910-24 MagnaValve®

910-24 Non-Ferrous MagnaValve®

for Air-Blast Machines

The Smart Valve with SteadyFlow Technology

Instruction Manual

Electronics Inc.
Shot Peening Control

56790 Magnetic Drive, Mishawaka, Indiana 46545 USA • 1-800-832-5653 or (574)256-5001 • www.electronics-inc.com

IM0127 2025-03

Table of Contents

Safety Notices

Good safety practices must be followed when operating and handling the MagnaValve®. Improper usage could result in damage to the product or personal injury.

- Please note: The MagnaValve emits magnetic fields that can be harmful to people who wear pacemakers.
- The MagnaValve operates with internal air pressure. Refer all servicing to qualified personnel.
- Power off the FM-24 Monitor or FC-24 Controller and the MagnaValve before connecting or disconnecting the MagnaValve.

Product Overview

The 910-24 MagnaValve® is a normally closed valve that regulates the flow of non-ferrous materials—ceramic bead or aluminum oxide—in suction-type or pressure-type air blast machines for shot peening and blast cleaning applications. The 910-24 MagnaValve has only one moving part—a magnetic shuttle that provides precise media flow regulation—making it a low-maintenance valve.

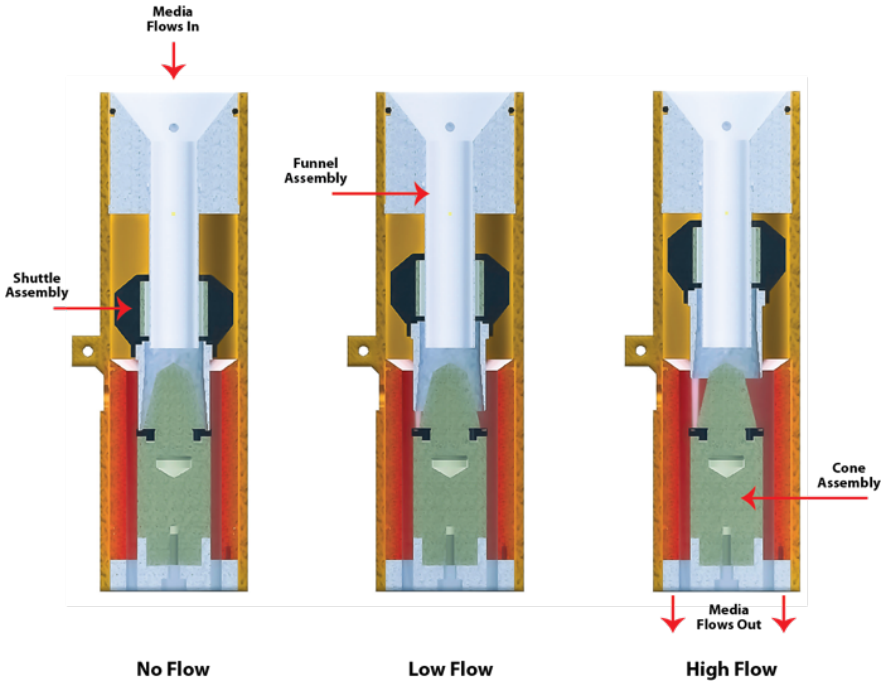
A 910-24 MagnaValve is a Smart Valve with SteadyFlow Technology. It has an embedded webpage, a built-in sensor that measures flow rate, a built-in servo, and a flow rate jump-to feature that provides accurate and repeatable flow rates. The Flow Jump-To feature starts media flow at the desired flow rate instead of ramping up to the desired rate. The MagnaValve can be factory calibrated for various media types and sizes. It will be calibrated for the media type, size, and flow rate specified on the purchase order.

Note: To take advantage of the advanced technology in a 910-24 MagnaValve, it should be used with a FM-24 Monitor or a PLC. It can be used with a FC-24 Controller or Potentiometer, but some of its features will not be accessible.

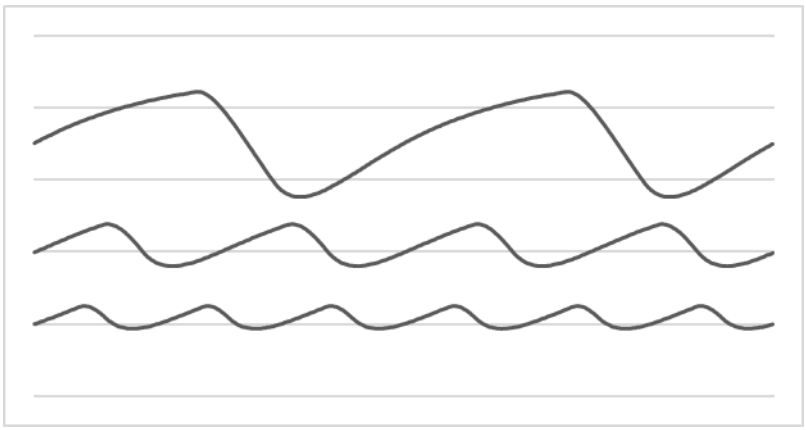
*U.S. Patent No. 10,253,901 • China Patent No. CN 110805702 B • Japan Patent No. JP 6,821,804 • Patents Pending in Europe and Singapore

Principle of Operation

The 910-24 MagnaValve controls media flow through the application of power to an electromagnet. Current is applied to the electromagnet surrounding the magnetic shuttle. This raises the shuttle, allowing the media to pass over the cone and drop through the capacitive sensor. The sensor measures the amount of media and generates an analog output signal. When no power is applied, or if power is interrupted for any reason, the shuttle drops onto the cone and securely blocks the flow of media.



In the 910-24 MagnaValve, the PWM signal controls the duration that media is flowing verses not flowing and Pulse Frequency is the period of the cycle. However, the 910-24 rises and lowers the magnetic shuttle using a DC current with an AC dither. This AC dither signal causes the shuttle to vibrate to encourage difficult flowing media to flow through the 910-24 MagnaValve. The dither is controlled by the Pulse Frequency parameter shown in the image below.



10 Hz Pulse Frequency

20 Hz Pulse Frequency

30 Hz Pulse Frequency

Warning: Do not use ferrous media (steel shot, steel grit, cut-wire media, etc.) in the 910-24 MagnaValve. This will contaminate the magnetic shuttle and cause product failure. Use of any of these media types will void the warranty. For proper operation, media must be free from ferrous contamination and fines (broken media and dust). The media must be free flowing. Install a magnetic separator and a screen separator in the reclaim system to ensure necessary media quality.

Installation

The following items are required for the installation of a 910-24 MagnaValve®.

- Pipe Fitting Requirements:
    - Assortment of 2” NPT Short Nipples and other NPT Pipe Fittings
    - Two 2” NPT Pipe Unions
    - One 2” Mixing Tee
- Thread sealant (Teflon® tape)
- Other fittings as required
- A 150% capacity manual shut-off valve mounted above the MagnaValve for maintenance
- For direct pressure applications only – an automatic shut-off valve mounted below the MagnaValve

Note: A magnetic separator **MUST** be installed and a screen separator is recommended.

Installation of a Magnetic Separator and Screen Separator

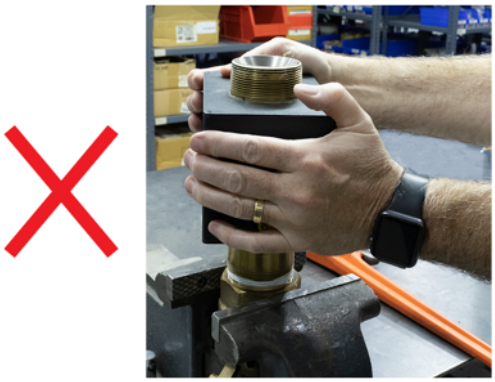
The media supply for the 910-24 MagnaValve must be free from ferrous contamination and broken media. Install a magnetic separator to prevent media with ferrous contamination from covering the magnetic shuttle and reducing its ability to move freely. Install a screen separator to remove the broken media that affects media flow. Without these separators, the MagnaValve may require additional cleaning to maintain desired media flow and normal valve function.

Example of a shuttle covered in ferrous-contaminated media. A contaminated shuttle will disrupt media flow and MagnaValve function will become erratic.

Installing and Uninstalling Pipe Fittings

It is essential to attach and remove pipe fittings to and from the MagnaValve correctly so as not to break the valve body or the pipe from the valve. Below are some examples of proper procedures when installing or uninstalling pipe fittings.

DO NOT use the valve body as a wrenching surface. This can break the valve.



DO NOT mount the valve into a vise and use a single pipe wrench on the pipe fitting to install or uninstall pipe fittings.

DO use two pipe wrenches—one on the valve pipe and one on the pipe fitting—to install or uninstall the fitting.

DO mount the pipe fitting into a vise and use one pipe wrench on the valve pipe to install or uninstall the pipe fitting.

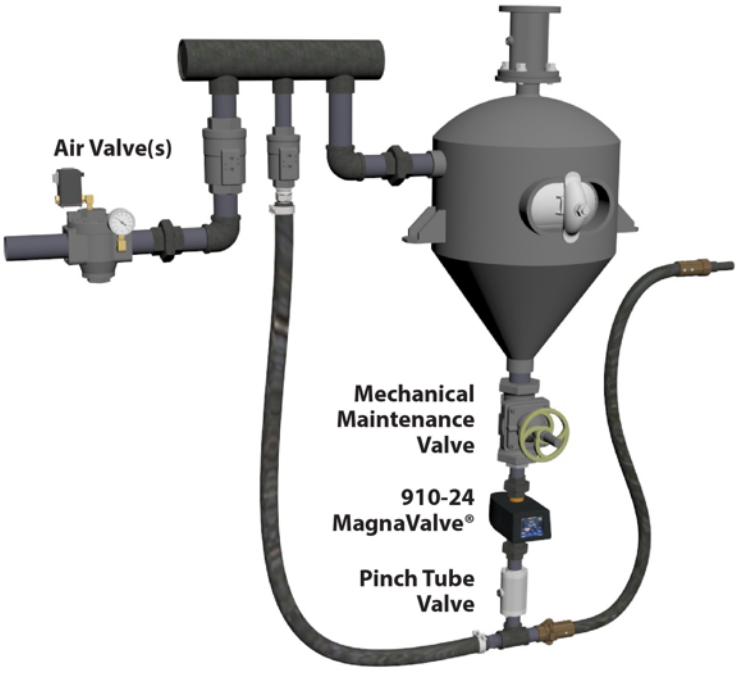
Critical Requirements for Direct Pressure Machine Applications

The following are critical requirements for the installation and operation of the 910-24 MagnaValve® on a direct pressure machine. Failure to follow these steps could result in damage to the MagnaValve and void its warranty.

Installation

To correctly install a 910-24 MagnaValve on a direct pressure machine, perform the following steps.

- Install a mechanical maintenance valve above the MagnaValve
- Install a pinch tube valve below the MagnaValve
- The mechanical maintenance valve and pinch tube valve must be rated at 150% of the maximum media flow rate of the MagnaValve
- Ensure there are no air leaks between the pressure pot and the mixing tee



NOTE: The air hold off should not exceed 5 psi, and the pressure differential must remain below 3 PSI. The installation of a pinch valve, as shown here, with a proper start and stop sequence will allow this accommodation.

Operation

The following steps must be followed in sequence when starting and stopping a blast cleaning or shot peening cycle.

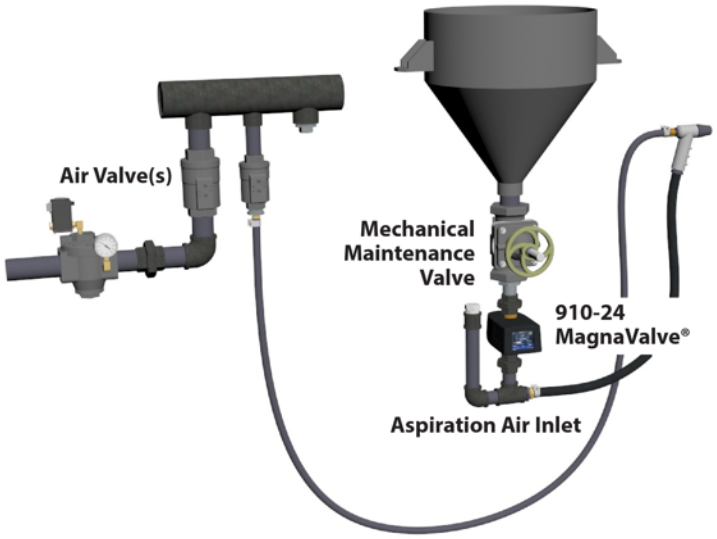
To start the blast/peen cycle	To stop the blast/peen cycle
1. Turn on the air valve(s)	1. Turn off the MagnaValve
2. Wait 10 seconds for the air to stabilize	2. Close the pinch tube valve
3. Open the pinch tube valve	3. Wait 10 seconds while the media clears the blasting hose
4. Turn on the MagnaValve	4. Turn off the air valve(s)

Critical Requirements for Suction Blast Machine Applications

The following are critical requirements for the installation and operation of the 910-24 MagnaValve® on a suction blast machine. Failure to follow these steps could result in damage to the MagnaValve and void its warranty.

Installation

- Install a mechanical maintenance valve above the MagnaValve
- The mechanical maintenance valve must be rated at 150% of the maximum media flow rate of the MagnaValve
- Install aspiration air inlet below the MagnaValve
- The aspiration air inlet must be large enough to supply adequate air volume to allow conveyance of the media to the nozzle
- Ensure there are no air leaks between the pressure pot and the mixing tee



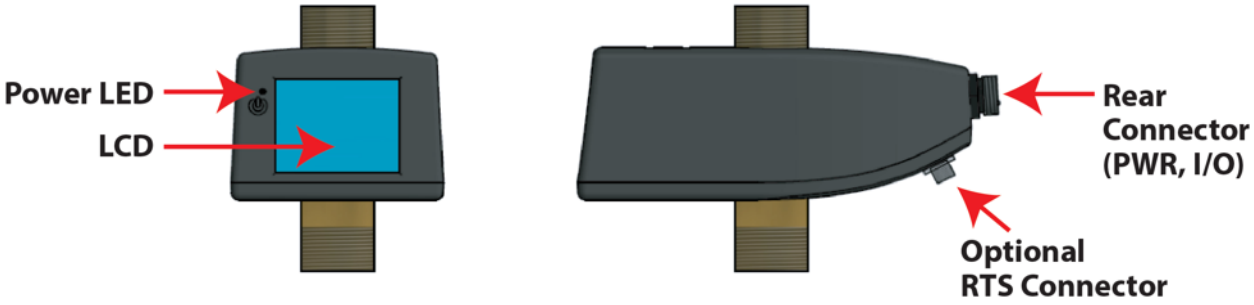
Operation

The following steps must be followed in sequence when starting and stopping a blast cleaning or shot peening cycle.

To start the blast/peen cycle	To stop the blast/peen cycle
1. Turn on the air valve(s)	1. Turn off the MagnaValve
2. Wait 10 seconds for the air to stabilize	2. Wait 10 seconds while the media clears the blasting hose
3. Turn on the MagnaValve	3. Turn off the air valve

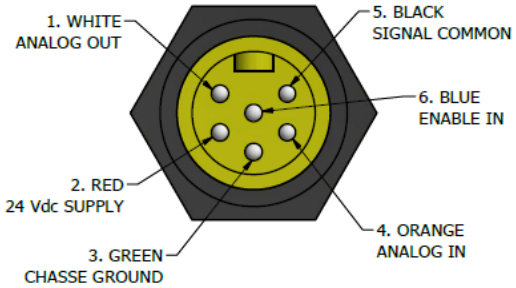
Electrical

The 910-24 MagnaValve® is equipped with a rear connector that contains the necessary power, analog I/O, and enable lines for normal operation of the MagnaValve. The RTS (Remote Table Select) version of the 910-24 MagnaValve includes an additional connector for the RTS control line. The figure below shows the location of these two connectors.



Rear Connector

The rear connector is the primary communication link between either a PLC or a FM-24 and the 910-24 MagnaValve. The connector contains the following signals: power, ground, analog input / output, and enable (see illustration below). These signals will control the MagnaValve during operation. Each signal's function will be discussed in detail in the following sections.



Rear connector and pin out

Rear Connector Pin Functions

Wire	Function	Voltage
Red	24 Vdc Supply	24 Vdc
Black	Supply Common	0 V
Green	Chassis Ground	0 V
Orange	Analog Input	0 – 10 V or 4 – 20 mA
White	Analog Output	0 – 10 V or 4 – 20 mA
Blue	Enable Input	24 Vdc

24 Vdc Supply

Power Requirements per MagnaValve®

Parameter	Value	Tolerance
Voltage	24 Vdc	±10 %
Current	2 Adc per connected valve	1.75 Adc min

The 24 Vdc Supply Input consists of two wires on the rear connector, the Supply Input (RED wire), and the Signal Common (BLACK wire). The Supply Input and the Signal Common provides power to the 910-24 MagnaValve. It is requested that the customer provide a DC supply capable of 2.0 amps of current for each 910-24 MagnaValve connected to the supply. The 910-24 MagnaValve, when flowing 100%, typically has a current draw of 0.8 A to 1.3 A. The requested 2.0 A supply is meant to handle surge currents while the 910-24 MagnaValve is pulsing.

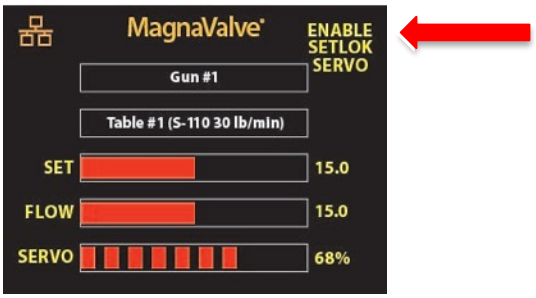
Enable Input

Enable Input Requirements

Parameter	Value	Tolerance
Voltage	24 Vdc	30.0 V to 14.7 V
Current	2.07 mA	2.59 mA to 1.27 mA
HIGH IN	Flow Media	14.7 V to 30.0 V
LOW IN	NO Flow Media	0.0 V to 5.9 V

The Enable Input commands the 910-24 MagnaValve to start flowing media. The input is pulled LOW (0.0 V) for the NO flow condition and driven HIGH (24 V) for the media flow condition.

Applying 24 Vdc to the Enable Input causes media to start flowing. Upon applying 24 Vdc to the Enable Input, the Enable indicator illuminates.



Run Screen

Analog Input

Analog Input requirements

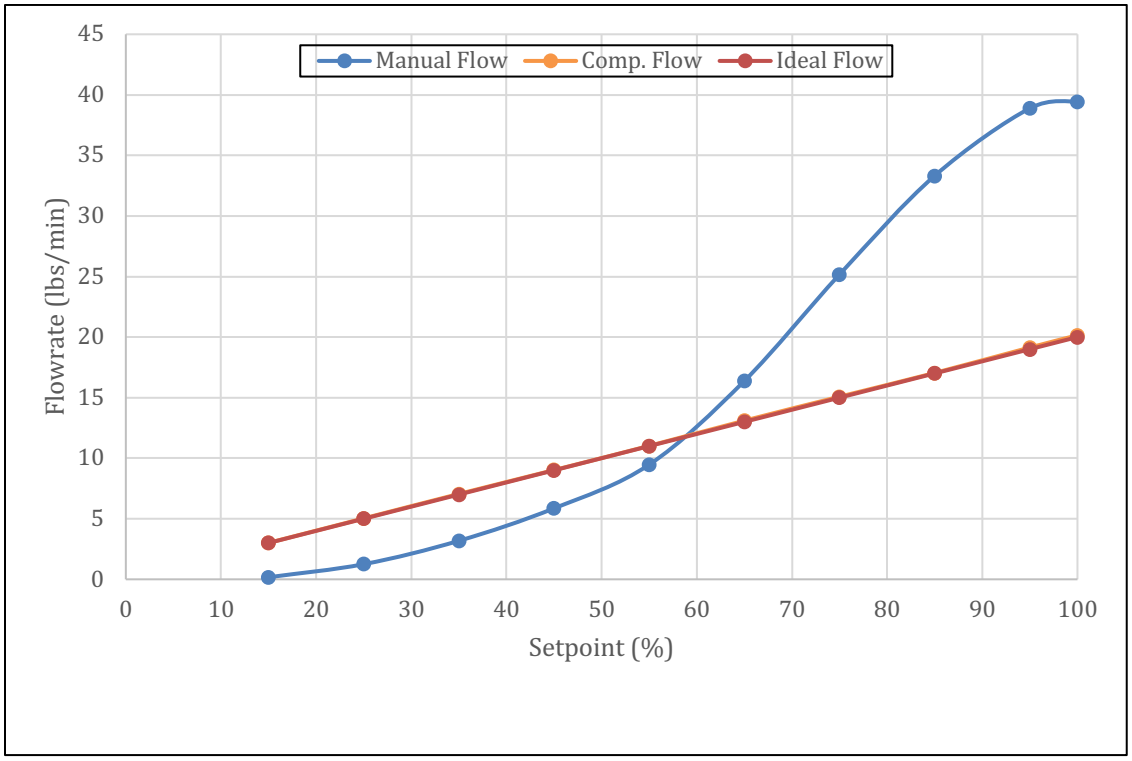
Parameter	Value
Voltage Input	0 V to 10 V
Current	0 A to 672 µA

The Analog Input is the flow request signal. The Analog Input can be set for voltage control (0 – 10 Vdc) or current control (4 – 20 mA) through the embedded webpage.

The Analog Input has two operational modes. If the 910-24 MagnaValve's internal Servo is turned ON, the Analog Input is the Setpoint Input. Where 0 Vdc / 4 mA input represents 0 lb/min of media flow and 10 Vdc / 20 mA input represents a request for the Full-Scale Value, this is the maximum flow rate for which the valve is calibrated.

If the 910-24 MagnaValve's internal Servo is turned OFF, the Analog Input controls the 910-24 MagnaValve® in the open-loop mode. While in the open-loop mode, the 0 Vdc / 4 mA to 10 Vdc / 20 mA input signal translates to 0% to 100% PWM output signal to the valve driver. For an input of 0 Vdc / 4 mA, the valve will turn ON 0% or 0 lb/min of flow. For an input of 10 Vdc / 20 mA, the valve will turn on 100 % or the maximum flow capability of the 910-24 MagnaValve.

Note: The open-loop flow rate of the 910-24 MagnaValve is non-linear. An example is shown below. The blue graph is the open-loop (Servo turned OFF), and the orange graph is closed-loop (Servo turned ON). In this example, the maximum flow rate with the Servo turned OFF is 40.5 lb/min and is non-linear. The maximum flow rate with the Servo turned ON is 30.0 lb/min and is linear. To see the open and closed-loop flow rate profile of your 910-24 MagnaValve, refer to the Calibration Certificate shipped with the 910-24 MagnaValve.



Analog Output

Analog Output requirements

Parameter	Value
Voltage Output	0 V to 10 V
Current	0 mA to 10 mA
Rload_max	1 kΩ

The Analog Output is the scaled representation of the flow rate through the sensor. The Analog Output can be set for voltage output (0 – 10 Vdc) or current output (4 – 20 mA) through the embedded webpage.

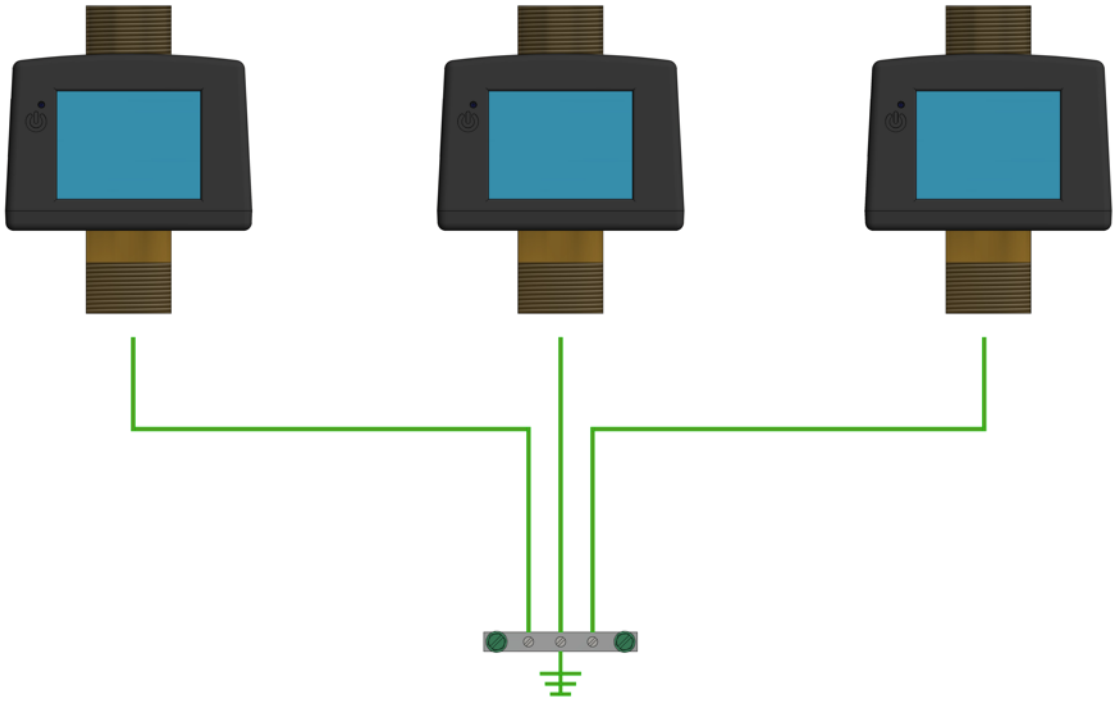
Unlike the Analog Input, the Analog Output maintains the same scaling regardless of the MagnaValve's internal Servo setting. The Analog Output is scaled such that 0 Vdc / 4 mA output represents 0 lb/min of media flow, and 10 Vdc / 20 mA output represents the Full-Scale Value—this is the maximum flow rate for which the valve is calibrated.

Note: If the flow rate exceeds the calibrated flow rate, the Analog Output Voltage increases beyond 10 Vdc to a max of approximately 11 Vdc.

Chassis Ground

The Chassis Ground (GREEN wire) in the rear connector provides a dedicated path for high-voltage transients to dissipate without disrupting critical signals or creating damage to internal circuitry. The Chassis Ground also provides a ground path for any ESD events that may happen on the pipe, ethernet connector, and Rear Connector.

The Chassis Ground must be connected to good earth ground. If multiple 910-24 MagnaValves are installed, it is recommended that the Chassis Ground be tied to the earth ground in a star configuration, see image below. This means that each 910-24 MagnaValve® has a direct path to the earth ground. The Chassis Ground (GREEN wire) and Signal Common (BLACK wire) must **NOT** be connected at any point.



1Star Configuration

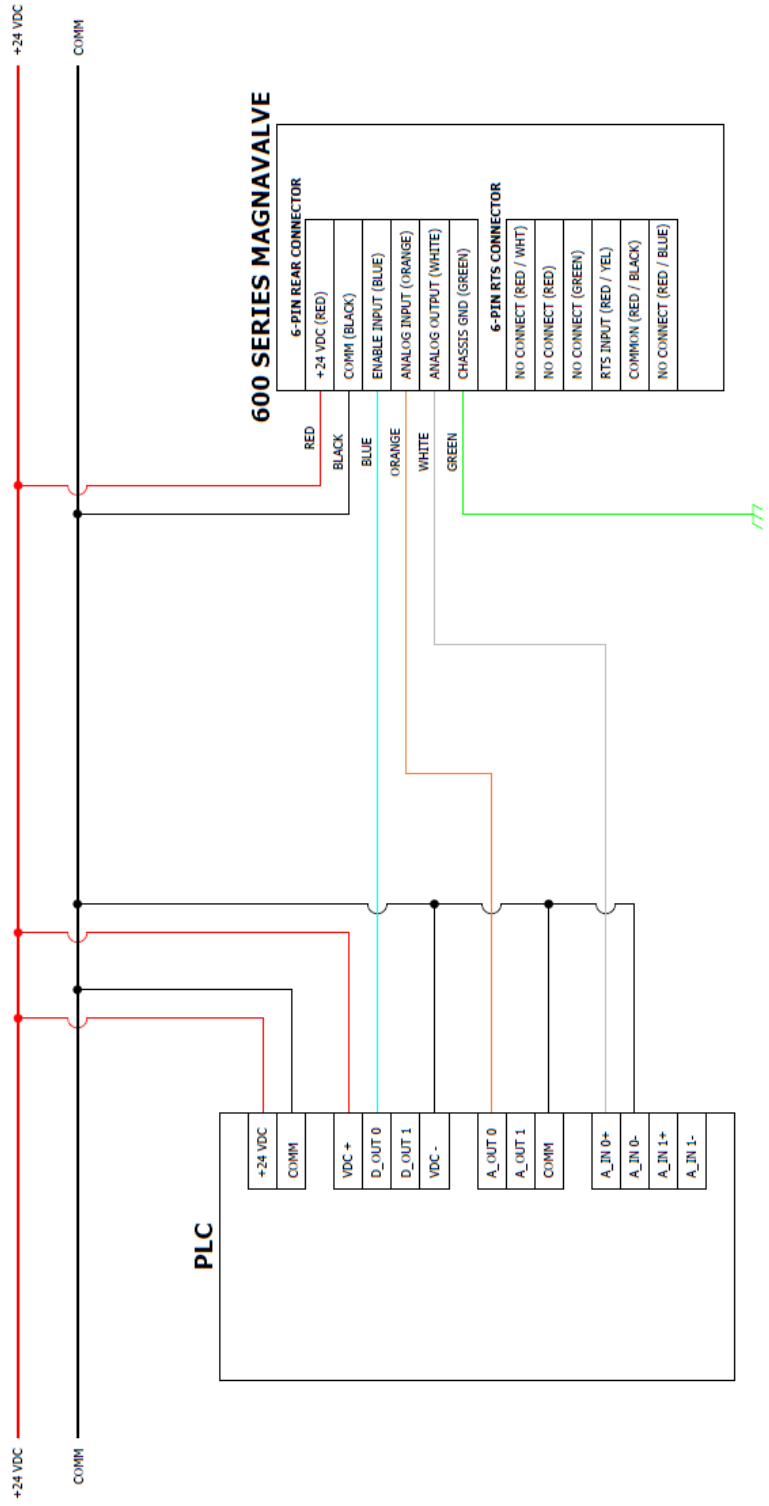
Wiring

When connecting the 910-24 MagnaValve® to the 24 Vdc supply, avoid daisy-chaining devices with the 910-24 MagnaValve. It is recommended that all 910-24 MagnaValves attach to the 24 Vdc power buss directly (star configuration). This will reduce possible interference with other 910-24 MagnaValves and other electronics.

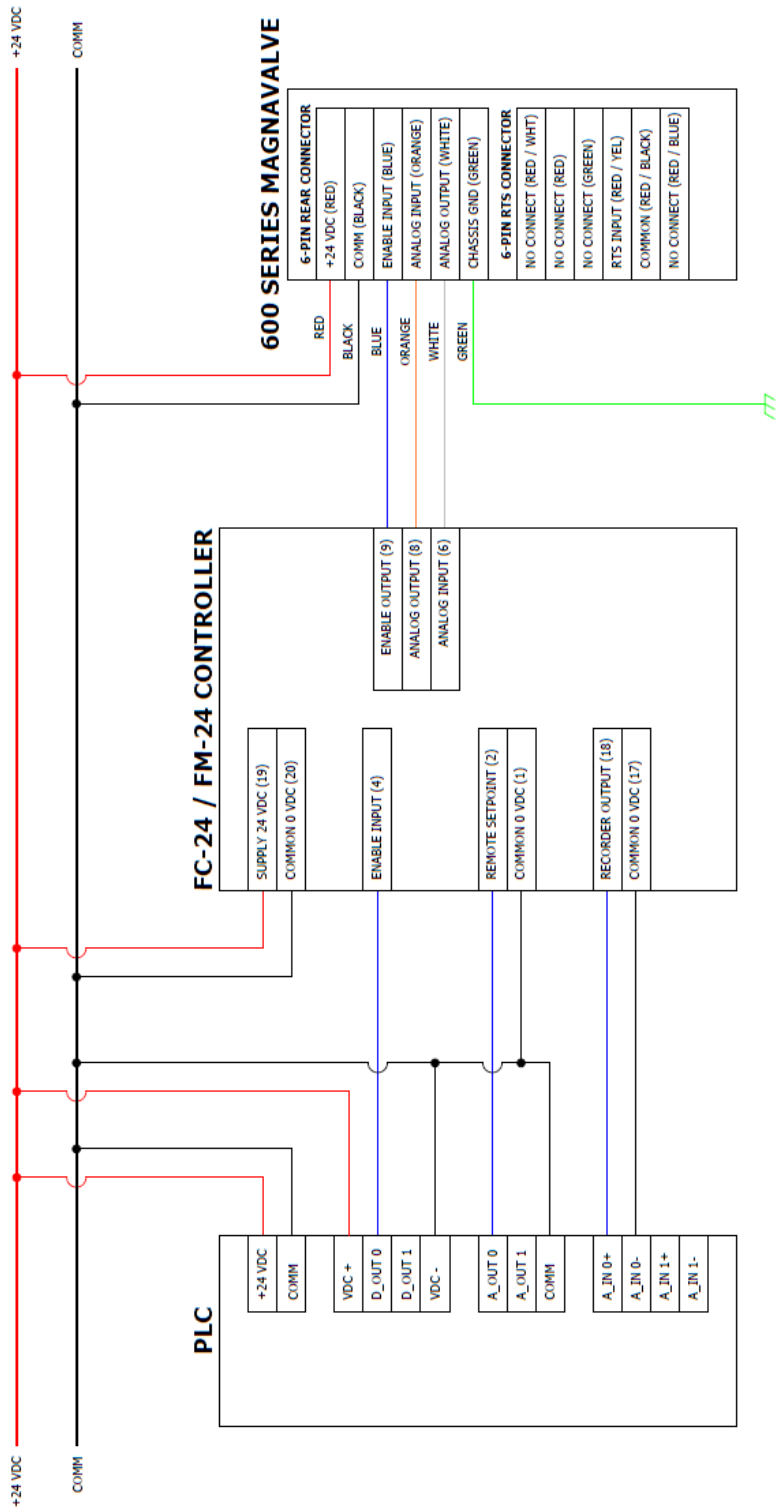
The chassis ground from each 910-24 MagnaValve must be attached directly to a clean earth ground (star configuration).

To reduce EMI issues, run all 910-24 MagnaValve wiring and DC supply wiring away from AC lines and signals.

Wiring a 910-24 MagnaValve Directly to a PLC



Wiring a 910-24 MagnaValve® Directly to a FC-24 / FM-24



RTS (Remote Table Select)

RTS input requirements

Parameter	Value
Voltage	0 Vdc - 10 Vdc
Current	0 µA – 12 µA

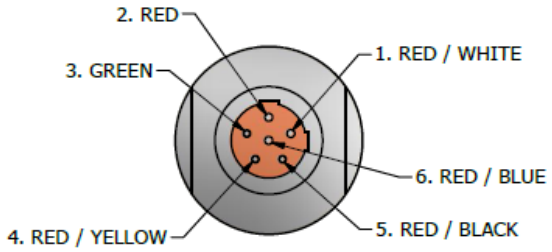
With a single analog input, located on the RTS connector, one of nine tables can be selected. The table below shows the analog voltage that selects the table.

RTS Voltage Ranges

Table #	Voltage Range +	Voltage Range -
Table 1	0.00 Vdc – 1.75 Vdc	0.00 Vdc – 1.25 Vdc
Table 2	1.76 Vdc – 2.75 Vdc	1.26 Vdc – 2.25 Vdc
Table 3	2.76 Vdc – 3.75 Vdc	2.26 Vdc – 3.25 Vdc
Table 4	3.76 Vdc – 4.75 Vdc	3.26 Vdc – 4.25 Vdc
Table 5	4.76 Vdc – 5.75 Vdc	4.26 Vdc – 5.25 Vdc
Table 6	5.76 Vdc – 6.75 Vdc	5.26 Vdc – 6.25 Vdc
Table 7	6.76 Vdc – 7.75 Vdc	6.26 Vdc – 7.25 Vdc
Table 8	7.76 Vdc – 8.75 Vdc	7.26 Vdc – 8.25 Vdc

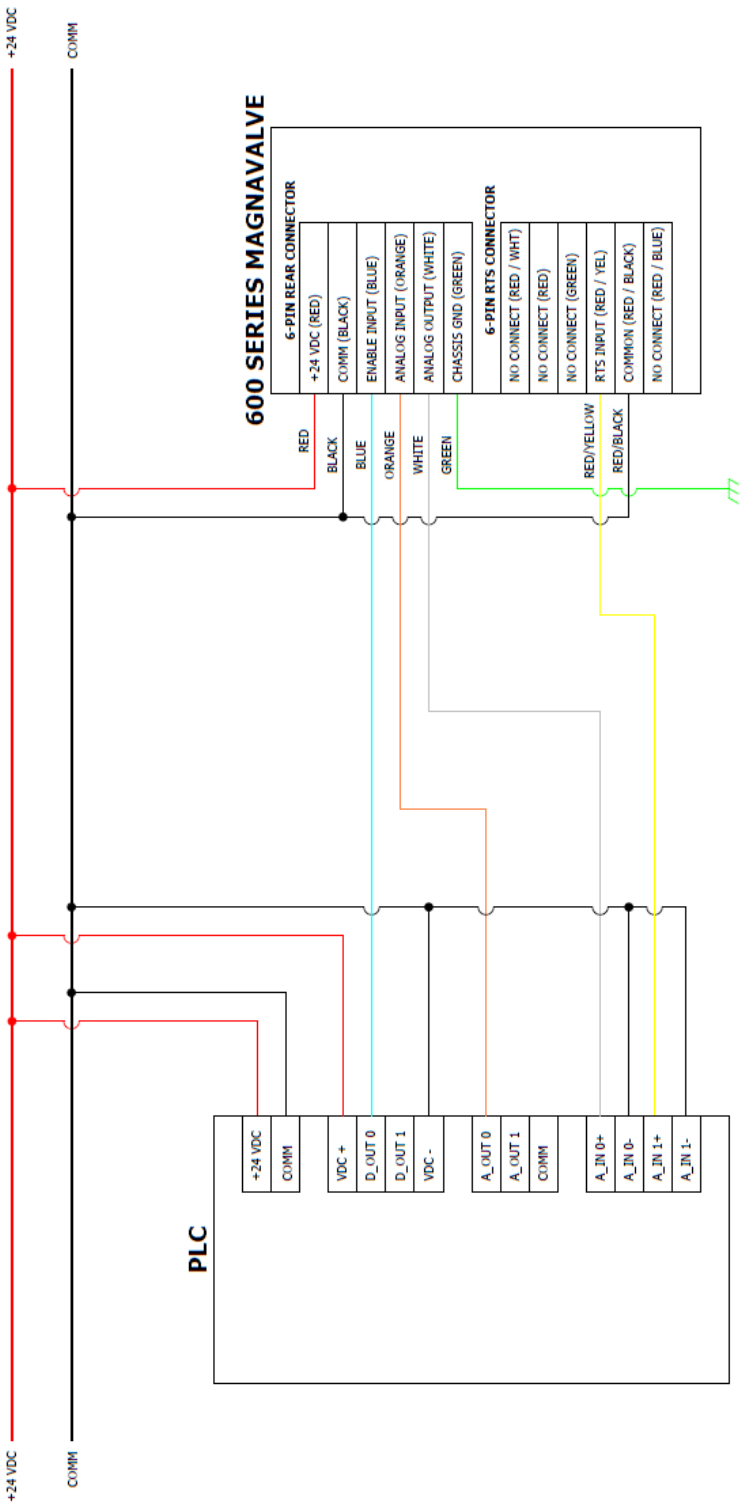
RTS Cable Pinout

Wire – Pin #	Table 1
Red / White – Pin 1	NC
Red – Pin 2	NC
Green – Pin 3	NC
Red / Yellow – Pin 4	0 – 10 Vdc
Red / Black – Pin 5	0 V
Red / Blue – Pin 6	NC



RTS connector and pin out

RTS Wiring


+24 VDC
COMM
600 SERIES MAGNAVALVE
6-PIN REAR CONNECTOR
+24 VDC (RED)
COMM (BLACK)
ENABLE INPUT (BLUE)
ANALOG INPUT (ORANGE)
ANALOG OUTPUT (WHITE)
CHASSIS GND (GREEN)
6-PIN RTS CONNECTOR
NO CONNECT (RED / WHT)
NO CONNECT (RED)
NO CONNECT (GREEN)
RTS INPUT (RED / YEL)
COMMON (RED / BLACK)
NO CONNECT (RED / BLUE)
RED
BLACK
BLUE
ORANGE
WHITE
GREEN
RED/YELLOW
RED/BLACK
PLC
+24 VDC
COMM
VDC +
D_OUT 0
D_OUT 1
VDC -
A_OUT 0
A_OUT 1
COMM
A_IN 0+
A_IN 0-
A_IN 1+
A_IN 1-
+24 VDC
COMM

MagnaValve Operation – Quick Start

Flowing Media Using a PLC

This section describes the basic operation of the 910-24 MagnaValve® when wired directly to a PLC.

The 910-24 MagnaValve comes from the factory with the following settings.

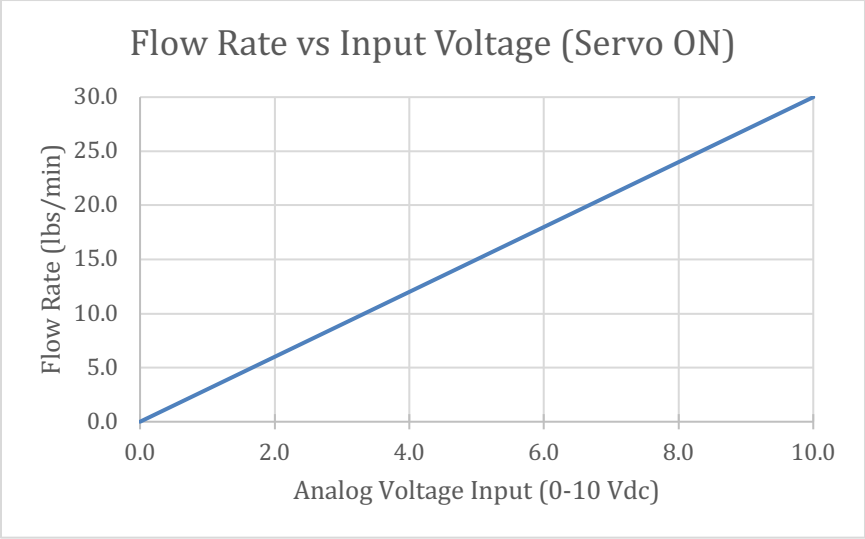
- Servo – Enabled
- Setpoint Lock – Enabled
- Servo Delay – 30

Use the following steps to start and control media flow from a PLC using the factory settings listed above.

1. Wire the 910-24 MagnaValve to the PLC as shown in the Electrical section.
2. Apply 24 Vdc supply to the 910-24 MagnaValve.
3. Apply the Analog Input Signal (0-10 Vdc) to the Analog Input (orange wire). This sets the Setpoint (lb/min). Use the equation below to calculate the Analog Input.

Note: The Flow Limit is the maximum flow rate for which the 910-24 MagnaValve has been calibrated. This can be found on the gold label located on the side of the 910-24 MagnaValve, or from the Home tab in the embedded webpage. While the Setpoint Lock is enabled, changing the Analog Input (orange wire) while the 910-24 MagnaValve is enabled will not influence the flow rate. While the Setpoint Lock is enabled, any changes to the Analog Input will take effect in the next peening cycle.

$$Analog\ Input\ (Vdc) = \frac{10\ (Vdc)}{Flow\ Limit\ \left(\frac{lb}{min}\right)} \times Setpoint\ \left(\frac{lb}{min}\right)$$

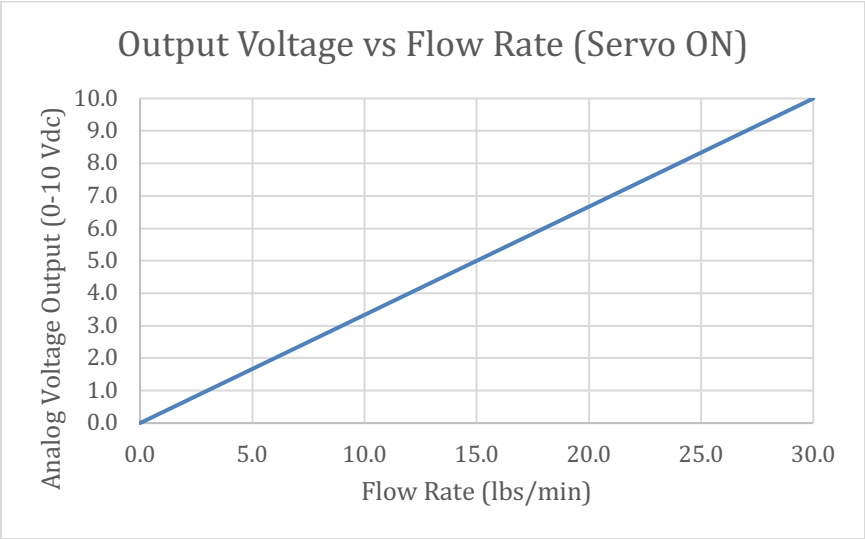


4. Apply 24 Vdc to the Enable Input (blue wire) to start flow and apply 0 Vdc to the Enable Input to stop flow.

Note: After changing the Analog Input, allow approximately 2 seconds before applying 24 Vdc to the Enable Input.

5. Monitor the Analog Output Signal (0-10 Vdc) on the Analog Output (white wire). This signal expresses the flow rate measured by the sensor in the 910-24 MagnaValve. Use the equation below to calculate the Flow Rate from the Analog Output.

$$Flow\ Rate\ \left(\frac{lb}{min}\right) = \frac{Flow\ Limit\ \left(\frac{lb}{min}\right)}{10\ (Vdc)} \times Analog\ Output\ (Vdc)$$



The 910-24 MagnaValve® Control Center

The 910-24 MagnaValves have a web browser-based control center that allows users to:

- Review the 910-24 MagnaValve's settings
- Calibrate up to nine tables
- Adjust the 910-24 MagnaValve's settings
- Record results of catch tests
- Verify catch tests results and restore the 910-24 MagnaValve to a previous state

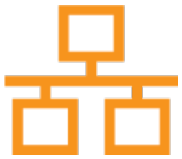
Accessing the Control Center (Connecting to a PC)

The following is the equipment needed to access the 910-24 MagnaValve's browser-based control center:

- A computer with web browser
- An Ethernet cable
- An Ethernet-to-USB port adapter if the computer does not have an Ethernet port

Connecting to the control center (direct connect)

1. Plug an Ethernet cable from the Ethernet port on the 910-24 MagnaValve to an Ethernet port on a PC. Use an Ethernet-to-USB adaptor if needed.
2. Apply power to the 910-24 MagnaValve.
3. Wait until the Ethernet Symbol is displayed in the top left corner of the LCD located on the front of the 910-24 MagnaValve. (The connection will take approximately 90 seconds.)
4. Type the 910-24 MagnaValve's IP address in the computer's internet browser search bar and press Enter. The factory default IP address is 169.254.158.24.

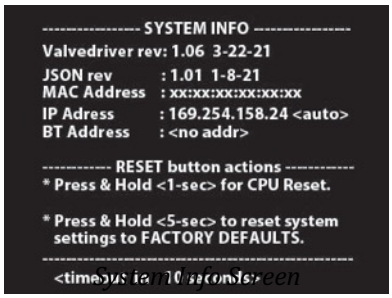


Ethernet Symbol

Connecting to the control center (DHCP router)

1. Plug an Ethernet cable from the Ethernet port on the 910-24 MagnaValve to an Ethernet port on a DHCP router, and another Ethernet cable from the DHCP router to a PC.
2. Apply power to the 910-24 MagnaValve.
3. Wait until the Ethernet Symbol is displayed in the top left corner of the LCD located on the front of the 910-24 MagnaValve.
4. Press and release the RESET button (using a paper clip) in the bottom of the 910-24 MagnaValve.
5. The LCD shows the SYSTEM INFO for 10 seconds, record the IP address.
6. Type the MagnaValve's IP address in the computer's internet browser search bar and press Enter.

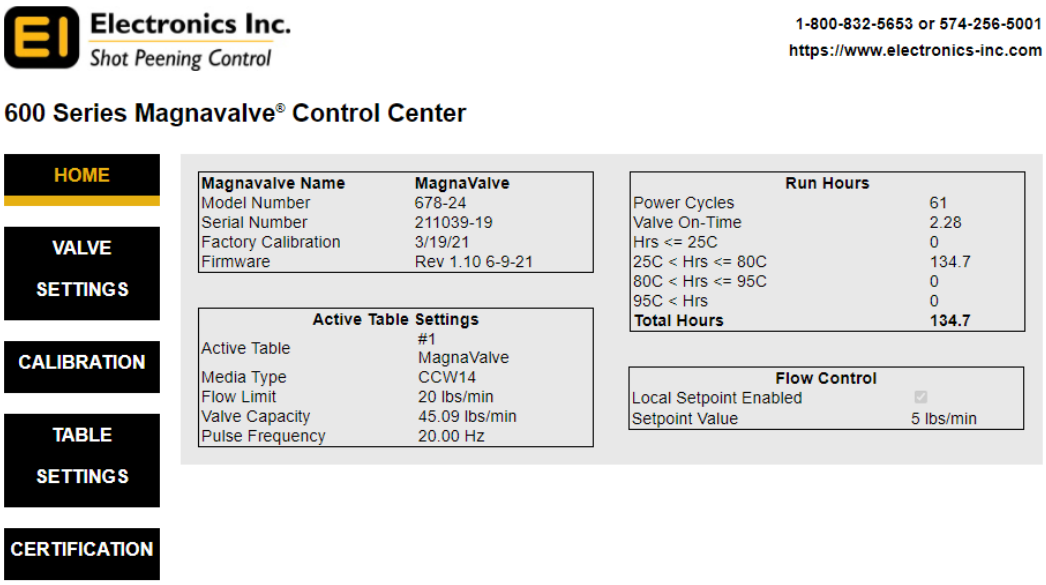
Ethernet Symbol



System Info Screen

Home

The Home screen displays reference data from the MagnaValve including the Model Number, Serial Number, the Date of the Factory Calibration, and the Firmware Version. The Home screen also displays the Active Table Settings and the Run Hours.



General Information

MagnaValve Name – The name of the MagnaValve. This name can also be used to search for the MagnaValve on the network, i.e., http://nozzle_no2. This value can be changed. See the **Settings section**.

Model Number – The model number of the 910-24 MagnaValve and is entered at the factory during manufacturing.

Serial Number – The serial number of the 910-24 MagnaValve and is entered at the factory during manufacturing. This number matches the serial number on the gold label located on the side of the 910-24 MagnaValve.

Factory Calibration – The day the 910-24 MagnaValve was calibrated at the factory. The Factory Calibration date may be the calibration at the time of purchase or when the 910-24 MagnaValve was sent back to the factory for recalibration.

Firmware – The installed version of the Firmware.

Active Table Settings

Active Table – The active table number, followed by the table name. This value can be changed. See the **Calibration section**.

Media Type – The media type and size used during the calibration of the Active Table. This value is typically set during calibration. See the **Calibration section**.

Flow Limit – Displays the calibration flow rate. In the above example, the output voltage is 10 Vdc when the 910-24 MagnaValve is flowing 20 lb/min. This value can be changed. See the **Calibration section**.

Valve Capacity – Displays the maximum flow rate of the 910-24 MagnaValve with the selected shot size. This value is set during the 100% catch test during calibration. See the **Calibration section**.

Pulse Frequency –This parameter will change the dither (small amount of shaking) of the shuttle. The value must be set before calibration. See the **Calibration section**. ***Note:*** Changing this value affects the 910-24 MagnaValve's calibration.

Run Hours

Power Cycles – Number of times the 910-24 MagnaValve has been powered ON and OFF.

Valve On-Time – The amount of time that the 910-24 MagnaValve has been both powered ON and enabled, i.e., the total amount of time the 910-24 MagnaValve has been flowing shot.

Hrs <= 25C – The amount of time the 910-24 MagnaValve has been powered ON while below a temperature of 25 °C.

25C < Hrs <= 80C – The amount of time the 910-24 MagnaValve has been powered ON while between the temperature of 25 °C and 80 °C.

80C < Hrs <= 95C – The amount of time the 910-24 MagnaValve has been powered ON while between the temperature of 80 °C and 95 °C.

95C < Hrs – The amount of time the 910-24 MagnaValve has been powered ON while above the temperature of 95 °C.

Total Hours – Displays the total time that the 910-24 MagnaValve has been powered ON.

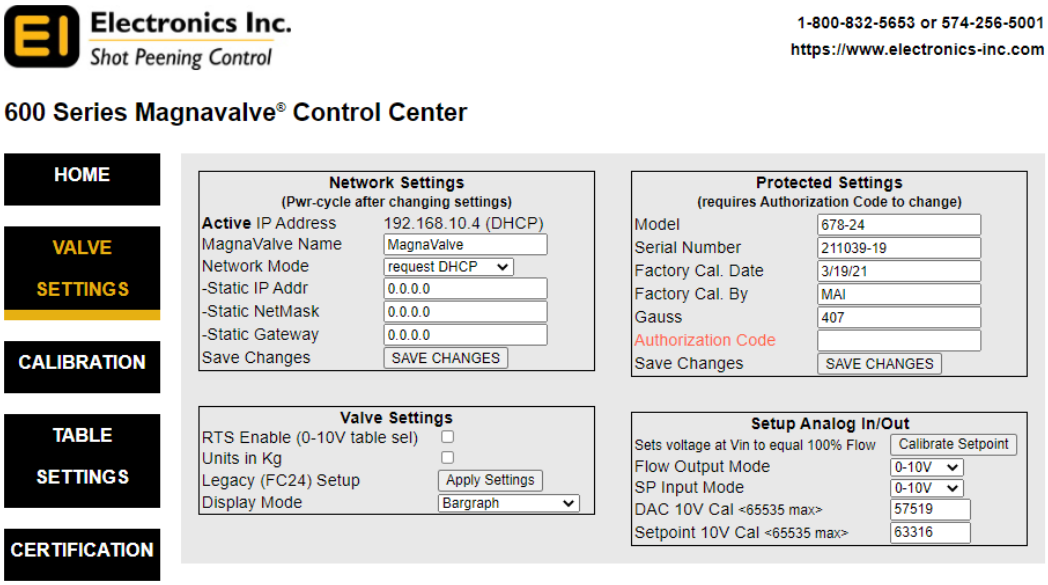
Flow Control

Local Setpoint Enabled – Indicates whether the local setpoint is enabled or not.

Setpoint Value – Displays the setpoint value. ***Note:*** This value is updated only when the page is updated.

Valve Settings

The Settings screen contains all the settings that affect the whole MagnaValve® and not just one table. For example, it includes network settings and display options.



Network Settings

Active IP Address – Displays the 910-24 MagnaValve's active IP Address. The default IP address is 169.254.158.24

MagnaValve Name – Allows the user to enter a desired name for the 910-24 MagnaValve. This name is displayed on the 910-24 MagnaValve's LCD. This name can also be used in place of the IP address when connecting through a browser. In this example, http://MagnaValve was entered. Other possible options are nozzle_no2, gun2_, or MagnaValve3. ***Note:*** Do not use spaces in the 910-24 MagnaValve's name.

Network Mode – The 910-24 MagnaValve can be configured to use DHCP or static IP addressing. Select from the drop-down list.

-Static IP Addr – When static IP addressing is used, it allows the user to enter the desired static IP address.

-Static NetMask – When static IP addressing is used, it allows the user to enter the desired static Netmask.

-Static Gateway – When static IP addressing is used, it allows the user to enter the desired static gateway.

Save Changes – Press "Save Changes" after making changes to Network Settings. ***Note:*** User must cycle power for changes to take effect after saving the changes.

Valve Settings

RTS Enable (0-10V table select) – Checking this option enables RTS mode. When selected, a 0-10V signal applied to the RTS line controls which table is active. When selected, the RTS indicator appears on the MagnaValve's screen. ***Note:*** The RTS option requires a hardware change. If the MagnaValve does not have the RTS option, please contact Electronics Inc. for more information.

Units in Kg – Checking this option displays weight in kilograms instead of pounds.

Legacy (FC24) Setup – When the 910-24 MagnaValve is used with a FC-24 Controller, selecting this option will automatically make changes to select table settings to ensure proper operation with the FC-24. ***Note:*** This is a one-way switch—selecting this option makes the changes, but unselecting does not reverse the changes.

Display Mode – Selects different MagnaValve screen display options. The different options are Off, Splash (MagnaValve logo), Bargraph (default), Legacy (LEDs), and Bargraph & Splash (cycles between the bargraph and the splash screens).

Setup Analog In/Out

Sets voltage at Vin to equal 100% Flow – Calibrates the user's 10Vdc analog input signal to Full-Scale Flow Rate of the 910-24 MagnaValve. ***Note:*** This feature only works when SP Input Mode is set to 0-10V. To use this feature, apply 10 Vdc to the Analog Input (Setpoint Input), and then click the "Calibrate Setpoint" button.
Flow Output Mode – Allows the user to select between 0-10V or 4-20mA for the Analog Output (Flow Rate Output) signal.
SP Input Mode – Allows the user to select between 0-10V or 4-20mA for the Analog Input (Setpoint Input) signal.
DAC 10V Cal – Analog Output setting. Default setting is 59410.
Setpoint 10V Cal – This value is the result of "Sets voltage at Vin to equal 100% Flow". ***Note:*** This value can be overwritten. It is recommended to use the above procedure to set this value.

Protected Settings

All protected settings are entered at the factory and cannot be changed by the end-user.

Calibration

The Calibration screen is used to change active tables, view current calibration values, and calibrate the MagnaValve with a specific media type, size, and flow rate.

Note: Do not forget to press “Save Changes” after making changes on this screen.

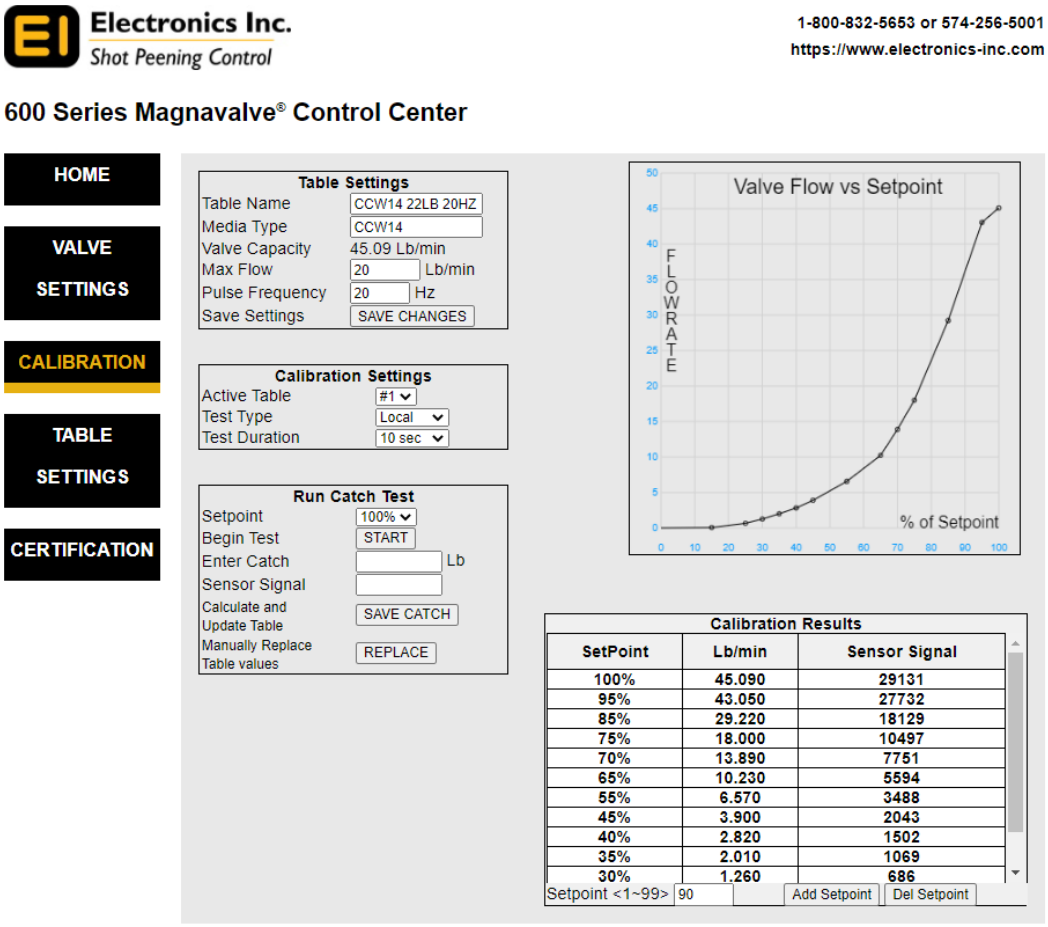


Table Settings

Table Name – Enter the desired table name and click “Save Changes.” This table name is displayed on the 910-24 MagnaValve’s LCD.

Media Type – Enter the media type and size used during the active table’s calibration and click “Save Changes.” An example of media type and size is S-230 or CCW-14. The media type is displayed on the Home Screen.

Valve Capacity – Valve Capacity is the maximum flow rate the 910-24 MagnaValve is capable of with the media type and size used. This value is automatically collected from the 100% Setpoint catch test and equals the 100% catch test flow rate. It is updated each time the 100% Setpoint catch test is completed and saved.

Max Flow – Max Flow is the desired maximum flow rate for the active table and is the calibrated flow rate for the Analog Output. If the Servo is turned ON, then when 10 Vdc is applied to the Analog Input (Setpoint Input), the 910-24 MagnaValve flows the Max Flow and the 910-24 MagnaValve outputs 10 Vdc on the Analog Output when flowing the Max Flow value. For example, if the Max Flow is equal to 30 lb/min, then 0 – 10 Vdc is applied to the Analog Input will flow 0 – 30 lb/min (where 0 Vdc flows 0 lb/min and 10 Vdc flows 30 lb/min). While at the same time, when

the 910-24 MagnaValve is flowing 0 lb/min, the Analog Output Signal is 0 Vdc and when the MagnaValve is flowing 30 lb/min, the Analog Output Signal is 10 Vdc.
Pulse Frequency - This parameter will change the dither (small amount of shaking) of the shuttle. See the Principle of Operation section for more information. The value must be set before calibration. See the **Calibration section**.
Note: Changing this value affects the 910-24 MagnaValve's calibration. The range is 6 to 50 Hz.
Save Settings – Press "Save Settings" after making changes to Table Settings.

Calibration Settings

The Calibration Settings control which table is active (the desired table to be calibrated must be active), how the catch test is triggered, and the duration of the catch test, if done locally.

Active Table – Selects the active table. To change the active table, select the desired table from the drop-down list. The selected table becomes the Active Table. The graph and the Calibration Results table display the saved values for the Active Table.
Test Type – Selects whether the catch test is triggered locally (Local) or remotely through the Enable Signal (Remote).
Test Duration – If the test type is Local, select the duration of the catch test. Options are 10, 20, 30, 45, 60, 90, 120 seconds. If conducting a Remote test, the catch test duration is equal to the applied Enable signal duration.

Run Catch Test

This section contains the controls to conduct a catch test.

Setpoint – Select the desired Setpoint to conduct a catch test.
Begin Test – If Test Type is set to Local, clicking the Start button starts media flow. Media flows for the selected Test Duration. If Test Type is set to Remote, clicking the Start button allows the catch test to start after an Enable signal is received. At that time, the media starts flowing. Media continues to flow until the Enable signal is removed.
Enter Catch – At the end of a catch test, enter the total weight caught during the catch test. The system calculates the flow rate automatically based on the catch test's duration and the weight of the media caught.
Sensor Signal – This is the measured sensor signal during the catch test.
Calculate and Update Table – Press "Save Catch" to enter Catch Test results to the Calibration Results table.
Manually Replace Table Entries – Press "Replace" to make changes to the Catch Test results in the Calibration Results table.

Graph

The graph shows the open-loop Calibration Results. The graph is flow rate vs. Analog Input where 0 – 100% represents 0 – 10 Vdc on the Analog Input.

Calibration Results

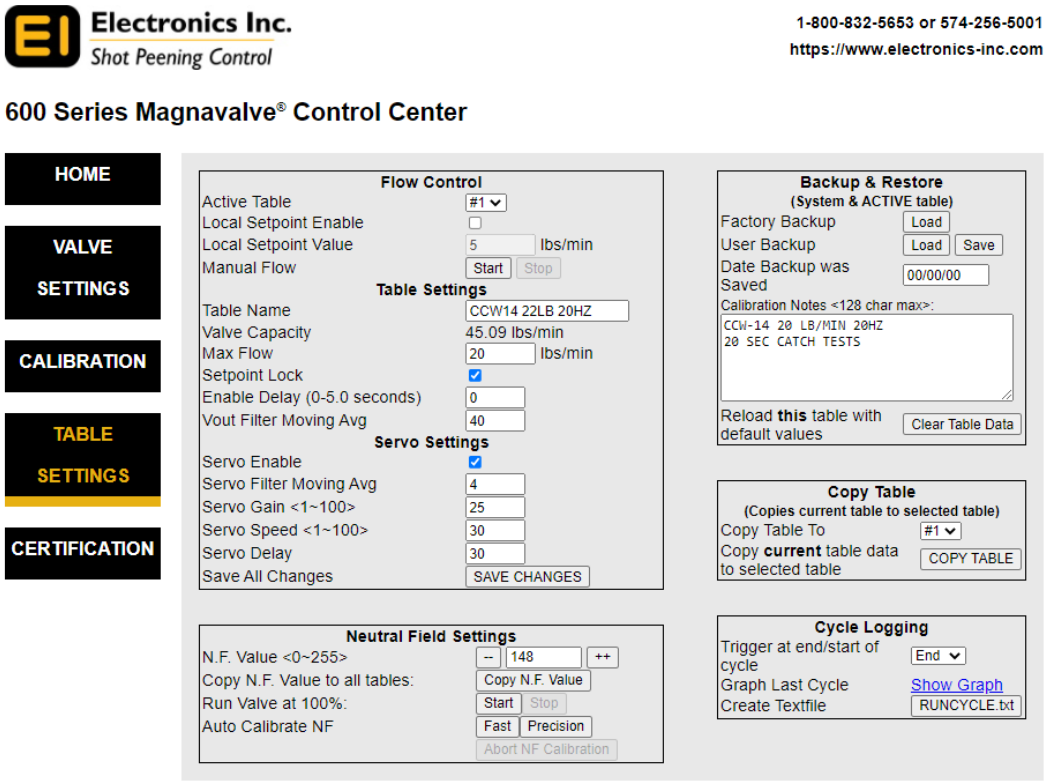
The Calibration Results table shows the flow rate for each Setpoint and its corresponding Sensor Signal. The Sensor Signal was measured during the catch test for the given Setpoint, and the lb/min is the flow rate calculated from the entered catchweight at the end of the catch test.

Add Setpoint / Del Setpoint

The Add Setpoint and Del (delete) Setpoint buttons at the bottom of the Calibration Results table allow Setpoints to be added or removed from the Calibration Results table.

Table Settings

The Table Settings screen enables the user to fine-tune the shot peening process, setup data logging, and backup tables.



Flow Control

Active Table – Selects the active table. To change the active table, select the desired table from the dropdown list. The selected table becomes the Active Table. The graph and the Calibration Results table display the saved values for the Active Table.

Local Setpoint Enable – When enabled, the Analog Input is disabled and the Setpoint is controlled by the Local Setpoint Value entered by the user on the Table Setting tab in the embedded webpage.

Local Setpoint Value – When the Local Setpoint is enabled, the Local Setpoint Valve sets the flow rate of the 910-24 MagnaValve.

Manual Flow – Pressing the Start button will start media flow through the 910-24 MagnaValve. Pressing the Stop button will stop media flow through the 910-24 MagnaValve. ***Note:*** The Start / Stop buttons will start and stop media flow regardless of the Setpoint mode (local or remote).

Table Settings

Table Name – Enter the desired table name and click "Save Changes." This table name is displayed on the 910-24 MagnaValve's LCD and the Home Screen.

Valve Capacity – Valve Capacity is the maximum flow rate the 910-24 MagnaValve is capable of with the media type and size used. This value is automatically collected from the 100% Setpoint catch test and equals the 100% catch test flow rate. It is updated each time the 100% Setpoint catch test is completed and saved.

Max Flow – Max Flow is the desired maximum flow rate for the active table and is the calibrated flow rate for the Analog Output. If the Servo is turned ON, then when 10 Vdc is applied to the Analog Input (Setpoint Input), the 910-

24 MagnaValve flows the Max Flow and the 910-24 MagnaValve outputs 10 Vdc on the Analog Output when flowing the Max Flow value. For example, if Max Flow is equal to 30 lb/min, then 0 – 10 Vdc applied to the Analog Input flows 0 – 30 lb/min (where 0 Vdc flows 0 lb/min and 10 Vdc flows 30 lb/min). While at the same time, when the 910-24 MagnaValve is flowing 0 lb/min, the Analog Output Signal is 0 Vdc and when the 910-24 MagnaValve is flowing 30 lb/min, the Analog Output Signal is 10 Vdc.

Setpoint Lock – When the box is checked, the Analog Input (Setpoint Input) gets latched when the Enabled signal is applied. This ensures that the Setpoint remains steady throughout the run cycle.

Enable Delay (0-5.0 seconds) – This setting delays the start of media flow for the set time after the enable signal to the 910-24 MagnaValve has been received.

Vout Filter Moving Avg – Controls the amount of filtering on the Analog Output signal. This parameter does not affect the servo response. The moving average filter works for averaging the last x number of analog output values together. The sample rate of the Analog Output is equal to the Pulse Frequency. The default value is 4. The range is 1 to 512.

Servo Settings

Servo Enable - Checking this option enables the servo (closed-loop mode). Enabling the servo uses the sensor inside the 910-24 MagnaValve as feedback to maintain a constant flow rate.

Servo Filter Moving Avg – Filters the sensor signal before it is used by the servo. This is helpful when the sensor signal is very noisy. The default value is 4. The range is 1 to 32. Increasing this value will slow down the servo's response.

Servo Gain <1-100> - The proportional contribution of the PI servo algorithm. The higher the number; the more aggressive the servo response will be. The default value is 25. The range is 1 to 100.

Servo Speed <1-100> - The integral contribution of the PI servo algorithm. The higher the number; the quicker the servo will respond. The default value is 30. The range is 1 to 100.

Servo Delay – Delays the servo for a set amount of time at the start of a cycle. At the start of a cycle, it takes time for media to reach the sensor and for the flow rate to stabilize. If the servo is active during this stabilization period, the system will start to oscillate. The default value is 30. The range is 1 to 100. The Servo Delay is scaled such that each increment is equal to the Pulse Frequency period.

$$Delay\ time\ (s) = \frac{1}{Pulse\ Frequency\ (Hz)} \times Servo\ Delay\ Value$$

Example: What is the delay when the Pulse Frequency is 20 Hz and the Servo Delay value is 30?

$$\frac{1}{20\ Hz} \times 30 = 1.5\ seconds$$

Save All Changes – Press "SAVE CHANGES" after making any changes on this page. ***Note:*** Pressing "SAVE CHANGES" does not save the cycle logging data.

Neutral Field Settings

N.F. Value <0~255> - This value sets the current through the power coil that lifts the magnetic shuttle. This value is critical in ensuring that the 910-24 MagnaValve will flow the maximum amount physically possible when fully turned on. ***Note:*** This value is set at the factory and should not need to be changed. The value is set to 128.

Copy NF. Value to all tables – Pressing this button will copy the neutral field (N.F.) valve from the active table to all other tables. In most applications, all tables will have the same N.F. value. Only in special circumstances, such as one table is calibrated with cast steel and another table is calibrated with stainless conditioned cut wire, then the N.F. values maybe different for those tables. ***Note:*** Pressing this button will overwrite the N.F. values in all other tables.

Run Valve at 100% - Clicking the Start button will turn the 910-24 MagnaValve on 100%; clicking the Stop button will turn off the 910-24 MagnaValve. This option is typically used when setting neutral field (N.F.) using a gauss meter.
Auto Calibrate NF –***Note:*** This option is not needed for the 910-24 MagnaValve.

Backup & Restore

Factory Backup – Choosing "Load" restores all tables back to factory settings. ***Note:*** It is recommended that before choosing the Factory Backup option, save all calibrated tables to the User Backup. Doing so allows the user data to be reloaded after the Factory Backup if desired.
User Backup – Choosing "Load" restores the active table and table setting to last user backup. Choosing "Save" saves the active table and table settings to the User Backup.
Date Backup was Saved – Allows the user to date the backup. The date entered in this field will be displayed at all times even if the "Save" button was never pressed.
Calibration Notes – Allows the user to add notes to the backup or to this table. The data entered in this field will be displayed at all times even if the "Save" button was never pressed.
Reload this table with default values – Erases the active table and loads all zero values.

Copy Table

This allows a user to copy the active table to another table. Copy Table can be used to test out different servo settings without risk of affecting the active table.
Copy Table To – Selects the table number for the placement of the active table copy.
Copy current table data to selected table – Pressing this button will copy the contents and settings of the active table to the selected desired table.

Cycle Logging

Trigger at end/start of cycle – The 910-24 MagnaValve data logs 500 samples of the of the start or end of the peening cycle. The Trigger at end/start of cycle sets whether the first or last 500 samples are logged. Choose from the dropdown list. To see the data, click the "Show Graph" link below.
Graph Last Cycle – Clicking the Show Graph link will display a graph showing the first or last 500 samples of the last cycle.
Create Textfile – Clicking the RUNCYCLE.txt button will build and download a text file of the first or last 500 samples of the last cycle. The text file is tab delimited and can be imported into Excel or MATLAB for further evaluation.

Certification

Certification verifies catch tests results. The 910-24 MagnaValve's Jump-To feature enables users to reduce the length of a catch test.

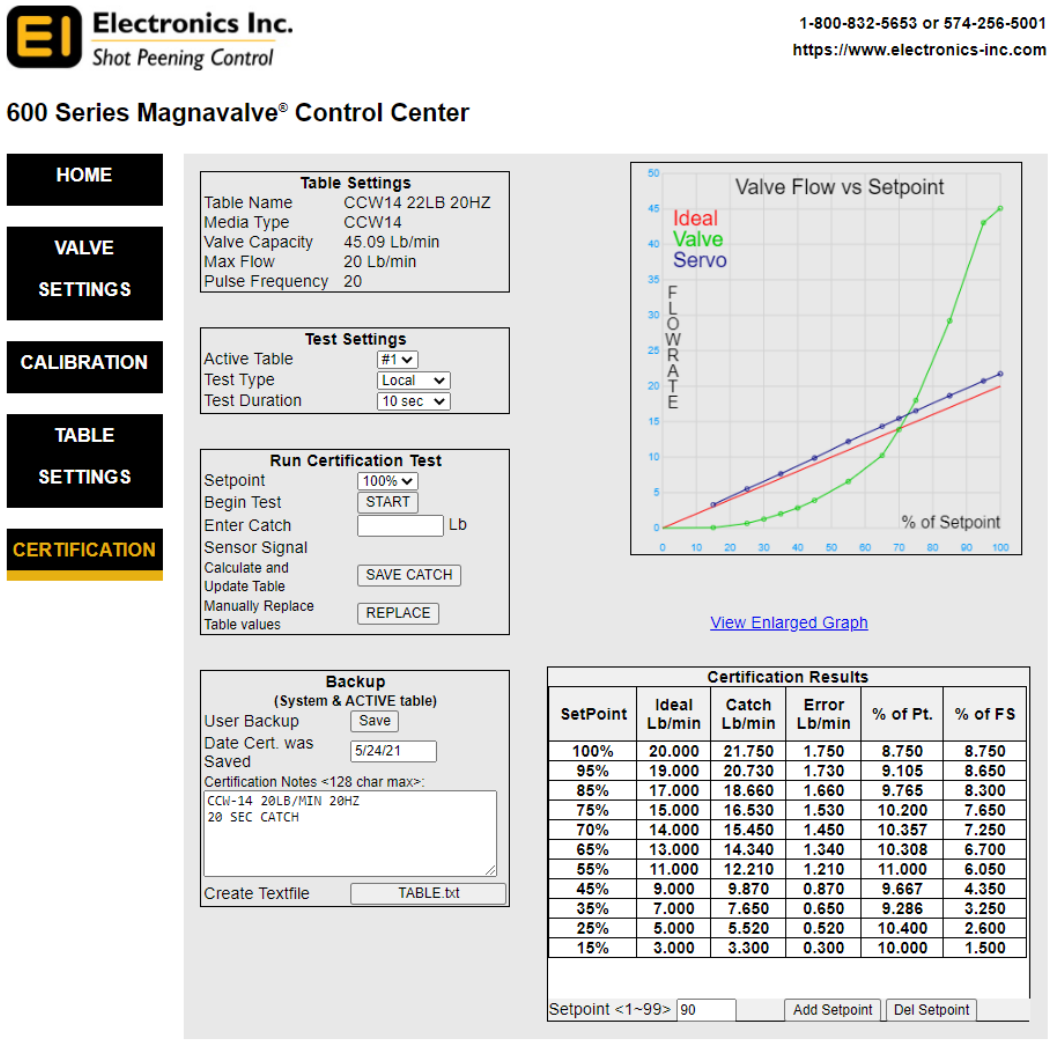


Table Settings

Table Name –This table name is displayed on the 910-24 MagnaValve's LCD and the Home Screen.

Media Type – Enter the media type and size used during the active table's calibration and click "Save Changes." An example of media type and size is S-230 or CCW-14. The media type is displayed on the Home Screen.

Valve Capacity – Valve Capacity is the maximum flow rate the MagnaValve is capable of with the media type and size used. This value is automatically collected from the 100% Setpoint catch test and equals the 100% catch test flow rate. It is updated each time the 100% Setpoint catch test is completed and saved.

Max Flow – Max Flow is the desired maximum flow rate for the active table and is the calibrated flow rate for the Analog Output. If the Servo is turned ON, then when 10 Vdc is applied to the Analog Input (Setpoint Input), the 910-24 MagnaValve flows the Max Flow, and the 910-24 MagnaValve outputs 10 Vdc on the Analog Output when flowing the Max Flow value. For example, if Max Flow is equal to 30 lb/min, then 0 – 10 Vdc is applied to the Analog Input will flow 0 – 30 lb/min (where 0 Vdc flows 0 lb/min and 10 Vdc flows 30 lb/min). While at the same time, when the 910-24 MagnaValve is flowing 0 lb/min, the Analog Output Signal is 0 Vdc and when the 910-24 MagnaValve is flowing 30 lb/min, the Analog Output Signal is 10 Vdc.

Pulse Frequency – This parameter will change the dither (small amount of shaking) of the shuttle. See the Principle of Operation section for more information. This value must be set before calibration. See the **Calibration section**. ***Note:*** Changing this value affects the 910-24 MagnaValve's calibration. See Principle of Operation for more details.

Test Settings

Active Table – Selects the active table. To change the active table, select the desired table from the drop-down list. The selected table becomes the Active Table. The graph and the Calibration Results table display the saved values for the Active Table.
Test Type – Selects whether the catch test is triggered locally (Local) or remotely through the Enable Signal (Remote).
Test Duration – If the test type is Local, select the duration of the catch test. Options are 10, 20, 30, 45, 60, 90, 120 seconds. If conducting a Remote test, the catch test duration is equal to the applied Enable signal duration.

Run Certification Test

Setpoint – Selects the desired Setpoint to conduct a catch test.
Begin Test – If Test Type is set to Local, clicking the Start button starts media flow. Media flows for the selected Test Duration. If Test Type is set to Remote, clicking the Start button allows the catch test to start after an Enable signal is received. At that time, the media starts flowing. Media continues to flow until the Enable signal is removed.
Enter Catch – At the end of a catch test, enter the total weight caught during the catch test. The system calculates the flow rate automatically based on the catch test's duration and the weight of the media caught.
Sensor Signal – This is the measured sensor signal during the catch test.
Calculate and Update Table – Press "Save Catch" to save Catch Test results to the Certification Results table.
Manually Replace Table values – Press "Replace" to make changes to Catch Test results in the Certification Results table.

Backup

User Backup – Choosing "Load" restores the active table and table setting to the last user backup. Choosing "Save" saves the active table and table settings to the User Backup.
Date Cert. was Saved – Allows the user to date the backup. The date entered in this field is displayed at all times even if the "Save" button was never pressed.
Calibration Notes – Allows the user to add notes to the backup or to this table. The data entered in this field is displayed at all times even if the "Save" button was never pressed.
Create Textfile – Clicking the TABLE.txt button builds and downloads the text file with all the data (both open-loop and closed-loop tests) from the active table. The textfile is tab-delimited and can be imported into Excel or MATLAB for further evaluation.

Graph

The graph shows the results of the open-loop test (from the calibration page) and the closed-loop test (the certification results). The graph is flow rate vs. Analog Input where 0 – 100% represents 0 – 10 Vdc on the Analog Input. Green line is open-loop, Blue is closed-loop, and Red is ideal.

Certification Results

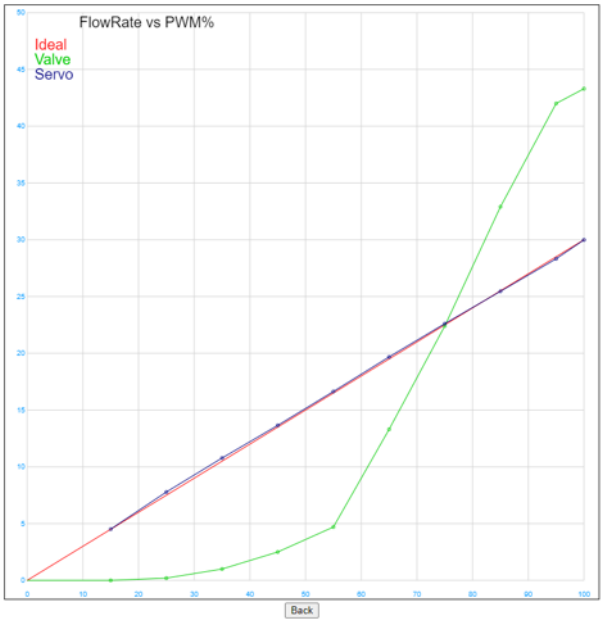
The Certification Results table shows the flow rate for each Setpoint and its corresponding Sensor Signal. The Sensor Signal was measured during the catch test for the given Setpoint, and the lb/min is the flow rate calculated from the entered catchweight at the end of the catch test.

Add Setpoint / Del Setpoint

The Add Setpoint and Del (delete) Setpoint buttons at the bottom of the Certification Results table allow additional Setpoints to be added or current setpoints removed from the Certification Results table.

Graph

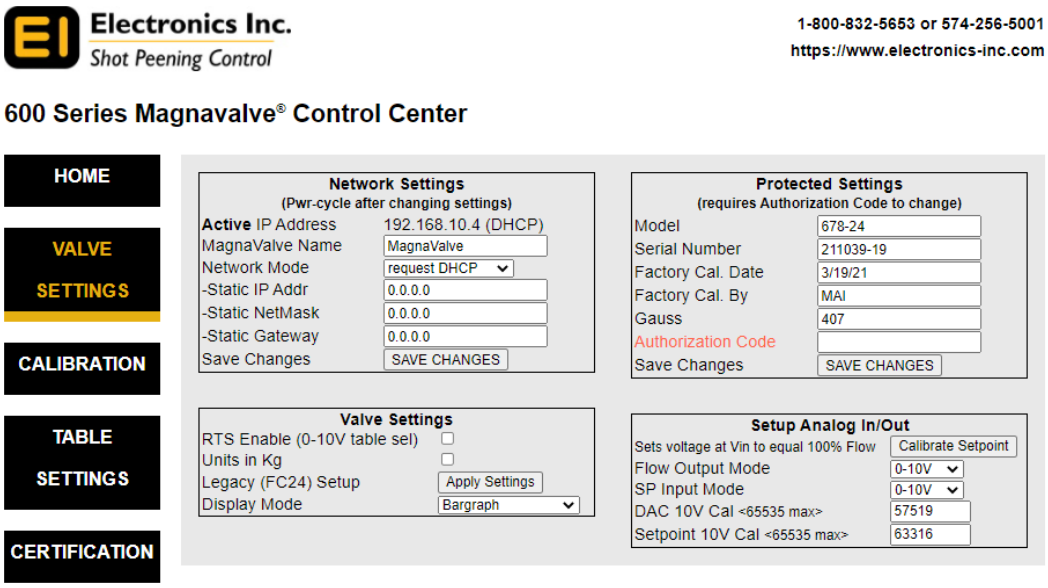
The graph shows the results of the open-loop test (from the calibration page) and the closed-loop test (the certification results). The graph is flow rate vs. Analog Input where 0 – 100% represents 0 – 10 Vdc on the Analog Input. Green line is open-loop, Blue is closed-loop, and Red is ideal.



Valve Operation

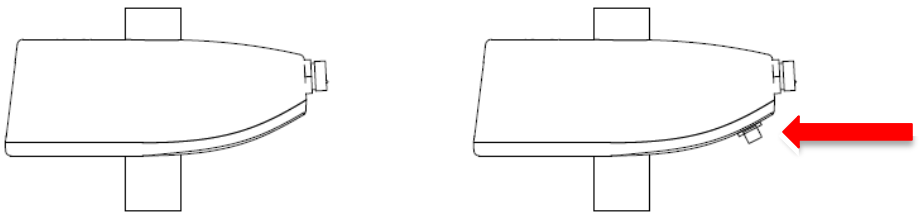
Changing Valve Settings

Valve Settings can be found by selecting the VALVE SETTINGS tab on the embedded webpage.



How to Enable / Disable RTS (Remote Table Select) if installed

If the RTS option is installed on the MagnaValve, the RTS Enable should be selected. If the RTS option is NOT installed on the MagnaValve and this option is selected, unintentional table changes may occur.



No RTS Option Installed

RTS Option Installed

To Enable or Disable RTS mode:

1. Left click the Valve Settings tab.
2. Under Valve Settings,
3. Check the box next to **RTS Enable** to enable the RTS mode.
4. Uncheck the box next to **RTS Enable** to disable the RTS mode.

How to change weight units (lb or kg)

The weight values in the calibration tables can be displayed in either kilograms or pounds.

Note: Ensure the correct units are chosen before entering catch weights into a table. The value entered is assumed to be in the units selected under Valve Settings.

To change the weight units:

1. Left click on the Valve Settings tab.
2. Under Valve Settings,
3. Check the box next to **The Units in Kg** to display the weight units in kilograms.
4. Uncheck the box next to **The Units in Kg** to display the units in pounds.

How to set the 910-24 MagnaValve to work with a FC-24 Controller

To quickly configure the 910-24 MagnaValve to be operated from a FC-24 Controller:

1. Left click the Valve Settings tab.
2. Under Valve Settings,
3. Left click the “Apply Settings” button next to **Legacy (FC24) Setup**.

Note: Clicking the “Apply Settings” button makes the following changes:

- Turn off the Servo for all tables
- Turn off Setpoint lock
- Change the display mode of the LCD to Bargraph no Servo

Note: To revert to the previous state after clicking the “Apply Settings” button next to **Legacy (FC24) Setup**, all settings must be changed back manually.

How to change the Display Mode

The 910-24 MagnaValve has five screen display options. The different options are Off, Splash, Bargraph, Legacy, and Bargraph & Splash. The different options are shown below (off is not shown).

Off – When “Off” is chosen, the LCD remains blank after power on.

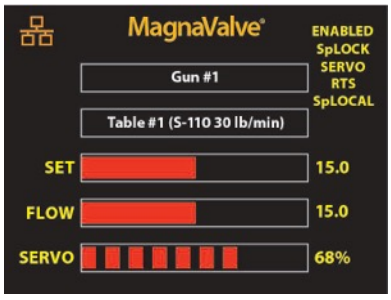
Bargraph – When "Bargraph" is chosen, the LCD displays the most information of all the screens. This option shows the setpoint, flow rate, and servo output in both a bar graph view and digital readout. It displays the 910-24 MagnaValve's name, table number, and table name. It also displays the status of the Enable, Setpoint Lock, and Servo. When the servo is turned OFF, the display will show all the same information; however, the Setpoint bar graph and read out will not be displayed.
Legacy – When "Legacy" is chosen, the LCD mimics the four LEDs on the front of the 5xx – 24 MagnaValves.
Bargraph & Splash – When "Bargraph & Splash" is chosen, the LCD will toggle between the Bargraph and Splash screens at a fixed interval entered into the Change Time number box.

To change the Display Mode:

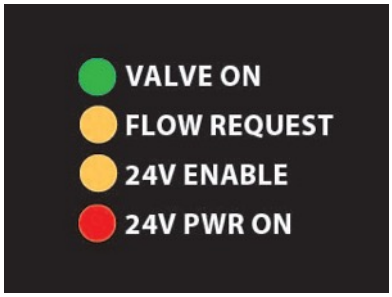
1. Left click the Valve Setting tab.
2. Under Valve Settings,
3. Select the desired Display Mode from the drop-down next to **Display Mode**.
4. If Bargraph and Splash are chosen for the Display Mode, then enter the switching duration in the number box next to **Change Time**.

The default valve for the Display Mode is Bargraph.

Splash Screen



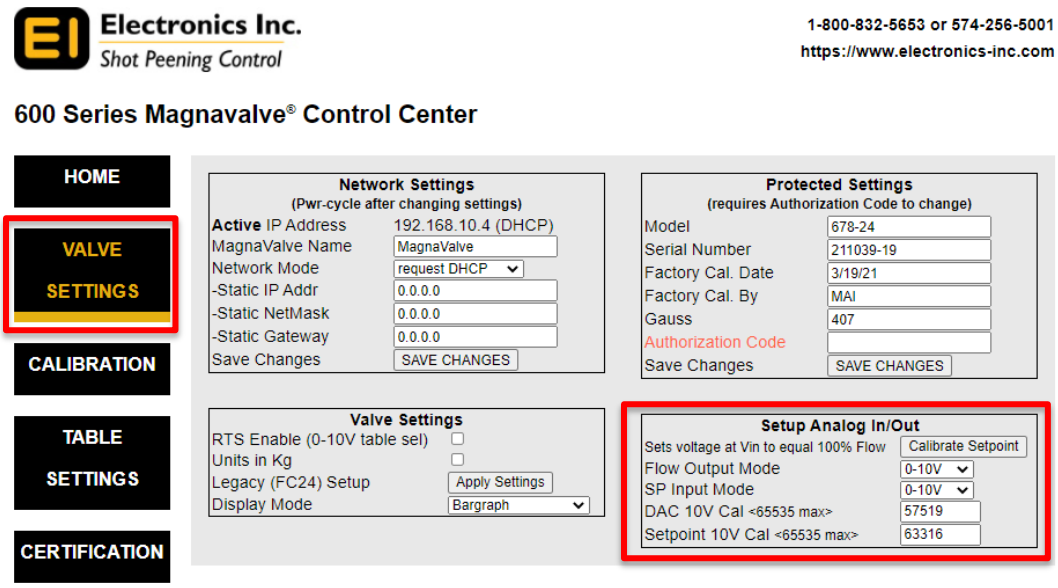
Bargraph Screen



Legacy Screen

Setup Analog In/Out

Setup Analog In/Out can be found by selecting the SETTINGS tab on the embedded webpage.



How to change the Setpoint Input to Voltage or Current Input

The Analog Input can be configured to either 0 – 10 V output or 4 – 20 mA input.

To change the Analog Input mode (SP Input Mode):

1. Left click the Valve Settings tab.
2. Under Setup Analog In/Out,
3. Left-click the drop-down next to **SP Input Mode** and choose either 0 – 10 V or 4 – 20 mA.

Note: If "Off" is chosen for the "SP Input Mode," then the Analog Input is disabled.

How to adjust the Analog Voltage Input

To ensure that the 10 Vdc applied to the Analog Input of the 910-24 MagnaValve® causes the MagnaValve to flow the maximum calibrated flow rate, the Calibrate Setpoint can be run. When this procedure is run, the 910-24 MagnaValve reads the applied voltage signal on the Analog Input and rescales the input to that applied voltage signal.

To adjust the Analog Voltage Input:

1. Left click the Valve Settings tab.
2. Set the PLC, FM-24, or FC-24 to output 10Vdc.
3. Under Setup Analog In/Out,
4. Left click the "Calibrate Setpoint" button.
5. The **Setpoint 10V Cal** number box updates with the new value.

Note: This value can be overwritten. It is recommended to use the above procedure to set this value. However, if an adjustment is still needed after running the above procedure, then type in a new value and press Enter on the keyboard. Alternatively, left click the increment or decrement arrows inside the text box.

Note: This procedure is only available when the Setpoint Input is set to 0 – 10V.

How to change Analog Output to either Voltage or Current Output

The Analog Output can be configured to either 0 – 10 V output or 4 – 20 mA output.

To change the Analog Output mode (Flow Output Mode):

1. Left click the Valve Settings tab.
2. Under Setup Analog In/Out,
3. Left-click the drop-down next to **Flow Output Mode** and choose either 0 – 10 V or 4 – 20 mA.

Note: If "Off" is chosen for the "Flow Output Mode," then the Analog Output is disabled.

How to adjust the Analog Output

The analog output of the 910-24 MagnaValve® can be adjusted to ensure that the attached receiver receives the proper analog output, i.e., the analog output signal and the receiver matches the flow rate displayed on the LCD on the 910-24 MagnaValve.

Note: 168 µVdc / count. The default setting is 59410.

To check the Analog Output:

1. Ensure the Analog Output is attached to a receiver, such as a PLC input.
2. Ensure the Analog Output Mode matches the receiver input type (0 – 10 V or 4 – 20 mA).

3. Start flow through the 910-24 MagnaValve or insert a ferrous metal rod into the sensor of the 910-24 MagnaValve, ensure the sensor signal is less than full flow.
4. Record the Analog Output value, voltage or current.
5. Record the flow rate reading on the LCD, located on the front of the 910-24 MagnaValve.
6. Use the following equations to calculate the Correcting Count.

$$Desired\ Analog\ Output\ = \frac{10\ V\ or\ 20\ mA}{Full\ Scale\ Flow\ Rate} \times Flow\ Rate\ Reading\ on\ LCD$$

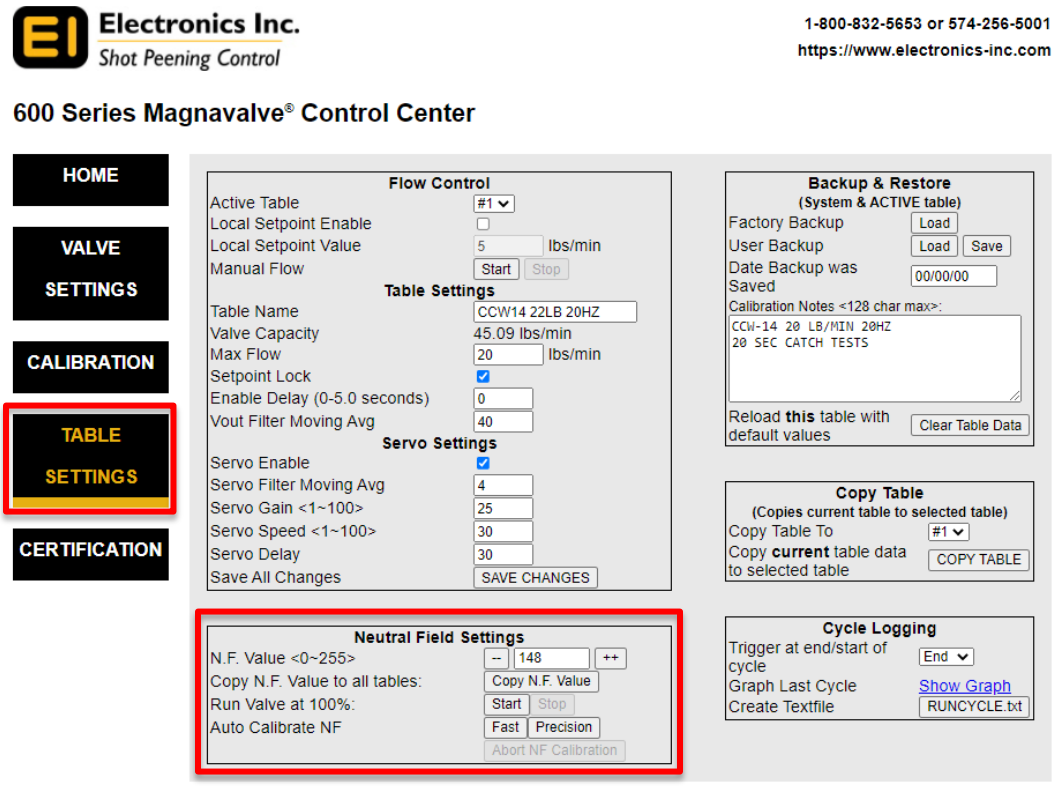
$$Correcting\ Count\ = \frac{Desired\ Analog\ Output - Recorded\ Analog\ Output}{168\ \mu V/count}$$

$$Correcting\ Count\ = \frac{Desired\ Analog\ Output - Recorded\ Analog\ Output}{24\ \mu A\ /\ count}$$

To adjust the Analog Output:

1. Left click the Valve Settings tab.
2. Under Setup Analog In/Out,
3. Add the Correcting Counts to the number in the number box next to **DAC 10V Cal**.
4. In the number box next to **DAC 10V Cal**, type the new value and press Enter on the keyboard.
5. Alternatively, left click the increment or decrement arrows inside the text box.

Adjusting Neutral Field



How to Set the Neutral Field Current

The 910-24 MagnaValve is a normally off valve by movable magnetic shuttle. When media flow is required, an electromagnet (power coil) is energized and lifts the magnet shuttle. The shuttle sits over a cone, and as the shuttle is lifted higher, a higher flow rate of non-ferrous media is achieved. The Neutral Field Value should remain fixed at 128. Decreasing the Neutral Field Value will reduce the maximum flow rate of the 910-24 MagnaValve. However, increasing the Neutral Field Value above 128 will not increase the maximum flow rate, but rather use more energy and increase the self-heating of the 910-24 MagnaValve.

How to copy a Neutral Field Value from one table to all other tables

1. Left click the Table Settings tab.
2. Under Neutral Field Settings,
3. Left click the “Copy N.F. Value” button next to **Copy N.F. Value to all tables**.

Note: In most applications, cast steel shot and conditioned cut wire shot uses the same N.F. Value. Copying the N.F. Value from the active table into all other tables ensures each table has a good N.F. Value applied.

Note: After N.F. is set for Table #1, that value is copied to the other tables at the factory.

Controlling the Flow Rate

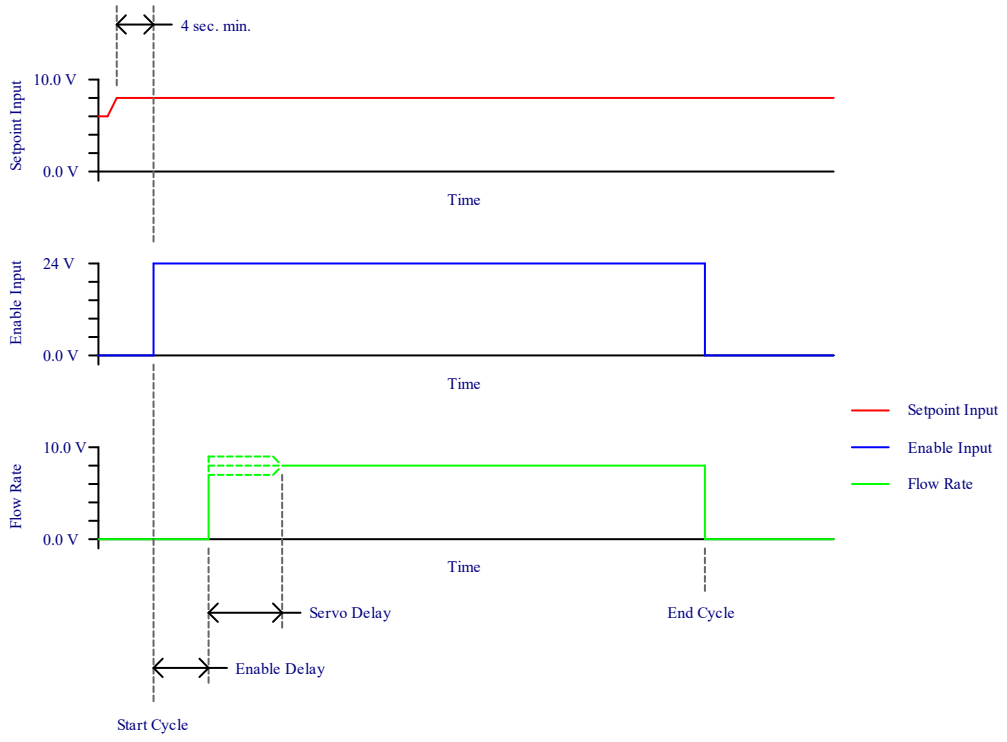
How to start and stop media flow using Analog I/O

Use the following steps to start and stop media flow.

1. Apply the Setpoint to the Analog Input (0 – 10 Vdc or 4 – 20 mA) the orange wire. To calculate the Analog Input signal, see **How to change the flow rate, servo On** and **How to change the flow rate, servo Off**.
2. Apply 24 Vdc to the Enable Input (blue wire) to start the flow and apply 0 Vdc to the Enable Input to stop the flow.
3. Media flow starts after the application of the Enable Input and the Enable Delay times out. See **How to change the Enable Delay**.

Note: After changing the Analog Input, allow approximately two seconds before applying 24 Vdc to the Enable Input.

Note: If the Setpoint Lock is enabled, changing the Analog Input (orange wire) while the MagnaValve is enabled (flowing media) does not influence the flow rate. While the Setpoint Lock is enabled, any changes to the Analog Input will take effect the next peening cycle.



How to start and stop media flow using Local Setpoint

Use the following steps to start media flow when Local Setpoint is enabled.

1. Left click the Table Settings tab.
2. Under Flow Control,
3. Left click the **Start** button.

Use the following steps to stop media flow when Local Setpoint is enabled.

1. Left click the Table Settings tab.
2. Under Flow Control,
3. Left click the **Stop** button.

How to change the flow rate, Servo On

The 910-24 MagnaValve has two methods of controlling the flow rate: Analog I/O or Local Setpoint. The 910-24 MagnaValve also has two methods of controlling the flow rate: Servo ON (Closed-Loop Mode) and Servo OFF (Open-Loop Mode). When the Internal Servo is ON, the Analog Input or Local Setpoint serves as the Setpoint control where the Analog Input or Local Setpoint controls the flow rate through the 910-24 MagnaValve in a linear response from No Flow to Maximum Calibrated Flow Rate.

The 0 – 10 Vdc or 4 – 20 mA Analog Input represents the flow rate from 0 lb/min (or kg/min) to the Full-Scale Value. For example, if a 910-24 MagnaValve is calibrated and set to 30 lb/min, then 10 Vdc or 20 mA applied to the Analog Input sets the Setpoint to 30 lb/min.

Note: The Maximum Calibrated Flow Rate can be found on the gold label located on the side of the MagnaValve, or from the Home tab in the embedded webpage.

To control the flow rate using the Analog I/O.

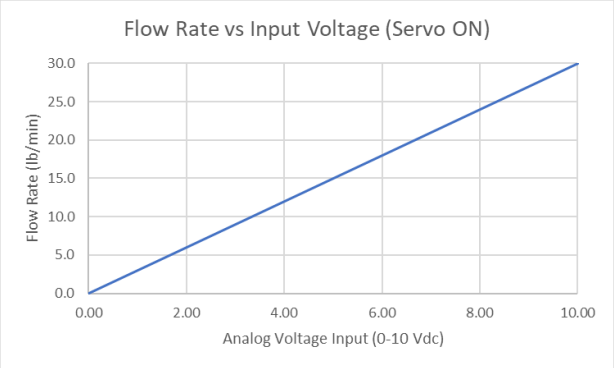
1. Left click the Table Settings tab.
2. Under Flow Control,
3. Ensure the check box next to **Local Setpoint Enabled** is un-checked.
4. Left click on the **SAVE CHANGES** button if changes were made.

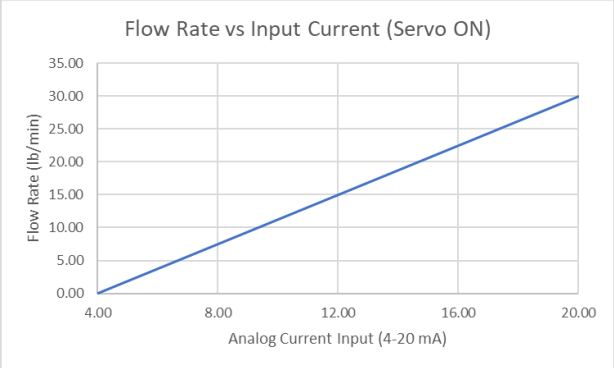
To calculate the Setpoint from the Analog Input signal, use the following equations.

$$Setpoint\ \left(\frac{lb}{min}\ or\ \frac{kg}{min}\right) = \frac{Max\ Calibrated\ Flow\ Rate\ \left(\frac{lb}{min}\ or\ \frac{kg}{min}\right)}{10\ Vdc} \times Analog\ Input\ (Vdc)$$

$$Setpoint\ \left(\frac{lb}{min}\ or\ \frac{kg}{min}\right) = \frac{Max\ Calibrated\ Flow\ Rate\ \left(\frac{lb}{min}\ or\ \frac{kg}{min}\right)}{16\ mA} \times (Analog\ Input\ (mA) - 4\ mA)$$

Example Only





To control the flow rate using the Local Setpoint.

1. Left click the Table Settings tab.
2. Under Flow Control,
3. Ensure the check box next to **Local Setpoint Enabled** is checked.
4. Left click on the **SAVE CHANGES** button if changes were made.
5. Enter the desired flow rate in the number box next to **Local Setpoint Value**.
6. Left click on the **SAVE CHANGES** button if changes were made.

How to change the flow rate, Servo Off

The 910-24 MagnaValve has two methods of controlling the flow rate, Analog I/O or Local Setpoint. The 910-24 MagnaValve also has two methods of controlling the flow rate: Servo ON (Closed-Loop Mode) and Servo OFF (Open-Loop Mode). When the Servo is OFF, the Analog Input or Local Setpoint controls the PWM directly. The 0 – 10 Vdc or 4 – 20 mA Analog Input represents 0 – 100% PWM. However, when entering a value for the Local Setpoint, the PWM is equal to the percentage of the entered valve to the Max Flow value (see equation below).

$$PWM\ \% = \frac{Setpoint\ \left(\frac{lb}{min}\ or\ \frac{kg}{min}\right)}{Max\ Calibrated\ Flow\ Rate\ \left(\frac{lb}{min}\ or\ \frac{kg}{min}\right)}$$

With the Servo disabled, the internal sensor still measures the media flow rate and updates the Analog Output. However, the flow rate is not adjusted to maintain the desired flow rate.

Note: In this mode, the Analog Input could be controlled by a FC-24 that has a built-in servo, or could be controlled by a PLC, with or without a servo.

Note: In this mode, the flow rate vs. Analog Input is a non-linear response. See the graphs below.

To calculate the PWM (%) from the Analog Input signal, use the following equations.

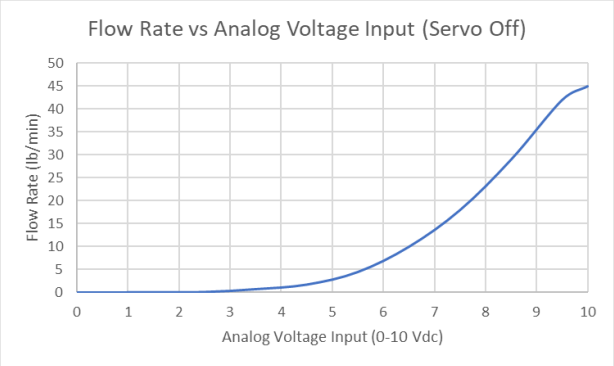
$$PWM\ (\%) = \frac{100\ \%}{10\ Vdc} \times Analog\ Input\ (Vdc)$$

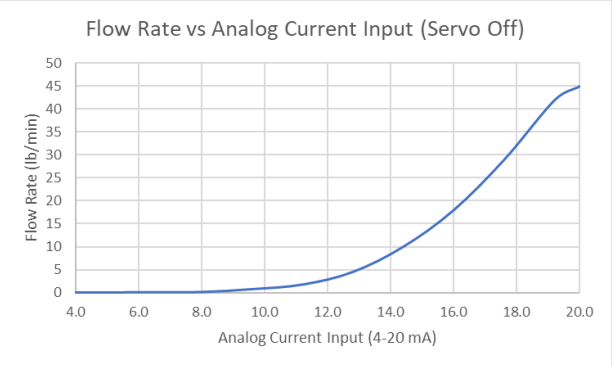
$$PWM\ (\%) = \frac{100\ \%}{16\ \text{mA}} \times (Analog\ Input\ (mA) - 4\ mA)$$

Note: These graphs are an example only. The actual Flow Rate vs. Analog Input is affected by:

- Pulse Frequency
- Shot type
- Shot size
- Pressure differential across the valve

Example Only





How to change active tables (RTS)

If the 910-24 MagnaValve® is equipped with the RTS (Remote Table Select) option, then the active table is controlled through the RTS cable located on the bottom of the MagnaValve. See the **Electrical** section on page 17 for more information.

Using a single 0 – 10 Vdc Analog Input (Pin 4, Red/Yellow), located on the RTS connector, one of nine tables can be selected. The RTS input has hysteresis built in. The table below shows the trip points for a increasing Analog Input and the trip points for decreasing Analog Input.

Note: To use the RTS option, it must be enabled. See **How to Enable / Disable RTS (Remote Table Select)**.

RTS Voltage Ranges

Table #	Voltage Range +	Voltage Range -
Table 1	0.00 Vdc – 1.75 Vdc	0.00 Vdc – 1.25 Vdc
Table 2	1.76 Vdc – 2.75 Vdc	1.26 Vdc – 2.25 Vdc
Table 3	2.76 Vdc – 3.75 Vdc	2.26 Vdc – 3.25 Vdc
Table 4	3.76 Vdc – 4.75 Vdc	3.26 Vdc – 4.25 Vdc
Table 5	4.76 Vdc – 5.75 Vdc	4.26 Vdc – 5.25 Vdc
Table 6	5.76 Vdc – 6.75 Vdc	5.26 Vdc – 6.25 Vdc
Table 7	6.76 Vdc – 7.75 Vdc	6.26 Vdc – 7.25 Vdc
Table 8	7.76 Vdc – 8.75 Vdc	7.26 Vdc – 8.25 Vdc

Table 9	8.76 Vdc – 10.0 Vdc	8.26 Vdc – 10.0 Vdc

How to change active tables (Non RTS)

The active table is changed from one of three locations on the embedded webpage: the Calibration, Table Settings, or Certification tab.

Use the following steps to change the table from the embedded webpage:

1. Left click the Calibration tab.
2. Under Calibration Settings,
3. Left click the drop-down next to **Active Table** and choose the desired table number.

Or

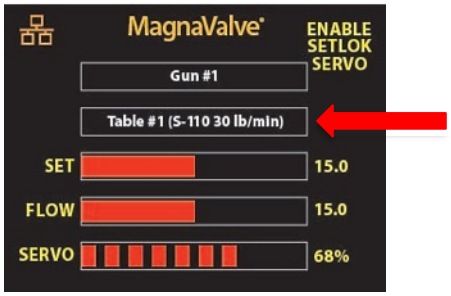
1. Left click the Table Settings tab.
2. Under Flow Control,
3. Left click the drop-down next to **Active Table** and choose the desired table number.

Or

1. Left click the Certification tab.
2. Under Test Settings,
3. Left click the drop-down next to **Active Table** and choose the desired table number.

How to change the Table Name

The table name is displayed on the LCD located on the front of the 910-24 MagnaValve®. See the image below. The table name is used to provide information about the active table to the user.



Use the following steps to change the Table Name:

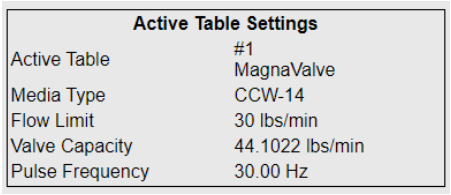
1. Left click on the Calibration tab.
2. Ensure the desired Active Table is selected.
3. Under Table Settings,
4. Enter the new table name in the text box next to **Table Name**.
5. Click the “Save Changes” button next to **Save Settings**.

Or

1. Left click on the Table Settings tab.
2. Ensure the desired Active Table is selected.
3. Under Table Settings,
4. Enter the new table name in the text box next to **Table Name**.
5. Click the “Save Changes” button next to **Save Settings**.

How to change the Media Type

The Media Type is displayed on the Home tab. See the image below. The Media Type is used to provide information about the media type used during the calibration of the active table to the user.



Active Table Settings	
Active Table	#1 MagnaValve
Media Type	CCW-14
Flow Limit	30 lbs/min
Valve Capacity	44.1022 lbs/min
Pulse Frequency	30.00 Hz

Use the following steps to change the Media Type:

1. Left click on the Calibration tab.
2. Under Table Settings,
3. Ensure the desired Active Table is selected.
4. Enter the new media type in the text box next to **Media Type**.
5. Click the “Save Changes” button next to **Save Settings**.

How to change the maximum flow rate

Use the following steps to change the maximum flow rate:

1. Left click on the Calibration tab.
2. Ensure the desired Active Table is selected.
3. Under Table Settings,
4. Change the value in the number box next to **Max Flow**.
5. Click the “Save Changes” button next to **Save Settings**.

Or

1. Left click on the Table Settings tab.
2. Ensure the desired Active Table is selected.
3. Under Table Settings,
4. Change the value in the number box next to **Max Flow**.
5. Click the “Save Changes” button next to **Save Settings**.

How to change the pulse frequency

The pulse frequency is the amount of dither (small amount of shaking) of the shuttle. This dither will improve the flowability of difficult to flow materials, such as fine glass bead and fine aluminum oxide. See **Principle of Operation** for more information.

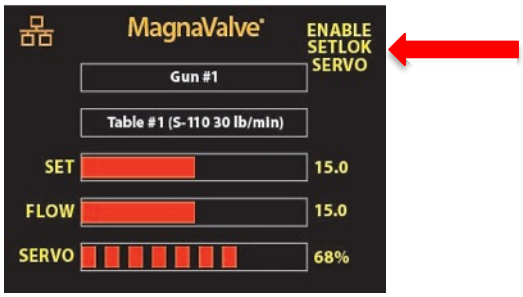
Note: Changing this value after calibration affects the MagnaValve's calibration. The range is 6 to 50 Hz.

Use the following steps to change the Pulse Frequency:

1. Left click on the Calibration tab.
2. Ensure the desired Active Table is selected.
3. Under Table Settings,
4. Enter the new pulse frequency in the number box next to **Pulse Frequency**.
5. Click the "Save Changes" button next to **Save Settings**.

How to turn the Setpoint Lock On or Off

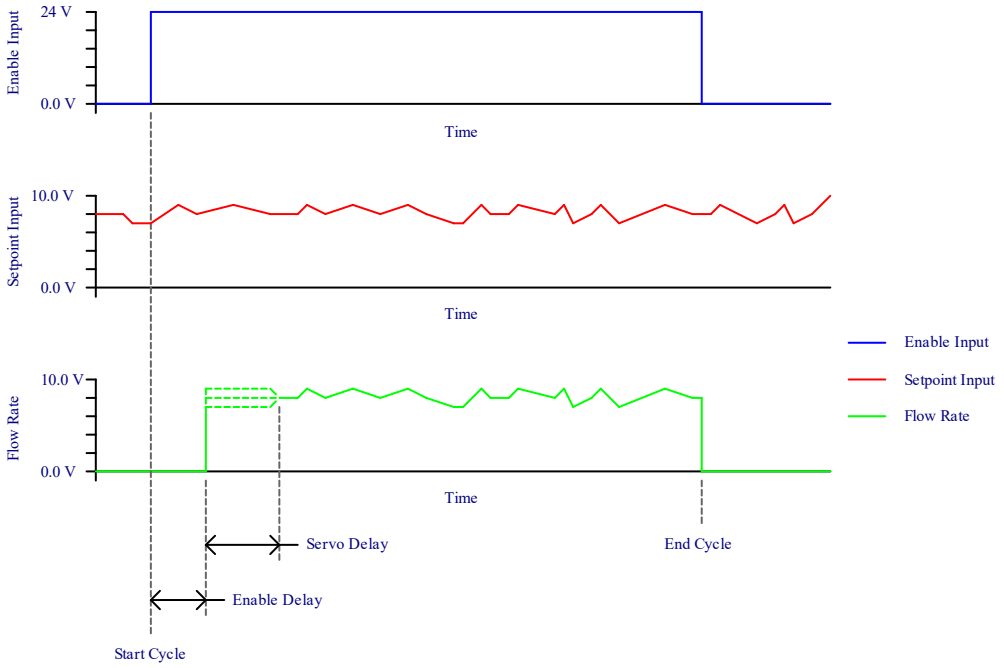
The Setpoint Lock latches the Analog Input (Setpoint Input) when the Enable signal is applied. This ensures that the Setpoint remains steady throughout the run cycle. This is typically used in noisy environments. When Setpoint Lock is enabled, an indicator is shown in the top-right corner of the LCD located on the front of the 910-24 MagnaValve®. See the image below.



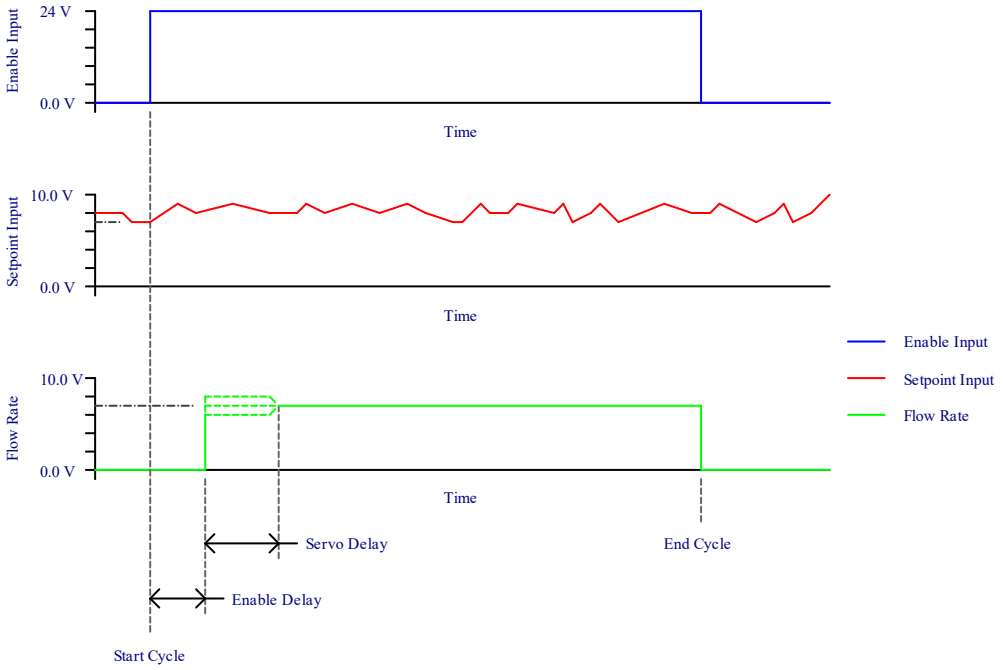
Use the following steps to turn the Setpoint Lock On or Off:

1. Left click on the Table Settings tab.
2. Ensure the desired Active Table is selected.
3. Under Table Settings,
4. Check the box next to **Setpoint Lock**, to enable the Setpoint Lock.
5. Uncheck the box next to **Setpoint Lock**, to disable the Setpoint Lock.
6. Click the "Save Changes" button next to **Save Settings**.

Setpoint Lock Disabled



Setpoint Lock Enabled



How to change the Enable Delay

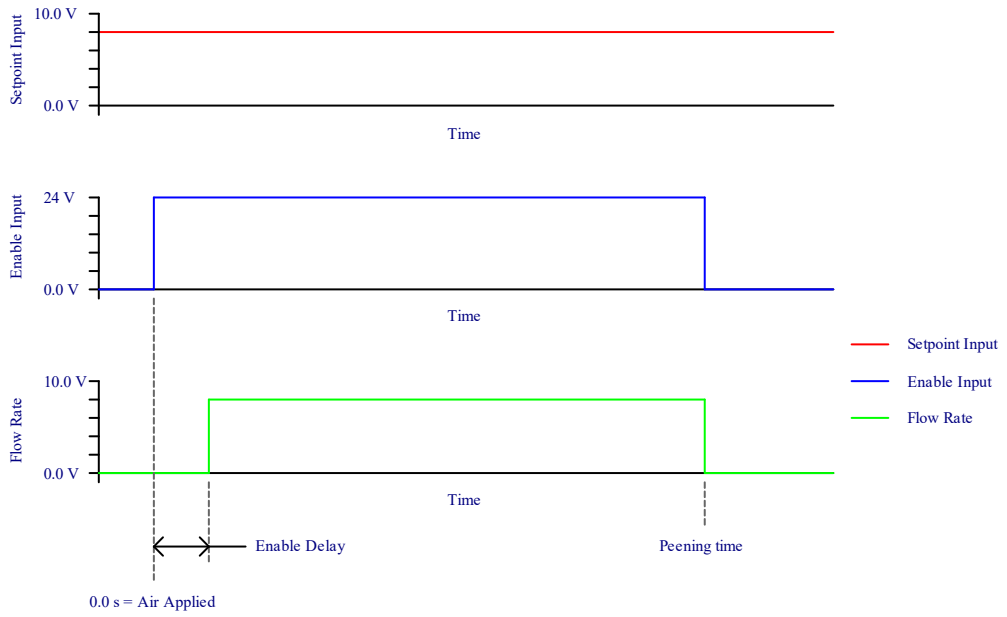
The Enable Delay delays the start of media flow for a set amount of time after the enable signal to the MagnaValve has been received. The top graph in the figure below shows the applied Setpoint. The middle graph in the figure below shows an applied Enable Signal, where the enable signal equals the duration of the peening cycle, plus the Enable Delay. The bottom graph shows the start of media flow after the Enable Delay times out.

Note: The media flow stops at the same time the Enable Signal is removed.

To change the Enable Delay:

1. Left click the Table Settings tab.
2. Under Table Settings,
3. Change the value in the number box next to **Enable Delay**.
4. Click the "Save Changes" button next to **Save Settings**.

The default value for the Enable Delay is 0 seconds.
The range of values for the Enable Delay is 0 – 5.0 seconds.



How to change the filter for the Analog Output

The Analog Output Filter is a moving average filter that works by averaging the last x number of analog output values. The Analog Output Filter controls the filtering on the Analog Output signal and does not affect the servo response. The sample rate of the Analog Output is equal to the Pulse Frequency.

The default value is 4. The range is 1 to 512.

Use the following steps to change the Pulse Frequency:

1. Left click on the Table Settings tab.
2. Ensure the desired Active Table is selected.
3. Under Table Settings,
4. Enter the new filter value in the number box next to **Vout Filter Moving Avg**.
5. Click the "Save Changes" button next to **Save Settings**.

How to turn the Servo On or Off

Use the following steps to turn the Servo On or Off:

1. Left click on the Table Settings tab.
2. Ensure the desired Active Table is selected.
3. Under Servo Settings,
4. Check the box next to **Servo Enable**, to enable the servo.
5. Uncheck the box next to **Servo**, to disable the servo.
6. Click the "Save Changes" button next to **Save Settings**.

How to change Servo settings

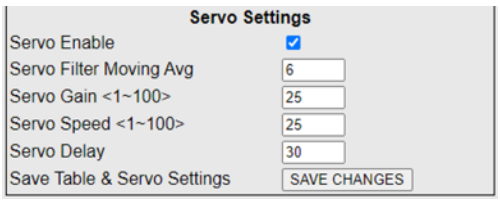
Servo Enable – Checking this option enables the servo (closed-loop mode). Enabling the servo uses the sensor inside the MagnaValve as feedback to maintain a constant flow rate. The default is Servo Enabled.
Servo Filter Moving Avg – Filters the sensor signal before it is used by the servo. This is helpful when the sensor signal is very noisy. The default value is 4. The range is 1 to 32. Increasing this value slows down the servo's response.
Servo Gain <1-100> – The proportional contribution of the PI servo algorithm. The higher the number, the more aggressive the servo response. The default value is 25. The range is 1 to 100.
Servo Speed <1-100> – The integral contribution of the PI servo algorithm. The higher the number, the quicker the servo responds. The default value is 30. The range is 1 to 100.
Servo Delay – Delays the servo for a set amount of time at the start of a cycle. At the start of a cycle, it takes time for media to reach the sensor and for the flow rate to stabilize. If the servo is active during this stabilization period, the system may start to oscillate. The default value is 30. The range is 1 to 100. The Servo Delay is scaled such that each increment is equal to the Pulse Frequency period.

$$Delay\ time\ (s) = \frac{1}{Pulse\ Frequency\ (Hz)} \times Servo\ Delay\ Value$$

Example: What is the delay when the Pulse Frequency is 20 Hz, and the Servo Delay value is 30?

$$\frac{1}{20\ Hz} \times 30 = 1.5\ seconds$$

Use the following steps to change the Servo setting:



1. Left click on the Table Settings tab.
2. Under Flow Control,
3. Ensure the desired Active Table is selected.
4. Then under Servo Settings, change the desired values for:
    a. Servo Filter Moving Avg

b. Servo Gain <1~100>
c. Servo Speed <1~100>
d. Servo Delay

5. Click the “Save Changes” button next to **Save Table & Servo Settings**.

How to backup a table

Factory Backup – This is the backup of all calibrated tables completed at the factory. The user can load the Factory Backup but not edit the Factory Backup.

User Backup – This is a backup completed by the user after making changes to the active table. The user can save to or restore from the User Backup. Each table has its own User Backup.

Date Backup was Saved – Allows the user to date the backup. The data entered in this field is displayed even if the “Save” button was never pressed.

Calibration Notes – Allows the user to add notes to the backup or to the active table. The data entered in this field is displayed even if the “Save” button was never pressed.
Use the following steps to save the active table to **User Backup**:

1. Left click on the Table Settings tab.
2. Under Flow Control,
3. Ensure the desired Active Table is selected.
4. Then under Backup & Restore,
5. Enter the “Date” in the number box next to **Date Backup was Saved**.
6. Enter any “Calibration Note” in the text box below **Calibration Notes**.
7. Click the “Save” button next to **User Backup**.

Or

Use the following steps to save the active table to **User Backup**:

1. Left click on the Certification tab.
2. Under Test Settings,
3. Ensure the desired Active Table is selected.
4. Then under Backup,
5. Enter the “Date” in the number box next to **Date Backup was Saved**.
6. Enter any “Calibration Note” in the text box below **Calibration Notes**.
7. Click the “Save” button next to **User Backup**.

How to restore a table

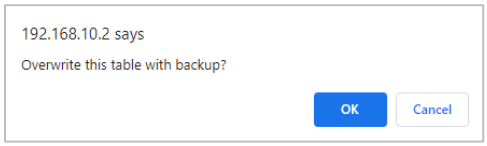
Factory Backup – This is the backup of all calibrated tables completed that the factory. The user can load the Factory Backup but not edit the Factory Backup.

User Backup – This is a backup completed by the user after making changes to the active table. The user can save to or restore from the User Backup. Each table has its own User Backup.

Reload this table with default values – Erases the active table, loads all zero values into the active table, and sets all Table Settings and Servo Settings to default values.

Use the following steps to restore the active table from **Factory Backup**:

1. Left click on the Table Settings tab.
2. Under Flow Control,
3. Ensure the desired Active Table is selected.
4. Then under Backup & Restore,
5. Click the "Load" button next to **Factory Backup**.

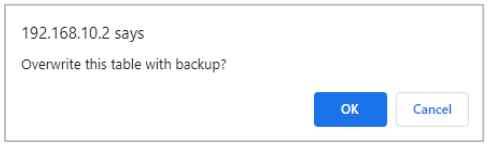


6. Click "OK" in the pop-up box.

Or

Use the following steps to restore the active table from **User Backup**:

1. Left click on the Table Settings tab.
2. Under Flow Control,
3. Ensure the desired Active Table is selected.
4. Then under Backup & Restore,
5. Click the "Load" button next to **User Backup**.

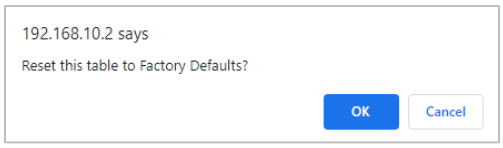


6. Click "OK" in the pop-up box.

Or

Use the following steps to restore the active table to **Default Values**:

1. Left click on the Table Settings tab.
2. Under Flow Control,
3. Ensure the desired Active Table is selected.
4. Then under Backup & Restore,
5. Click the "Clear Table Data" button next to **Reload this table with default values**.



6. Click “OK” in the pop-up box.

How to export a table

A text file can be created and downloaded containing all the data (both open-loop and closed-loop tests) from the active table. The text file is tab-delimited and can be imported into Excel or MatLAB for further evaluation.

Use the following steps to create and export a text file of the active table:

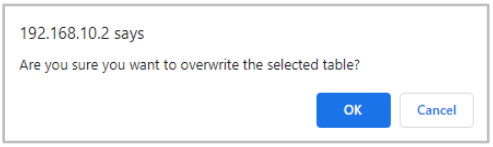
1. Left click on the Certification tab.
2. Under Flow Control,
3. Ensure the desired Active Table is selected.
4. Then under Backup,
5. Click the “TABLE.txt” button next to **Create Textfile**.

How to copy one table to another table

The Copy Table function copies all the Calibration Results, Certification Results, Table Settings, and Servo Settings from the active table to the selected table.

Use the following steps to copy one table to another table:

1. Left click on the Table Settings tab.
2. Under Flow Control,
3. Ensure the table to be copied (Active Table) is selected.
4. Then under Copy Table,
5. Left click the drop-down next to **Copy Table to** and choose the desired table to copy the active table to.
6. Click the “Copy Table” button next to **Copy current table data to selected table**.

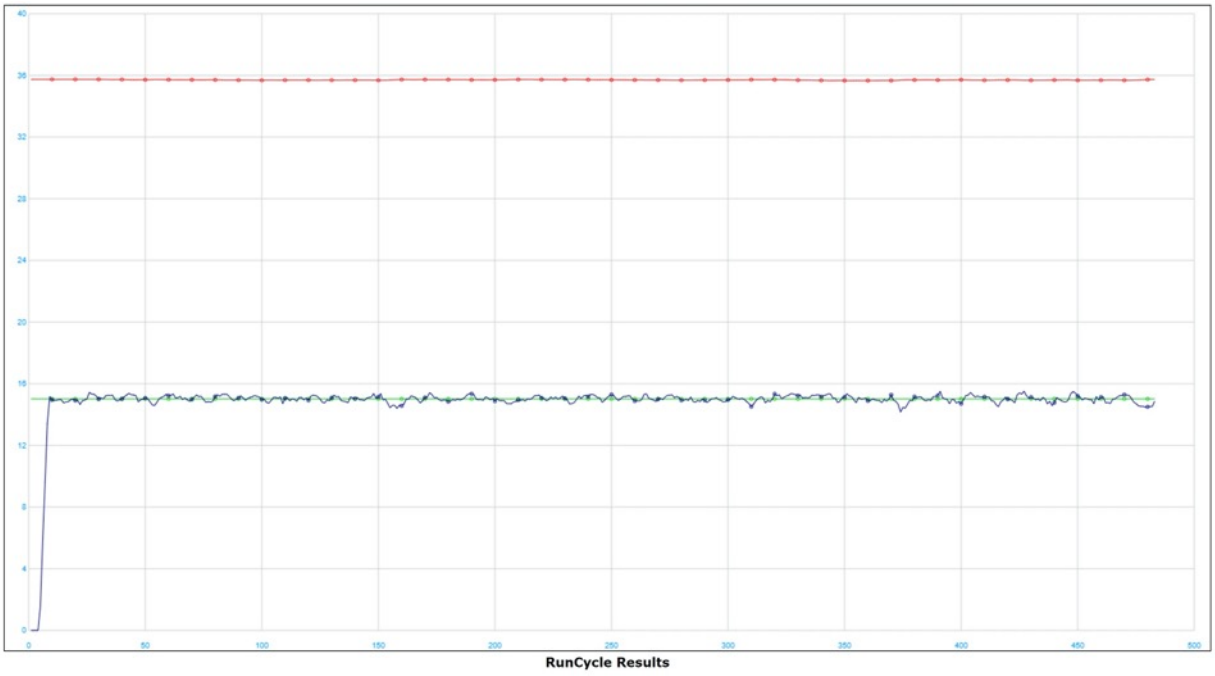


7. Click “OK” in the pop-up box.

How to log the start / end of a peening cycle

Use the following steps to Data Log the start of a peening cycle:

1. Left click on the Table Settings tab.
2. Under Cycle Logging,
3. Left click the drop-down next to **Trigger at end/start of cycle** and select either Start or End.
4. Run a peening cycle.
5. Then click the “Show Graph” link next to **Graph Last Cycle**.
6. To download a text file of the data, click the “RUNCYCLE.txt” button next to **Create Textfile**.



Legend:

- Red – PWM (Duty Cycle percentage of Pulse Frequency, see **Principle of Operation**)
- Green – Setpoint (Analog Input)
- Blue – Flow (Sensor Signal / Analog Output)

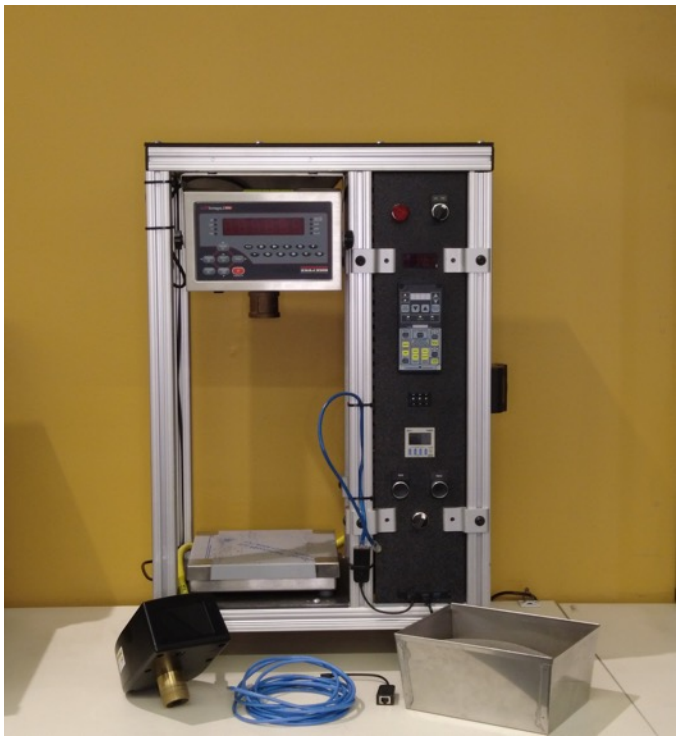
Scaling notes:

- Sample markers are every 10 samples (i.e., there are 9 samples plotted between two round markers).
- The sample interval is the Pulse Frequency time base (i.e., 1/20 Hz = 50 ms).
- The PWM amplitude value is the PWM on-time in milliseconds (i.e., 40% Duty Cycle of 20 Hz = 20 ms).
- Flow and Setpoint amplitude values are in user-selected units in kg/min or lb/min.

Calibration of 910-24 MagnaValve®

An annual calibration of the 910-24 MagnaValve® is recommended. The annual calibration should be based on the first date of use, not the factory date of calibration.

Preparing for Calibration



Equipment Needed

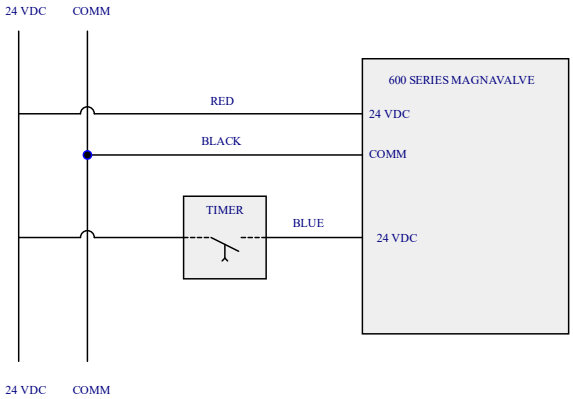
- 910-24 MagnaValve
- A peening/blasting machine or test stand (shown above)
- Scale capable of weighing total weight caught during a catch test
- Computer with web browser (not shown)
- Container to catch the media
- 6-pin cable (shipped with MagnaValve)
- CAT5 Ethernet cable
- Peening / Blasting media
- Timer with normally open contacts (optional)

Setting Up the Workstation

Mount the MagnaValve to the peening / blasting machine or to the test stand. See the **Installation section** for more information about installing the 910-24 MagnaValve on a peening / blasting machine. Shown above is a test stand with a platform scale with a digital readout and a control timer for conducting a timed catch test (optional).

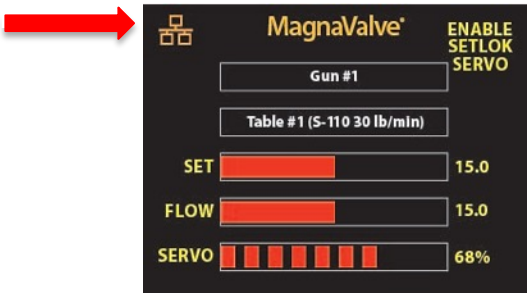
Wire and connect the 6-pin cable to the 910-24 MagnaValve. (See the **Electrical section** for more information about wiring the 910-24 MagnaValve.) Connect the computer to the 910-24 MagnaValve by using a CAT5 Ethernet cable. If using a laptop without an Ethernet port, an Ethernet to USB converter may be used.

Note: The 910-24 MagnaValve has a built-in timer for conducting timed catch tests during calibration. However, if timed catch tests or installation on a simple peening / blasting machine without a PLC, an external timer may be used. The wiring diagram below shows how an external timer is wired to the 910-24 MagnaValve.



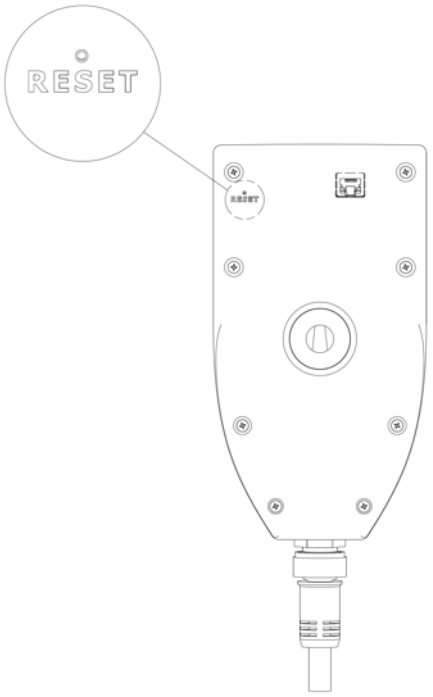
Apply power to the 910-24 MagnaValve. During power up, the splash screen will be displayed on the LCD for five seconds and then switch to the selected display mode. Bargraph is the selected display mode in the above photograph.

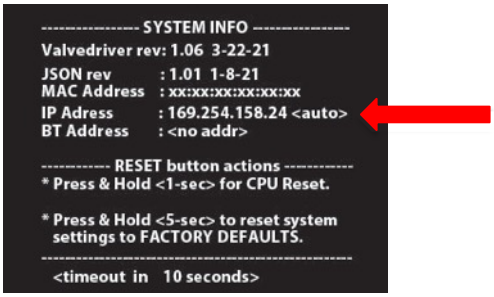
Fill hopper with the shot type / size desired for calibration. ***Note:*** A small amount of media may fall through the 910-24 MagnaValve when filling the hopper. Place a catch container below the 910-24 MagnaValve and tare the scale.



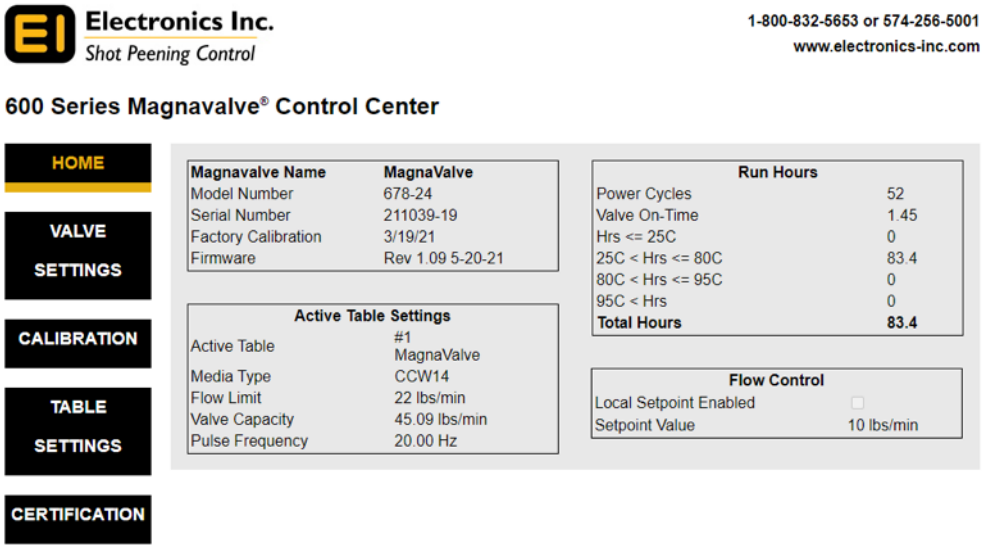
After powering on the 910-24 MagnaValve, it will take approximately 90 seconds to establish Ethernet communication. Once the 910-24 MagnaValve is communicating with the computer, the network indicator will be displayed in the top left corner of the LCD located on the front of the 910-24 MagnaValve.

Open a web browser and enter the IP address of the 910-24 MagnaValve. The default IP address is: http://169.254.158.24.





Note: If a DHCP server is used or the IP address has been changed and is unknown, use a paper clip and press the RESET button on the bottom of the 910-24 MagnaValve. An information screen will be displayed for 10 seconds that will show the IP address of the 910-24 MagnaValve.



Once connected and logged into the 910-24 MagnaValve, the Home Screen will be displayed in the web browser. The Home Screen displays information about the MagnaValve's setup.

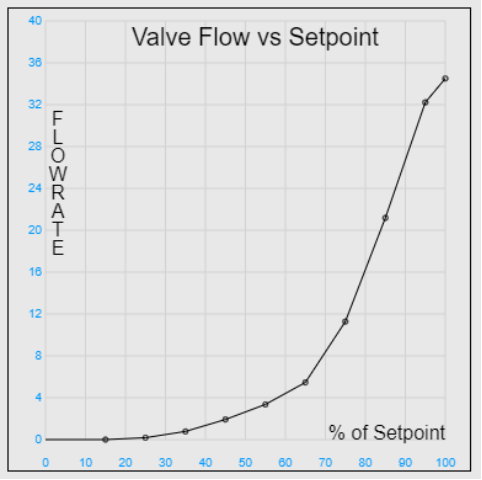
Conducting a Calibration

The process of calibrating a 910-24 MagnaValve is simply filling in a look-up table with measured sensor signals for known flow rates across the operating range of the MagnaValve. Typically, from the factory, the 910-24 MagnaValve has 10 calibration points in a table. These calibration points are spaced across the operating range of the MagnaValve and referred to as Setpoint percent. Because the media flow through the 910-24 MagnaValve is controlled by PWM (pulse width modulation), the open-loop response (servo turn OFF) is non-linear (see table and graph below). The flow rate of media at each Setpoint in the table is affected by several parameters, such as:

- Media type (cast steel, cut wire, conditioned stainless cut wire, etc.)
- Media size
- Pulse frequency
- Pressure differential (difference in pressure between the pressure pot and mixing tee)

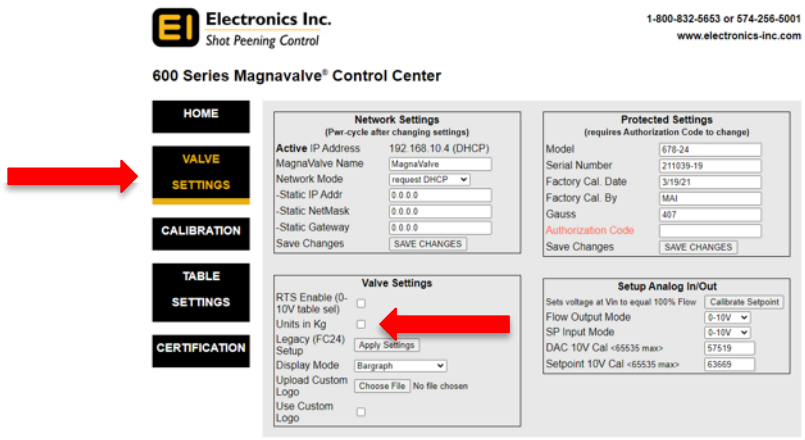
Therefore, it is necessary to re-calibrate the 910-24 MagnaValve if any of these parameters are changed.

Calibration Results		
SetPoint	**Lb/min**	**Sensor Signal**
100%	34.500	22327
95%	32.220	20666
85%	21.180	13087
75%	11.280	6397
65%	5.460	2941
55%	3.360	1793
45%	1.920	1029
35%	0.780	488
25%	0.180	133
15%	0.000	0

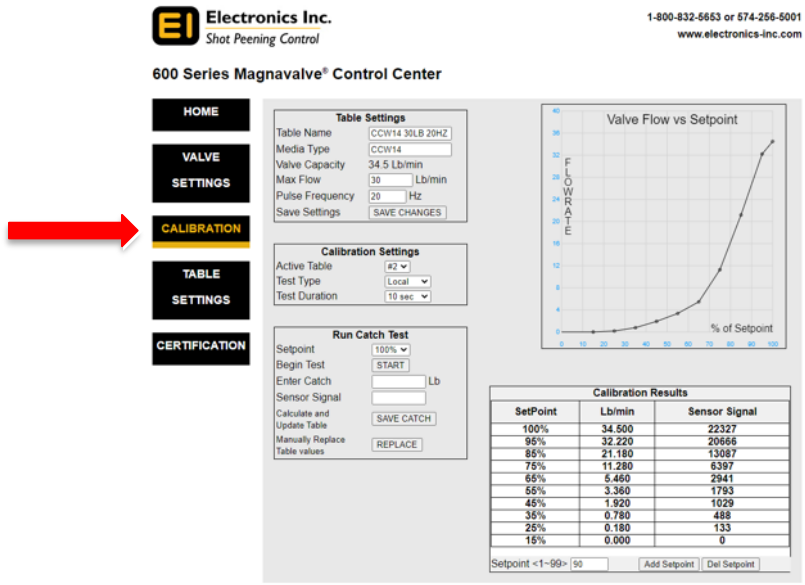


To calibrate the 910-24 MagnaValve, a timed catch test is conducted at each Setpoint in the table. During the catch test, the sensor signal is measured and then user enters the media weight caught during the duration of the catch test. This information is then loaded into the table. After a catch test has been conducted for each Setpoint, the calibration is complete. However, it is recommended that the calibration be certified by conducting another set of closed-loop (servo ON) catch tests across the calibrated range of the 910-24 MagnaValve. When the servo is turned ON, the 910-24 MagnaValve utilizes the look-up table to ensure the actual flow rate matches the requested flow rate. The certification will confirm that it does.

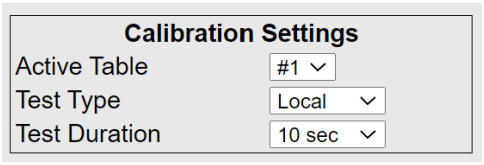
Setting Up the Open-Loop Test



Before starting calibration, left click on the Valve Settings tab. In the Valve Settings section, confirm the proper Units are selected: lb/min or kg/min. ***Note:*** All weights entered during calibration must be entered in the Units selected.



1. Left click on the Calibration Tab on the left side of the webpage.

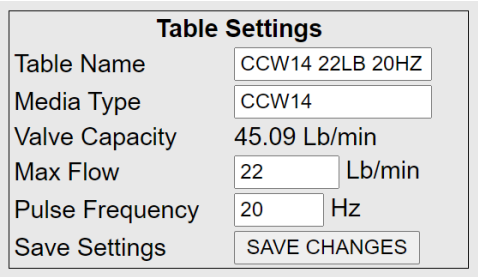


2. Under Calibration Settings, select the table to be calibrated from the drop-down next to **Active Table**.

Choose the Test Type, Local or Remote from the drop-down next to Test Type.

- Remote – the flow duration during a catch test is controlled by the Enable Signal.
- Local – the flow duration is chosen from the Test Duration drop-down and controlled by a timer built-in the 910-24 MagnaValve.

3. If using Local as the Test Type, then choose the desired Test Duration from the drop-down next to **Test Duration**.

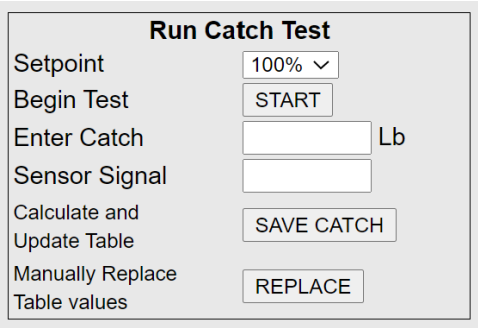


4. Under Table Settings enter the Table Name, Media Type, Max Flow, and Pulse Frequency into their respected fields.

Note: Ensure the Pulse Frequency is set to the desired value. Changing the Pulse Frequency after calibration will affect flow rate accuracy. Then Click “Save Changes”.

Conducting the Open-Loop Catch Test

1. Ensure a catch container is below the 910-24 MagnaValve and the scale has been tared.

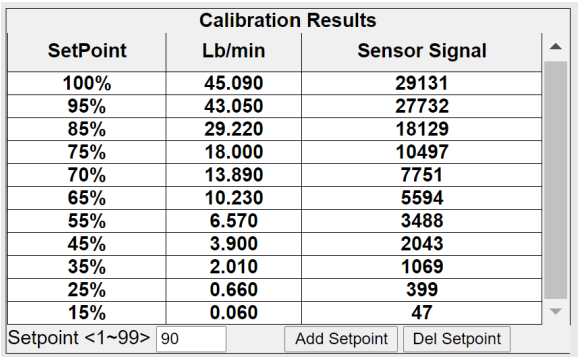


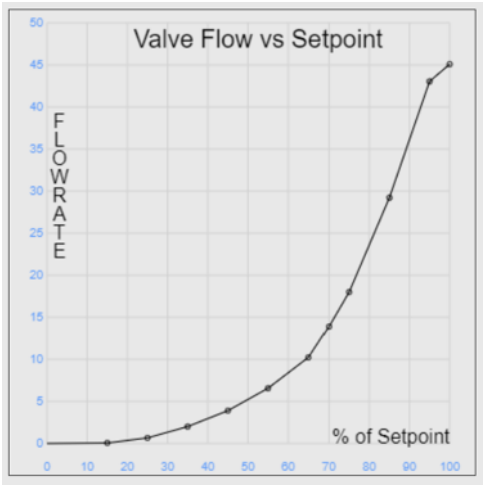
2. Under Run Catch Test select the desired Setpoint from the drop-down next to **Setpoint**.
3. Left click on the START button next to **Begin Test**.

Note: The autozero limit is calculated from the 100% catch test values.

Note: Notice that after pressing the START button, it changes to an ABORT button. Pressing the ABORT button will cancel the test.

4. After the catch test stops, enter the weight caught during the test in the number box next to **Enter Catch** and left click the SAVE CATCH button.
5. The results of the catch test will be added to the Calibration Results table and displayed in the graph above the table.
6. After the SAVE CATCH button has been pressed, the Setpoint will automatically decrement to the next Setpoint. Repeat steps 1 and 4 until all Setpoint valves have been tested.



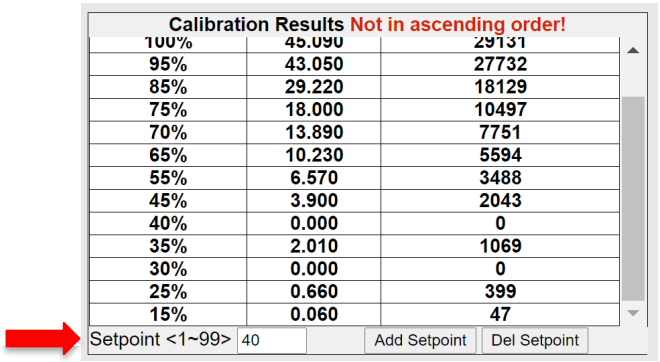


Note: If a mistake was made entering data into the table, the entry can be changed by:

A. Select the Setpoint to be edited.
B. Enter the correct information in both the Enter Catch box and Sensor Signal box.
C. Left click the Replace Button next to **Manually Replace Table values**.

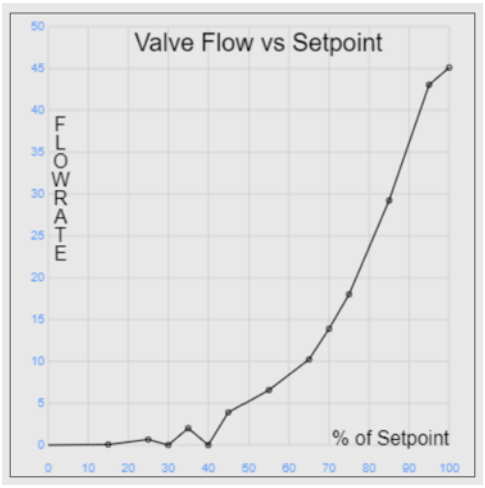
Note: Ensure that both the Enter Catch and Sensor Signal boxes have data. If left blank, a zero will be entered into the table for that information.

7. If it is desired to add additional setpoints, enter the setpoint valve to be added and left click the Add Setpoint button located below the **Calibration Results table**.



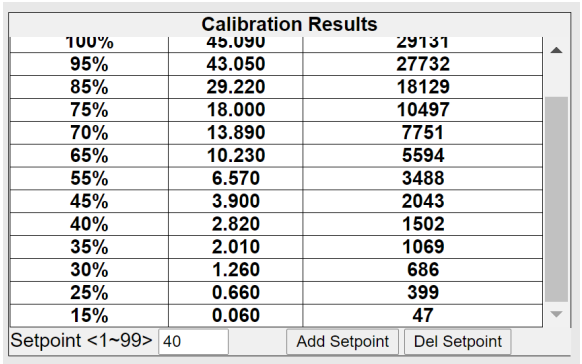
Calibration Results Not in ascending order!		
100%	45.090	29131
95%	43.050	27732
85%	29.220	18129
75%	18.000	10497
70%	13.890	7751
65%	10.230	5594
55%	6.570	3488
45%	3.900	2043
40%	0.000	0
35%	2.010	1069
30%	0.000	0
25%	0.660	399
15%	0.060	47

Setpoint <1~99> 40 Add Setpoint Del Setpoint



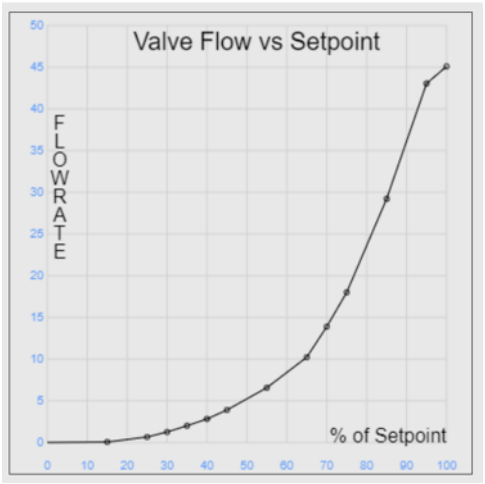
Note: 10 additional setpoint can be added to each table, total of 20 setpoints per table.

8. If any setpoints were added to the table, be sure to conduct a catch test on those setpoint by following steps 1 through 4. The table and graph below show Setpoints 30% and 40% added.



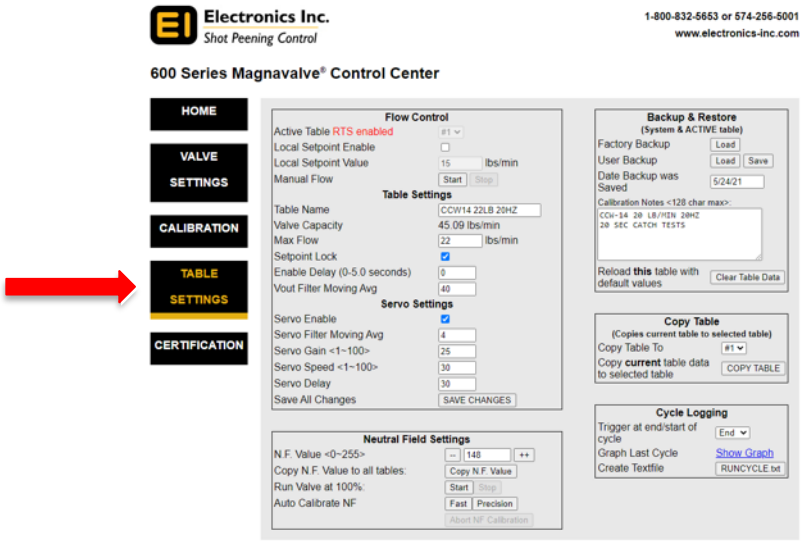
Calibration Results		
100%	45.090	29131
95%	43.050	27732
85%	29.220	18129
75%	18.000	10497
70%	13.890	7751
65%	10.230	5594
55%	6.570	3488
45%	3.900	2043
40%	2.820	1502
35%	2.010	1069
30%	1.260	686
25%	0.660	399
15%	0.060	47

Setpoint <1~99> 40 Add Setpoint Del Setpoint

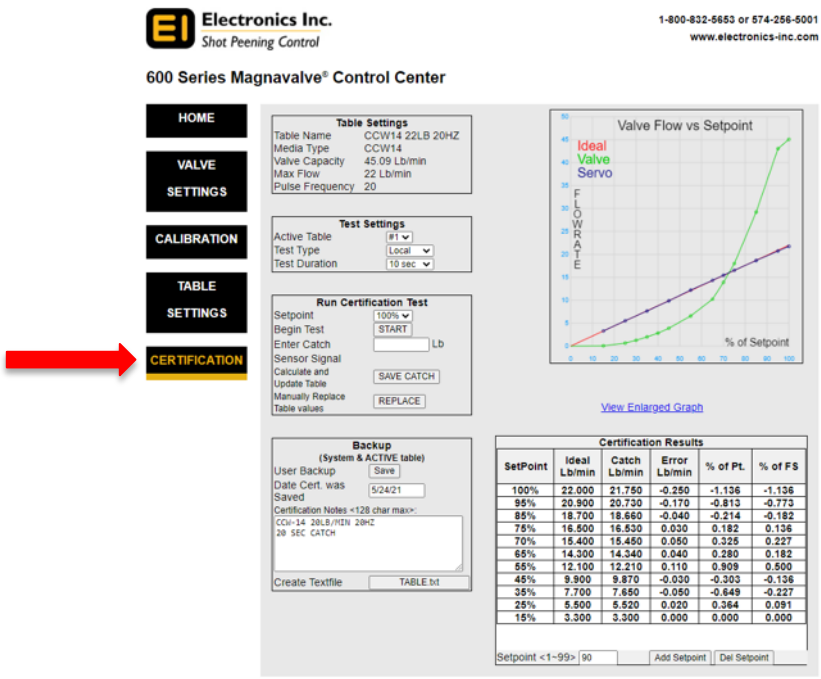


Confirming the Calibration

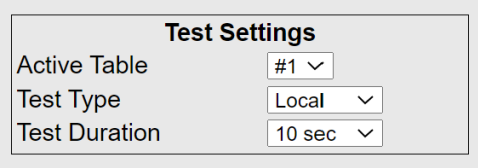
Confirming the calibration follows the same procedure as the calibration. The main difference is that the servo is ON. When the servo is turned ON, the 910-24 MagnaValve utilizes the look-up table to ensure the actual flow rate matches the requested flow rate. The certification will confirm that it does.



Left click on Table Settings. Table Setting and Servo Settings and be changed here. For more detail on any single function, please refer to the 910-24 MagnaValve Control Center section or the Valve Operation section.



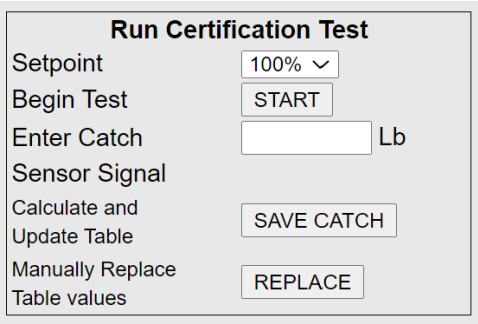
After making changes, left click on the Certification tab.



In the Test Setting section, enter the desired settings for the Active Table (should be the same as calibrated table), Test Type, and Test Duration (if doing Local Test Type).

Conducting the Closed-Loop Catch Test

1. Ensure a catch container is below the 910-24 MagnaValve and the scale has been tared.



2. Under Run Certification Test, select the desired Setpoint from the drop-down next to Setpoint.
3. Left click on the START button next to Begin Test.

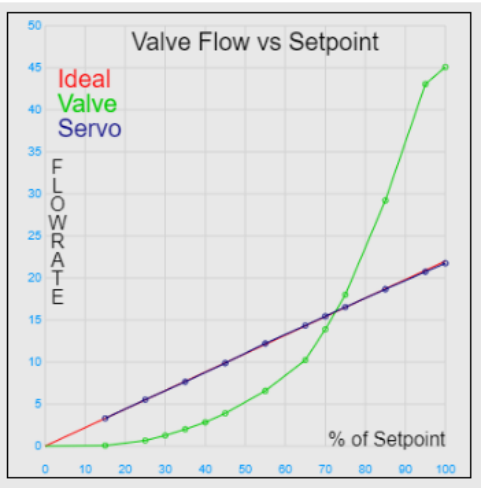
Note: Notice that after pressing the START button, it changes to an ABORT button. Pressing the ABORT button will cancel the test.

4. After the catch test stops, enter the weight caught during the test in the number box next to Enter Catch and left click the SAVE CATCH button.
5. The results of the catch test will be added to the Certification Results table and displayed in the graph above the table.
6. After the SAVE CATCH button has been pressed, the Setpoint will automatically decrement to the next Setpoint. Repeat steps 1 and 4 until all Setpoint valves have been tested.

Certification Results

SetPoint	Ideal Lb/min	Catch Lb/min	Error Lb/min	% of Pt.	% of FS
100%	22.000	30.160	8.160	37.091	37.091
95%	20.900	28.700	7.800	37.321	35.455
85%	18.700	25.620	6.920	37.005	31.455
75%	16.500	22.560	6.060	36.727	27.545
65%	14.300	19.540	5.240	36.643	23.818
55%	12.100	16.559	4.459	36.851	20.268
45%	9.900	13.620	3.720	37.576	16.909
35%	7.700	10.580	2.880	37.403	13.091
25%	5.500	7.500	2.000	36.364	9.091
15%	3.300	4.500	1.200	36.364	5.455

Setpoint <1~99> 90 Add Setpoint Del Setpoint

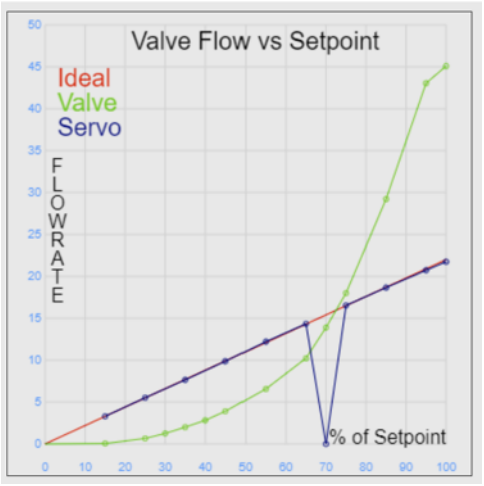


1. If it is desired to add additional setpoints, enter the setpoint valve to be added and left click the Add Setpoint button located below the Calibration Results table.

Certification Results

SetPoint	Ideal Lb/min	Catch Lb/min	Error Lb/min	% of Pt.	% of FS
100%	22.000	21.750	-0.250	-1.136	-1.136
95%	20.900	20.730	-0.170	-0.813	-0.773
85%	18.700	18.660	-0.040	-0.214	-0.182
75%	16.500	16.530	0.030	0.182	0.136
70%	15.400	0.000	-15.400	-100.000	-70.000
65%	14.300	14.340	0.040	0.280	0.182
55%	12.100	12.210	0.110	0.909	0.500
45%	9.900	9.870	-0.030	-0.303	-0.136
35%	7.700	7.650	-0.050	-0.649	-0.227
25%	5.500	5.520	0.020	0.364	0.091
15%	3.300	3.300	0.000	0.000	0.000

Setpoint <1~99> 70 Add Setpoint Del Setpoint



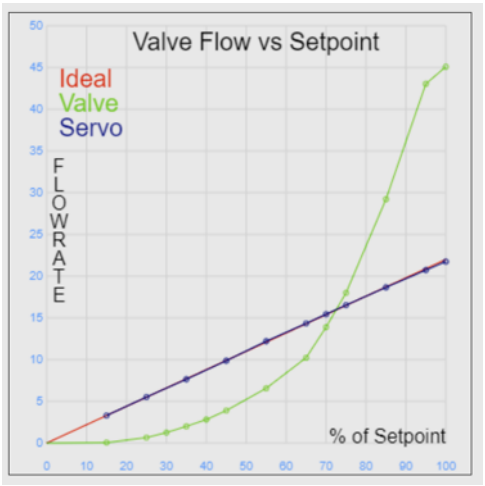
Note: 10 additional setpoint can be added to each table for a total of 20 setpoints per table.

2. If any setpoints were added to the table, be sure to conduct a catch test on those setpoint by following steps 1 through 4. The table and graph below show Setpoint 70% added.

Certification Results

SetPoint	Ideal Lb/min	Catch Lb/min	Error Lb/min	% of Pt.	% of FS
100%	22.000	21.750	-0.250	-1.136	-1.136
95%	20.900	20.730	-0.170	-0.813	-0.773
85%	18.700	18.660	-0.040	-0.214	-0.182
75%	16.500	16.530	0.030	0.182	0.136
70%	15.400	15.450	0.050	0.325	0.227
65%	14.300	14.340	0.040	0.280	0.182
55%	12.100	12.210	0.110	0.909	0.500
45%	9.900	9.870	-0.030	-0.303	-0.136
35%	7.700	7.650	-0.050	-0.649	-0.227
25%	5.500	5.520	0.020	0.364	0.091
15%	3.300	3.300	0.000	0.000	0.000

Setpoint <1~99> 70 Add Setpoint Del Setpoint



Calculating Percentage Error

The percentage error is the total percentage of all errors in taking a measurement. This error contains the uncertainties in the MagnaValve, the uncertainties in the scale used to measure the flow rate, and the uncertainties in the timer used to control the flow while measuring the flow rate.

The percentage error can be calculated two main ways: Percentage error of full scale and percentage error of point. This percentage error can then be used to validate the peening process.

Note: The Certification Results table located on the Certification page shows both percentage error of point and of full scale.

The Certification Results table located on the Certification page shows for each Setpoint, the Ideal catch weight, the Actual catch weight, the error between the Ideal and Actual, percentage error of point, and percentage error of full scale (see image below).

Certification Results

SetPoint	Ideal Lb/min	Catch Lb/min	Error Lb/min	% of Pt.	% of FS
100%	22.000	21.750	-0.250	-1.136	-1.136
95%	20.900	20.730	-0.170	-0.813	-0.773
85%	18.700	18.660	-0.040	-0.214	-0.182
75%	16.500	16.530	0.030	0.182	0.136
70%	15.400	15.450	0.050	0.325	0.227
65%	14.300	14.340	0.040	0.280	0.182
55%	12.100	12.210	0.110	0.909	0.500
45%	9.900	9.870	-0.030	-0.303	-0.136
35%	7.700	7.650	-0.050	-0.649	-0.227
25%	5.500	5.520	0.020	0.364	0.091
15%	3.300	3.300	0.000	0.000	0.000

Setpoint <1~99> 70 Add Setpoint Del Setpoint

Percentage Error of Full Scale

Percentage Error of full scale can be described as the possible constant error band across the complete operating range. The tolerance band is calculated at the full-scale value (100% Setpoint) and that percentage is used at all points along the operating range. In the example below, the MagnaValve was calibrated for 10 lb/min. The tolerance for the valve is +/-5% of full scale, the tolerance band would be:

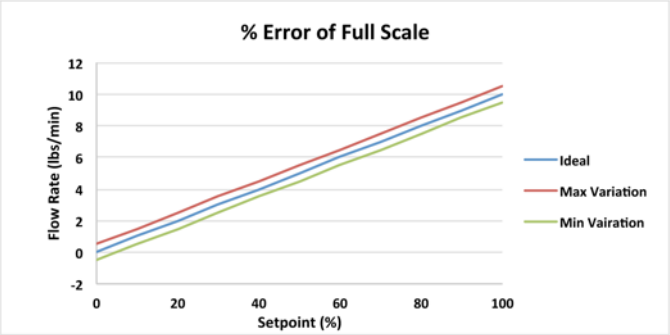
$$\pm tolerance\ band = Full\ Scale\ Flow\ Rate\ \times 5\%$$

$$\pm 0.5\ lb/min = \ 10\ lb/min\ \times 5\%$$

The actual % error of full scale at a specific Setpoint can be calculated by:

$$Error\ (\%\ FS) = \frac{Measure\ Flow\ Rate - Ideal\ Flow\ Rate}{Full\ Scale\ Range} \times 100\%$$

This tolerance band for percentage error of full scale is shown in the graph below.



The following table shows this same +/- 5% of full-scale tolerance band for the MagnaValve in this example.

Setpoint (%)	Tolerance Variation (lbs/min)	Max Flow Rate (lbs/min)	Ideal Flow Rate (lbs/min)	Min Flow Rate (lbs/min)
100	0.50	10.50	10.00	9.50
90	0.50	9.50	9.00	8.50
80	0.50	8.50	8.00	7.50
70	0.50	7.50	7.00	6.50
60	0.50	6.50	6.00	5.50
50	0.50	5.50	5.00	4.50
40	0.50	4.50	4.00	3.50
30	0.50	3.50	3.00	2.50
20	0.50	2.50	2.00	1.50
10	0.50	1.50	1.00	0.50
0	0.50	0.00	0.00	0.00

Red: Amount of variation for given Setpoint
Blue: Maximum and minimum flow rate based on the variation for given Setpoint
Green: Ideal flow rate for given Setpoint

Percentage Error of Point

Percentage Error of point can be described as the possible amount of variation at any specific Setpoint where the amount of variation is calculated using that specific Setpoint. In the example below, the MagnaValve was calibrated for 10 lb/min, the tolerance for the valve is +/-5% of point, then the tolerance band would be calculated by:

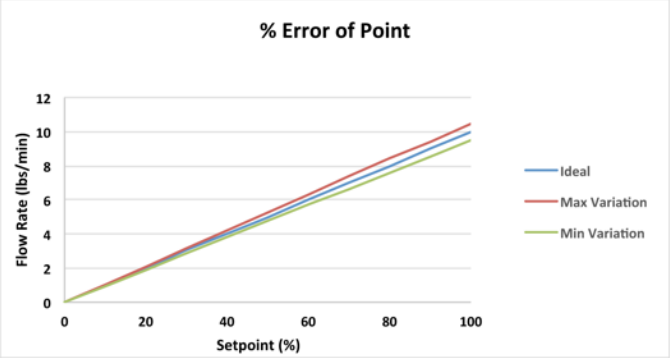
$$\pm tolerance\ for\ given\ Setpoint = \ Ideal\ Setpoint\ Flow\ Rate\ \times 5\%$$

$$\pm 0.35\ lbs/min = 7\ lb/min\ (70\%\ Setpoint) \times 5\%$$

The percentage error of point at a specific Setpoint can be calculated by:

$$Error\ (\%)\ = \frac{Measure\ Flow\ Rate - Ideal\ Flow\ Rate}{Ideal\ Flow\ Rate} \times 100\%$$

This tolerance band for percentage error of point is shown in the graph below.



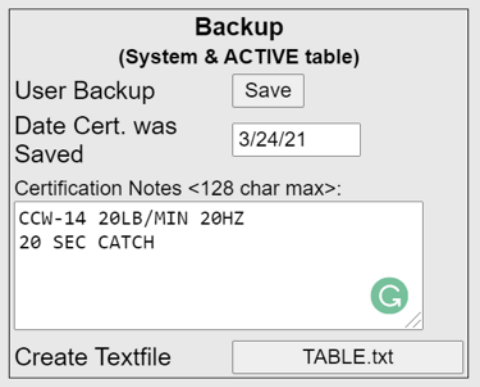
The following table shows this same +/- 5% of full-scale tolerance band for the MagnaValve in this example.

Setpoint (%)	Tolerance Variation (lbs/min)	Max Flow Rate (lbs/min)	Ideal Flow Rate (lbs/min)	Min Flow Rate (lbs/min)
100	0.50	10.50	10.00	9.50
90	0.45	9.45	9.00	8.55
80	0.40	8.40	8.00	7.60
70	0.35	7.35	7.00	6.65
60	0.30	6.30	6.00	5.70
50	0.25	5.25	5.00	4.75
40	0.20	4.20	4.00	3.80
30	0.15	3.15	3.00	2.85
20	0.10	2.10	2.00	1.90
10	0.05	1.05	1.00	0.95
0	0.00	0.00	0.00	0.00

Red: Amount of variation for given Setpoint
Blue: Maximum and minimum flow rate based on the variation for given Setpoint
Green: Ideal flow rate for given Setpoint

Backing up a Table

1. While still on the Certification page, ensure the desired table is selected under the Test Settings section.
2. Under the Backup section, enter the Date and any Certification Notes.
3. Left click the Save button next to User Backup.



4. To export the table data to a text file, left click the TABLE.txt button next to Create Textfile.
5. Once the text file finishes downloading, open the text file with MS Excel or similar program.

Specifications

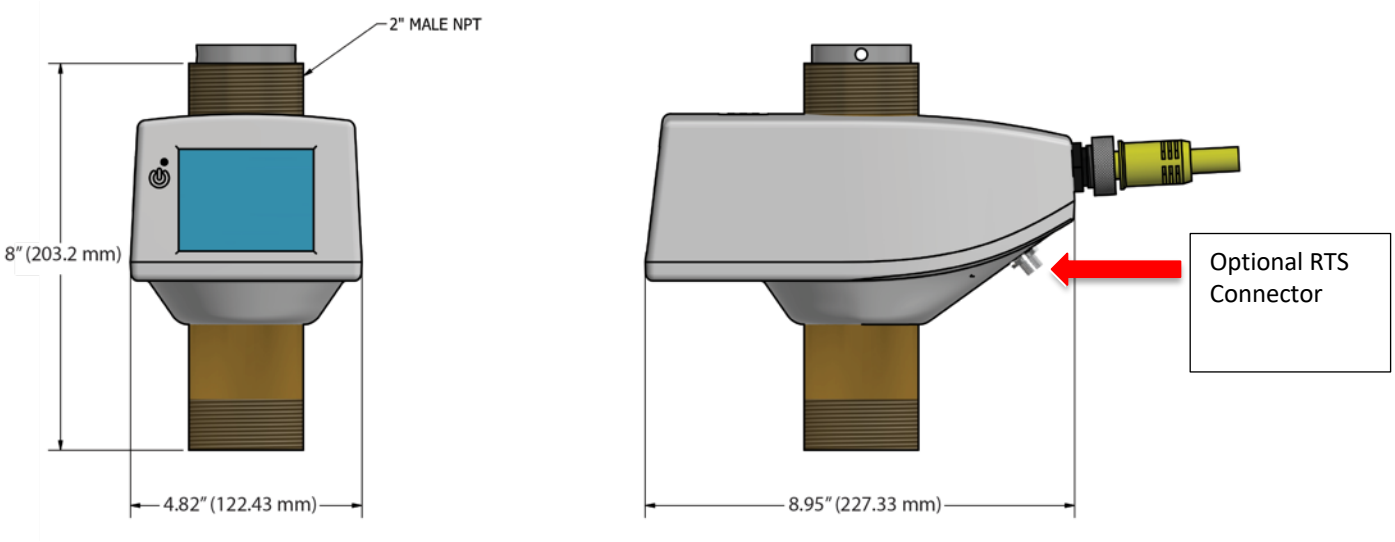
Power	+24Vdc @ 2A (50VA)
Maximum Pressure	100 PSI
Maximum Differential Pressure	5 PSI
Mode	Normally Closed
Media	Ceramic and Aluminum Oxide
Temperature Range	40˚F - 110°F (5˚C - 43°C)
Flow Enable Input	24 Vdc
Setpoint Input	0 - 10 Vdc / 4 - 20 mA
Flow Sensor Output	0 - 10 Vdc, max output 11.5 Vdc 4 - 20 mA, max output 15 Vdc
Ethernet	10/100 Mbps

Media Flow Rate Chart

Maximum Flow Rate (pound per minute / kilogram per minute)				
Ceramic Bead*				
Media Size	150	300	425	600
Maximum Media Weight	20 lb / 10 kg	20 lb / 10 kg	15 lb / 7 kg	15 lb / 7 kg

***NOTE:** Other non-ferrous media, such as Glass Bead and Aluminum Oxide, may be used by special arrangement. Please contact Electronics Inc. for consultation on material and sizes.

Product Dimensions



Troubleshooting Guide

To expedite a solution, please send images of your valve installation, the valve's Calibration Label and/or a video of the controller and valve driver during operation.

Telephone: (574) 256-5001 or 1-800-832-5653 (USA and Canada) Fax: (574) 256-5222

Replacement Parts

Part Number	Description	Quantity
980302	910-24 Funnel Assembly	1
801094	10-32 x 3/16" Socket Head Cup Set Screw	2
980304	910-24 Cone Assembly	1
980303	910-24 Shuttle Assembly	1

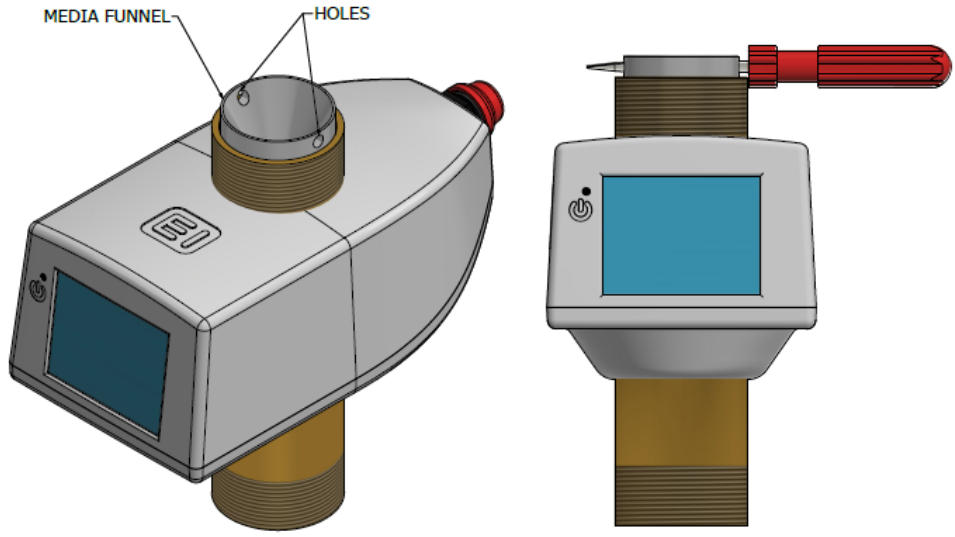
Maintenance

An annual calibration is recommended for the 910-24 MagnaValve.

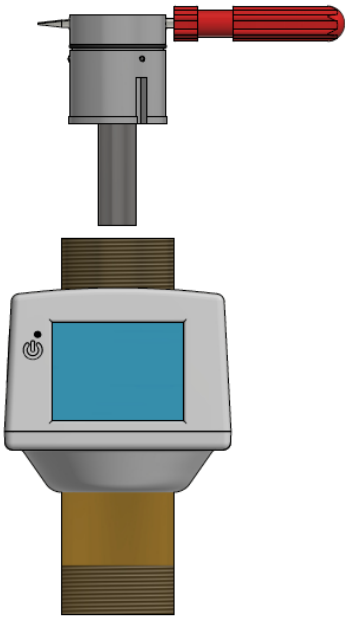
How to remove and clean the shuttle

Use the following steps to remove the shuttle from the valve and clean it.

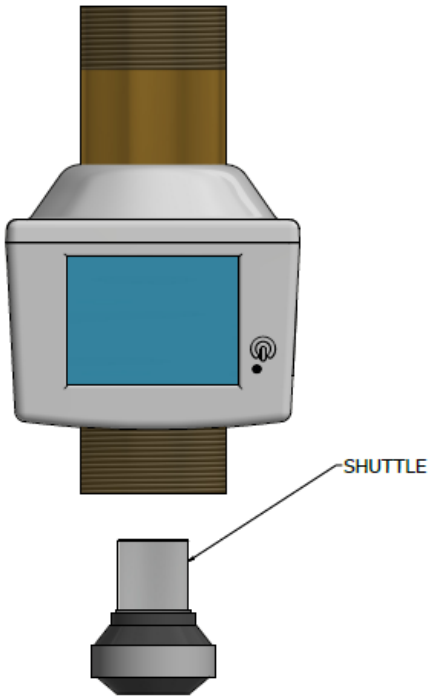
1. Take a screwdriver and insert it into the media funnel holes.



2. Rotate the screwdriver back and forth to loosen the media funnel.
3. Pull up on the screwdriver removing the media funnel.



4. Turn the valve upside down to allow the shuttle to fall out.



5. Clean the shuttle of shot and debris.

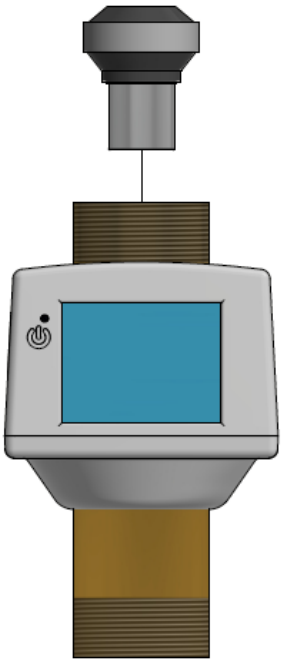
DIRTY

CLEAN

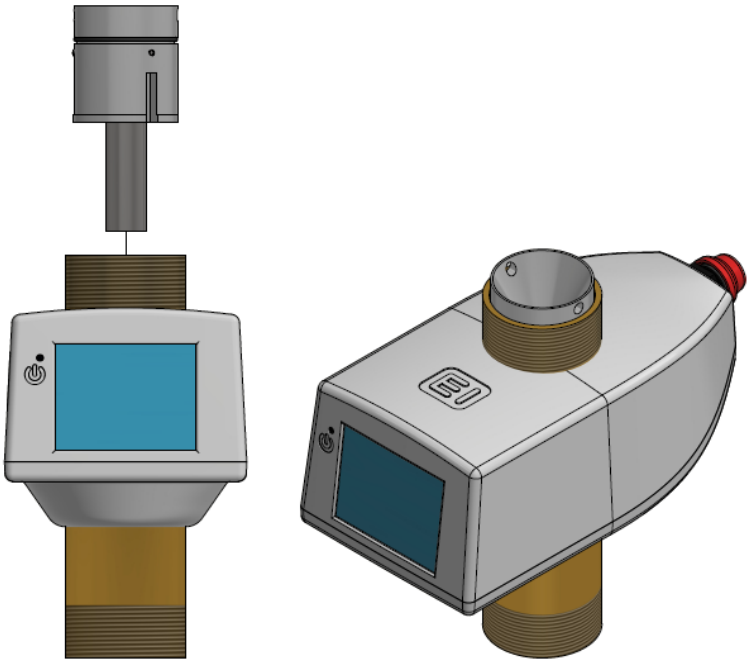
How to reinstall the clean shuttle

Use the following steps to reinstall the clean shuttle.

1. Turn the valve right side up.
2. Put the clean shuttle back into the valve by slowly dropping it into the pipe.



3. Insert the media funnel back into the valve by pushing it into the pipe securely.
4. Remount the valve onto the machine.



Contacting Electronics Inc.

Mailing and Shipping Address:
Electronics Inc.
56790 Magnetic Drive
Mishawaka, IN 46545 USA

Telephone: 1-800-832-5653 (Toll-free in USA and Canada) or (574) 256-5001
Fax: (574) 256-5222
Email: sales@electronics-inc.com
Website: www.electronics-inc.com

Limited Warranty

910-24 MagnaValve®

Warning: Use of ferrous media, such as shot or grit, will void the warranty of the 910-24 MagnaValve®. This product is intended for use with ceramic and aluminum oxide media only.

The warranty obligations of Electronics Inc. for this product are limited to the terms set forth below.

Length of Warranty Period
This limited warranty lasts one (1) year from the shipping date of this product.

What is Covered
This limited warranty covers defects in materials and workmanship in this product.

What is Not Covered
This limited warranty does not cover any damage, deterioration or malfunction resulting from any alteration, modification, improper or unreasonable use or maintenance or use of a media for which the MagnaValve was not calibrated, misuse, abuse, accident, neglect, exposure to excess moisture, fire, improper packing and shipping (such claims must be presented to the carrier), lightning, power surges, or other acts of nature. This limited warranty does not cover any damage, deterioration or malfunction resulting from the installation or removal of this product from any installation, any unauthorized tampering with this product, any repairs attempted by anyone unauthorized by Electronics Inc. to make such repairs, or any other cause which does not relate directly to a defect in materials and/or workmanship of this product. This limited warranty does not cover equipment enclosures, cables or accessories used in conjunction with this product.

How to Obtain a Remedy Under this Limited Warranty
To obtain a remedy under this limited warranty, contact Electronics Incorporated by letter, email, fax or telephone with the following information:

- Product name and model
- Product serial number
- Original shipping date (see label on product)
- Company name and location
- Name of contact person for description of symptoms
- Return shipping address and any special instructions

If it is determined that the product must be returned under this limited warranty, a Returned Goods (RG) number, obtained from Electronics Inc., will be required. This product should be properly packed to prevent damage in transit. Cartons not bearing a RG number will require additional processing time and repair service may be delayed.

What Electronics Inc. Will Do Under This Limited Warranty
Electronics Inc. will, at its sole discretion, provide one of the following remedies to whatever extent it shall deem necessary to satisfy a proper claim under this limited warranty:

1. Elect to repair or facilitate the repair of any defective parts within a reasonable period of time, free of any charge for the necessary parts and labor to complete the repair and restore this product to its proper operating condition. Electronics Inc. will pay the shipping costs necessary to return this product once the repair is complete.

2. If the defective product cannot be repaired, it will be replaced with a new unit and the original warranty period will be extended by six (6) months. Electronics Inc. will pay the shipping costs necessary to replace this product.

If this product is returned to Electronics Inc., the product must be insured during shipment, with the insurance and shipping charges prepaid. If this product is returned uninsured, Electronics Inc. does not assume any risk of loss or damage during shipment. Electronics Inc. will not be responsible for any costs related to the removal or re-installation of this product.

Out-of-Warranty Product

Product that is out-of-warranty will be repaired at customer's request and the cost of repair will be disclosed prior to proceeding with the repair. A purchase order must be received prior to repair. If the product cannot be repaired, Electronics Inc. will provide one of the following remedies:

1) New unit at current pricing with a one (1) year Limited Warranty from the shipping date of product.

2) Refurbished unit (if available) at a discounted price with a six (6) month Limited Warranty from the shipping date of product.

Limitation on Liability

The maximum liability of Electronics Inc. under this limited warranty shall not exceed the actual purchase price paid for the product. Electronics Inc. is not responsible for direct, special, incidental or consequential damages resulting from any breach of warranty or condition, or under any other legal theory to the maximum extent permitted by law.

Exclusive Remedy

To the maximum extent permitted by law, this limited warranty and the remedies set forth above are exclusive and in lieu of all other warranties, remedies and conditions, whether oral or written, express or implied. To the maximum extent permitted by law, Electronics Inc. specifically disclaims any and all implied warranties, including, without limitation, warranties of merchantability and fitness for a particular purpose. If Electronics Inc. cannot lawfully disclaim or exclude implied warranties under applicable law, then all implied warranties covering this product, including warranties of merchantability and fitness for a particular purpose, shall apply to this product as provided under applicable law.

Rights Under State Law

This warranty defines specific legal rights relative to these products provided by Electronics Inc. Legal rights may also vary from state to state.