Name		Units		Scaling	4mA =	20mA =	Decimal

(Signal Powered by Controller: ☐ for Analog Input #1, ☑ for Analog Input #2, ☐ for Analog Input #3 through #6)

Digital Inputs *6 Available*

☐ *Digital Input 1* Name / Purpose	☐ *Digital Input 2* Name / Purpose	☐ *Digital Input 3* Name / Purpose
☐ *Digital Input 4* Name / Purpose	☐ *Digital Input 5* Name / Purpose	☐ *Digital Input 6* Name / Purpose

 Control • Power • Information • Communication

Form Rev. 4

Analog Outputs (4-20mA) *Note: Analog Outputs are sourced with controller power.*

☐ *Analog Output #1*
Name | Units | Scaling: 4mA = | 20mA = | Decimal

☐ *Analog Output #2*
Name | Units | Scaling: 4mA = | 20mA = | Decimal

☐ *Analog Output #3*
Name | Units | Scaling: 4mA = | 20mA = | Decimal

☐ *Analog Output #4*
Name | Units | Scaling: 4mA = | 20mA = | Decimal

Solenoid Outputs

☑ **Solenoid Output #1 (SO1)*
Name: Close Solenoid
Default: Closing Solenoid

☑ *Solenoid Output #2 (SO2)*
Name: Open Solenoid
Default: Opening Solenoid

Note: *SO1 and SO2 are a powered solid state output typically reserved for solenoids used on a 131 or 133 series valve. The output can be configured as PWM (default) or Discrete ON/OFF. If configured as discrete, a value of 0 represents an open circuit, and 1 a closed circuit.*

Relay Output

☐ *Relay Output #1 (RO1)*
Name

☐ *Relay Output #2 (RO2)*
Name

Note: *RO1 and RO2 are configured as dry contact mechanical relays typically used for alarms. These outputs are configured as Discrete ON/OFF, a value of 0 represents an open circuit, and 1 a closed circuit.*

Actions/Alarms

☐ *Action #1*
Name | Describe
Additional Comments

☐ *Action #2*
Name | Describe
Additional Comments

☐ *Action #3*
Name | Describe
Additional Comments

☐ *Action #4*
Name | Describe
Additional Comments

Communication

☐ **GSM/GPRS** ☐ **Modbus TCP/IP** ☐ **Modbus RTU (RS485/RS232)**

Note: *See ModBus specification page for register mapping and implementation. Refer to manual for more details.*

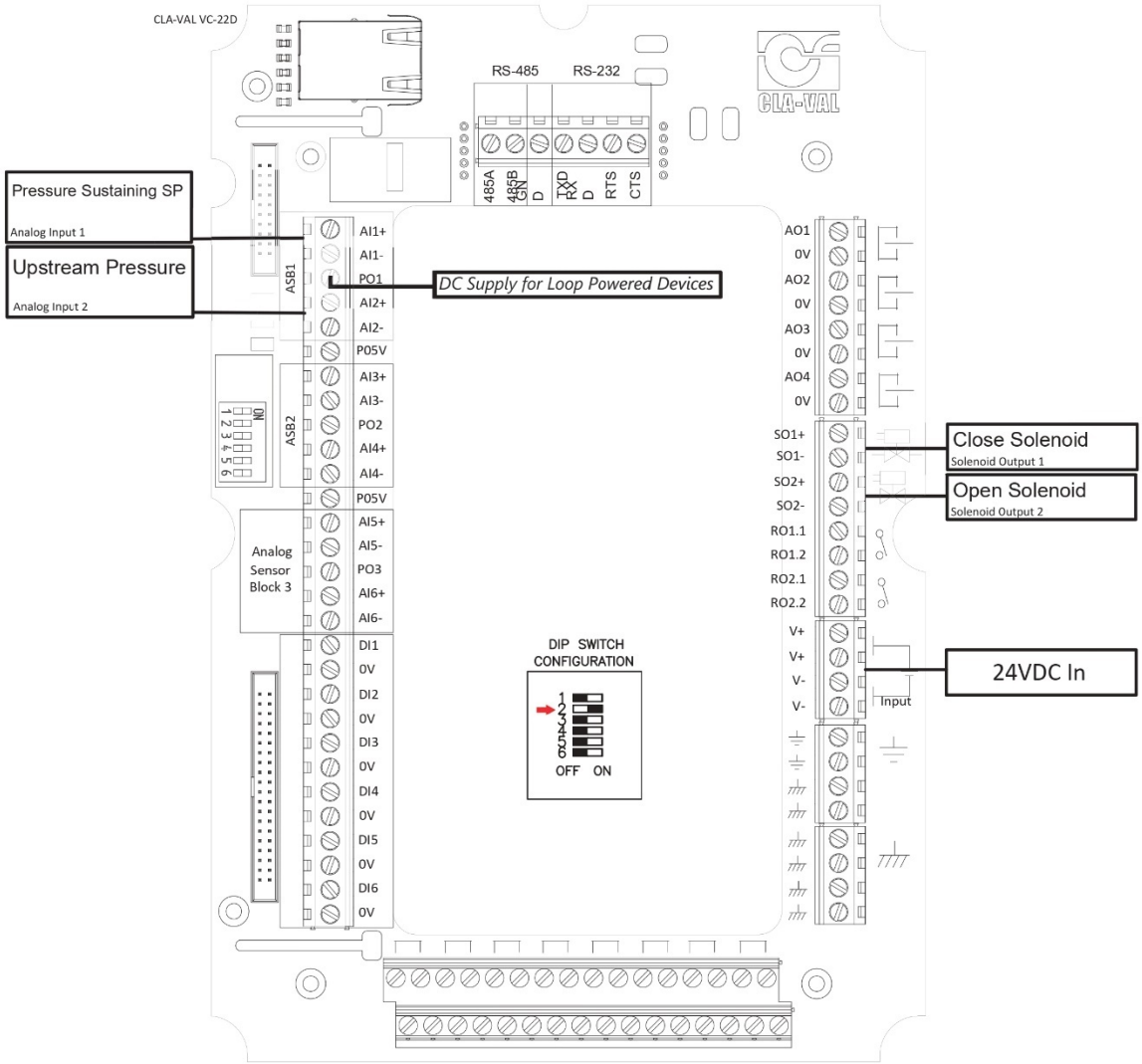
***Control Logic** (*Please specify all control logic using sketches, diagrams, etc. Attach additional sheets if necessary*)

This ValvApp provides a standard pressure sustaining function for a 131 series valve. If the inlet pressure rises above the SP, the valve will modulate open. If the inlet pressure drops below the SP, the valve will modulate closed.

DI1 and AI3 have been added into this program, even though they are currently not used for anything. These serve as spare IO points so additional functionality can be added in the field by landing signal cables on these IO points and configuring actions in the VC-22D.

 Control • Power • Information • Communication Page 2 of 3

* This is only to give an idea of where wires will be landed. Does not account for number of wires and Loop or Field powered. Please refer to **Electrical Wiring** section of VC-22D IOM for help wiring loop or field powered devices.



Cla-Val VC-22D Modbus Addresses

Project Name: N/A
Date:

Modbus	Input	Description	Data Type	Access	I/O Mapping	Comments
40007 Bit 0	Pressure Sustaining SP	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI1 Input to use Modbus Address 43000/43001
40007 Bit 1	Upstream Pressure	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI2 Input to use Modbus Address 43002/43003
40007 Bit 2	Spare	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI3 Input to use Modbus Address 43004/43005
40007 Bit 3	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI4 Input to use Modbus Address 43006/43007
40007 Bit 4	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI5 Input to use Modbus Address 43008/43009
40007 Bit 5	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI6 Input to use Modbus Address 43010/43011
40008 Bit 0	Spare	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI1 Input to use Modbus Address 41000
40008 Bit 1	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI2 Input to use Modbus Address 41001
40008 Bit 2	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI3 Input to use Modbus Address 41002
40008 Bit 3	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI4 Input to use Modbus Address 41003
40008 Bit 4	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI5 Input to use Modbus Address 41004
40008 Bit 5	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI6 Input to use Modbus Address 41005
41000	Spare	Digital Input	Word	Read/Write	DI1	Register Holds/Reads DI1 Value
41001	--	Digital Input	Word	Read/Write	DI2	Register Holds/Reads DI2 Value
41002	--	Digital Input	Word	Read/Write	DI3	Register Holds/Reads DI3 Value
41003	--	Digital Input	Word	Read/Write	DI4	Register Holds/Reads DI4 Value
41004	--	Digital Input	Word	Read/Write	DI5	Register Holds/Reads DI5 Value
41005	--	Digital Input	Word	Read/Write	DI6	Register Holds/Reads DI6 Value
41006	Close Solenoid	Digital Output	Word	Read	S01	Monitory Purposes (Optional)
41007	Open Solenoid	Digital Output	Word	Read	S02	Monitory Purposes (Optional)
41008	--	Digital Output	Word	Read	R01	Monitory Purposes (Optional)
41009	--	Digital Output	Word	Read	R02	Monitory Purposes (Optional)
43000/43001	Pressure Sustaining SP	Analog Input	Int 32	Read/Write	AI1	Register Holds/Reads AI1 Value x100 for Two Implied Decimals
43002/43003	Upstream Pressure	Analog Input	Int 32	Read/Write	AI2	Register Holds/Reads AI2 Value x100 for Two Implied Decimals
43004/43005	Spare	Analog Input	Int 32	Read/Write	AI3	Register Holds/Reads AI3 Value x100 for Two Implied Decimals
43006/43007	--	Analog Input	Int 32	Read/Write	AI4	Register Holds/Reads AI4 Value x100 for Two Implied Decimals
43008/43009	--	Analog Input	Int 32	Read/Write	AI5	Register Holds/Reads AI5 Value x100 for Two Implied Decimals
43010/43011	--	Analog Input	Int 32	Read/Write	AI6	Register Holds/Reads AI6 Value x100 for Two Implied Decimals
43036/43037	--	Analog Output	Int 32	Read	AO1	Monitory Purposes (Optional) - Register Holds AO1 Value x100 for Two Implied Decimals
43038/43039	--	Analog Output	Int 32	Read	AO2	Monitory Purposes (Optional) - Register Holds AO2 Value x100 for Two Implied Decimals
43040/43041	--	Analog Output	Int 32	Read	AO3	Monitory Purposes (Optional) - Register Holds AO3 Value x100 for Two Implied Decimals
43042/43043	--	Analog Output	Int 32	Read	AO4	Monitory Purposes (Optional) - Register Holds AO4 Value x100 for Two Implied Decimals

***Additional ModBus information can be found in the manual.

Control • Power • Information • Communication
ModBus Register Mapping

C.8 133-Flow-DP+X117D-V2.1

VC-22D ValvApp™ Worksheet

This worksheet is intended for the configuration of ValvApps™ used in the VC-22D Valve Controller. From the information provided below, Cla-Val will determine whether a standard ValvApp™ should be used or if a custom ValvApp™ is required. Additionally, this worksheet acts as a check list during commissioning to verify all parameters have been correctly configured in the VC-22D Valve Controller. Once this worksheet is completed, please return to your Cla-Val representative for approval. If a custom ValvApp is required and approved, a custom wiring diagram and ValvApp™ will be created and emailed to you. Please verify all *Required fields have been filled out prior to submittal.

Information — Reset Form — Configuration: VC-22D

*Project Name	N/A	*Today's Date	12/19/22
*Cla-Val Representive	N/A	Project Completion Date	
Control Valve Model Number (if known)	133	Customer Approval Signature	

Valve Regulation *(If more than 2 PID's are required, specify in logic on page 2)*

☑ PID 1 - Valve Regulation	*Solenoid Config	NC / NC (P.F. Lock)	☐ PID 2 - Valve Regulation	PID Selection Mode			
*Control Type	Flow	*Signal Loss	Lock Valve	Control Type		Signal Loss	
Deadband (+/-)		Ramping		Deadband (+/-)		Ramping	

DP Metering (133 Valve)

☑ *DP Metering* — Pressure Measurement: ○ P1+P2 ◉ DPT — Output: Analog Out 1

Size	Body Style	Seat	Units	Output Scaling
			gpm	

Totalizer

	Reset	Units	Ouput	Output Scaling
☐ *Totalizer*				

Analog Inputs (4-20mA) *6 Available*

	Name	Units	Scaling 4mA =	Scaling 20mA =	Signal Powered by Controller	Decimal
☑ *Analog Input #1 (Typically reserved for control setpoint signal)*	Flow Setpoint	gpm	0 gpm	2,000 gpm	☐	0
☑ *Analog Input #2 (Typically reserved for control feedback signal)*	Valve Position	%	0 %	100 %	☑	0.0
☑ *Analog Input #3*	DP Transmitter	psi	0 psi	100 psi	☑	0.0
☐ *Analog Input #4*					☐	
☐ *Analog Input #5*					☐	
☐ *Analog Input #6*					☐	

Digital Inputs *6 Available*

☐ *Digital Input 1* Name / Purpose	☐ *Digital Input 2* Name / Purpose	☐ *Digital Input 3* Name / Purpose
☐ *Digital Input 4* Name / Purpose	☐ *Digital Input 5* Name / Purpose	☐ *Digital Input 6* Name / Purpose

 Control • Power • Information • Communication

Form Rev. 4

Analog Outputs (4-20mA) *Note: Analog Outputs are sourced with controller power.*

☑ *Analog Output #1*	**Name** Flow Rate	**Units** gpm	**Scaling**	**4mA =** 0 gpm	**20mA =** 2,000 gpm	**Decimal** 0
☐ *Analog Output #2*	**Name**	**Units**	**Scaling**	**4mA =**	**20mA =**	**Decimal**
☐ *Analog Output #3*	**Name**	**Units**	**Scaling**	**4mA =**	**20mA =**	**Decimal**
☐ *Analog Output #4*	**Name**	**Units**	**Scaling**	**4mA =**	**20mA =**	**Decimal**

Solenoid Outputs

☑ *****Solenoid Output #1 (SO1)* — **Name** Close Solenoid — *Default: Closing Solenoid*

☑ *Solenoid Output #2 (SO2)* — **Name** Open Solenoid — *Default: Opening Solenoid*

Note: *SO1 and SO2 are a powered solid state output typically reserved for solenoids used on a 131 or 133 series valve. The output can be configured as PWM (default) or Discrete ON/OFF. If configured as discrete, a value of 0 represents an open circuit, and 1 a closed circuit.*

Relay Output

☐ *Relay Output #1 (RO1)* — **Name**

☐ *Relay Output #2 (RO2)* — **Name**

Note: *RO1 and RO2 are configured as dry contact mechanical relays typically used for alarms. These outputs are configured as Discrete ON/OFF, a value of 0 represents an open circuit, and 1 a closed circuit.*

Actions/Alarms

☐ *Action #1* — **Name** — **Describe** — *Additional Comments*

☐ *Action #2* — **Name** — **Describe** — *Additional Comments*

☐ *Action #3* — **Name** — **Describe** — *Additional Comments*

☐ *Action #4* — **Name** — **Describe** — *Additional Comments*

Communication

☐ **GSM/GPRS** ☐ **Modbus TCP/IP** ☐ **Modbus RTU (RS485/RS232)**

Note: *See ModBus specification page for register mapping and implementation. Refer to manual for more details.*

***Control Logic** (*Please specify all control logic using sketches, diagrams, etc. Attach additional sheets if necessary*)

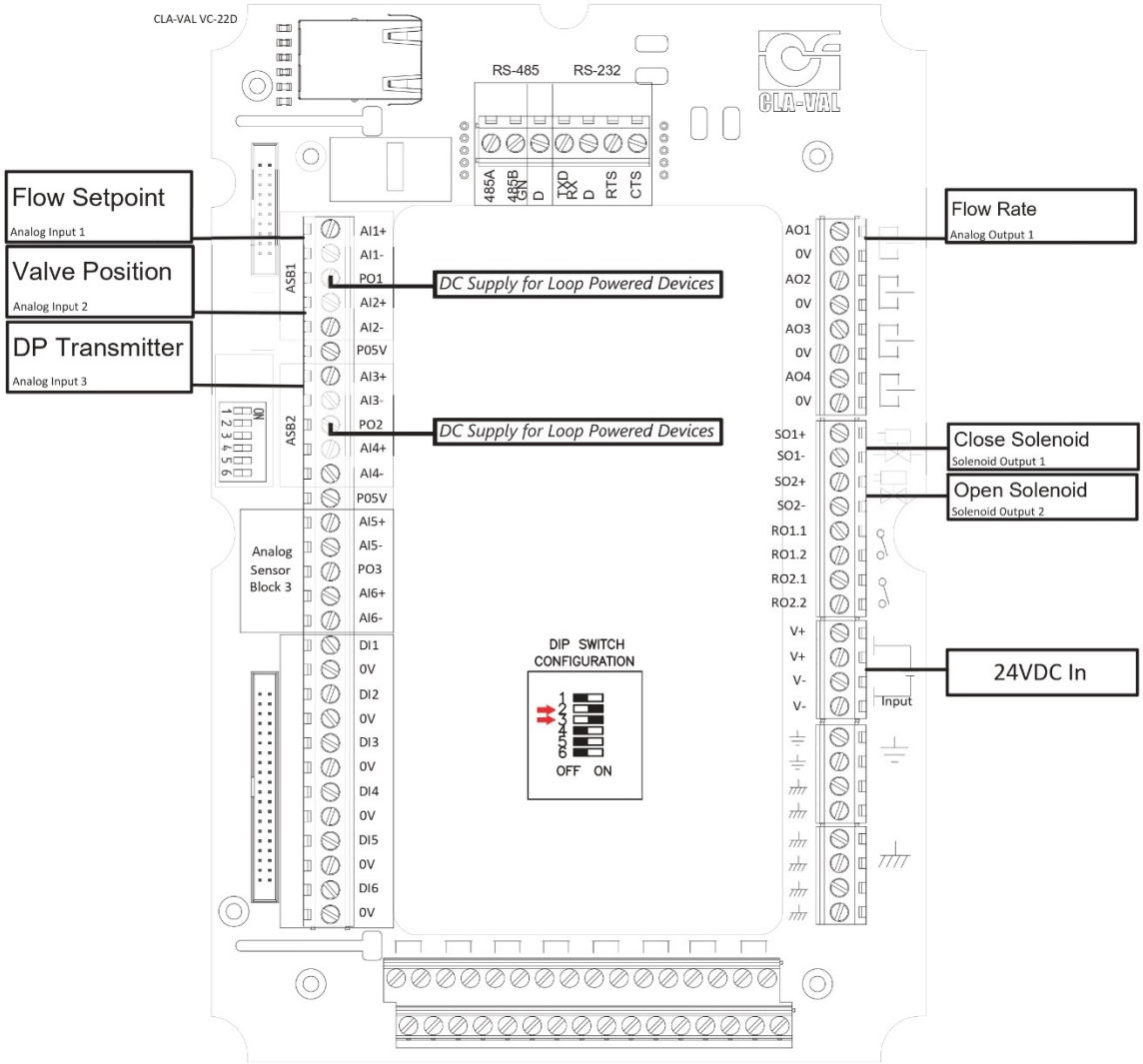
This ValvApp provides a standard flow control function for a 133 series valve. If th flow rises above the SP, the valve will modulate closed. If the flow drops below the SP, the valve will modulate open.

DI1 and AI3 have been added into this program, even though they are currently not used for anything. These serve as spare IO points so additional functionality can be added in the field by landing signal cables on these IO points and configuring actions in the VC-22D.

A custom control curve has been added to this program which allows the position transmitter to be pseudo calibrated in the field. This exists to allow the DP Metering to be adjusted to match a mag meter in the field.

 Control • Power • Information • Communication Page 2 of 3

* This is only to give an idea of where wires will be landed. Does not account for number of wires and Loop or Field powered. Please refer to **Electrical Wiring** section of VC-22D IOM for help wiring loop or field powered devices.



 Control • Power • Information • Communication Page 3 of 3

Cla-Val VC-22D Modbus Addresses

Project Name: N/A
Date:

Modbus	Input	Description	Data Type	Access	I/O Mapping	Comments
40007 Bit 0	Flow Setpoint	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI1 Input to use Modbus Address 43000/43001
40007 Bit 1	Valve Position	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI2 Input to use Modbus Address 43002/43003
40007 Bit 2	DP Transmitter	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI3 Input to use Modbus Address 43004/43005
40007 Bit 3	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI4 Input to use Modbus Address 43006/43007
40007 Bit 4	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI5 Input to use Modbus Address 43008/43009
40007 Bit 5	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI6 Input to use Modbus Address 43010/43011
40008 Bit 0	Spare	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI1 Input to use Modbus Address 41000
40008 Bit 1	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI2 Input to use Modbus Address 41001
40008 Bit 2	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI3 Input to use Modbus Address 41002
40008 Bit 3	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI4 Input to use Modbus Address 41003
40008 Bit 4	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI5 Input to use Modbus Address 41004
40008 Bit 5	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI6 Input to use Modbus Address 41005
41000	Spare	Digital Input	Word	Read/Write	DI1	Register Holds/Reads DI1 Value
41001	--	Digital Input	Word	Read/Write	DI2	Register Holds/Reads DI2 Value
41002	--	Digital Input	Word	Read/Write	DI3	Register Holds/Reads DI3 Value
41003	--	Digital Input	Word	Read/Write	DI4	Register Holds/Reads DI4 Value
41004	--	Digital Input	Word	Read/Write	DI5	Register Holds/Reads DI5 Value
41005	--	Digital Input	Word	Read/Write	DI6	Register Holds/Reads DI6 Value
41006	Close Solenoid	Digital Output	Word	Read	S01	Monitory Purposes (Optional)
41007	Open Solenoid	Digital Output	Word	Read	S02	Monitory Purposes (Optional)
41008	--	Digital Output	Word	Read	R01	Monitory Purposes (Optional)
41009	--	Digital Output	Word	Read	R02	Monitory Purposes (Optional)
43000/43001	Flow Setpoint	Analog Input	Int 32	Read/Write	AI1	Register Holds/Reads AI1 Value x100 for Two Implied Decimals
43002/43003	Valve Position	Analog Input	Int 32	Read/Write	AI2	Register Holds/Reads AI2 Value x100 for Two Implied Decimals
43004/43005	DP Transmitter	Analog Input	Int 32	Read/Write	AI3	Register Holds/Reads AI3 Value x100 for Two Implied Decimals
43006/43007	--	Analog Input	Int 32	Read/Write	AI4	Register Holds/Reads AI4 Value x100 for Two Implied Decimals
43008/43009	--	Analog Input	Int 32	Read/Write	AI5	Register Holds/Reads AI5 Value x100 for Two Implied Decimals
43010/43011	--	Analog Input	Int 32	Read/Write	AI6	Register Holds/Reads AI6 Value x100 for Two Implied Decimals
43036/43037	Flow Rate	Analog Output	Int 32	Read	AO1	Monitory Purposes (Optional) - Register Holds AO1 Value x100 for Two Implied Decimals
43038/43039	--	Analog Output	Int 32	Read	AO2	Monitory Purposes (Optional) - Register Holds AO2 Value x100 for Two Implied Decimals
43040/43041	--	Analog Output	Int 32	Read	AO3	Monitory Purposes (Optional) - Register Holds AO3 Value x100 for Two Implied Decimals
43042/43043	--	Analog Output	Int 32	Read	AO4	Monitory Purposes (Optional) - Register Holds AO4 Value x100 for Two Implied Decimals

***Additional ModBus information can be found in the manual.

Control • Power • Information • Communication
ModBus Register Mapping

C.9 133-Flow-P1+P2+X117D-V2.1

VC-22D ValvApp™ Worksheet

This worksheet is intended for the configuration of ValvApps™ used in the VC-22D Valve Controller. From the information provided below, Cla-Val will determine whether a standard ValvApp™ should be used or if a custom ValvApp™ is required. Additionally, this worksheet acts as a check list during commissioning to verify all parameters have been correctly configured in the VC-22D Valve Controller. Once this worksheet is completed, please return to your Cla-Val representative for approval. If a custom ValvApp is required and approved, a custom wiring diagram and ValvApp™ will be created and emailed to you. Please verify all *Required fields have been filled out prior to submittal.

Information — Reset Form — Configuration: VC-22D

*Project Name	N/A	*Today's Date	12/19/22
*Cla-Val Representive	N/A	Project Completion Date	
Control Valve Model Number (if known)	133	Customer Approval Signature	

Valve Regulation *(If more than 2 PID's are required, specify in logic on page 2)*

☑ PID 1 - Valve Regulation	*Solenoid Config	NC / NC (P.F. Lock)	☐ PID 2 - Valve Regulation	PID Selection Mode			
*Control Type	Flow	*Signal Loss	Lock Valve	Control Type		Signal Loss	
Deadband (+/-)		Ramping		Deadband (+/-)		Ramping	

DP Metering (133 Valve)

☑ *DP Metering* — Pressure Measurement: ◉ P1+P2 ○ DPT — Output: Analog Out 1

Size | Body Style | Seat | Units: gpm | Output Scaling

Totalizer

☐ *Totalizer* — Reset | Units | Ouput | Output Scaling

Analog Inputs (4-20mA) *6 Available*

	Name	Units	Scaling 4mA =	Scaling 20mA =	Signal Powered by Controller	Decimal
☑ *Analog Input #1* (Typically reserved for control setpoint signal)	Flow Setpoint	gpm	0 gpm	2,000 gpm	☐	0
☑ *Analog Input #2* (Typically reserved for control feedback signal)	Valve Position	%	0 %	100 %	☑	0.0
☑ *Analog Input #3*	P1 Transmitter	psi	0 psi	290 psi	☑	0.0
☑ *Analog Input #4*	P2 Transmitter	psi	0 psi	290 psi	☑	0.0
☐ *Analog Input #5*					☐	
☐ *Analog Input #6*					☐	

Digital Inputs *6 Available*

☐ *Digital Input 1* Name / Purpose	☐ *Digital Input 2* Name / Purpose	☐ *Digital Input 3* Name / Purpose
☐ *Digital Input 4* Name / Purpose	☐ *Digital Input 5* Name / Purpose	☐ *Digital Input 6* Name / Purpose

 Control • Power • Information • Communication Page 1 of 3

Form Rev. 4

Analog Outputs (4-20mA) *Note: Analog Outputs are sourced with controller power.*

☑ *Analog Output #1*	**Name** Flow Rate	**Units** gpm	**Scaling**	**4mA =** 0 gpm	**20mA =** 2,000 gpm	**Decimal** 0
☐ *Analog Output #2*	**Name**	**Units**	**Scaling**	**4mA =**	**20mA =**	**Decimal**
☐ *Analog Output #3*	**Name**	**Units**	**Scaling**	**4mA =**	**20mA =**	**Decimal**
☐ *Analog Output #4*	**Name**	**Units**	**Scaling**	**4mA =**	**20mA =**	**Decimal**

Solenoid Outputs

☑ *****Solenoid Output #1 (SO1)* — **Name** Close Solenoid — *Default: Closing Solenoid*

☑ *Solenoid Output #2 (SO2)* — **Name** Open Solenoid — *Default: Opening Solenoid*

Note: *SO1 and SO2 are a powered solid state output typically reserved for solenoids used on a 131 or 133 series valve. The output can be configured as PWM (default) or Discrete ON/OFF. If configured as discrete, a value of 0 represents an open circuit, and 1 a closed circuit.*

Relay Output

☐ *Relay Output #1 (RO1)* — **Name**

☐ *Relay Output #2 (RO2)* — **Name**

Note: *RO1 and RO2 are configured as dry contact mechanical relays typically used for alarms. These outputs are configured as Discrete ON/OFF, a value of 0 represents an open circuit, and 1 a closed circuit.*

Actions/Alarms

☐ *Action #1* — **Name** — **Describe** — *Additional Comments*

☐ *Action #2* — **Name** — **Describe** — *Additional Comments*

☐ *Action #3* — **Name** — **Describe** — *Additional Comments*

☐ *Action #4* — **Name** — **Describe** — *Additional Comments*

Communication

☐ **GSM/GPRS** ☐ **Modbus TCP/IP** ☐ **Modbus RTU (RS485/RS232)**

Note: *See ModBus specification page for register mapping and implementation. Refer to manual for more details.*

***Control Logic** (*Please specify all control logic using sketches, diagrams, etc. Attach additional sheets if necessary*)

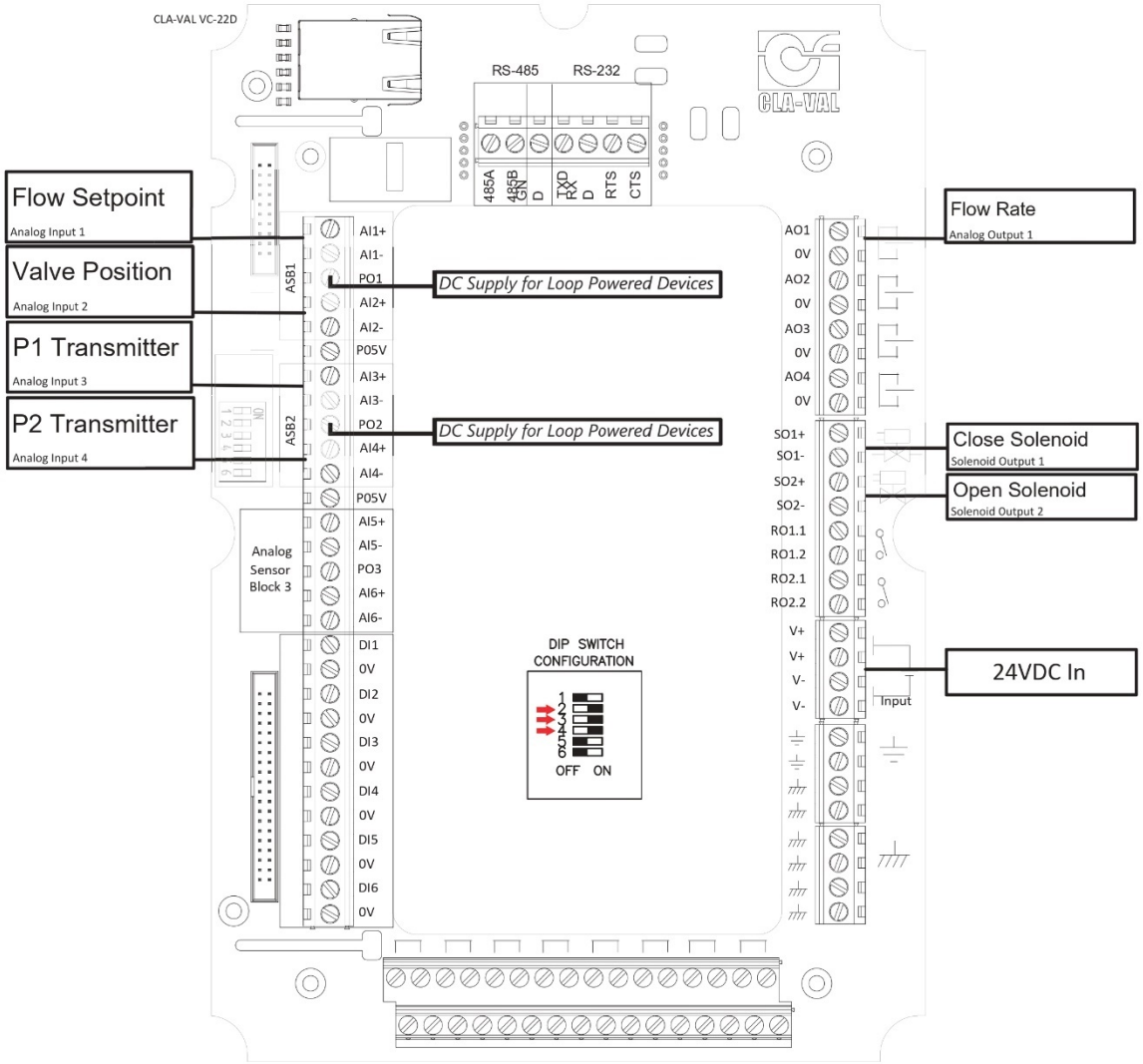
This ValvApp provides a standard flow control function for a 133 series valve. If th flow rises above the SP, the valve will modulate closed. If the flow drops below the SP, the valve will modulate open.

DI1 and AI3 have been added into this program, even though they are currently not used for anything. These serve as spare IO points so additional functionality can be added in the field by landing signal cables on these IO points and configuring actions in the VC-22D.

A custom control curve has been added to this program which allows the position transmitter to be pseudo calibrated in the field. There is also an interactive variable for P1 and P2 offset which can be adjusted in the field. This exists to allow the DP Metering to be adjusted to match a mag meter in the field.

 Control • Power • Information • Communication Page 2 of 3

* This is only to give an idea of where wires will be landed. Does not account for number of wires and Loop or Field powered. Please refer to **Electrical Wiring** section of VC-22D IOM for help wiring loop or field powered devices.



 Control • Power • Information • Communication

Cla-Val VC-22D Modbus Addresses

Project Name: N/A
Date:

Modbus	Input	Description	Data Type	Access	I/O Mapping	Comments
40007 Bit 0	Flow Setpoint	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI1 Input to use Modbus Address 43000/43001
40007 Bit 1	Valve Position	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI2 Input to use Modbus Address 43002/43003
40007 Bit 2	P1 Transmitter	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI3 Input to use Modbus Address 43004/43005
40007 Bit 3	P2 Transmitter	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI4 Input to use Modbus Address 43006/43007
40007 Bit 4	- -	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI5 Input to use Modbus Address 43008/43009
40007 Bit 5	- -	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI6 Input to use Modbus Address 43010/43011
40008 Bit 0	Spare	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI1 Input to use Modbus Address 41000
40008 Bit 1	- -	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI2 Input to use Modbus Address 41001
40008 Bit 2	- -	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI3 Input to use Modbus Address 41002
40008 Bit 3	- -	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI4 Input to use Modbus Address 41003
40008 Bit 4	- -	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI5 Input to use Modbus Address 41004
40008 Bit 5	- -	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI6 Input to use Modbus Address 41005
41000	Spare	Digital Input	Word	Read/Write	DI1	Register Holds/Reads DI1 Value
41001	- -	Digital Input	Word	Read/Write	DI2	Register Holds/Reads DI2 Value
41002	- -	Digital Input	Word	Read/Write	DI3	Register Holds/Reads DI3 Value
41003	- -	Digital Input	Word	Read/Write	DI4	Register Holds/Reads DI4 Value
41004	- -	Digital Input	Word	Read/Write	DI5	Register Holds/Reads DI5 Value
41005	- -	Digital Input	Word	Read/Write	DI6	Register Holds/Reads DI6 Value
41006	Close Solenoid	Digital Output	Word	Read	S01	Monitory Purposes (Optional)
41007	Open Solenoid	Digital Output	Word	Read	S02	Monitory Purposes (Optional)
41008	- -	Digital Output	Word	Read	R01	Monitory Purposes (Optional)
41009	- -	Digital Output	Word	Read	R02	Monitory Purposes (Optional)
43000/43001	Flow Setpoint	Analog Input	Int 32	Read/Write	AI1	Register Holds/Reads AI1 Value x100 for Two Implied Decimals
43002/43003	Valve Position	Analog Input	Int 32	Read/Write	AI2	Register Holds/Reads AI2 Value x100 for Two Implied Decimals
43004/43005	P1 Transmitter	Analog Input	Int 32	Read/Write	AI3	Register Holds/Reads AI3 Value x100 for Two Implied Decimals
43006/43007	P2 Transmitter	Analog Input	Int 32	Read/Write	AI4	Register Holds/Reads AI4 Value x100 for Two Implied Decimals
43008/43009	- -	Analog Input	Int 32	Read/Write	AI5	Register Holds/Reads AI5 Value x100 for Two Implied Decimals
43010/43011	- -	Analog Input	Int 32	Read/Write	AI6	Register Holds/Reads AI6 Value x100 for Two Implied Decimals
43036/43037	Flow Rate	Analog Output	Int 32	Read	AO1	Monitory Purposes (Optional) - Register Holds AO1 Value x100 for Two Implied Decimals
43038/43039	- -	Analog Output	Int 32	Read	AO2	Monitory Purposes (Optional) - Register Holds AO2 Value x100 for Two Implied Decimals
43040/43041	- -	Analog Output	Int 32	Read	AO3	Monitory Purposes (Optional) - Register Holds AO3 Value x100 for Two Implied Decimals
43042/43043	- -	Analog Output	Int 32	Read	AO4	Monitory Purposes (Optional) - Register Holds AO4 Value x100 for Two Implied Decimals

***Additional ModBus information can be found in the manual.

Control • Power • Information • Communication
ModBus Register Mapping

C.10 136-LvlAlt-HLLL-Switches-V1.0

VC-22D ValvApp™ Worksheet

This worksheet is intended for the configuration of ValvApps™ used in the VC-22D Valve Controller. From the information provided below, Cla-Val will determine whether a standard ValvApp™ should be used or if a custom ValvApp™ is required. Additionally, this worksheet acts as a check list during commissioning to verify all parameters have been correctly configured in the VC-22D Valve Controller. Once this worksheet is completed, please return to your Cla-Val representative for approval. If a custom ValvApp is required and approved, a custom wiring diagram and ValvApp™ will be created and emailed to you. Please verify all *Required fields have been filled out prior to submittal.

Information — Reset Form — Configuration: VC-22D

*Project Name	N/A	*Today's Date	3/14/23
*Cla-Val Representive	N/A	Project Completion Date	
Control Valve Model Number (if known)	136	Customer Approval Signature	

Valve Regulation *(If more than 2 PID's are required, specify in logic on page 2)*

☐ PID 1 - Valve Regulation	*Solenoid Config		☐ PID 2 - Valve Regulation	PID Selection Mode			
*Control Type		*Signal Loss		Control Type		Signal Loss	
Deadband (+/-)		Ramping		Deadband (+/-)		Ramping	

DP Metering (133 Valve)

☐ *DP Metering* — Pressure Measurement: ◉ P1+P2 ○ DPT — Output

Size | Body Style | Seat | Units | Output Scaling

Totalizer

☐ *Totalizer* — Reset | Units | Ouput | Output Scaling

Analog Inputs (4-20mA) *6 Available*

☐ *Analog Input #1 (Typically reserved for control setpoint signal)	Name	Units	Scaling	4mA =	20mA =	Signal Powered by Controller / Decimal
☐ *Analog Input #2 (Typically reserved for control feedback signal)	Name	Units	Scaling	4mA =	20mA =	Signal Powered by Controller / Decimal
☐ *Analog Input #3*	Name	Units	Scaling	4mA =	20mA =	Signal Powered by Controller / Decimal
☐ *Analog Input #4*	Name	Units	Scaling	4mA =	20mA =	Signal Powered by Controller / Decimal
☐ *Analog Input #5*	Name	Units	Scaling	4mA =	20mA =	Signal Powered by Controller / Decimal
☐ *Analog Input #6*	Name	Units	Scaling	4mA =	20mA =	Signal Powered by Controller / Decimal

Digital Inputs *6 Available*

☑ *Digital Input 1* Name: High Level Switch	☑ *Digital Input 2* Name: Low Level Switch	☐ *Digital Input 3* Name:	
Purpose:	Purpose:	Purpose:	
☐ *Digital Input 4* Name:	☐ *Digital Input 5* Name:	☐ *Digital Input 6* Name:	
Purpose:	Purpose:	Purpose:	

 Control • Power • Information • Communication

Form Rev. -

Analog Outputs (4-20mA) *Note: Analog Outputs are sourced with controller power.*

☐ *Analog Output #1*
Name | Units | Scaling 4mA = | 20mA = | Decimal

☐ *Analog Output #2*
Name | Units | Scaling 4mA = | 20mA = | Decimal

☐ *Analog Output #3*
Name | Units | Scaling 4mA = | 20mA = | Decimal

☐ *Analog Output #4*
Name | Units | Scaling 4mA = | 20mA = | Decimal

Solenoid Outputs

☑ **Solenoid Output #1 (SO1)*
Name: Control Solenoid
Default: Closing Solenoid

☐ *Solenoid Output #2 (SO2)*
Name
Default: Opening Solenoid

Note: *SO1 and SO2 are a powered solid state output typically reserved for solenoids used on a 131 or 133 series valve. The output can be configured as PWM (default) or Discrete ON/OFF. If configured as discrete, a value of 0 represents an open circuit, and 1 a closed circuit.*

Relay Output

☐ *Relay Output #1 (RO1)*
Name

☐ *Relay Output #2 (RO2)*
Name

Note: *RO1 and RO2 are configured as dry contact mechanical relays typically used for alarms. These outputs are configured as Discrete ON/OFF, a value of 0 represents an open circuit, and 1 a closed circuit.*

Actions/Alarms

☐ *Action #1*
Name | Describe
Additional Comments

☐ *Action #2*
Name | Describe
Additional Comments

☐ *Action #3*
Name | Describe
Additional Comments

☐ *Action #4*
Name | Describe
Additional Comments

Communication

☐ **GSM/GPRS** ☐ **Modbus TCP/IP** ☐ **Modbus RTU (RS485/RS232)**

Note: *See ModBus specification page for register mapping and implementation. Refer to manual for more details.*

***Control Logic** (*Please specify all control logic using sketches, diagrams, etc. Attach additional sheets if necessary*)

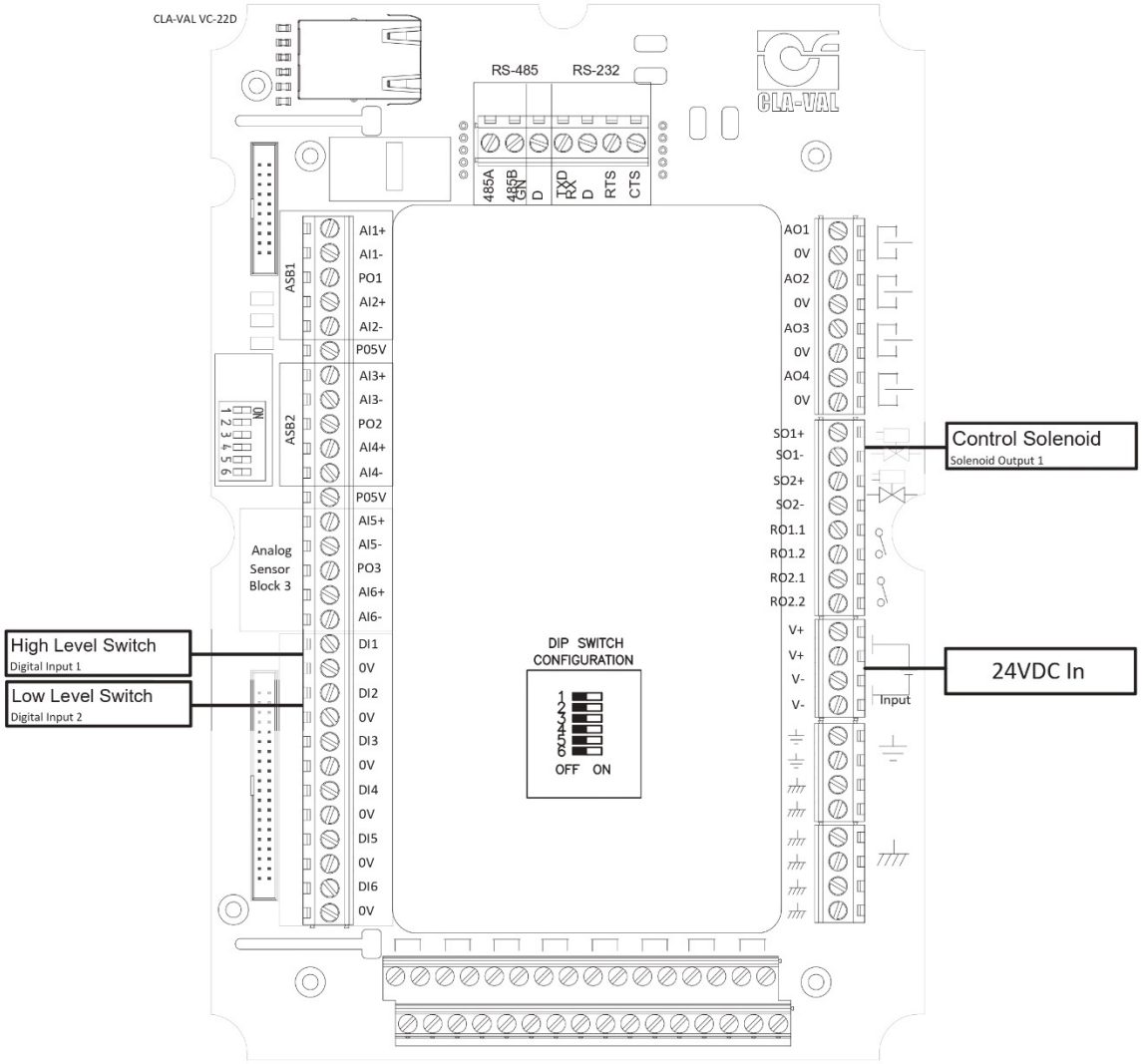
This ValvApp provides standard level control for single solenoid valves utilizing High and Low Level Switches. If the level is above the high level switch, the valve goes full closed. If the level is below the low level switch, the valve goes full open.

This ValvApp provides an interactive variable to configure the Control Solenoid as NC (Energize to Open) or NO (Energize to Close).

This ValvApp also provides interactive variables to configure the High Level and Low Level Switches as NC or NO.

 Control • Power • Information • Communication Page 2 of 3

* This is only to give an idea of where wires will be landed. Does not account for number of wires and Loop or Field powered. Please refer to **Electrical Wiring** section of VC-22D IOM for help wiring loop or field powered devices.



Cla-Val VC-22D Modbus Addresses

Project Name: N/A
Date:

Modbus	Input	Description	Data Type	Access	I/O Mapping	Comments
40007 Bit 0	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI1 Input to use Modbus Address 43000/43001
40007 Bit 1	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI2 Input to use Modbus Address 43002/43003
40007 Bit 2	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI3 Input to use Modbus Address 43004/43005
40007 Bit 3	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI4 Input to use Modbus Address 43006/43007
40007 Bit 4	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI5 Input to use Modbus Address 43008/43009
40007 Bit 5	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI6 Input to use Modbus Address 43010/43011
40008 Bit 0	High Level Switch	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI1 Input to use Modbus Address 41000
40008 Bit 1	Low Level Switch	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI2 Input to use Modbus Address 41001
40008 Bit 2	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI3 Input to use Modbus Address 41002
40008 Bit 3	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI4 Input to use Modbus Address 41003
40008 Bit 4	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI5 Input to use Modbus Address 41004
40008 Bit 5	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI6 Input to use Modbus Address 41005
41000	High Level Switch	Digital Input	Word	Read/Write	DI1	Register Holds/Reads DI1 Value
41001	Low Level Switch	Digital Input	Word	Read/Write	DI2	Register Holds/Reads DI2 Value
41002	--	Digital Input	Word	Read/Write	DI3	Register Holds/Reads DI3 Value
41003	--	Digital Input	Word	Read/Write	DI4	Register Holds/Reads DI4 Value
41004	--	Digital Input	Word	Read/Write	DI5	Register Holds/Reads DI5 Value
41005	--	Digital Input	Word	Read/Write	DI6	Register Holds/Reads DI6 Value
41006	Control Solenoid	Digital Output	Word	Read	S01	Monitory Purposes (Optional)
41007	--	Digital Output	Word	Read	S02	Monitory Purposes (Optional)
41008	--	Digital Output	Word	Read	R01	Monitory Purposes (Optional)
41009	--	Digital Output	Word	Read	R02	Monitory Purposes (Optional)
43000/43001	--	Analog Input	Int 32	Read/Write	AI1	Register Holds/Reads AI1 Value x100 for Two Implied Decimals
43002/43003	--	Analog Input	Int 32	Read/Write	AI2	Register Holds/Reads AI2 Value x100 for Two Implied Decimals
43004/43005	--	Analog Input	Int 32	Read/Write	AI3	Register Holds/Reads AI3 Value x100 for Two Implied Decimals
43006/43007	--	Analog Input	Int 32	Read/Write	AI4	Register Holds/Reads AI4 Value x100 for Two Implied Decimals
43008/43009	--	Analog Input	Int 32	Read/Write	AI5	Register Holds/Reads AI5 Value x100 for Two Implied Decimals
43010/43011	--	Analog Input	Int 32	Read/Write	AI6	Register Holds/Reads AI6 Value x100 for Two Implied Decimals
43036/43037	--	Analog Output	Int 32	Read	AO1	Monitory Purposes (Optional) - Register Holds AO1 Value x100 for Two Implied Decimals
43038/43039	--	Analog Output	Int 32	Read	AO2	Monitory Purposes (Optional) - Register Holds AO2 Value x100 for Two Implied Decimals
43040/43041	--	Analog Output	Int 32	Read	AO3	Monitory Purposes (Optional) - Register Holds AO3 Value x100 for Two Implied Decimals
43042/43043	--	Analog Output	Int 32	Read	AO4	Monitory Purposes (Optional) - Register Holds AO4 Value x100 for Two Implied Decimals

***Additional ModBus information can be found in the manual.

C.11 136-LvlAltitude-OnOff-V1.0

VC-22D ValvApp™ Worksheet

This worksheet is intended for the configuration of ValvApps™ used in the VC-22D Valve Controller. From the information provided below, Cla-Val will determine whether a standard ValvApp™ should be used or if a custom ValvApp™ is required. Additionally, this worksheet acts as a check list during commissioning to verify all parameters have been correctly configured in the VC-22D Valve Controller. Once this worksheet is completed, please return to your Cla-Val representative for approval. If a custom ValvApp is required and approved, a custom wiring diagram and ValvApp™ will be created and emailed to you. Please verify all *Required fields have been filled out prior to submittal.

Information — Reset Form — Configuration: VC-22D

*Project Name	N/A	*Today's Date	3/14/23
*Cla-Val Representive	N/A	Project Completion Date	
Control Valve Model Number (if known)	136	Customer Approval Signature	

Valve Regulation *(If more than 2 PID's are required, specify in logic on page 2)*

☐ PID 1 - Valve Regulation	*Solenoid Config		☐ PID 2 - Valve Regulation	PID Selection Mode			
*Control Type		*Signal Loss		Control Type		Signal Loss	
Deadband (+/-)		Ramping		Deadband (+/-)		Ramping	

DP Metering (133 Valve)

☐ *DP Metering*	Pressure Measurement	◉ P1+P2 ○ DPT			Output	
Size		Body Style		Seat	Units	Output Scaling

Totalizer

☐ *Totalizer*	Reset	Units	Ouput	Output Scaling	

Analog Inputs (4-20mA) *6 Available*

☑ *Analog Input #1* *(Typically reserved for control setpoint signal)*	Name: Level SP	Units: ft	Scaling	☐ Signal Powered by Controller	4mA = 0	20mA = 20	Decimal: 0.00
☑ *Analog Input #2* *(Typically reserved for control feedback signal)*	Name: Level Feedback	Units: ft	Scaling	☑ Signal Powered by Controller	4mA = 0	20mA = 20	Decimal: 0.00
☑ *Analog Input #3*	Name: Spare	Units:	Scaling	☐ Signal Powered by Controller	4mA =	20mA =	Decimal:
☐ *Analog Input #4*	Name:	Units:	Scaling	☐ Signal Powered by Controller	4mA =	20mA =	Decimal:
☐ *Analog Input #5*	Name:	Units:	Scaling	☐ Signal Powered by Controller	4mA =	20mA =	Decimal:
☐ *Analog Input #6*	Name:	Units:	Scaling	☐ Signal Powered by Controller	4mA =	20mA =	Decimal:

Digital Inputs *6 Available*

☑ *Digital Input 1* Name: Spare	☐ *Digital Input 2* Name:	☐ *Digital Input 3* Name:	
Purpose:	Purpose:	Purpose:	
☐ *Digital Input 4* Name:	☐ *Digital Input 5* Name:	☐ *Digital Input 6* Name:	
Purpose:	Purpose:	Purpose:	

 Control • Power • Information • Communication Page 1 of 3

Form Rev. -

Analog Outputs (4-20mA) *Note: Analog Outputs are sourced with controller power.*

☐ *Analog Output #1*
Name | Units | Scaling: 4mA = | 20mA = | Decimal

☐ *Analog Output #2*
Name | Units | Scaling: 4mA = | 20mA = | Decimal

☐ *Analog Output #3*
Name | Units | Scaling: 4mA = | 20mA = | Decimal

☐ *Analog Output #4*
Name | Units | Scaling: 4mA = | 20mA = | Decimal

Solenoid Outputs

☑ **Solenoid Output #1 (SO1)*
Name: Control Solenoid
Default: Closing Solenoid

☐ *Solenoid Output #2 (SO2)*
Name
Default: Opening Solenoid

Note: *SO1 and SO2 are a powered solid state output typically reserved for solenoids used on a 131 or 133 series valve. The output can be configured as PWM (default) or Discrete ON/OFF. If configured as discrete, a value of 0 represents an open circuit, and 1 a closed circuit.*

Relay Output

☐ *Relay Output #1 (RO1)*
Name

☐ *Relay Output #2 (RO2)*
Name

Note: *RO1 and RO2 are configured as dry contact mechanical relays typically used for alarms. These outputs are configured as Discrete ON/OFF, a value of 0 represents an open circuit, and 1 a closed circuit.*

Actions/Alarms

☐ *Action #1*
Name | Describe
Additional Comments

☐ *Action #2*
Name | Describe
Additional Comments

☐ *Action #3*
Name | Describe
Additional Comments

☐ *Action #4*
Name | Describe
Additional Comments

Communication

☐ **GSM/GPRS** ☐ **Modbus TCP/IP** ☐ **Modbus RTU (RS485/RS232)**

Note: *See ModBus specification page for register mapping and implementation. Refer to manual for more details.*

***Control Logic** (*Please specify all control logic using sketches, diagrams, etc. Attach additional sheets if necessary*)

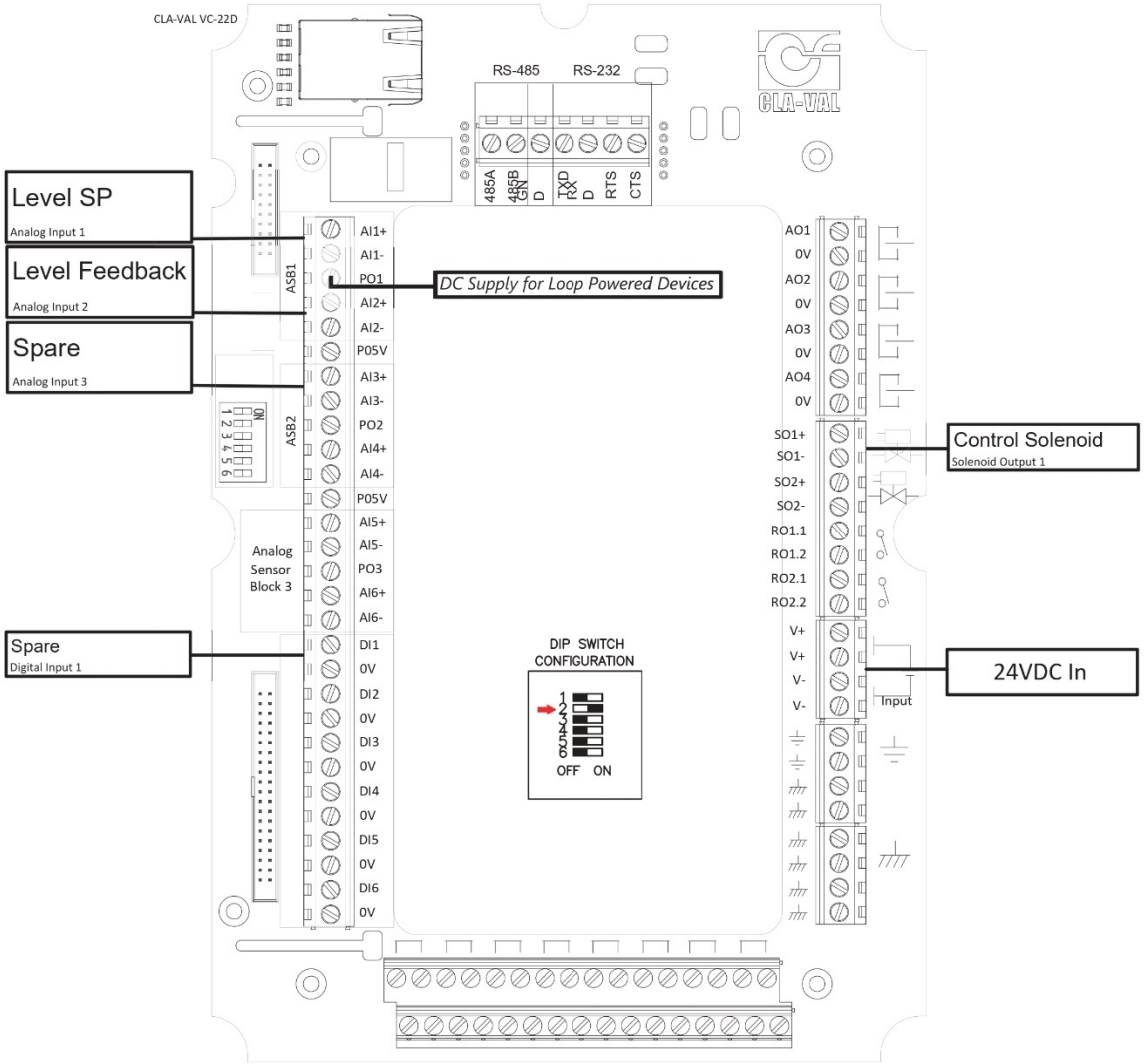
This ValvApp provides standard level altitude control for a single solenoid valve. If the level is above a high setpoint, the valve goes full closed. If the level is below a low setpoint, the valve goes full open.

DI1 and AI3 have been added into this program, even though they are currently not used for anything. These serve as spare IO points so additional functionality can be added in the field by landing signal cables on these IO points and configuring actions in the VC-22D.

This ValvApp provides an interactive variables to switch solenoid between "Energize To Open" and "Energize to Close".

 Control • Power • Information • Communication Page 2 of 3

* This is only to give an idea of where wires will be landed. Does not account for number of wires and Loop or Field powered. Please refer to **Electrical Wiring** section of VC-22D IOM for help wiring loop or field powered devices.



Cla-Val VC-22D Modbus Addresses

Project Name: N/A
Date:

Modbus	Input	Description	Data Type	Access	I/O Mapping	Comments
40007 Bit 0	Level SP	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI1 Input to use Modbus Address 43000/43001
40007 Bit 1	Level Feedback	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI2 Input to use Modbus Address 43002/43003
40007 Bit 2	Spare	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI3 Input to use Modbus Address 43004/43005
40007 Bit 3	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI4 Input to use Modbus Address 43006/43007
40007 Bit 4	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI5 Input to use Modbus Address 43008/43009
40007 Bit 5	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI6 Input to use Modbus Address 43010/43011
40008 Bit 0	Spare	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI1 Input to use Modbus Address 41000
40008 Bit 1	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI2 Input to use Modbus Address 41001
40008 Bit 2	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI3 Input to use Modbus Address 41002
40008 Bit 3	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI4 Input to use Modbus Address 41003
40008 Bit 4	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI5 Input to use Modbus Address 41004
40008 Bit 5	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI6 Input to use Modbus Address 41005
41000	Spare	Digital Input	Word	Read/Write	DI1	Register Holds/Reads DI1 Value
41001	--	Digital Input	Word	Read/Write	DI2	Register Holds/Reads DI2 Value
41002	--	Digital Input	Word	Read/Write	DI3	Register Holds/Reads DI3 Value
41003	--	Digital Input	Word	Read/Write	DI4	Register Holds/Reads DI4 Value
41004	--	Digital Input	Word	Read/Write	DI5	Register Holds/Reads DI5 Value
41005	--	Digital Input	Word	Read/Write	DI6	Register Holds/Reads DI6 Value
41006	Control Solenoid	Digital Output	Word	Read	S01	Monitory Purposes (Optional)
41007	--	Digital Output	Word	Read	S02	Monitory Purposes (Optional)
41008	--	Digital Output	Word	Read	R01	Monitory Purposes (Optional)
41009	--	Digital Output	Word	Read	R02	Monitory Purposes (Optional)
43000/43001	Level SP	Analog Input	Int 32	Read/Write	AI1	Register Holds/Reads AI1 Value x100 for Two Implied Decimals
43002/43003	Level Feedback	Analog Input	Int 32	Read/Write	AI2	Register Holds/Reads AI2 Value x100 for Two Implied Decimals
43004/43005	Spare	Analog Input	Int 32	Read/Write	AI3	Register Holds/Reads AI3 Value x100 for Two Implied Decimals
43006/43007	--	Analog Input	Int 32	Read/Write	AI4	Register Holds/Reads AI4 Value x100 for Two Implied Decimals
43008/43009	--	Analog Input	Int 32	Read/Write	AI5	Register Holds/Reads AI5 Value x100 for Two Implied Decimals
43010/43011	--	Analog Input	Int 32	Read/Write	AI6	Register Holds/Reads AI6 Value x100 for Two Implied Decimals
43036/43037	--	Analog Output	Int 32	Read	AO1	Monitory Purposes (Optional) - Register Holds AO1 Value x100 for Two Implied Decimals
43038/43039	--	Analog Output	Int 32	Read	AO2	Monitory Purposes (Optional) - Register Holds AO2 Value x100 for Two Implied Decimals
43040/43041	--	Analog Output	Int 32	Read	AO3	Monitory Purposes (Optional) - Register Holds AO3 Value x100 for Two Implied Decimals
43042/43043	--	Analog Output	Int 32	Read	AO4	Monitory Purposes (Optional) - Register Holds AO4 Value x100 for Two Implied Decimals

***Additional ModBus information can be found in the manual.

C.12 340-Flow-Mag-V2.1

VC-22D ValvApp™ Worksheet

This worksheet is intended for the configuration of ValvApps™ used in the VC-22D Valve Controller. From the information provided below, Cla-Val will determine whether a standard ValvApp™ should be used or if a custom ValvApp™ is required. Additionally, this worksheet acts as a check list during commissioning to verify all parameters have been correctly configured in the VC-22D Valve Controller. Once this worksheet is completed, please return to your Cla-Val representative for approval. If a custom ValvApp is required and approved, a custom wiring diagram and ValvApp™ will be created and emailed to you. Please verify all *Required fields have been filled out prior to submittal.

Information — Reset Form — Configuration: VC-22D

*Project Name	N/A	*Today's Date	12/19/22
*Cla-Val Representive	N/A	Project Completion Date	
Control Valve Model Number (if known)	340	Customer Approval Signature	

Valve Regulation *(If more than 2 PID's are required, specify in logic on page 2)*

☐ PID 1 - Valve Regulation	*Solenoid Config		☐ PID 2 - Valve Regulation	PID Selection Mode			
*Control Type		*Signal Loss		Control Type		Signal Loss	
Deadband (+/-)		Ramping		Deadband (+/-)		Ramping	

DP Metering (133 Valve)

☐ *DP Metering*	Pressure Measurement	◉ P1+P2 ○ DPT			Output	
Size		Body Style		Seat	Units	Output Scaling

Totalizer

☐ *Totalizer*	Reset	Units	Ouput	Output Scaling	

Analog Inputs (4-20mA) *6 Available*

☑ *Analog Input #1* *(Typically reserved for control setpoint signal)*	Name: CDHS SP	Units:	Scaling	☐ Signal Powered by Controller	4mA = 4 mA	20mA = 20 mA	Decimal: 0.00
☑ *Analog Input #2* *(Typically reserved for control feedback signal)*	Name: Flow Rate	Units: gpm	Scaling	☑ Signal Powered by Controller	4mA = 0 gpm	20mA = 2,000 gpm	Decimal: 0
☑ *Analog Input #3*	Name: 34 Actuator Feedback	Units:	Scaling	☐ Signal Powered by Controller	4mA = 4 mA	20mA = 20 mA	Decimal: 0.00
☐ *Analog Input #4*	Name:	Units:	Scaling	☐ Signal Powered by Controller	4mA =	20mA =	Decimal:
☐ *Analog Input #5*	Name:	Units:	Scaling	☐ Signal Powered by Controller	4mA =	20mA =	Decimal:
☐ *Analog Input #6*	Name:	Units:	Scaling	☐ Signal Powered by Controller	4mA =	20mA =	Decimal:

Digital Inputs *6 Available*

☐ *Digital Input 1* Name:	☐ *Digital Input 2* Name:	☐ *Digital Input 3* Name:
Purpose:	Purpose:	Purpose:
☐ *Digital Input 4* Name:	☐ *Digital Input 5* Name:	☐ *Digital Input 6* Name:
Purpose:	Purpose:	Purpose:

 Control • Power • Information • Communication

Form Rev. 4

Analog Outputs (4-20mA) *Note: Analog Outputs are sourced with controller power.*

☑ *Analog Output #1*
Name: CDHS34 Command | Units: | Scaling: 4mA = 4 mA | 20mA = 20 mA | Decimal: 0.00

☐ *Analog Output #2*
Name: | Units: | Scaling: 4mA = | 20mA = | Decimal:

☐ *Analog Output #3*
Name: | Units: | Scaling: 4mA = | 20mA = | Decimal:

☐ *Analog Output #4*
Name: | Units: | Scaling: 4mA = | 20mA = | Decimal:

Solenoid Outputs

☐ **Solenoid Output #1 (SO1)*
Name:
Default: Closing Solenoid

☐ *Solenoid Output #2 (SO2)*
Name:
Default: Opening Solenoid

Note: *SO1 and SO2 are a powered solid state output typically reserved for solenoids used on a 131 or 133 series valve. The output can be configured as PWM (default) or Discrete ON/OFF. If configured as discrete, a value of 0 represents an open circuit, and 1 a closed circuit.*

Relay Output

☐ *Relay Output #1 (RO1)*
Name:

☐ *Relay Output #2 (RO2)*
Name:

Note: *RO1 and RO2 are configured as dry contact mechanical relays typically used for alarms. These outputs are configured as Discrete ON/OFF, a value of 0 represents an open circuit, and 1 a closed circuit.*

Actions/Alarms

☐ *Action #1*
Name: | Describe:
Additional Comments

☐ *Action #2*
Name: | Describe:
Additional Comments

☐ *Action #3*
Name: | Describe:
Additional Comments

☐ *Action #4*
Name: | Describe:
Additional Comments

Communication

☐ **GSM/GPRS** ☐ **Modbus TCP/IP** ☐ **Modbus RTU (RS485/RS232)**

Note: *See ModBus specification page for register mapping and implementation. Refer to manual for more details.*

***Control Logic** (*Please specify all control logic using sketches, diagrams, etc. Attach additional sheets if necessary*)

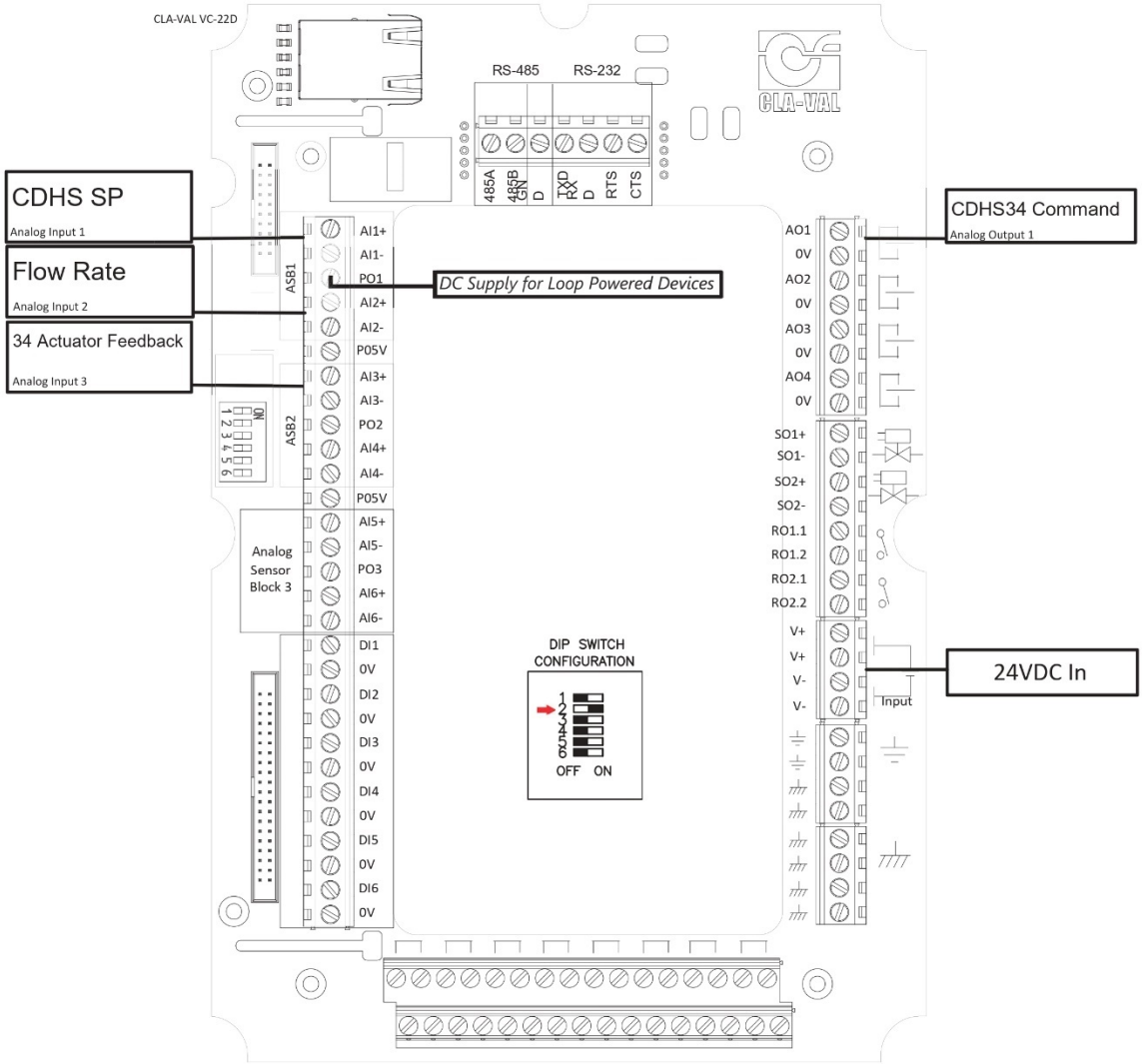
This ValvApp provides a standard open loop flow control function for a 340 series valve. The VC-22D will transmit the flow setpoint via a 4-20mA signal to the 34 series actuator. The 34 series actuator is calibrated to move to a position that applies appropriate spring force on the pilot based on the flow setpoint it receives.

DI1 has been added into this program, even though it is currently not used for anything. This serves as a spare IO point so additional functionality can be added in the field by landing signal cables on this IO point and configuring actions in the VC-22D.

A flow offset interactive variable has been included. This may be adjusted in the field if the 34 series actuator feedback and command do not match each other.

 Control • Power • Information • Communication Page 2 of 3

* This is only to give an idea of where wires will be landed. Does not account for number of wires and Loop or Field powered. Please refer to **Electrical Wiring** section of VC-22D IOM for help wiring loop or field powered devices.



 Control • Power • Information • Communication

Cla-Val VC-22D Modbus Addresses

Project Name: N/A
Date:

Modbus	Input	Description	Data Type	Access	I/O Mapping	Comments
40007 Bit 0	CDHS SP	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI1 Input to use Modbus Address 43000/43001
40007 Bit 1	Flow Rate	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI2 Input to use Modbus Address 43002/43003
40007 Bit 2	34 Actuator Feedback	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI3 Input to use Modbus Address 43004/43005
40007 Bit 3	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI4 Input to use Modbus Address 43006/43007
40007 Bit 4	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI5 Input to use Modbus Address 43008/43009
40007 Bit 5	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI6 Input to use Modbus Address 43010/43011
40008 Bit 0	Spare	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI1 Input to use Modbus Address 41000
40008 Bit 1	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI2 Input to use Modbus Address 41001
40008 Bit 2	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI3 Input to use Modbus Address 41002
40008 Bit 3	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI4 Input to use Modbus Address 41003
40008 Bit 4	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI5 Input to use Modbus Address 41004
40008 Bit 5	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI6 Input to use Modbus Address 41005
41000	Spare	Digital Input	Word	Read/Write	DI1	Register Holds/Reads DI1 Value
41001	--	Digital Input	Word	Read/Write	DI2	Register Holds/Reads DI2 Value
41002	--	Digital Input	Word	Read/Write	DI3	Register Holds/Reads DI3 Value
41003	--	Digital Input	Word	Read/Write	DI4	Register Holds/Reads DI4 Value
41004	--	Digital Input	Word	Read/Write	DI5	Register Holds/Reads DI5 Value
41005	--	Digital Input	Word	Read/Write	DI6	Register Holds/Reads DI6 Value
41006	--	Digital Output	Word	Read	S01	Monitory Purposes (Optional)
41007	--	Digital Output	Word	Read	S02	Monitory Purposes (Optional)
41008	--	Digital Output	Word	Read	R01	Monitory Purposes (Optional)
41009	--	Digital Output	Word	Read	R02	Monitory Purposes (Optional)
43000/43001	CDHS SP	Analog Input	Int 32	Read/Write	AI1	Register Holds/Reads AI1 Value x100 for Two Implied Decimals
43002/43003	Flow Rate	Analog Input	Int 32	Read/Write	AI2	Register Holds/Reads AI2 Value x100 for Two Implied Decimals
43004/43005	34 Actuator Feedback	Analog Input	Int 32	Read/Write	AI3	Register Holds/Reads AI3 Value x100 for Two Implied Decimals
43006/43007	--	Analog Input	Int 32	Read/Write	AI4	Register Holds/Reads AI4 Value x100 for Two Implied Decimals
43008/43009	--	Analog Input	Int 32	Read/Write	AI5	Register Holds/Reads AI5 Value x100 for Two Implied Decimals
43010/43011	--	Analog Input	Int 32	Read/Write	AI6	Register Holds/Reads AI6 Value x100 for Two Implied Decimals
43036/43037	CDHS34 Command	Analog Output	Int 32	Read	AO1	Monitory Purposes (Optional) - Register Holds AO1 Value x100 for Two Implied Decimals
43038/43039	--	Analog Output	Int 32	Read	AO2	Monitory Purposes (Optional) - Register Holds AO2 Value x100 for Two Implied Decimals
43040/43041	--	Analog Output	Int 32	Read	AO3	Monitory Purposes (Optional) - Register Holds AO3 Value x100 for Two Implied Decimals
43042/43043	--	Analog Output	Int 32	Read	AO4	Monitory Purposes (Optional) - Register Holds AO4 Value x100 for Two Implied Decimals

***Additional ModBus information can be found in the manual.

 Control • Power • Information • Communication ModBus Register Mapping

C.13 340-Flow-V2.1

VC-22D ValvApp™ Worksheet

This worksheet is intended for the configuration of ValvApps™ used in the VC-22D Valve Controller. From the information provided below, Cla-Val will determine whether a standard ValvApp™ should be used or if a custom ValvApp™ is required. Additionally, this worksheet acts as a check list during commissioning to verify all parameters have been correctly configured in the VC-22D Valve Controller. Once this worksheet is completed, please return to your Cla-Val representative for approval. If a custom ValvApp is required and approved, a custom wiring diagram and ValvApp™ will be created and emailed to you. Please verify all *Required fields have been filled out prior to submittal.

Information — Reset Form — Configuration: VC-22D

*Project Name	N/A	*Today's Date	12/19/22
*Cla-Val Representive	N/A	Project Completion Date	
Control Valve Model Number (if known)	340	Customer Approval Signature	

Valve Regulation *(If more than 2 PID's are required, specify in logic on page 2)*

☐ PID 1 - Valve Regulation	*Solenoid Config		☐ PID 2 - Valve Regulation	PID Selection Mode			
*Control Type		*Signal Loss		Control Type		Signal Loss	
Deadband (+/-)		Ramping		Deadband (+/-)		Ramping	

DP Metering (133 Valve)

☐ *DP Metering* — Pressure Measurement: ◉ P1+P2 ○ DPT — Output

Size | Body Style | Seat | Units | Output Scaling

Totalizer

☐ *Totalizer* — Reset | Units | Ouput | Output Scaling

Analog Inputs (4-20mA) *6 Available*

	Name	Units	Scaling 4mA =	Scaling 20mA =	Signal Powered by Controller	Decimal
☑ *Analog Input #1* (Typically reserved for control setpoint signal)	Flow SP		4 mA	20 mA	☐	0.00
☑ *Analog Input #2* (Typically reserved for control feedback signal)	34 Actuator Feedback		4 mA	20 mA	☐	0.00
☐ *Analog Input #3*					☐	
☐ *Analog Input #4*					☐	
☐ *Analog Input #5*					☐	
☐ *Analog Input #6*					☐	

Digital Inputs *6 Available*

☐ *Digital Input 1* Name / Purpose	☐ *Digital Input 2* Name / Purpose	☐ *Digital Input 3* Name / Purpose
☐ *Digital Input 4* Name / Purpose	☐ *Digital Input 5* Name / Purpose	☐ *Digital Input 6* Name / Purpose

 Control • Power • Information • Communication Page 1 of 3

Form Rev. 4

Analog Outputs (4-20mA) *Note: Analog Outputs are sourced with controller power.*

☑ *Analog Output #1*
Name: 34 Actuator Command | Units: | Scaling: 4mA = 4 mA | 20mA = 20 mA | Decimal: 0.00

☐ *Analog Output #2*
Name: | Units: | Scaling: 4mA = | 20mA = | Decimal:

☐ *Analog Output #3*
Name: | Units: | Scaling: 4mA = | 20mA = | Decimal:

☐ *Analog Output #4*
Name: | Units: | Scaling: 4mA = | 20mA = | Decimal:

Solenoid Outputs

☐ *****Solenoid Output #1 (SO1)*
Name:
Default: Closing Solenoid

☐ *Solenoid Output #2 (SO2)*
Name:
Default: Opening Solenoid

Note: *SO1 and SO2 are a powered solid state output typically reserved for solenoids used on a 131 or 133 series valve. The output can be configured as PWM (default) or Discrete ON/OFF. If configured as discrete, a value of 0 represents an open circuit, and 1 a closed circuit.*

Relay Output

☐ *Relay Output #1 (RO1)*
Name:

☐ *Relay Output #2 (RO2)*
Name:

Note: *RO1 and RO2 are configured as dry contact mechanical relays typically used for alarms. These outputs are configured as Discrete ON/OFF, a value of 0 represents an open circuit, and 1 a closed circuit.*

Actions/Alarms

☐ *Action #1*
Name: | Describe:
Additional Comments

☐ *Action #2*
Name: | Describe:
Additional Comments

☐ *Action #3*
Name: | Describe:
Additional Comments

☐ *Action #4*
Name: | Describe:
Additional Comments

Communication

☐ **GSM/GPRS** ☐ **Modbus TCP/IP** ☐ **Modbus RTU (RS485/RS232)**

Note: *See ModBus specification page for register mapping and implementation. Refer to manual for more details.*

***Control Logic** (*Please specify all control logic using sketches, diagrams, etc. Attach additional sheets if necessary*)

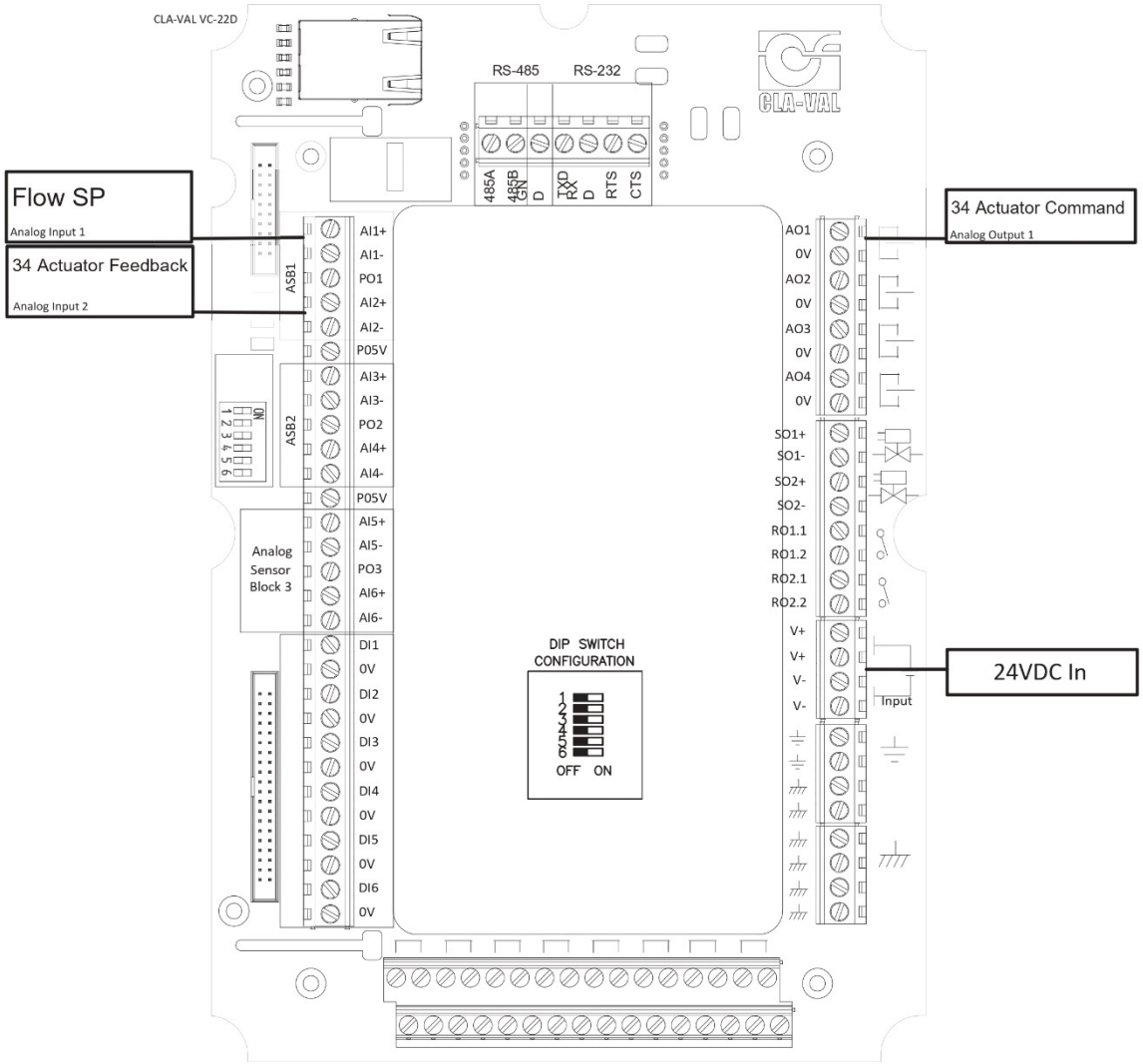
This ValvApp provides a standard open loop flow control function for a 340 series valve. The VC-22D will transmit the flow setpoint via a 4-20mA signal to the 34 series actuator. The 34 series actuator is calibrated to move to a position that applies appropriate spring force on the pilot based on the flow setpoint it receives.

DI1 and AI3 have been added into this program, even though they are currently not used for anything. These serve as spare IO points so additional functionality can be added in the field by landing signal cables on these IO points and configuring actions in the VC-22D.

A flow offset interactive variable has been included. This may be adjusted in the field if the 34 series actuator feedback and command do not match each other.

 Control • Power • Information • Communication Page 2 of 3

* This is only to give an idea of where wires will be landed. Does not account for number of wires and Loop or Field powered. Please refer to **Electrical Wiring** section of VC-22D IOM for help wiring loop or field powered devices.



 Control • Power • Information • Communication Page 3 of 3

Cla-Val VC-22D Modbus Addresses

Project Name: N/A
Date:

Modbus	Input	Description	Data Type	Access	I/O Mapping	Comments
40007 Bit 0	Flow SP	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI1 Input to use Modbus Address 43000/43001
40007 Bit 1	34 Actuator Feedback	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI2 Input to use Modbus Address 43002/43003
40007 Bit 2	Spare	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI3 Input to use Modbus Address 43004/43005
40007 Bit 3	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI4 Input to use Modbus Address 43006/43007
40007 Bit 4	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI5 Input to use Modbus Address 43008/43009
40007 Bit 5	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI6 Input to use Modbus Address 43010/43011
40008 Bit 0	Spare	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI1 Input to use Modbus Address 41000
40008 Bit 1	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI2 Input to use Modbus Address 41001
40008 Bit 2	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI3 Input to use Modbus Address 41002
40008 Bit 3	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI4 Input to use Modbus Address 41003
40008 Bit 4	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI5 Input to use Modbus Address 41004
40008 Bit 5	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI6 Input to use Modbus Address 41005
41000	Spare	Digital Input	Word	Read/Write	DI1	Register Holds/Reads DI1 Value
41001	--	Digital Input	Word	Read/Write	DI2	Register Holds/Reads DI2 Value
41002	--	Digital Input	Word	Read/Write	DI3	Register Holds/Reads DI3 Value
41003	--	Digital Input	Word	Read/Write	DI4	Register Holds/Reads DI4 Value
41004	--	Digital Input	Word	Read/Write	DI5	Register Holds/Reads DI5 Value
41005	--	Digital Input	Word	Read/Write	DI6	Register Holds/Reads DI6 Value
41006	--	Digital Output	Word	Read	S01	Monitory Purposes (Optional)
41007	--	Digital Output	Word	Read	S02	Monitory Purposes (Optional)
41008	--	Digital Output	Word	Read	R01	Monitory Purposes (Optional)
41009	--	Digital Output	Word	Read	R02	Monitory Purposes (Optional)
43000/43001	Flow SP	Analog Input	Int 32	Read/Write	AI1	Register Holds/Reads AI1 Value x100 for Two Implied Decimals
43002/43003	34 Actuator Feedback	Analog Input	Int 32	Read/Write	AI2	Register Holds/Reads AI2 Value x100 for Two Implied Decimals
43004/43005	Spare	Analog Input	Int 32	Read/Write	AI3	Register Holds/Reads AI3 Value x100 for Two Implied Decimals
43006/43007	--	Analog Input	Int 32	Read/Write	AI4	Register Holds/Reads AI4 Value x100 for Two Implied Decimals
43008/43009	--	Analog Input	Int 32	Read/Write	AI5	Register Holds/Reads AI5 Value x100 for Two Implied Decimals
43010/43011	--	Analog Input	Int 32	Read/Write	AI6	Register Holds/Reads AI6 Value x100 for Two Implied Decimals
43036/43037	34 Actuator Command	Analog Output	Int 32	Read	AO1	Monitory Purposes (Optional) - Register Holds AO1 Value x100 for Two Implied Decimals
43038/43039	--	Analog Output	Int 32	Read	AO2	Monitory Purposes (Optional) - Register Holds AO2 Value x100 for Two Implied Decimals
43040/43041	--	Analog Output	Int 32	Read	AO3	Monitory Purposes (Optional) - Register Holds AO3 Value x100 for Two Implied Decimals
43042/43043	--	Analog Output	Int 32	Read	AO4	Monitory Purposes (Optional) - Register Holds AO4 Value x100 for Two Implied Decimals

***Additional ModBus information can be found in the manual.

Control • Power • Information • Communication
ModBus Register Mapping

C.14 350-PressureSustaining-P1-V2.1

VC-22D ValvApp™ Worksheet

This worksheet is intended for the configuration of ValvApps™ used in the VC-22D Valve Controller. From the information provided below, Cla-Val will determine whether a standard ValvApp™ should be used or if a custom ValvApp™ is required. Additionally, this worksheet acts as a check list during commissioning to verify all parameters have been correctly configured in the VC-22D Valve Controller. Once this worksheet is completed, please return to your Cla-Val representative for approval. If a custom ValvApp is required and approved, a custom wiring diagram and ValvApp™ will be created and emailed to you. Please verify all *Required fields have been filled out prior to submittal.

Information — Reset Form — Configuration: VC-22D

*Project Name	N/A	*Today's Date	12/19/22
*Cla-Val Representive	N/A	Project Completion Date	
Control Valve Model Number (if known)	350	Customer Approval Signature	

Valve Regulation *(If more than 2 PID's are required, specify in logic on page 2)*

☐ PID 1 - Valve Regulation	*Solenoid Config		☐ PID 2 - Valve Regulation	PID Selection Mode			
*Control Type		*Signal Loss		Control Type		Signal Loss	
Deadband (+/-)		Ramping		Deadband (+/-)		Ramping	

DP Metering (133 Valve)

☐ *DP Metering*	Pressure Measurement	◉ P1+P2 ○ DPT			Output	
Size		Body Style		Seat	Units	Output Scaling

Totalizer

☐ *Totalizer*	Reset		Units	Ouput	Output Scaling

Analog Inputs (4-20mA) *6 Available*

☑ *Analog Input #1 (Typically reserved for control setpoint signal)*	Scaling	☐ Signal Powered by Controller						
Name: Pressure Sustaining Setpoint	Units: psi	4mA = 20 psi	20mA = 145 psi	Decimal: 0.0				
☑ *Analog Input #2 (Typically reserved for control feedback signal)*	Scaling	☑ Signal Powered by Controller						
Name: Upstream Pressure	Units: psi	4mA = 0 psi	20mA = 290 psi	Decimal: 0.0				
☑ *Analog Input #3*	Scaling	☐ Signal Powered by Controller						
Name: 34 Actuator Feedback	Units: psi	4mA = 20 psi	20mA = 145 psi	Decimal: 0.0				
☐ *Analog Input #4*	Scaling	☐ Signal Powered by Controller						
Name	Units	4mA =	20mA =	Decimal				
☐ *Analog Input #5*	Scaling	☐ Signal Powered by Controller						
Name	Units	4mA =	20mA =	Decimal				
☐ *Analog Input #6*	Scaling	☐ Signal Powered by Controller						
Name	Units	4mA =	20mA =	Decimal				

Digital Inputs *6 Available*

☐ *Digital Input 1* Name	☐ *Digital Input 2* Name	☐ *Digital Input 3* Name
Purpose	Purpose	Purpose
☐ *Digital Input 4* Name	☐ *Digital Input 5* Name	☐ *Digital Input 6* Name
Purpose	Purpose	Purpose

 Control • Power • Information • Communication

Form Rev. 4

Analog Outputs (4-20mA) *Note: Analog Outputs are sourced with controller power.*

☑ *Analog Output #1*
Name: 34 Actuator Command | Units: psi | Scaling: 4mA = 20 psi | 20mA = 145 psi | Decimal: 0.0

☐ *Analog Output #2*
Name: | Units: | Scaling: 4mA = | 20mA = | Decimal:

☐ *Analog Output #3*
Name: | Units: | Scaling: 4mA = | 20mA = | Decimal:

☐ *Analog Output #4*
Name: | Units: | Scaling: 4mA = | 20mA = | Decimal:

Solenoid Outputs

☐ **Solenoid Output #1 (SO1)*
Name:
Default: Closing Solenoid

☐ *Solenoid Output #2 (SO2)*
Name:
Default: Opening Solenoid

Note: *SO1 and SO2 are a powered solid state output typically reserved for solenoids used on a 131 or 133 series valve. The output can be configured as PWM (default) or Discrete ON/OFF. If configured as discrete, a value of 0 represents an open circuit, and 1 a closed circuit.*

Relay Output

☐ *Relay Output #1 (RO1)*
Name:

☐ *Relay Output #2 (RO2)*
Name:

Note: *RO1 and RO2 are configured as dry contact mechanical relays typically used for alarms. These outputs are configured as Discrete ON/OFF, a value of 0 represents an open circuit, and 1 a closed circuit.*

Actions/Alarms

☐ *Action #1*
Name: | Describe:
Additional Comments

☐ *Action #2*
Name: | Describe:
Additional Comments

☐ *Action #3*
Name: | Describe:
Additional Comments

☐ *Action #4*
Name: | Describe:
Additional Comments

Communication

☐ **GSM/GPRS** ☐ **Modbus TCP/IP** ☐ **Modbus RTU (RS485/RS232)**

Note: *See ModBus specification page for register mapping and implementation. Refer to manual for more details.*

***Control Logic** (*Please specify all control logic using sketches, diagrams, etc. Attach additional sheets if necessary*)

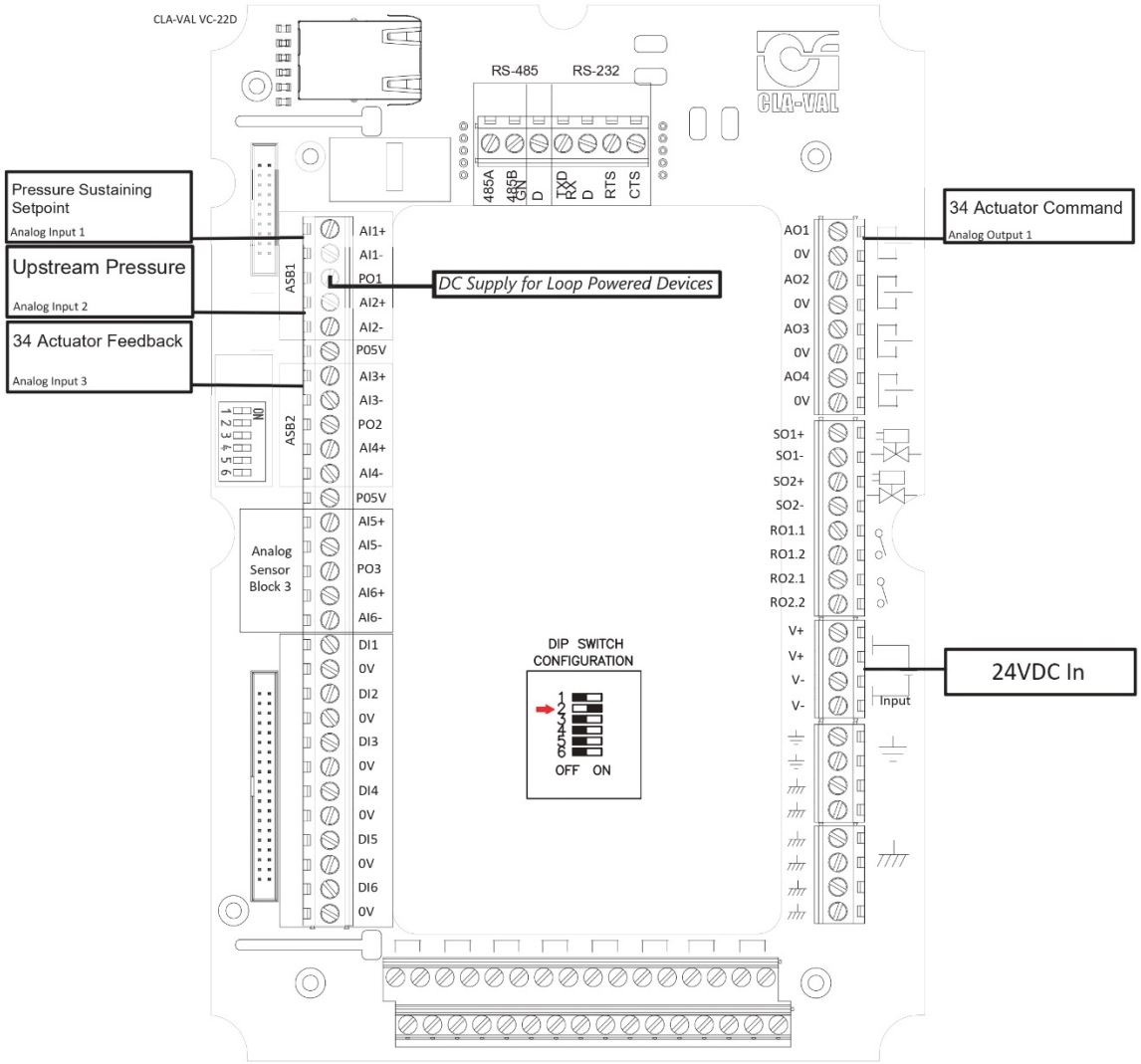
This ValvApp provides a standard open loop pressure sustaining control function for a 350 series valve. The VC-22D will transmit the pressure setpoint via a 4-20mA signal to the 34 series actuator. The 34 series actuator is calibrated to move to a position that applies appropriate spring force on the pilot based on the pressure setpoint it receives.

DI1 has been added into this program, even though it is currently not used for anything. This serves as a spare IO point so additional functionality can be added in the field by landing signal cables on this IO point and configuring actions in the VC-22D.

A pressure offset interactive variable has been included. This may be adjusted in the field if the 34 series actuator feedback and command do not match each other.

 Control • Power • Information • Communication Page 2 of 3

* This is only to give an idea of where wires will be landed. Does not account for number of wires and Loop or Field powered. Please refer to **Electrical Wiring** section of VC-22D IOM for help wiring loop or field powered devices.



 Control • Power • Information • Communication Page 3 of 3

Cla-Val VC-22D Modbus Addresses

Project Name: N/A
Date:

Modbus	Input	Description	Data Type	Access	I/O Mapping	Comments
40007 Bit 0	Pressure Sustaining Setpoint	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI1 Input to use Modbus Address 43000/43001
40007 Bit 1	Upstream Pressure	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI2 Input to use Modbus Address 43002/43003
40007 Bit 2	34 Actuator Feedback	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI3 Input to use Modbus Address 43004/43005
40007 Bit 3	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI4 Input to use Modbus Address 43006/43007
40007 Bit 4	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI5 Input to use Modbus Address 43008/43009
40007 Bit 5	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI6 Input to use Modbus Address 43010/43011
40008 Bit 0	Spare	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI1 Input to use Modbus Address 41000
40008 Bit 1	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI2 Input to use Modbus Address 41001
40008 Bit 2	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI3 Input to use Modbus Address 41002
40008 Bit 3	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI4 Input to use Modbus Address 41003
40008 Bit 4	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI5 Input to use Modbus Address 41004
40008 Bit 5	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI6 Input to use Modbus Address 41005
41000	Spare	Digital Input	Word	Read/Write	DI1	Register Holds/Reads DI1 Value
41001	--	Digital Input	Word	Read/Write	DI2	Register Holds/Reads DI2 Value
41002	--	Digital Input	Word	Read/Write	DI3	Register Holds/Reads DI3 Value
41003	--	Digital Input	Word	Read/Write	DI4	Register Holds/Reads DI4 Value
41004	--	Digital Input	Word	Read/Write	DI5	Register Holds/Reads DI5 Value
41005	--	Digital Input	Word	Read/Write	DI6	Register Holds/Reads DI6 Value
41006	--	Digital Output	Word	Read	S01	Monitory Purposes (Optional)
41007	--	Digital Output	Word	Read	S02	Monitory Purposes (Optional)
41008	--	Digital Output	Word	Read	R01	Monitory Purposes (Optional)
41009	--	Digital Output	Word	Read	R02	Monitory Purposes (Optional)
43000/43001	Pressure Sustaining Setpoint	Analog Input	Int 32	Read/Write	AI1	Register Holds/Reads AI1 Value x100 for Two Implied Decimals
43002/43003	Upstream Pressure	Analog Input	Int 32	Read/Write	AI2	Register Holds/Reads AI2 Value x100 for Two Implied Decimals
43004/43005	34 Actuator Feedback	Analog Input	Int 32	Read/Write	AI3	Register Holds/Reads AI3 Value x100 for Two Implied Decimals
43006/43007	--	Analog Input	Int 32	Read/Write	AI4	Register Holds/Reads AI4 Value x100 for Two Implied Decimals
43008/43009	--	Analog Input	Int 32	Read/Write	AI5	Register Holds/Reads AI5 Value x100 for Two Implied Decimals
43010/43011	--	Analog Input	Int 32	Read/Write	AI6	Register Holds/Reads AI6 Value x100 for Two Implied Decimals
43036/43037	34 Actuator Command	Analog Output	Int 32	Read	AO1	Monitory Purposes (Optional) - Register Holds AO1 Value x100 for Two Implied Decimals
43038/43039	--	Analog Output	Int 32	Read	AO2	Monitory Purposes (Optional) - Register Holds AO2 Value x100 for Two Implied Decimals
43040/43041	--	Analog Output	Int 32	Read	AO3	Monitory Purposes (Optional) - Register Holds AO3 Value x100 for Two Implied Decimals
43042/43043	--	Analog Output	Int 32	Read	AO4	Monitory Purposes (Optional) - Register Holds AO4 Value x100 for Two Implied Decimals

***Additional ModBus information can be found in the manual.

Control • Power • Information • Communication
ModBus Register Mapping

C.15 350-PressureSustaining-V2.1

VC-22D ValvApp™ Worksheet

This worksheet is intended for the configuration of ValvApps™ used in the VC-22D Valve Controller. From the information provided below, Cla-Val will determine whether a standard ValvApp™ should be used or if a custom ValvApp™ is required. Additionally, this worksheet acts as a check list during commissioning to verify all parameters have been correctly configured in the VC-22D Valve Controller. Once this worksheet is completed, please return to your Cla-Val representative for approval. If a custom ValvApp is required and approved, a custom wiring diagram and ValvApp™ will be created and emailed to you. Please verify all *Required fields have been filled out prior to submittal.

Information — Reset Form — Configuration: VC-22D

*Project Name	N/A	*Today's Date	12/19/22
*Cla-Val Representive	N/A	Project Completion Date	
Control Valve Model Number (if known)	350	Customer Approval Signature	

Valve Regulation *(If more than 2 PID's are required, specify in logic on page 2)*

☐ PID 1 - Valve Regulation	*Solenoid Config		☐ PID 2 - Valve Regulation	PID Selection Mode	
*Control Type		*Signal Loss		Control Type		Signal Loss	
Deadband (+/-)		Ramping		Deadband (+/-)		Ramping	

DP Metering (133 Valve)

☐ *DP Metering* — Pressure Measurement: ◉ P1+P2 ○ DPT — Output

Size | Body Style | Seat | Units | Output Scaling

Totalizer

☐ *Totalizer* — Reset | Units | Ouput | Output Scaling

Analog Inputs (4-20mA) *6 Available*

	Name	Units	Scaling	4mA =	20mA =	Signal Powered by Controller	Decimal
☑ *Analog Input #1* (Typically reserved for control setpoint signal)	Pressure Sustaining Setpoint	psi		20 psi	145 psi	☐	0.0
☑ *Analog Input #2* (Typically reserved for control feedback signal)	34 Actuator Feedback	psi		20 psi	145 psi	☐	0.0
☐ *Analog Input #3*						☐	
☐ *Analog Input #4*						☐	
☐ *Analog Input #5*						☐	
☐ *Analog Input #6*						☐	

Digital Inputs *6 Available*

☐ *Digital Input 1* Name / Purpose	☐ *Digital Input 2* Name / Purpose	☐ *Digital Input 3* Name / Purpose
☐ *Digital Input 4* Name / Purpose	☐ *Digital Input 5* Name / Purpose	☐ *Digital Input 6* Name / Purpose

 Control • Power • Information • Communication

Form Rev. 4

Analog Outputs (4-20mA) *Note: Analog Outputs are sourced with controller power.*

☑ *Analog Output #1*
Name: 34 Actuator Command | Units: psi | Scaling: 4mA = 20 psi | 20mA = 145 psi | Decimal: 0.0

☐ *Analog Output #2*
Name: | Units: | Scaling: 4mA = | 20mA = | Decimal:

☐ *Analog Output #3*
Name: | Units: | Scaling: 4mA = | 20mA = | Decimal:

☐ *Analog Output #4*
Name: | Units: | Scaling: 4mA = | 20mA = | Decimal:

Solenoid Outputs

☐ **Solenoid Output #1 (SO1)*
Name:
Default: Closing Solenoid

☐ *Solenoid Output #2 (SO2)*
Name:
Default: Opening Solenoid

Note: *SO1 and SO2 are a powered solid state output typically reserved for solenoids used on a 131 or 133 series valve. The output can be configured as PWM (default) or Discrete ON/OFF. If configured as discrete, a value of 0 represents an open circuit, and 1 a closed circuit.*

Relay Output

☐ *Relay Output #1 (RO1)*
Name:

☐ *Relay Output #2 (RO2)*
Name:

Note: *RO1 and RO2 are configured as dry contact mechanical relays typically used for alarms. These outputs are configured as Discrete ON/OFF; a value of 0 represents an open circuit, and 1 a closed circuit.*

Actions/Alarms

☐ *Action #1*
Name: | Describe:
Additional Comments

☐ *Action #2*
Name: | Describe:
Additional Comments

☐ *Action #3*
Name: | Describe:
Additional Comments

☐ *Action #4*
Name: | Describe:
Additional Comments

Communication

☐ **GSM/GPRS** ☐ **Modbus TCP/IP** ☐ **Modbus RTU (RS485/RS232)**

Note: *See ModBus specification page for register mapping and implementation. Refer to manual for more details.*

***Control Logic** (*Please specify all control logic using sketches, diagrams, etc. Attach additional sheets if necessary*)

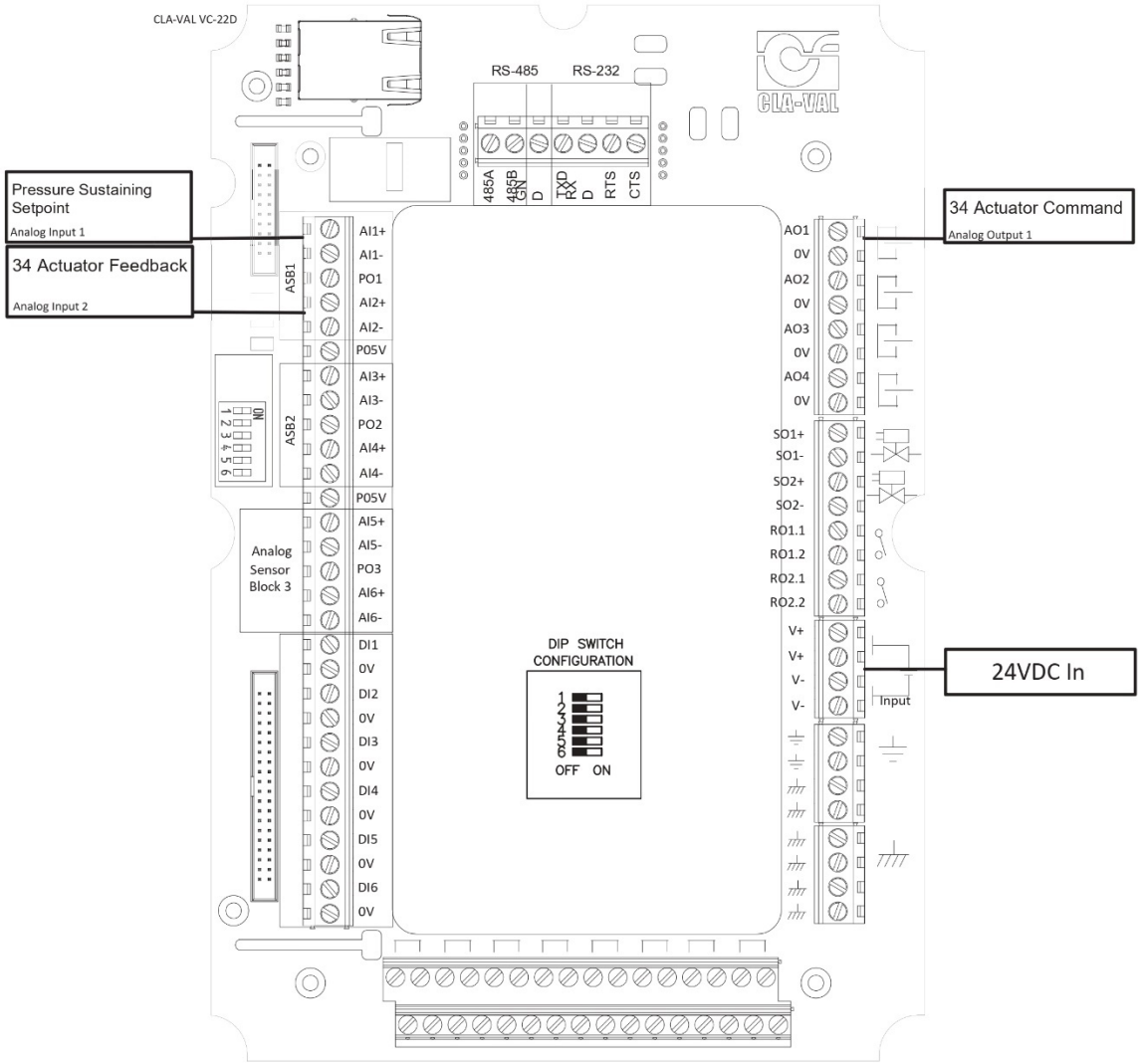
This ValvApp provides a standard open loop pressure sustaining control function for a 350 series valve. The VC-22D will transmit the pressure setpoint via a 4-20mA signal to the 34 series actuator. The 34 series actuator is calibrated to move to a position that applies appropriate spring force on the pilot based on the pressure setpoint it receives.

DI1 and AI3 have been added into this program, even though they are currently not used for anything. These serve as spare IO points so additional functionality can be added in the field by landing signal cables on these IO points and configuring actions in the VC-22D.

A pressure offset interactive variable has been included. This may be adjusted in the field if the 34 series actuator feedback and command do not match each other.

 Control • Power • Information • Communication Page 2 of 3

* This is only to give an idea of where wires will be landed. Does not account for number of wires and Loop or Field powered. Please refer to **Electrical Wiring** section of VC-22D IOM for help wiring loop or field powered devices.



Cla-Val VC-22D Modbus Addresses

Project Name: N/A
Date:

Modbus	Input	Description	Data Type	Access	I/O Mapping	Comments
40007 Bit 0	Pressure Sustaining Setpoint	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI1 Input to use Modbus Address 43000/43001
40007 Bit 1	34 Actuator Feedback	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI2 Input to use Modbus Address 43002/43003
40007 Bit 2	Spare	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI3 Input to use Modbus Address 43004/43005
40007 Bit 3	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI4 Input to use Modbus Address 43006/43007
40007 Bit 4	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI5 Input to use Modbus Address 43008/43009
40007 Bit 5	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI6 Input to use Modbus Address 43010/43011
40008 Bit 0	Spare	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI1 Input to use Modbus Address 41000
40008 Bit 1	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI2 Input to use Modbus Address 41001
40008 Bit 2	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI3 Input to use Modbus Address 41002
40008 Bit 3	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI4 Input to use Modbus Address 41003
40008 Bit 4	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI5 Input to use Modbus Address 41004
40008 Bit 5	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI6 Input to use Modbus Address 41005
41000	Spare	Digital Input	Word	Read/Write	DI1	Register Holds/Reads DI1 Value
41001	--	Digital Input	Word	Read/Write	DI2	Register Holds/Reads DI2 Value
41002	--	Digital Input	Word	Read/Write	DI3	Register Holds/Reads DI3 Value
41003	--	Digital Input	Word	Read/Write	DI4	Register Holds/Reads DI4 Value
41004	--	Digital Input	Word	Read/Write	DI5	Register Holds/Reads DI5 Value
41005	--	Digital Input	Word	Read/Write	DI6	Register Holds/Reads DI6 Value
41006	--	Digital Output	Word	Read	S01	Monitory Purposes (Optional)
41007	--	Digital Output	Word	Read	S02	Monitory Purposes (Optional)
41008	--	Digital Output	Word	Read	R01	Monitory Purposes (Optional)
41009	--	Digital Output	Word	Read	R02	Monitory Purposes (Optional)
43000/43001	Pressure Sustaining Setpoint	Analog Input	Int 32	Read/Write	AI1	Register Holds/Reads AI1 Value x100 for Two Implied Decimals
43002/43003	34 Actuator Feedback	Analog Input	Int 32	Read/Write	AI2	Register Holds/Reads AI2 Value x100 for Two Implied Decimals
43004/43005	Spare	Analog Input	Int 32	Read/Write	AI3	Register Holds/Reads AI3 Value x100 for Two Implied Decimals
43006/43007	--	Analog Input	Int 32	Read/Write	AI4	Register Holds/Reads AI4 Value x100 for Two Implied Decimals
43008/43009	--	Analog Input	Int 32	Read/Write	AI5	Register Holds/Reads AI5 Value x100 for Two Implied Decimals
43010/43011	--	Analog Input	Int 32	Read/Write	AI6	Register Holds/Reads AI6 Value x100 for Two Implied Decimals
43036/43037	34 Actuator Command	Analog Output	Int 32	Read	AO1	Monitory Purposes (Optional) - Register Holds AO1 Value x100 for Two Implied Decimals
43038/43039	--	Analog Output	Int 32	Read	AO2	Monitory Purposes (Optional) - Register Holds AO2 Value x100 for Two Implied Decimals
43040/43041	--	Analog Output	Int 32	Read	AO3	Monitory Purposes (Optional) - Register Holds AO3 Value x100 for Two Implied Decimals
43042/43043	--	Analog Output	Int 32	Read	AO4	Monitory Purposes (Optional) - Register Holds AO4 Value x100 for Two Implied Decimals

***Additional ModBus information can be found in the manual.

Control • Power • Information • Communication
ModBus Register Mapping

C.16 390-PressureReducing-P2-V2.1

VC-22D ValvApp™ Worksheet

This worksheet is intended for the configuration of ValvApps™ used in the VC-22D Valve Controller. From the information provided below, Cla-Val will determine whether a standard ValvApp™ should be used or if a custom ValvApp™ is required. Additionally, this worksheet acts as a check list during commissioning to verify all parameters have been correctly configured in the VC-22D Valve Controller. Once this worksheet is completed, please return to your Cla-Val representative for approval. If a custom ValvApp is required and approved, a custom wiring diagram and ValvApp™ will be created and emailed to you. Please verify all *Required fields have been filled out prior to submittal.

Information — Reset Form — Configuration: VC-22D

*Project Name	N/A	*Today's Date	12/19/22
*Cla-Val Representive	N/A	Project Completion Date	
Control Valve Model Number (if known)	390	Customer Approval Signature	

Valve Regulation *(If more than 2 PID's are required, specify in logic on page 2)*

☐ PID 1 - Valve Regulation	*Solenoid Config		☐ PID 2 - Valve Regulation	PID Selection Mode			
*Control Type		*Signal Loss		Control Type		Signal Loss	
Deadband (+/-)		Ramping		Deadband (+/-)		Ramping	

DP Metering (133 Valve)

☐ *DP Metering*	Pressure Measurement	◉ P1+P2 ○ DPT			Output	
Size		Body Style		Seat	Units	Output Scaling

Totalizer

☐ *Totalizer*	Reset		Units	Ouput	Output Scaling

Analog Inputs (4-20mA) *6 Available*

☑ *Analog Input #1* *(Typically reserved for control setpoint signal)*	Name: Pressure Reducing Setpoint	Units: psi	Scaling	☐ Signal Powered by Controller	4mA = 40 psi	20mA = 140 psi	Decimal: 0.0
☑ *Analog Input #2* *(Typically reserved for control feedback signal)*	Name: Downstream Pressure	Units: psi	Scaling	☑ Signal Powered by Controller	4mA = 0 psi	20mA = 290 psi	Decimal: 0.0
☑ *Analog Input #3*	Name: 34 Actuator Feedback	Units: psi	Scaling	☐ Signal Powered by Controller	4mA = 40 psi	20mA = 140 psi	Decimal: 0.0
☐ *Analog Input #4*	Name:	Units:	Scaling	☐ Signal Powered by Controller	4mA =	20mA =	Decimal:
☐ *Analog Input #5*	Name:	Units:	Scaling	☐ Signal Powered by Controller	4mA =	20mA =	Decimal:
☐ *Analog Input #6*	Name:	Units:	Scaling	☐ Signal Powered by Controller	4mA =	20mA =	Decimal:

Digital Inputs *6 Available*

☐ *Digital Input 1* Name:	☐ *Digital Input 2* Name:	☐ *Digital Input 3* Name:
Purpose:	Purpose:	Purpose:
☐ *Digital Input 4* Name:	☐ *Digital Input 5* Name:	☐ *Digital Input 6* Name:
Purpose:	Purpose:	Purpose:

 Control • Power • Information • Communication

Form Rev. 4

Analog Outputs (4-20mA) *Note: Analog Outputs are sourced with controller power.*

☑ *Analog Output #1*
Name: 34 Actuator Command | Units: psi | Scaling: 4mA = 40 psi | 20mA = 140 psi | Decimal: 0.0

☐ *Analog Output #2*
Name: | Units: | Scaling: 4mA = | 20mA = | Decimal:

☐ *Analog Output #3*
Name: | Units: | Scaling: 4mA = | 20mA = | Decimal:

☐ *Analog Output #4*
Name: | Units: | Scaling: 4mA = | 20mA = | Decimal:

Solenoid Outputs

☐ **Solenoid Output #1 (SO1)*
Name:
Default: Closing Solenoid

☐ *Solenoid Output #2 (SO2)*
Name:
Default: Opening Solenoid

Note: *SO1 and SO2 are a powered solid state output typically reserved for solenoids used on a 131 or 133 series valve. The output can be configured as PWM (default) or Discrete ON/OFF. If configured as discrete, a value of 0 represents an open circuit, and 1 a closed circuit.*

Relay Output

☐ *Relay Output #1 (RO1)*
Name:

☐ *Relay Output #2 (RO2)*
Name:

Note: *RO1 and RO2 are configured as dry contact mechanical relays typically used for alarms. These outputs are configured as Discrete ON/OFF, a value of 0 represents an open circuit, and 1 a closed circuit.*

Actions/Alarms

☐ *Action #1*
Name: | Describe:
Additional Comments

☐ *Action #2*
Name: | Describe:
Additional Comments

☐ *Action #3*
Name: | Describe:
Additional Comments

☐ *Action #4*
Name: | Describe:
Additional Comments

Communication

☐ **GSM/GPRS** ☐ **Modbus TCP/IP** ☐ **Modbus RTU (RS485/RS232)**

Note: *See ModBus specification page for register mapping and implementation. Refer to manual for more details.*

***Control Logic** (*Please specify all control logic using sketches, diagrams, etc. Attach additional sheets if necessary*)

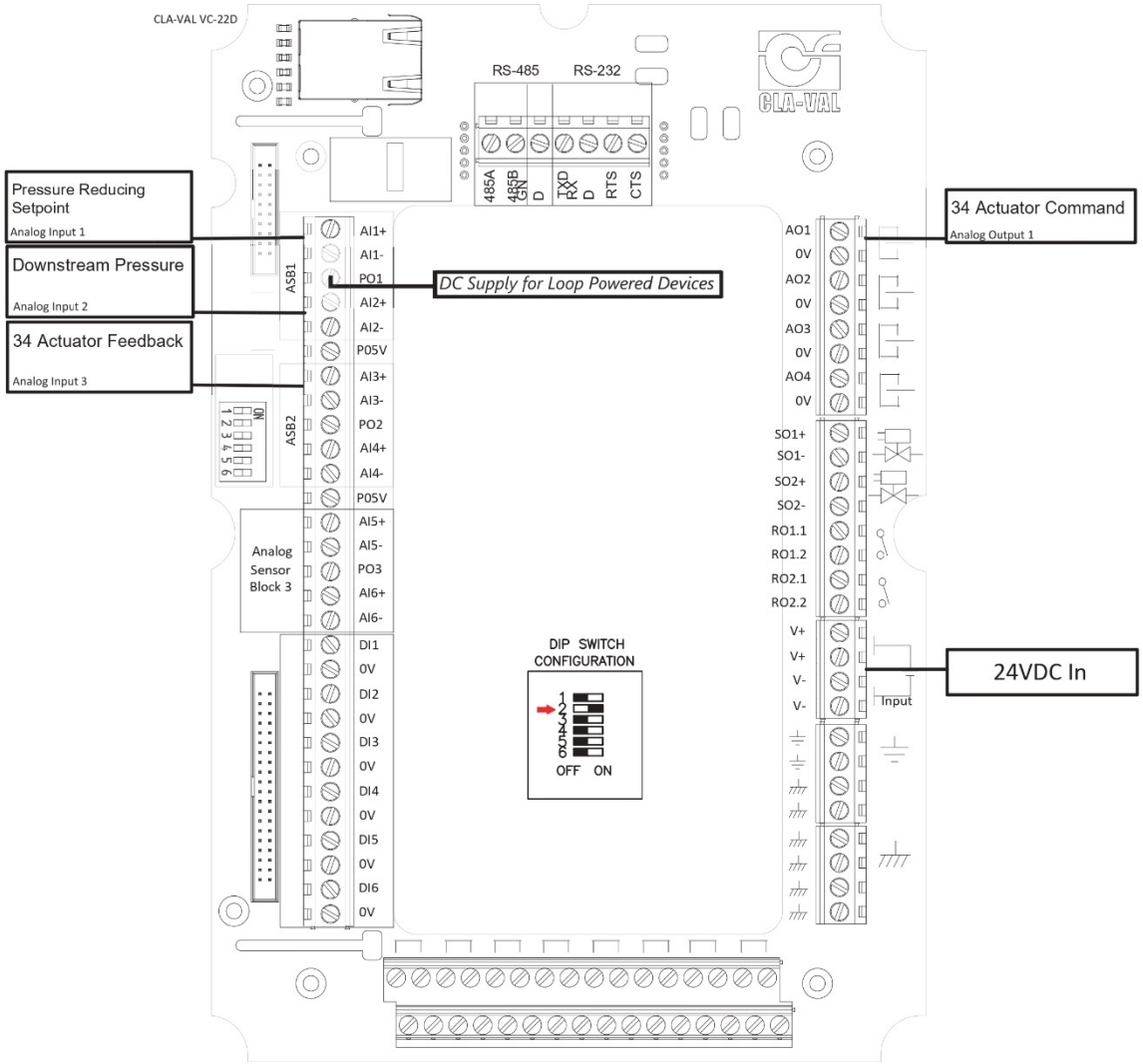
This ValvApp provides a standard open loop pressure reducing control function for a 390 series valve. The VC-22D will transmit the pressure setpoint via a 4-20mA signal to the 34 series actuator. The 34 series actuator is calibrated to move to a position that applies appropriate spring force on the pilot based on the pressure setpoint it receives.

DI1 has been added into this program, even though it is currently not used for anything. This serves as a spare IO point so additional functionality can be added in the field by landing signal cables on this IO point and configuring actions in the VC-22D.

A pressure offset interactive variable has been included. This may be adjusted in the field if the 34 series actuator feedback and command do not match each other.

 Control • Power • Information • Communication Page 2 of 3

* This is only to give an idea of where wires will be landed. Does not account for number of wires and Loop or Field powered. Please refer to **Electrical Wiring** section of VC-22D IOM for help wiring loop or field powered devices.



 Control • Power • Information • Communication Page 3 of 3

Cla-Val VC-22D Modbus Addresses

Project Name: N/A
Date:

Modbus	Input	Description	Data Type	Access	I/O Mapping	Comments
40007 Bit 0	Pressure Reducing Setpoint	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI1 Input to use Modbus Address 43000/43001
40007 Bit 1	Downstream Pressure	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI2 Input to use Modbus Address 43002/43003
40007 Bit 2	34 Actuator Feedback	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI3 Input to use Modbus Address 43004/43005
40007 Bit 3	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI4 Input to use Modbus Address 43006/43007
40007 Bit 4	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI5 Input to use Modbus Address 43008/43009
40007 Bit 5	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI6 Input to use Modbus Address 43010/43011
40008 Bit 0	Spare	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI1 Input to use Modbus Address 41000
40008 Bit 1	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI2 Input to use Modbus Address 41001
40008 Bit 2	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI3 Input to use Modbus Address 41002
40008 Bit 3	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI4 Input to use Modbus Address 41003
40008 Bit 4	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI5 Input to use Modbus Address 41004
40008 Bit 5	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI6 Input to use Modbus Address 41005
41000	Spare	Digital Input	Word	Read/Write	DI1	Register Holds/Reads DI1 Value
41001	--	Digital Input	Word	Read/Write	DI2	Register Holds/Reads DI2 Value
41002	--	Digital Input	Word	Read/Write	DI3	Register Holds/Reads DI3 Value
41003	--	Digital Input	Word	Read/Write	DI4	Register Holds/Reads DI4 Value
41004	--	Digital Input	Word	Read/Write	DI5	Register Holds/Reads DI5 Value
41005	--	Digital Input	Word	Read/Write	DI6	Register Holds/Reads DI6 Value
41006	--	Digital Output	Word	Read	S01	Monitory Purposes (Optional)
41007	--	Digital Output	Word	Read	S02	Monitory Purposes (Optional)
41008	--	Digital Output	Word	Read	R01	Monitory Purposes (Optional)
41009	--	Digital Output	Word	Read	R02	Monitory Purposes (Optional)
43000/43001	Pressure Reducing Setpoint	Analog Input	Int 32	Read/Write	AI1	Register Holds/Reads AI1 Value x100 for Two Implied Decimals
43002/43003	Downstream Pressure	Analog Input	Int 32	Read/Write	AI2	Register Holds/Reads AI2 Value x100 for Two Implied Decimals
43004/43005	34 Actuator Feedback	Analog Input	Int 32	Read/Write	AI3	Register Holds/Reads AI3 Value x100 for Two Implied Decimals
43006/43007	--	Analog Input	Int 32	Read/Write	AI4	Register Holds/Reads AI4 Value x100 for Two Implied Decimals
43008/43009	--	Analog Input	Int 32	Read/Write	AI5	Register Holds/Reads AI5 Value x100 for Two Implied Decimals
43010/43011	--	Analog Input	Int 32	Read/Write	AI6	Register Holds/Reads AI6 Value x100 for Two Implied Decimals
43036/43037	34 Actuator Command	Analog Output	Int 32	Read	AO1	Monitory Purposes (Optional) - Register Holds AO1 Value x100 for Two Implied Decimals
43038/43039	--	Analog Output	Int 32	Read	AO2	Monitory Purposes (Optional) - Register Holds AO2 Value x100 for Two Implied Decimals
43040/43041	--	Analog Output	Int 32	Read	AO3	Monitory Purposes (Optional) - Register Holds AO3 Value x100 for Two Implied Decimals
43042/43043	--	Analog Output	Int 32	Read	AO4	Monitory Purposes (Optional) - Register Holds AO4 Value x100 for Two Implied Decimals

***Additional ModBus information can be found in the manual.

 Control • Power • Information • Communication ModBus Register Mapping

C.17 390-PressureReducing-V2.1

VC-22D ValvApp™ Worksheet

This worksheet is intended for the configuration of ValvApps™ used in the VC-22D Valve Controller. From the information provided below, Cla-Val will determine whether a standard ValvApp™ should be used or if a custom ValvApp™ is required. Additionally, this worksheet acts as a check list during commissioning to verify all parameters have been correctly configured in the VC-22D Valve Controller. Once this worksheet is completed, please return to your Cla-Val representative for approval. If a custom ValvApp is required and approved, a custom wiring diagram and ValvApp™ will be created and emailed to you. Please verify all *Required fields have been filled out prior to submittal.

Information — Reset Form — Configuration: VC-22D

*Project Name	N/A	*Today's Date	12/19/22
*Cla-Val Representive	N/A	Project Completion Date	
Control Valve Model Number (if known)	390	Customer Approval Signature	

Valve Regulation *(If more than 2 PID's are required, specify in logic on page 2)*

☐ PID 1 - Valve Regulation	*Solenoid Config		☐ PID 2 - Valve Regulation	PID Selection Mode	
*Control Type		*Signal Loss	Control Type		Signal Loss
Deadband (+/-)		Ramping	Deadband (+/-)		Ramping

DP Metering (133 Valve)

☐ *DP Metering* — Pressure Measurement: ◉ P1+P2 ○ DPT — Output

Size | Body Style | Seat | Units | Output Scaling

Totalizer

☐ *Totalizer* — Reset | Units | Ouput | Output Scaling

Analog Inputs (4-20mA) *6 Available*

	Name	Units	Scaling 4mA =	20mA =	Signal Powered by Controller	Decimal
☑ *Analog Input #1 (Typically reserved for control setpoint signal)	Pressure Reducing Setpoint	psi	40 psi	140 psi	☐	0.0
☑ *Analog Input #2 (Typically reserved for control feedback signal)	34 Actuator Feedback	psi	40 psi	140 psi	☐	0.0
☐ *Analog Input #3*					☐	
☐ *Analog Input #4*					☐	
☐ *Analog Input #5*					☐	
☐ *Analog Input #6*					☐	

Digital Inputs *6 Available*

☐ *Digital Input 1* Name / Purpose	☐ *Digital Input 2* Name / Purpose	☐ *Digital Input 3* Name / Purpose
☐ *Digital Input 4* Name / Purpose	☐ *Digital Input 5* Name / Purpose	☐ *Digital Input 6* Name / Purpose

 Control • Power • Information • Communication Page 1 of 3

Form Rev. 4

Analog Outputs (4-20mA) *Note: Analog Outputs are sourced with controller power.*

☑ *Analog Output #1*
Name: 34 Actuator Command | Units: psi | Scaling: 4mA = 40 psi | 20mA = 140 psi | Decimal: 0.0

☐ *Analog Output #2*
Name: | Units: | Scaling: 4mA = | 20mA = | Decimal:

☐ *Analog Output #3*
Name: | Units: | Scaling: 4mA = | 20mA = | Decimal:

☐ *Analog Output #4*
Name: | Units: | Scaling: 4mA = | 20mA = | Decimal:

Solenoid Outputs

☐ **Solenoid Output #1 (SO1)*
Name:
Default: Closing Solenoid

☐ *Solenoid Output #2 (SO2)*
Name:
Default: Opening Solenoid

Note: *SO1 and SO2 are a powered solid state output typically reserved for solenoids used on a 131 or 133 series valve. The output can be configured as PWM (default) or Discrete ON/OFF. If configured as discrete, a value of 0 represents an open circuit, and 1 a closed circuit.*

Relay Output

☐ *Relay Output #1 (RO1)*
Name:

☐ *Relay Output #2 (RO2)*
Name:

Note: *RO1 and RO2 are configured as dry contact mechanical relays typically used for alarms. These outputs are configured as Discrete ON/OFF, a value of 0 represents an open circuit, and 1 a closed circuit.*

Actions/Alarms

☐ *Action #1*
Name: | Describe:
Additional Comments

☐ *Action #2*
Name: | Describe:
Additional Comments

☐ *Action #3*
Name: | Describe:
Additional Comments

☐ *Action #4*
Name: | Describe:
Additional Comments

Communication

☐ **GSM/GPRS** ☐ **Modbus TCP/IP** ☐ **Modbus RTU (RS485/RS232)**

Note: *See ModBus specification page for register mapping and implementation. Refer to manual for more details.*

***Control Logic** (*Please specify all control logic using sketches, diagrams, etc. Attach additional sheets if necessary*)

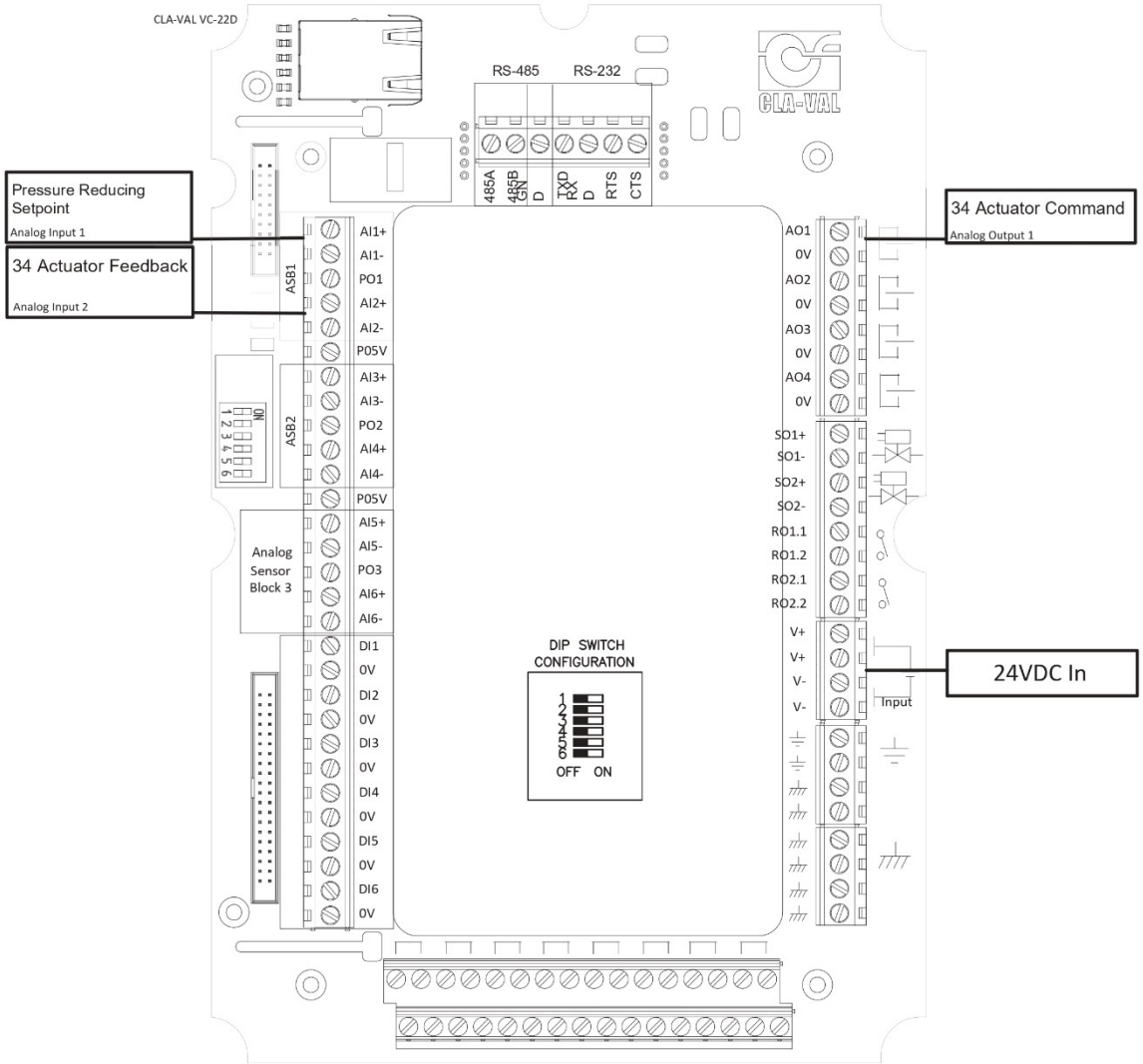
This ValvApp provides a standard open loop pressure reducing control function for a 390 series valve. The VC-22D will transmit the pressure setpoint via a 4-20mA signal to the 34 series actuator. The 34 series actuator is calibrated to move to a position that applies appropriate spring force on the pilot based on the pressure setpoint it receives.

DI1 and AI3 have been added into this program, even though they are currently not used for anything. These serve as spare IO points so additional functionality can be added in the field by landing signal cables on these IO points and configuring actions in the VC-22D.

A pressure offset interactive variable has been included. This may be adjusted in the field if the 34 series actuator feedback and command do not match each other.

 Control • Power • Information • Communication Page 2 of 3

* This is only to give an idea of where wires will be landed. Does not account for number of wires and Loop or Field powered. Please refer to **Electrical Wiring** section of VC-22D IOM for help wiring loop or field powered devices.



Cla-Val VC-22D Modbus Addresses

Project Name: N/A
Date:

Modbus	Input	Description	Data Type	Access	I/O Mapping	Comments
40007 Bit 0	Pressure Reducing Setpoint	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI1 Input to use Modbus Address 43000/43001
40007 Bit 1	34 Actuator Feedback	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI2 Input to use Modbus Address 43002/43003
40007 Bit 2	Spare	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI3 Input to use Modbus Address 43004/43005
40007 Bit 3	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI4 Input to use Modbus Address 43006/43007
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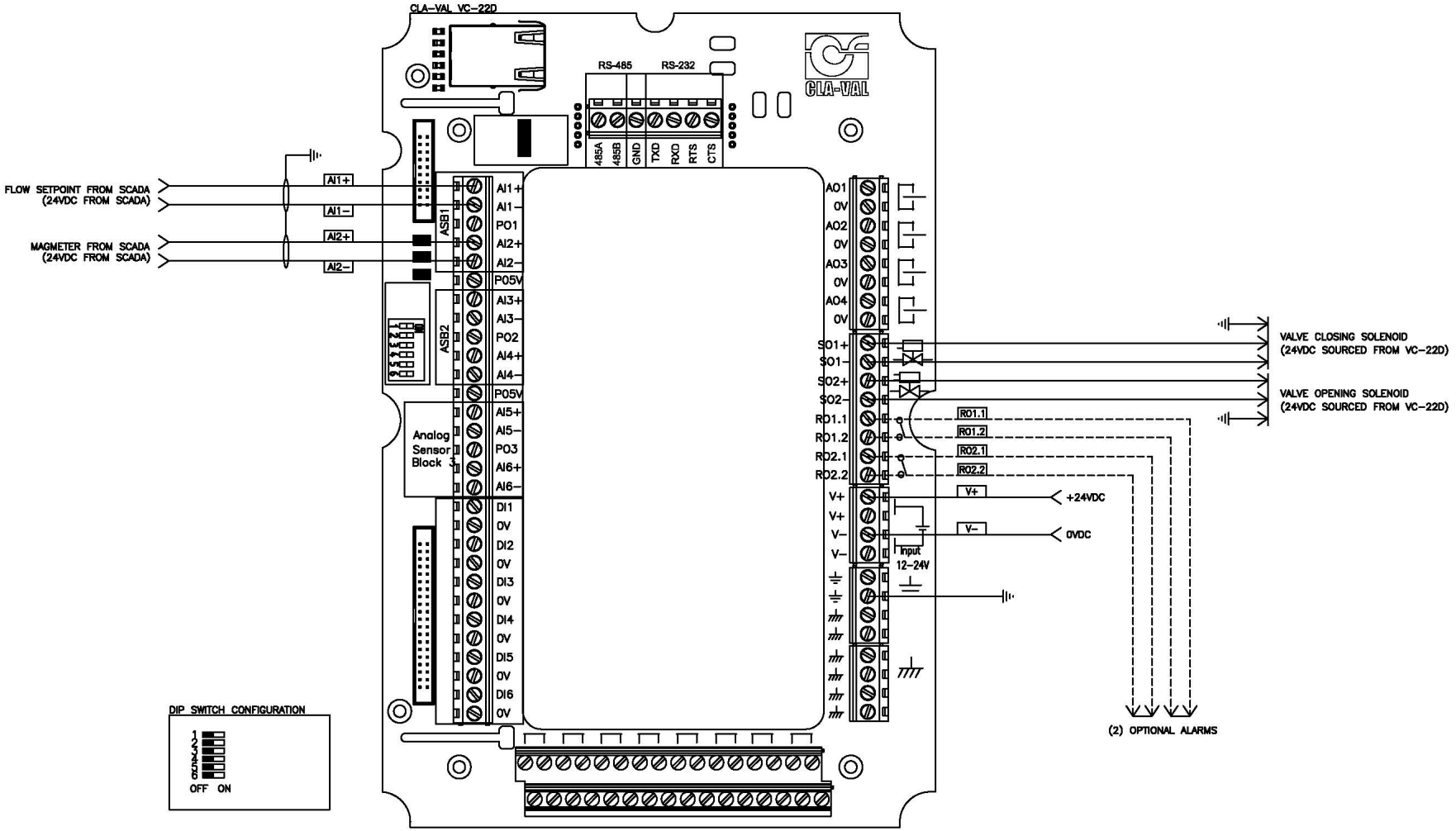
40007 Bit 5	--	Analog Input Modbus Override	Bit	Write	N/A	Overrides 4-20mA AI6 Input to use Modbus Address 43010/43011
40008 Bit 0	Spare	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI1 Input to use Modbus Address 41000
40008 Bit 1	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI2 Input to use Modbus Address 41001
40008 Bit 2	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI3 Input to use Modbus Address 41002
40008 Bit 3	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI4 Input to use Modbus Address 41003
40008 Bit 4	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI5 Input to use Modbus Address 41004
40008 Bit 5	--	Digital Input Modbus Override	Bit	Write	N/A	Overrides Hardwire DI6 Input to use Modbus Address 41005
41000	Spare	Digital Input	Word	Read/Write	DI1	Register Holds/Reads DI1 Value
41001	--	Digital Input	Word	Read/Write	DI2	Register Holds/Reads DI2 Value
41002	--	Digital Input	Word	Read/Write	DI3	Register Holds/Reads DI3 Value
41003	--	Digital Input	Word	Read/Write	DI4	Register Holds/Reads DI4 Value
41004	--	Digital Input	Word	Read/Write	DI5	Register Holds/Reads DI5 Value
41005	--	Digital Input	Word	Read/Write	DI6	Register Holds/Reads DI6 Value
41006	--	Digital Output	Word	Read	S01	Monitory Purposes (Optional)
41007	--	Digital Output	Word	Read	S02	Monitory Purposes (Optional)
41008	--	Digital Output	Word	Read	R01	Monitory Purposes (Optional)
41009	--	Digital Output	Word	Read	R02	Monitory Purposes (Optional)
43000/43001	Pressure Reducing Setpoint	Analog Input	Int 32	Read/Write	AI1	Register Holds/Reads AI1 Value x100 for Two Implied Decimals
43002/43003	34 Actuator Feedback	Analog Input	Int 32	Read/Write	AI2	Register Holds/Reads AI2 Value x100 for Two Implied Decimals
43004/43005	Spare	Analog Input	Int 32	Read/Write	AI3	Register Holds/Reads AI3 Value x100 for Two Implied Decimals
43006/43007	--	Analog Input	Int 32	Read/Write	AI4	Register Holds/Reads AI4 Value x100 for Two Implied Decimals
43008/43009	--	Analog Input	Int 32	Read/Write	AI5	Register Holds/Reads AI5 Value x100 for Two Implied Decimals
43010/43011	--	Analog Input	Int 32	Read/Write	AI6	Register Holds/Reads AI6 Value x100 for Two Implied Decimals
43036/43037	34 Actuator Command	Analog Output	Int 32	Read	AO1	Monitory Purposes (Optional) - Register Holds AO1 Value x100 for Two Implied Decimals
43038/43039	--	Analog Output	Int 32	Read	AO2	Monitory Purposes (Optional) - Register Holds AO2 Value x100 for Two Implied Decimals
43040/43041	--	Analog Output	Int 32	Read	AO3	Monitory Purposes (Optional) - Register Holds AO3 Value x100 for Two Implied Decimals
43042/43043	--	Analog Output	Int 32	Read	AO4	Monitory Purposes (Optional) - Register Holds AO4 Value x100 for Two Implied Decimals

***Additional ModBus information can be found in the manual.

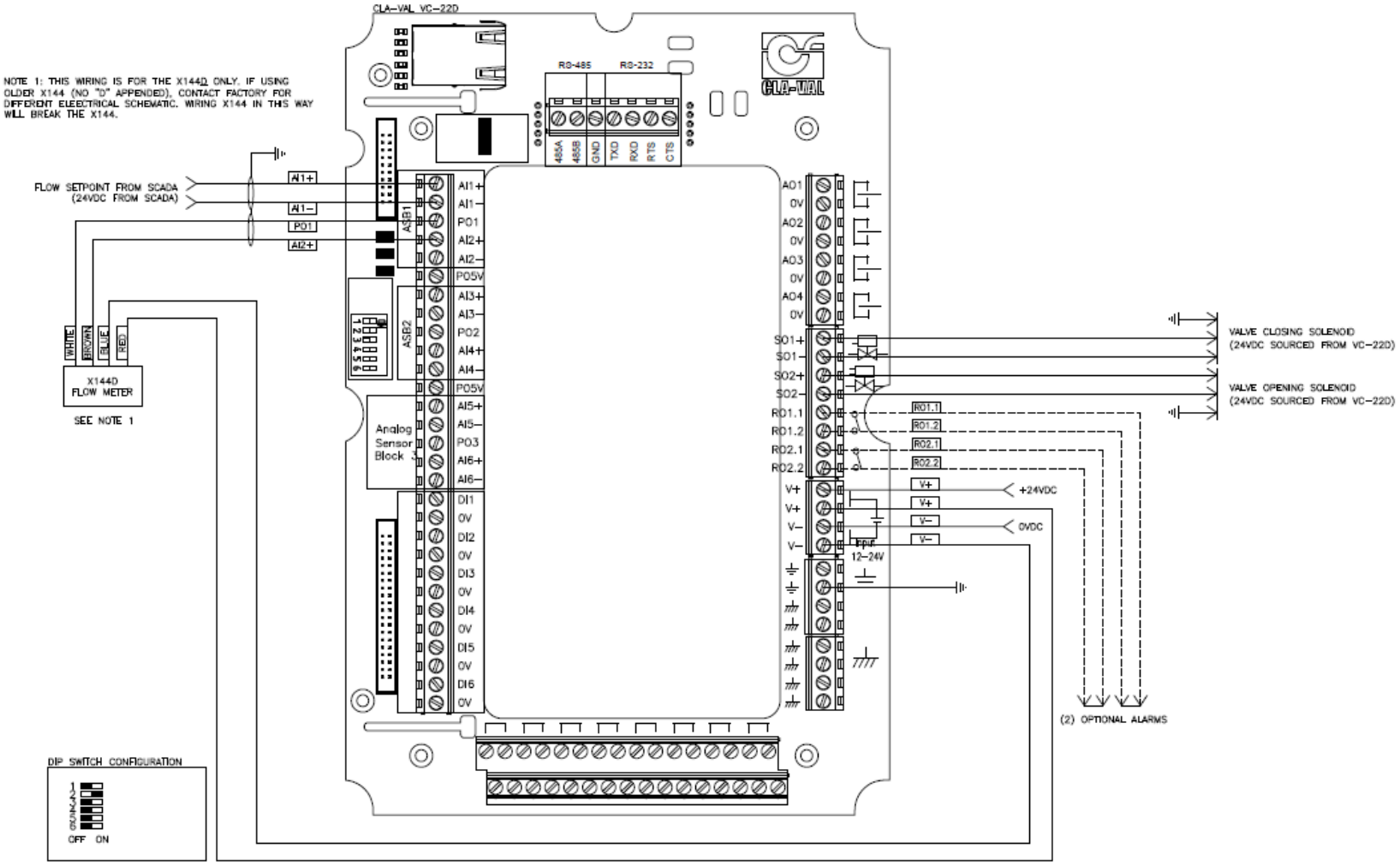
 Control • Power • Information • Communication ModBus Register Mapping

Appendix D: Standard ValvApp Wiring Diagrams

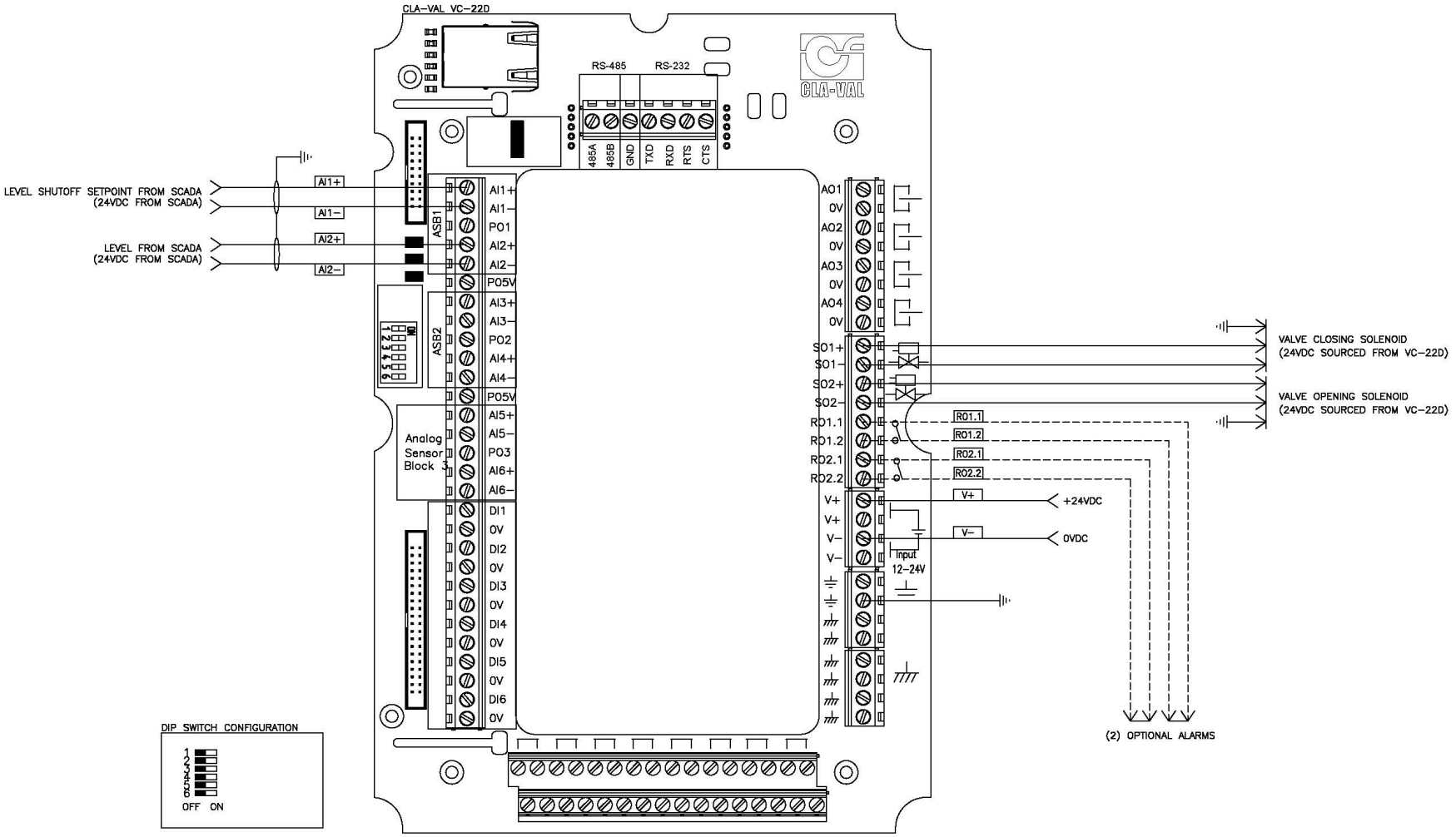
D.1 131-Flow-Mag-V2.1



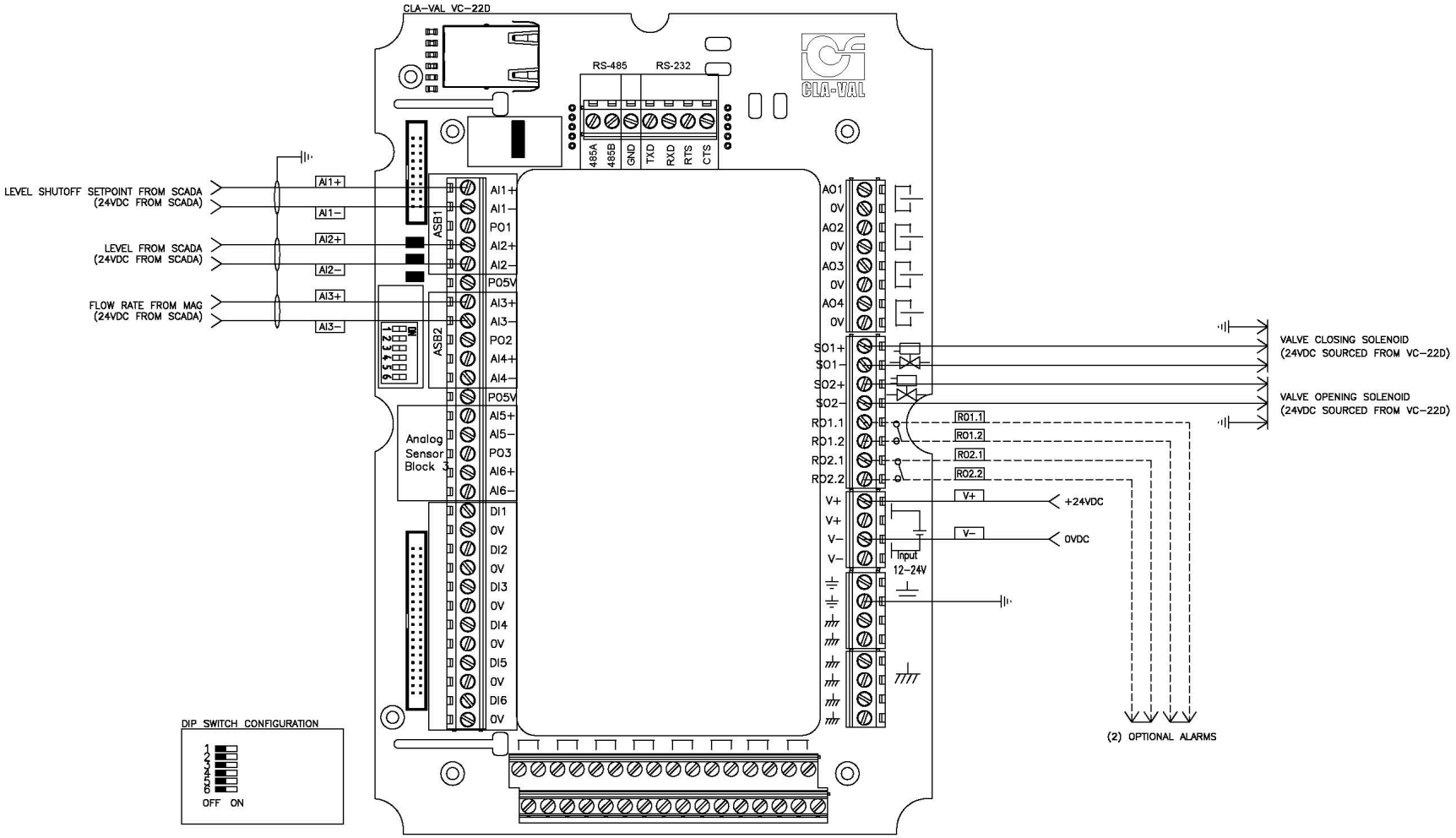
D.2 131-Flow-X144D-V2.1



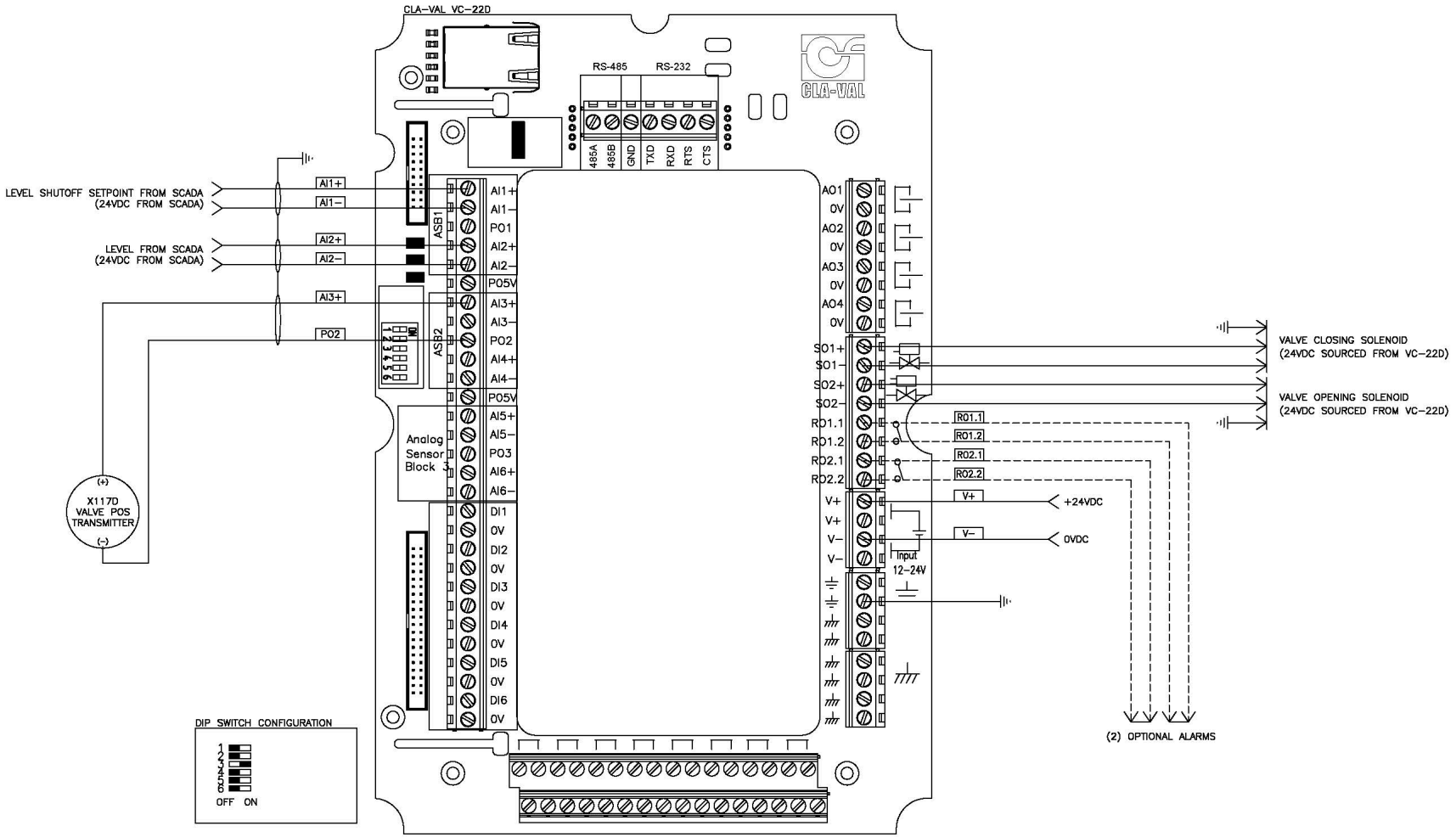
D.3 131-LvlAltitude-L-V2.1



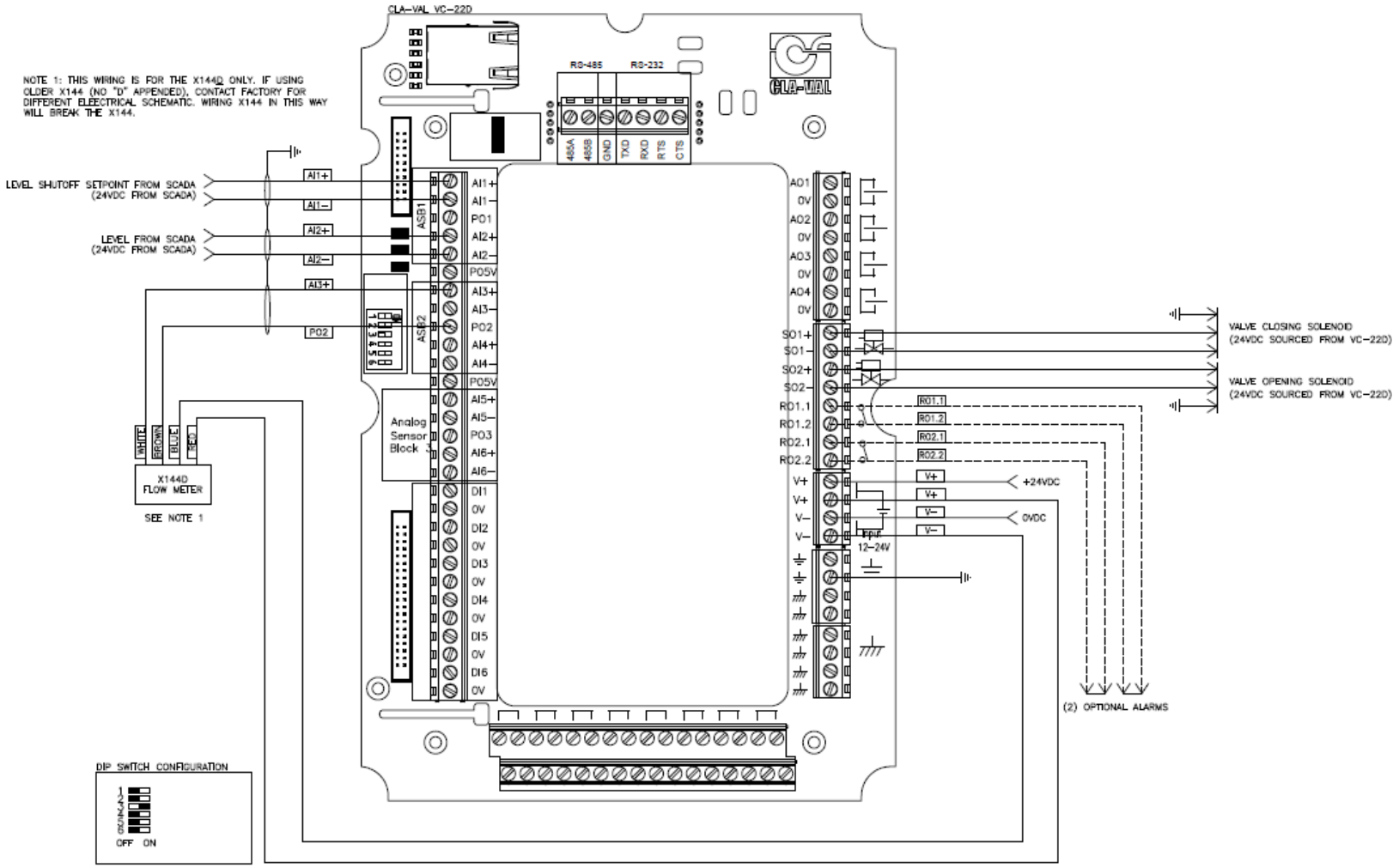
D.4 131-LvlMod-L+Mag-V2.1



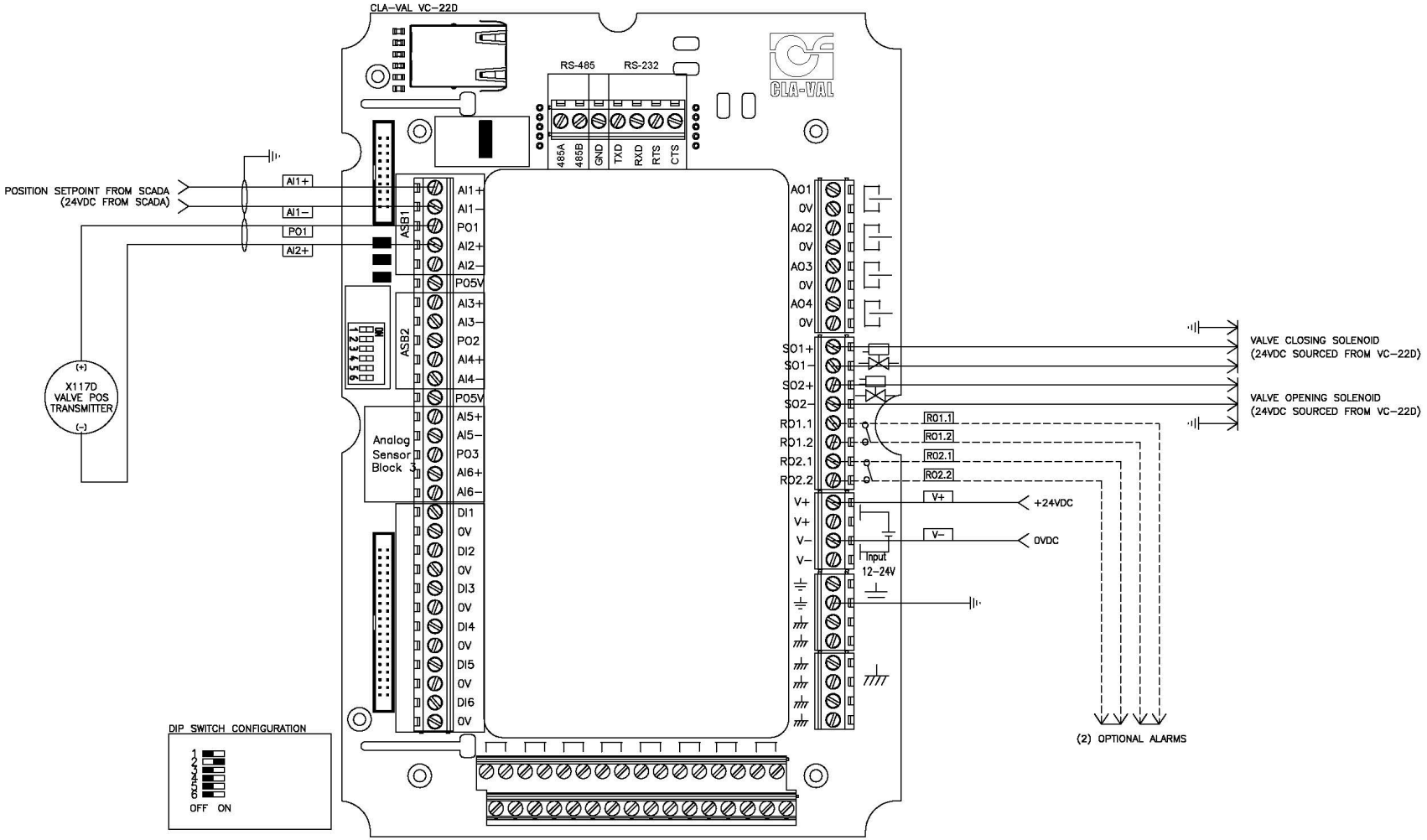
D.5 131-LvlMod-L+X117D-V2.1



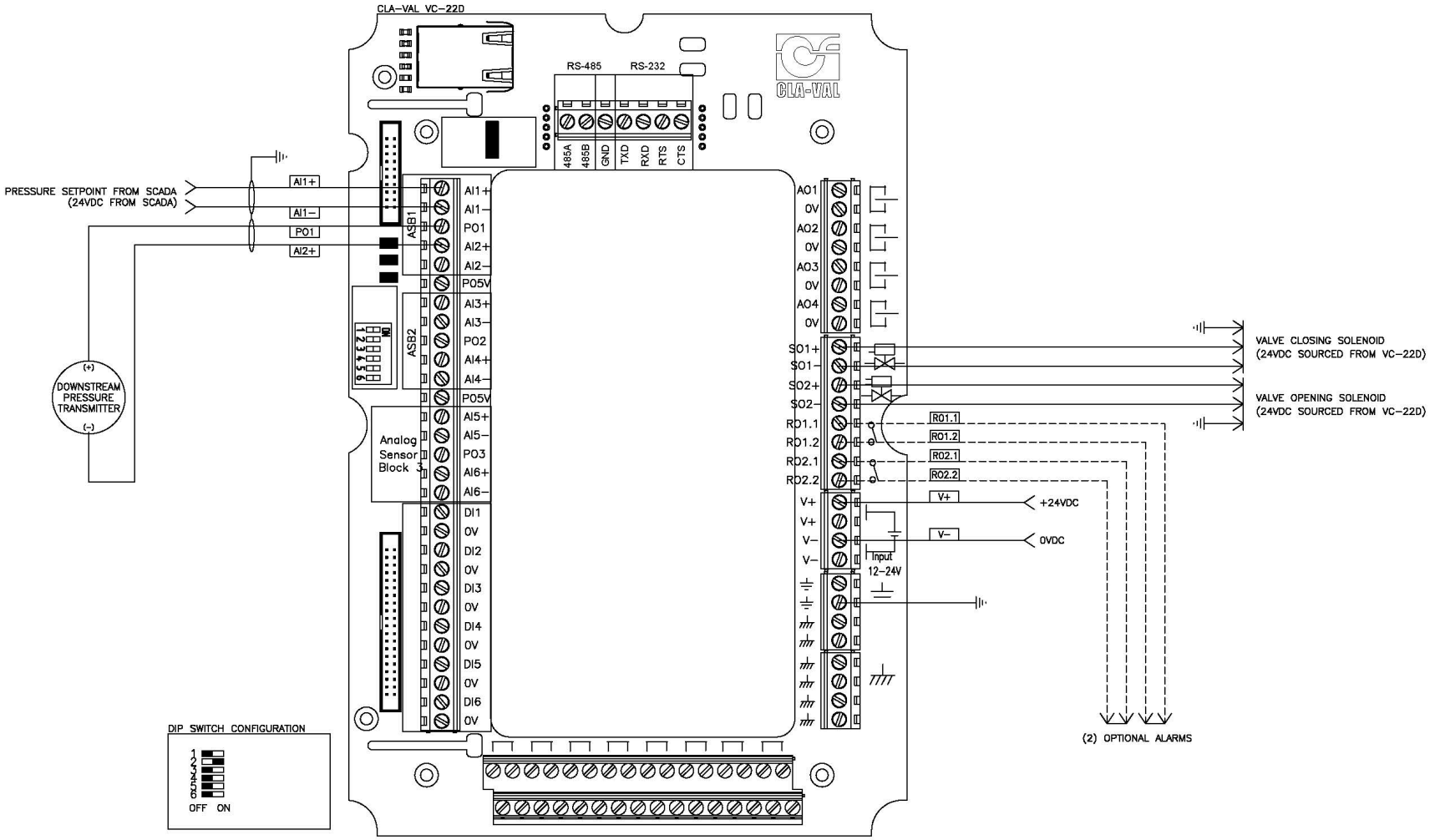
D.6 131-LvlMod-L+X144D-V2.1



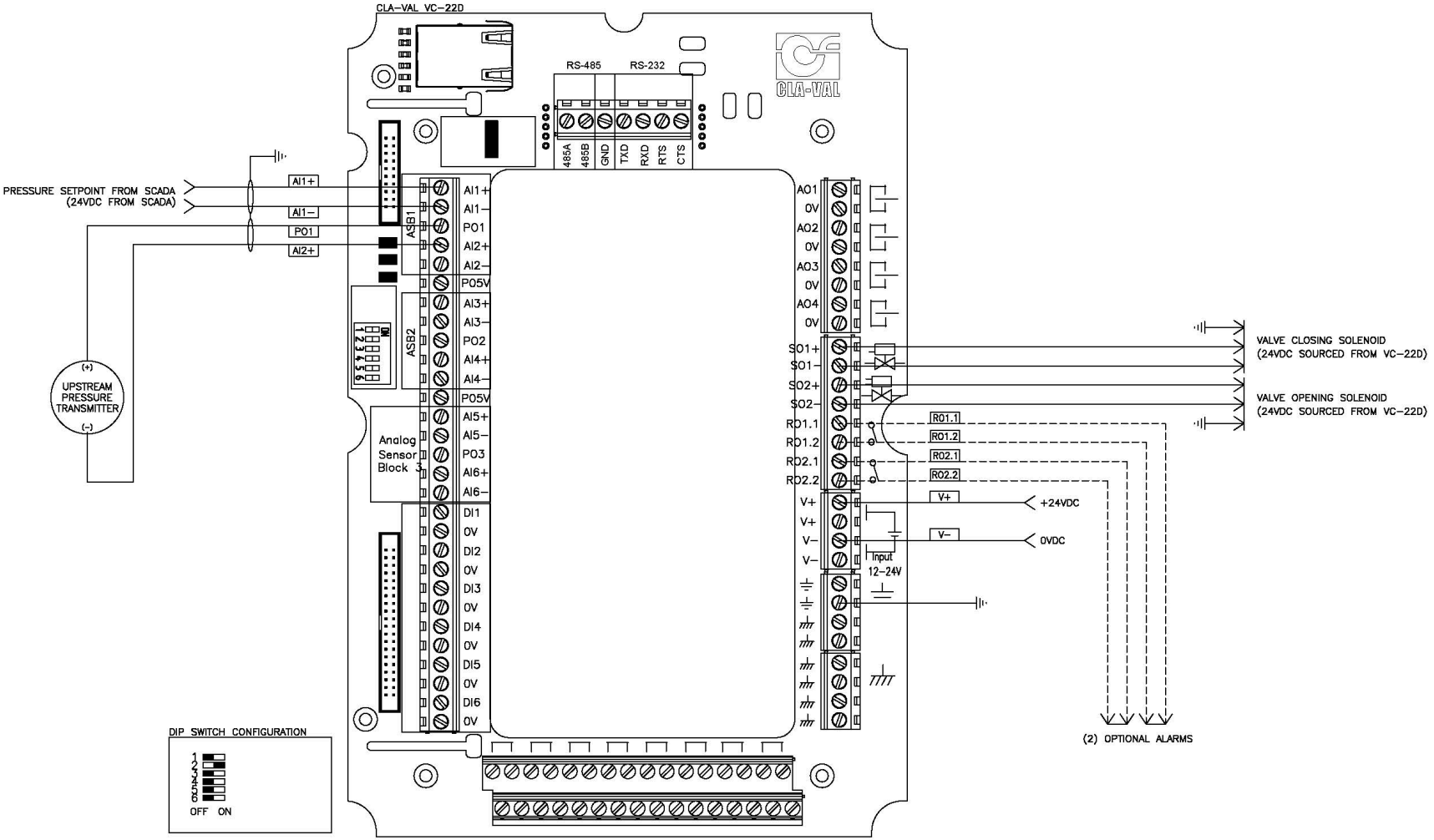
D.7 131-Position-X117D-V2.1



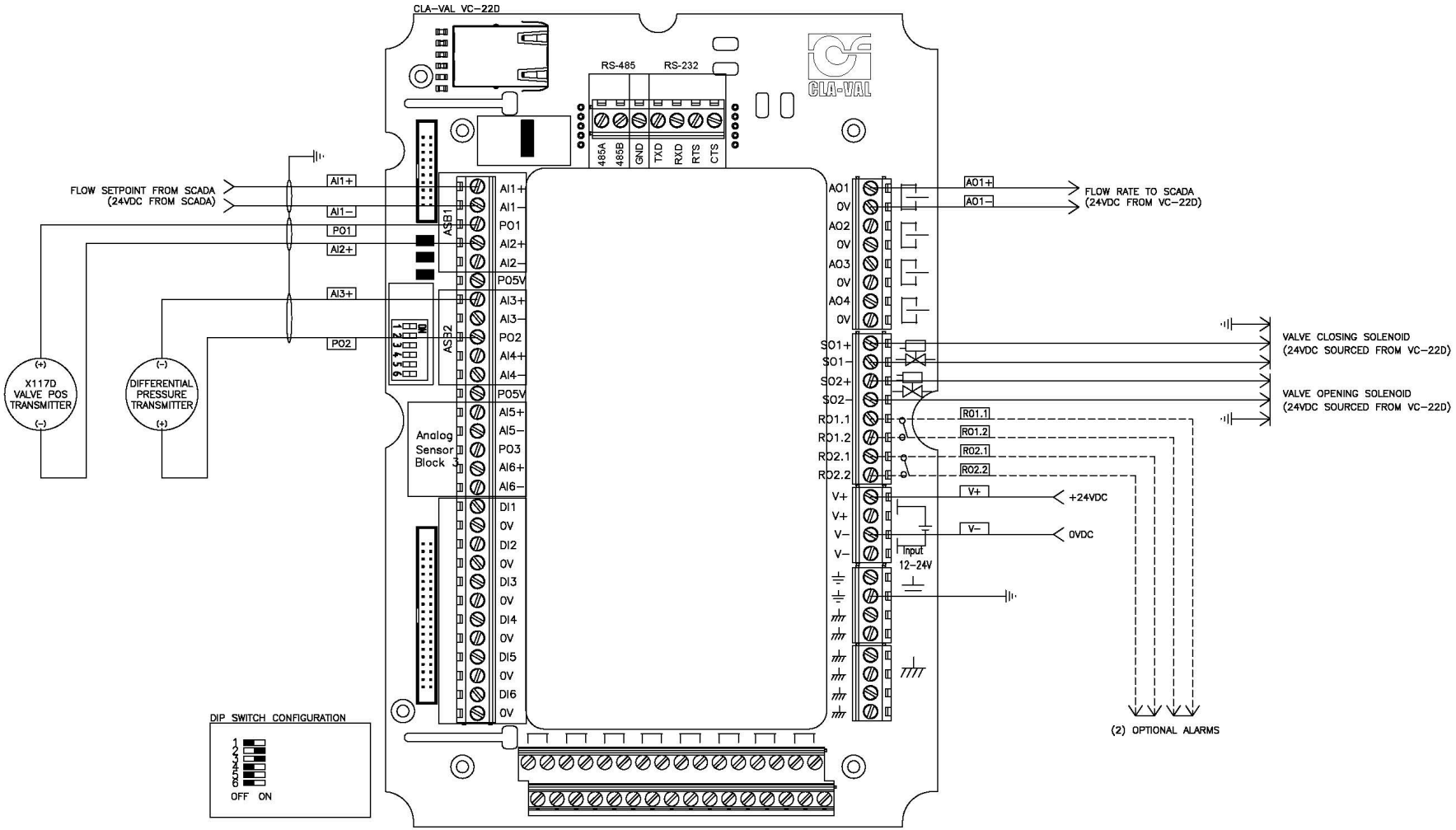
D.8 131-PressureReducing-P2-V2.1



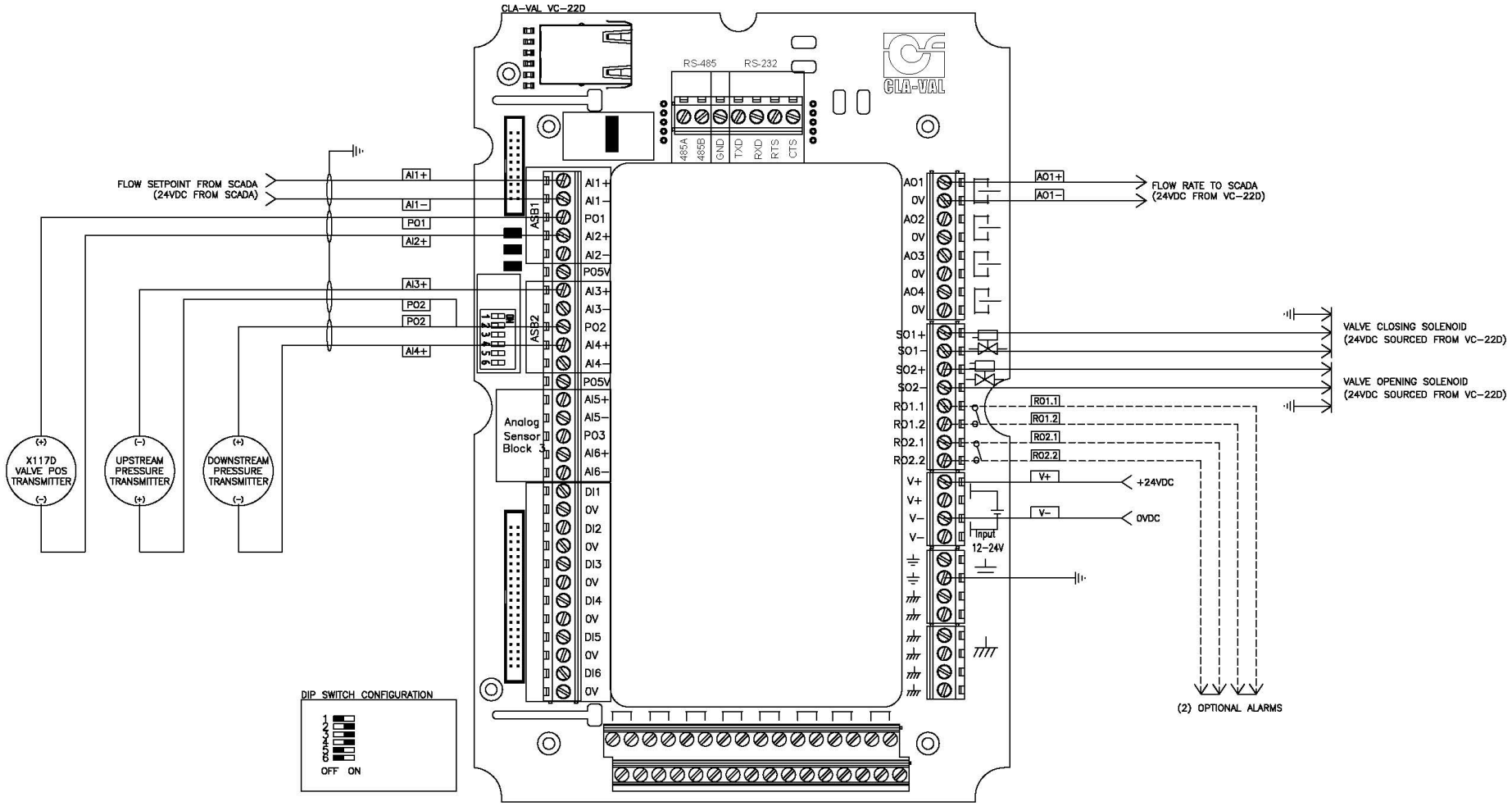
D.9 131-PressureSustaining-P1-V2.1



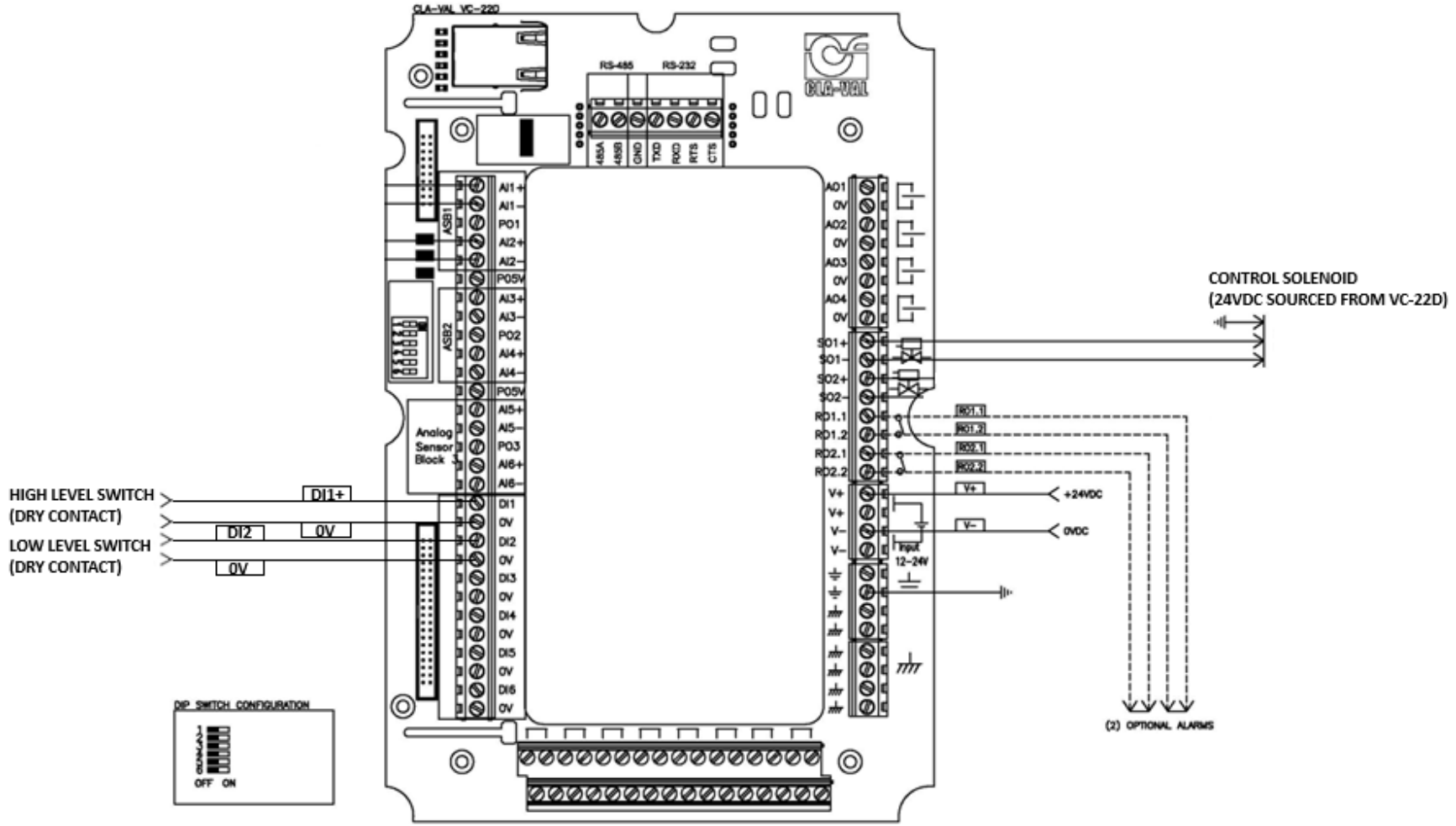
D.10 133-Flow-DP+X117D-V2.1



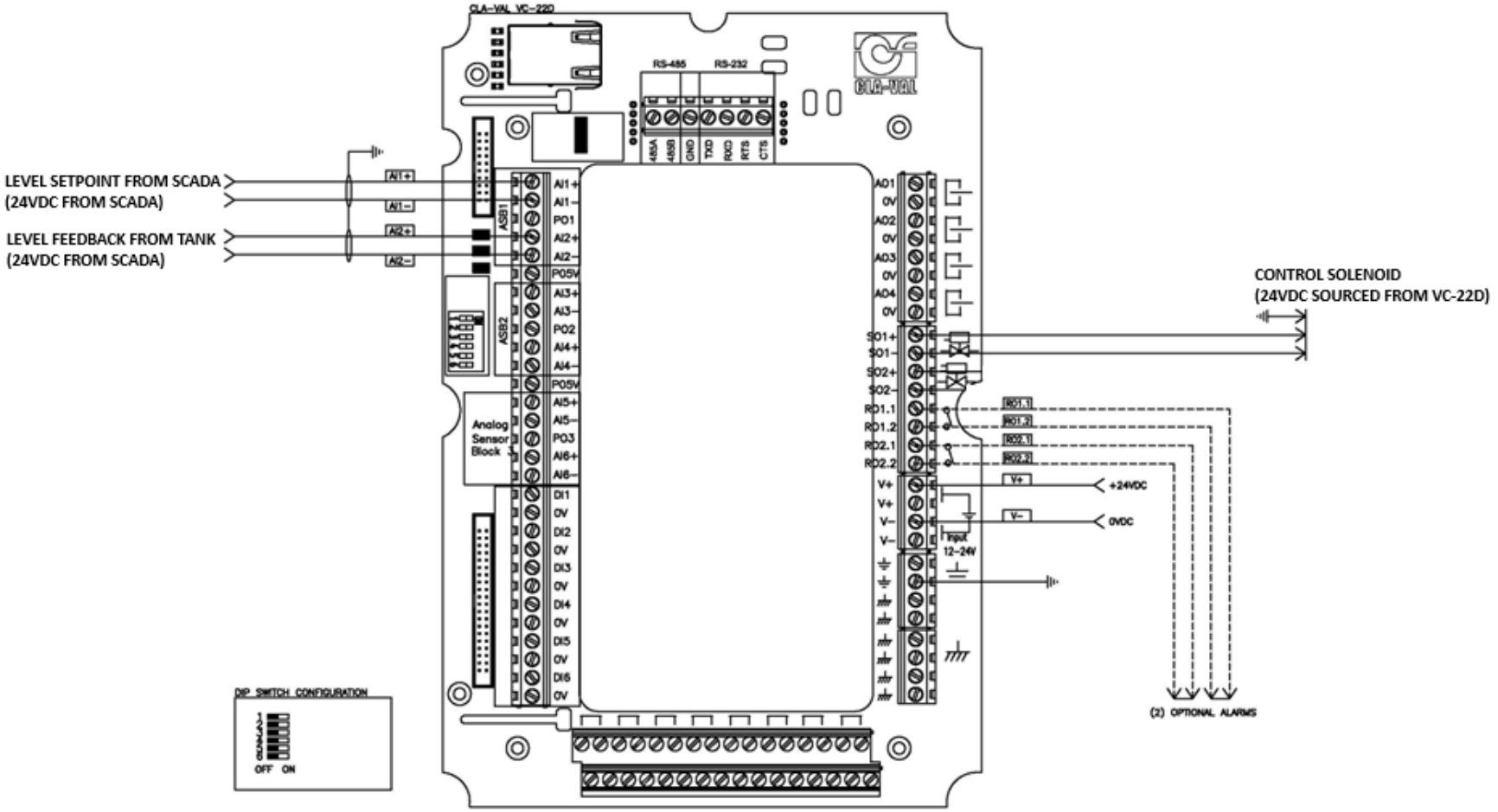
D.11 133-Flow-P1+P2+X117D-V2.1



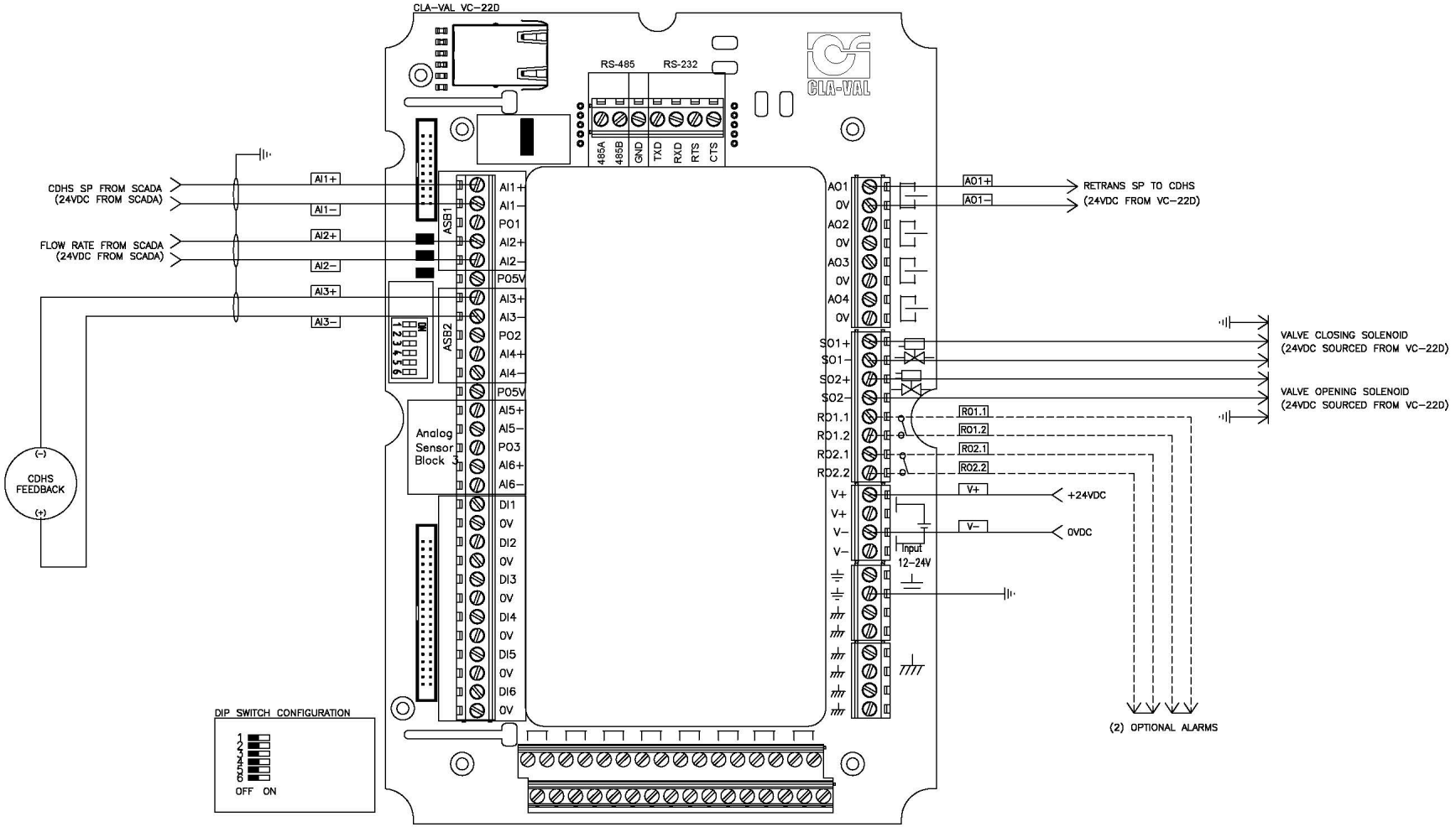
D.13 136-LvlAlt-HLLL-Switches-V1.0



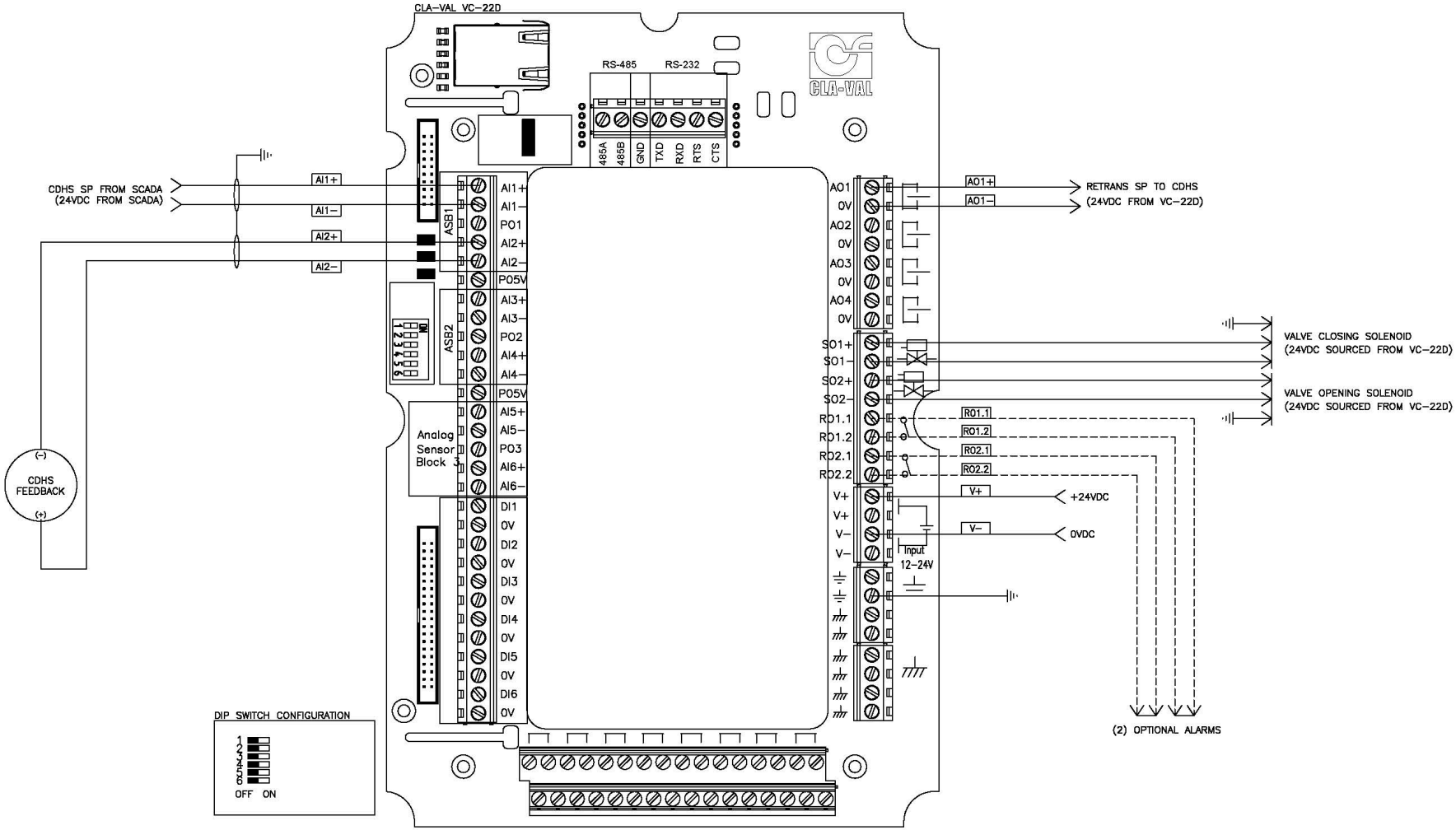
D.14 136-LvlAltitude-OnOff-V1.0



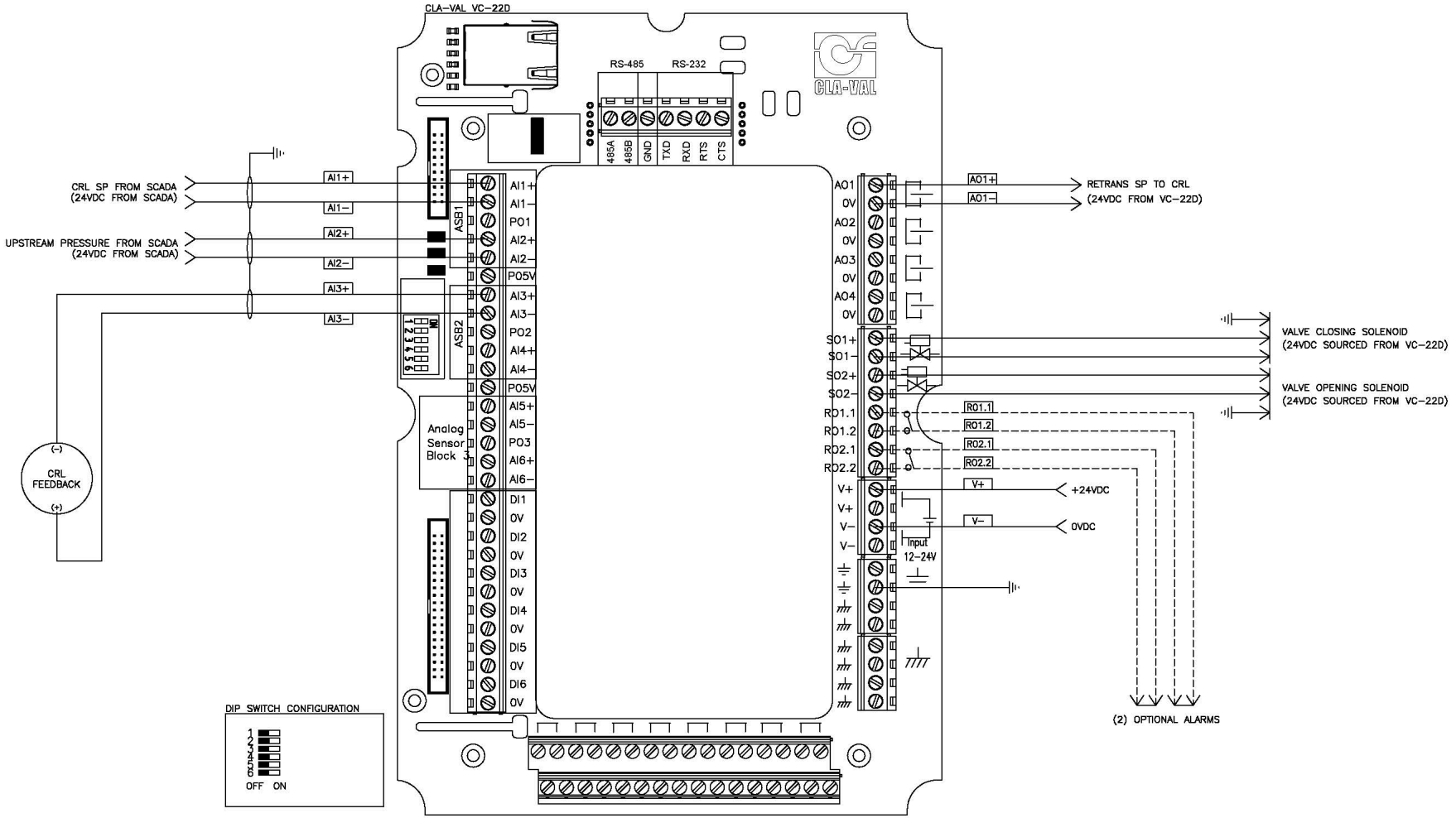
D.15 340-Flow-Mag-V2.1



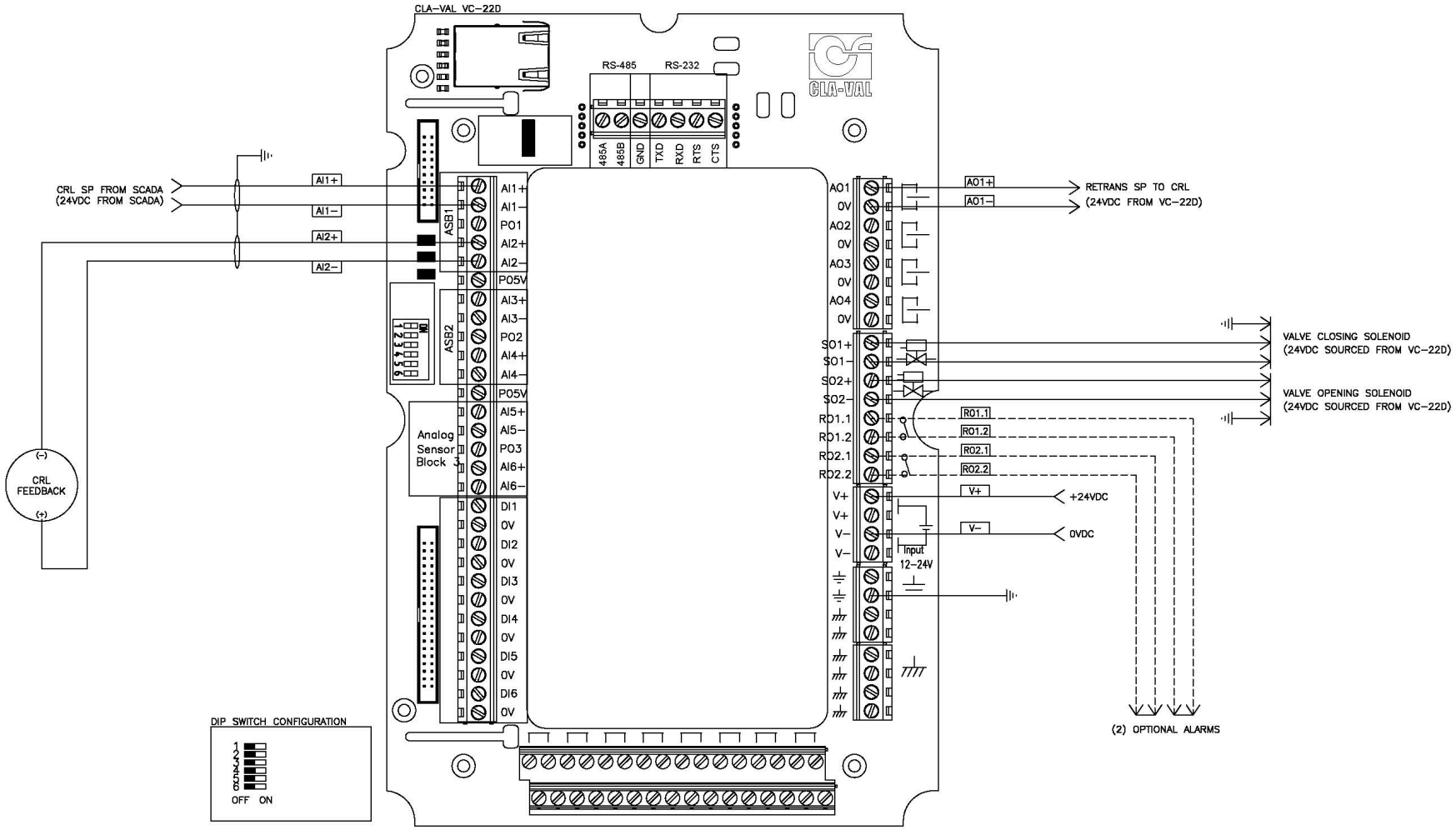
D.16 340-Flow-V2.1



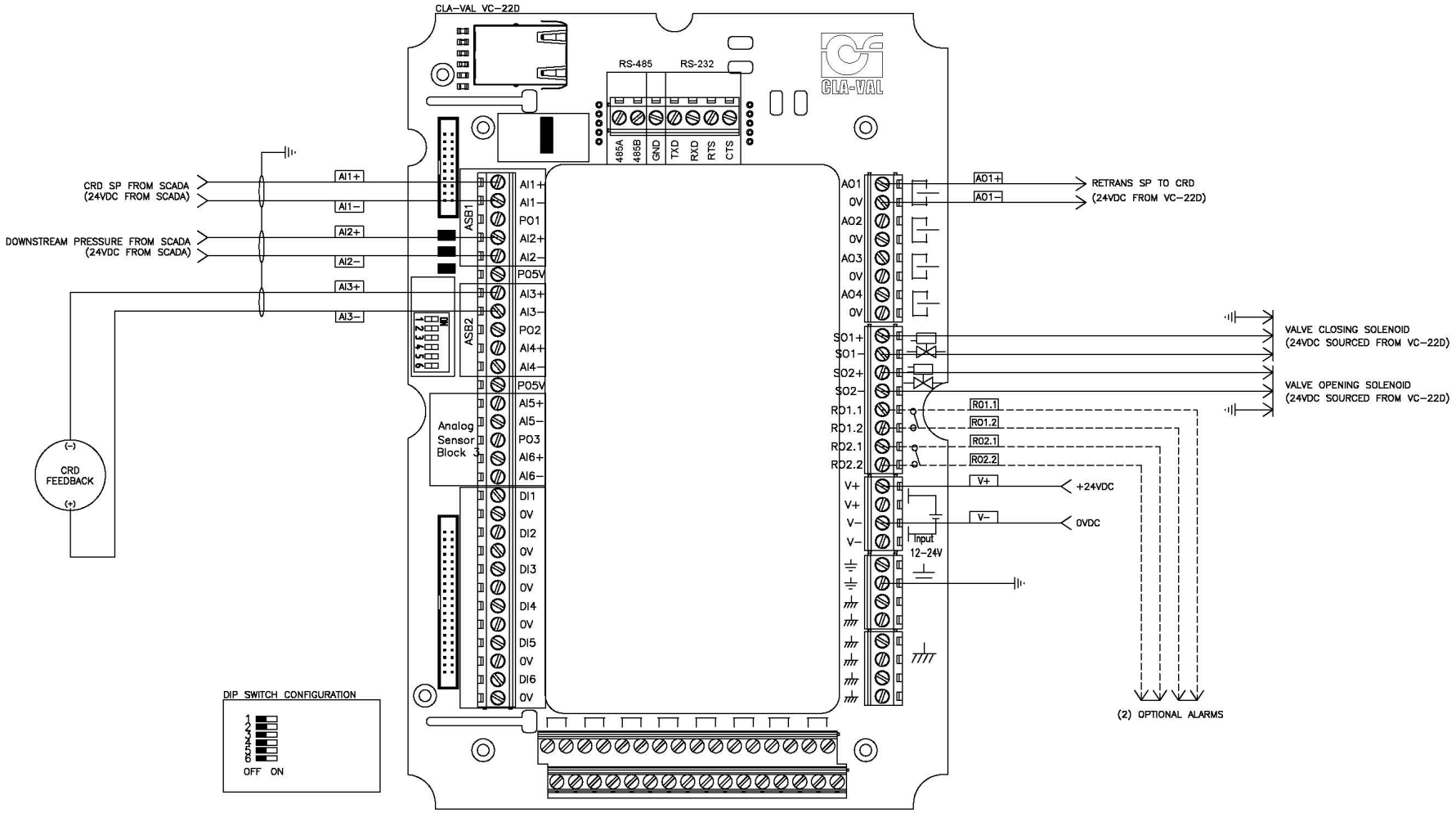
D.17 350-PressureSustaining-P1-V2.1



D.18 350-PressureSustaining-V2.1



D.19 390-PressureReducing-P2-V2.1



D.20 390-PressureReducing-V2.1