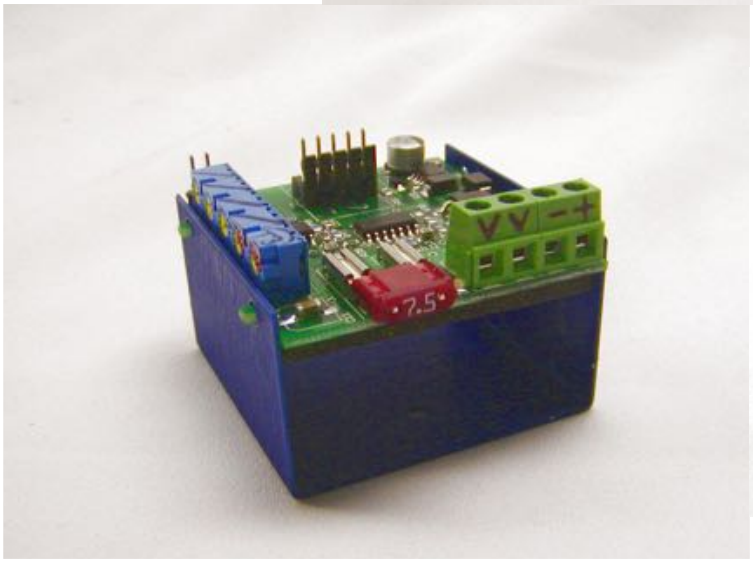
24P Installation and Operations Manual

P/N **24P01A1A** PWM Controller with integral potentiometer

P/N **24P02A1A** PWM Controller with cable for remote potentiometer



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24P Operations Manual

This instruction manual covers the 24P01A1A PWM Proportional Valve Driver with integral switch/pot and the 24P02A1A which uses a remote switch/pot. Both the 24P01A1A and the 24P02A1A use the same electronic circuitry, only the mounting is different.

Specifications:

Type: voltage control, pulse width modulated valve driver, single output
Power: 10 - 32 vdc, regulated, reverse polarity protected
Output: 2.5 amp continuous, fused at 7.5 amp
PWM frequency: adjustable 30 to 180Hz
Valve adjustments: minimum and maximum output trims
Ramp: adjustable, 0 to 5 seconds
Output indicator: LED, green
Optional: remote 1-5vdc input
Optional: 4-20ma input

Mechanical Installation:

The 24P01 is a compact assembly designed for direct panel mounting. It requires a single mounting hole. Drill and ream to fit a 3/8" (9.6mm) hole. The mounting location should allow sufficient rear and side access for wires and trim pots. The 24P01 includes hardware required to panel mount; knob, seal, label, bushing nut and lock washer.

The 24P01 has an aluminum cover to protect the circuit components. To remove the cover gently spread the sides of the cover apart to release the circuit board tabs from the four holes in the cover. Alternately, the 24P02 (remote switch/pot version) uses the cover as the mounting bracket. Remove the cover and fasten the larger side against the panel. Gently spread the sides and insert the circuit board tabs into the four holes to mount the 24P02. The 24P02 includes a 24-inch cable (24P02C1) for connecting to a remotely mounted switch/pot. Refer to the drawings on Pg. 5 of the manual for further details.

Wiring Installation:

Wiring lengths up to 50 feet should use a minimum size of 18 gauge wire. For distances over 50 feet, 16 gauge wire is recommended. Valve coils are not polarity sensitive and can be wired in either direction. The 24P01 uses a current sinking high powered MOSFET as a low side output switch. A flyback diode is included on the 24P01 to suppress the valve coil noise. If power is accidentally applied to the 24P01 in reverse polarity, the 7.5 amp fuse will trip. Refer to the drawings on Pg. 6 of the manual for further details.

IMPORTANT: The 24P has a switch-off position on the main control knob at the full CCW position. This switch interrupts power to the on-board logic only. If the output FET should short-circuit, the 24P switch will not turn the drive off. It is important that each installation provide an EMERGENCY SWITCH to interrupt the power supplying the 24P.

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24P Operations Manual

Setup adjustments:

The 24P requires four simple adjustments:

- PWM frequency
- minimum valve trim
- maximum valve trim
- ramp adjustment

There are four trim pots located along one side of the 24P assembly. Use a small, flat tipped screwdriver to adjust these trim pots. To decrease the effect, turn the trim pot to the left [CCW]. To increase the effect, turn the trim pot to the right [CW]. The fifth trim pot is marked with a red tag; it is factory set and should not be changed in the field.

PWM frequency: The frequency is factory preset to approximately 100 Hz. Check the literature from your valve manufacturer for the recommended PWM frequency. The actual PWM frequency setting can vary without significantly affecting the hydraulic function. You may also use a digital voltmeter(requires frequency feature) to set the frequency more accurately. If you do not know the correct PWM frequency for your valve, leave the factory setting of 100 hz and complete the other settings. During your check out, if you observe a large humming or shaking in the hydraulic lines, increase the PWM frequency. If you observe a stickiness in the speed control, where turning the knob above and below your desired flow cannot quite achieve the desired flow, decrease the PWM frequency setting.

Valve Trims: Prior to setting the minimum and maximum drive voltage for your proportional valve, ensure the hydraulic system is at normal operating temperature. Use the hydraulic motor shaft to confirm your minimum and maximum adjustments. The factory presets for the valve trims are 25% for minimum, and 75% for maximum. This is useful to quickly test out the basic operation. After the hydraulics are confirmed for proper operation, rotation, leaks, pressures, etc. you should fine tune the valve trims for optimal operation. Refer to Pg. 9 of the manual for further details.

The **minimum trim** is factory set to 25%. To adjust, set the main control knob nearly to its full counter-clockwise position, just before the detented position (full CCW (click) will turn off the 24P). Adjust the minimum trim pot to establish a very slow (creep) speed, or the lowest desired hydraulic flow for your application.

The **maximum trim** is factory set to 75%. The maximum trim is used to establish the highest desired flow, and is adjusted with the main control knob at its full CW position. First, turn the maximum trim pot down (CCW) and then slowly up (CW) to increase the output drive until the hydraulic flow is just enough for your highest requirement. Setting the maximum trim too high will overdrive the coil, causing unwanted heating and limiting the usable range of the front panel control knob. Using a handheld RPM gauge is a very good way to ensure the max trim is not set too high.

Ramp Adjustment: The ramp adjustment adds a small delay to changes in the control knob. This is a useful way to dampen your system and help prevent unwanted jerking of the load.
The ramp time is adjustable using the trim pot. The range is from 0 seconds at full CCW, to approximately 5 seconds at full CW.

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24P Operations Manual

Tips on using the 24P to control electro-hydraulic valves

The 24P will ONLY drive PWM proportional flow or pressure valves. Standard solenoid valves (bang-bang type) will burn up if you attempt to drive them using the 24P.

To properly VERIFY THE ELECTRICAL DRIVE of a proportional valve, you should use an amp meter to measure the RMS current through the valve coil. Alternately, you can measure coil voltage, but it's important that you measure directly across the valve coil with the voltmeter. Do not measure from the coil to ground, since the 24P uses a low side switch and your reading will appear inverted.

Wire length and gauge will have an effect on LONG DISTANCE INSTALLATIONS. The hydraulic flow is controlled by the valve's spool position, which is controlled by the force of the proportional coil, which is controlled by the current through the coil. Wire length adds series resistance and drops voltage along its length. This effect reduces drive current. As the wire length increases, you can compensate by increasing the wire gauge. To confirm you have enough valve drive, measure the valve current directly to see that it meets the valve manufacturer's specification for maximum flow.

The 24P can be used to drive a bi-directional 4 - way valve for functions such as: fwd/rev or up/dn. The installer will need to add a reversing switch to select between the fwd/rev or up/dn valve coils.

If you are driving a low power coil such as a servo valve, you must consider that these coils have a maximum voltage. To drive a low power coil you can reduce the coil voltage by using a series dropping zener diode.

To drive a Pulsar™ valve, manufactured by Applied Power Inc. you must cut the flyback diode free. Please contact your dealer for instructions.

The 24P can be configured by the factory to use a 4-20 ma input command signal. This must be done at the factory. Please contact your dealer for further information. If you are already using a configured 24P, refer to Pg. 8 of the manual for further details.

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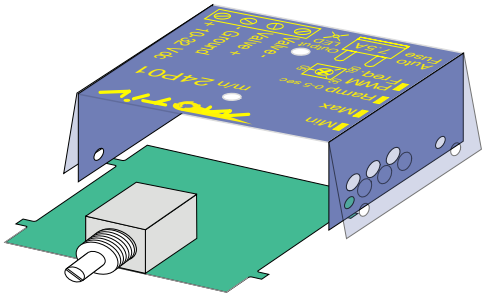
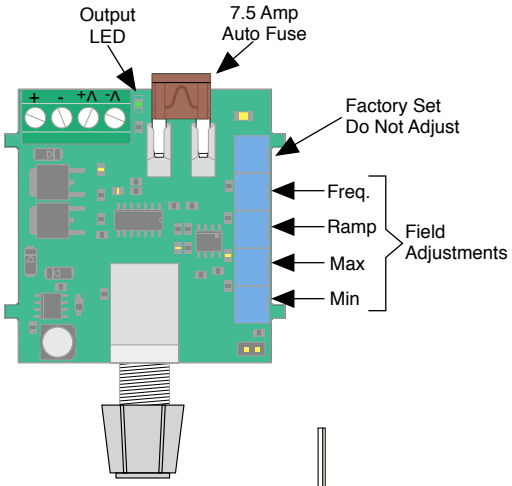
24P Operations Manual

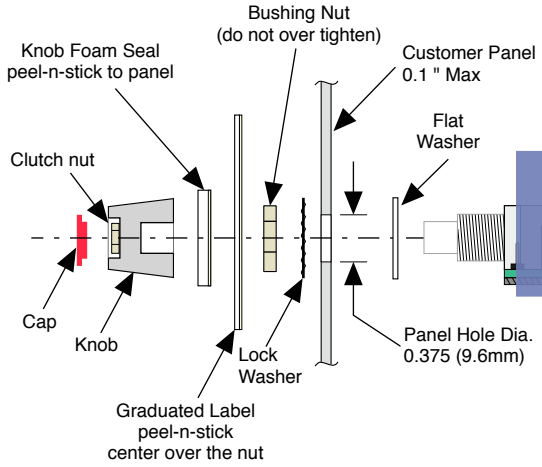
Mechanical Layout

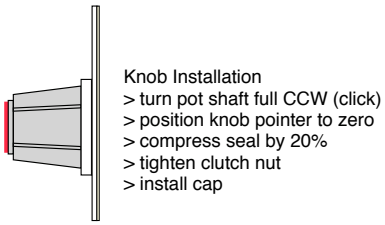


24P01 (Cover clips on top)

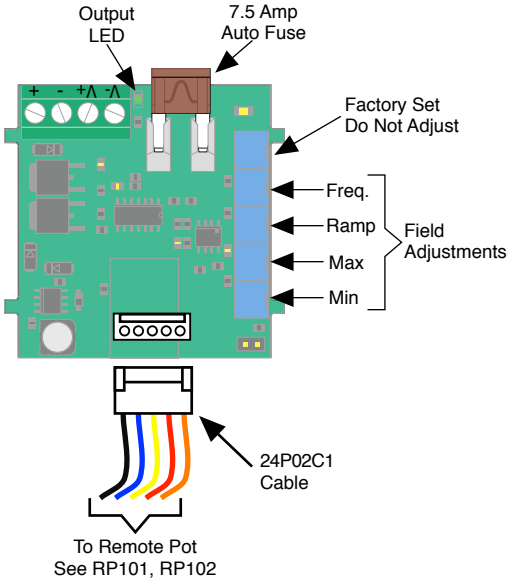
24P01

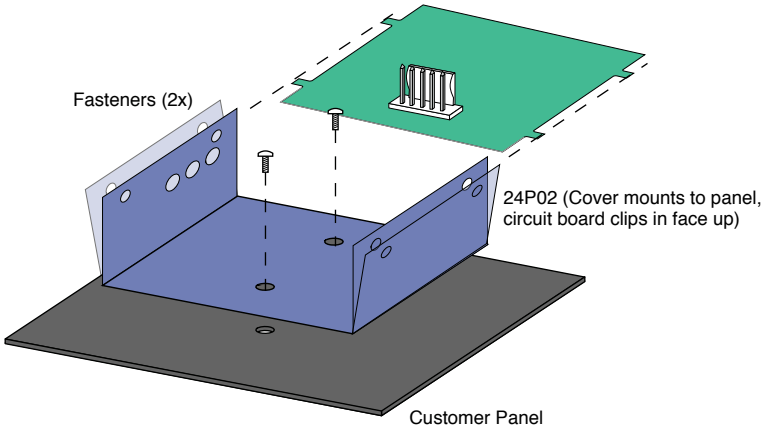






24P02





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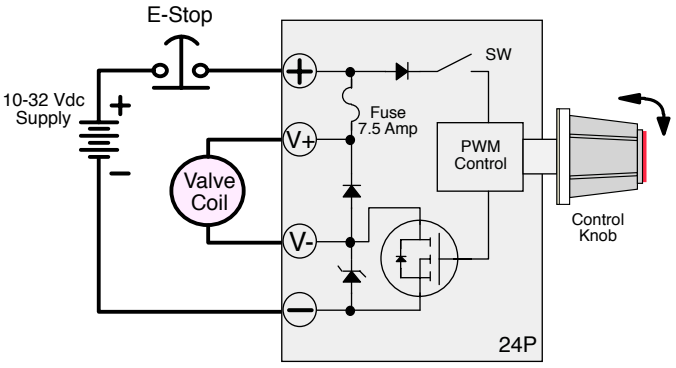
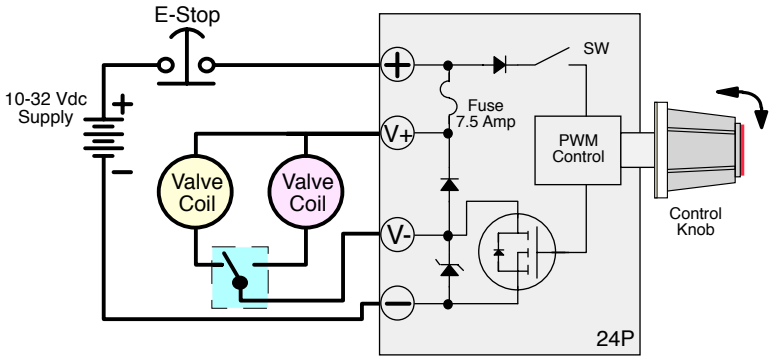
24P Operations Manual

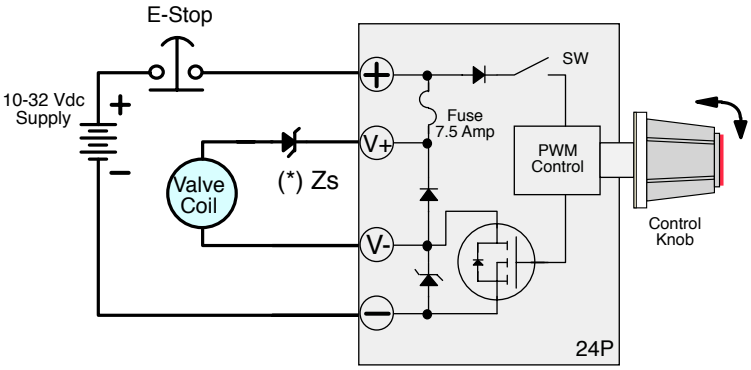
Standard Configuration

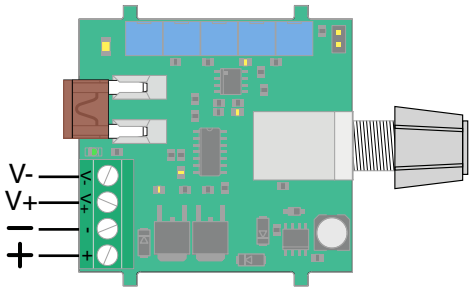


4-way Valve With Fwd/Rev Switch



Voltage Reduction for Servo Valves





Note: To place the series zener diode (Zs) into the circuit correctly, refer to V1 and V2. V1 is the "hot" side, and V2 is the PWM side. See sketch for the correct terminal location.

(*)For hydraulic valves with coils that use small drive currents a series zener diode is used to reduce the 24P drive voltage.

Max. Drive Current = Im
Coil Resistance = Rc
Valve Voltage = Rc x Im
Zener Voltage = Supply Voltage - Valve Voltage

example: Im=100ma, Rc=28ohms, Vs=12vdc
Zener Voltage = 12 vdc - (85 ma x 28 ohms) = 9.2 vdc
use the 8.7 volt zener

Partial List of 5 Watt Power Zeners

P/N	Voltage
1N5333A	3.3 Vdc
1N5336A	4.3 Vdc
1N5339A	5.6 Vdc
1N5342A	6.8 Vdc
1N5343A	7.5 Vdc
1N5345A	8.7 Vdc

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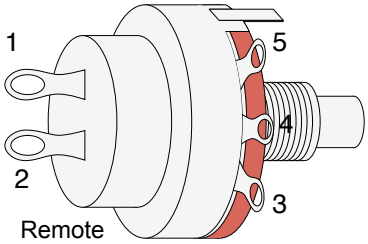
24P Operations Manual

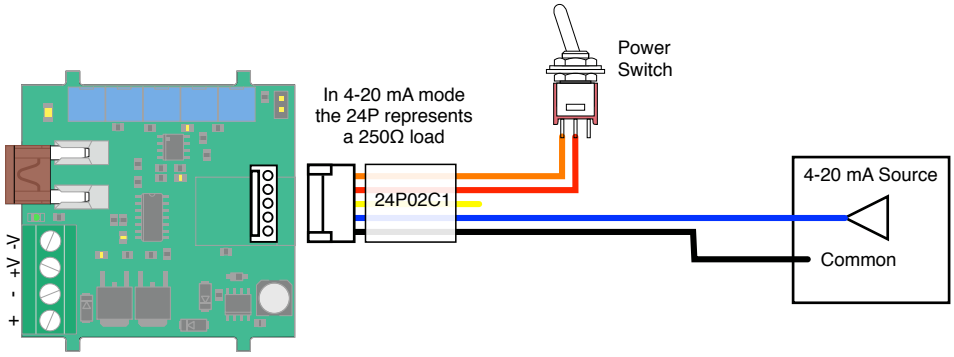
Wiring

A 24P02C1 cable is shipped with each 24P02 controller assembly
Note: The black mark on the connector indicates pin 1.

10K ohm
1/2 watt or better
w/ CCW switch

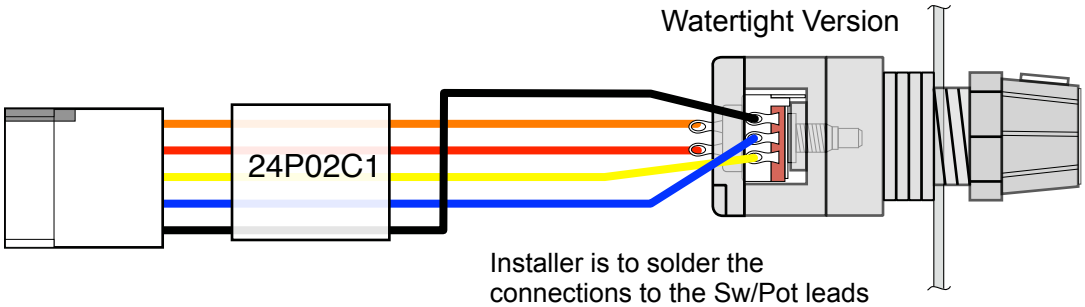


Remote
potentiometer
w/ switch



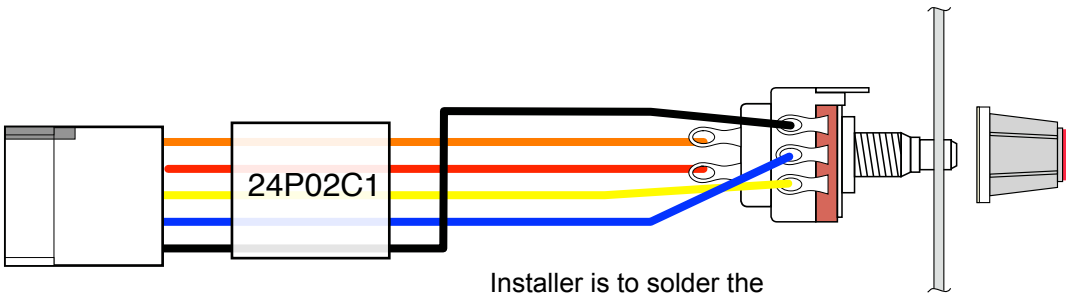
P/N RP101

Remote Sw/Pot
Watertight Version



Installer is to solder the
connections to the Sw/Pot leads

Heat shrink soldered
connections, optional



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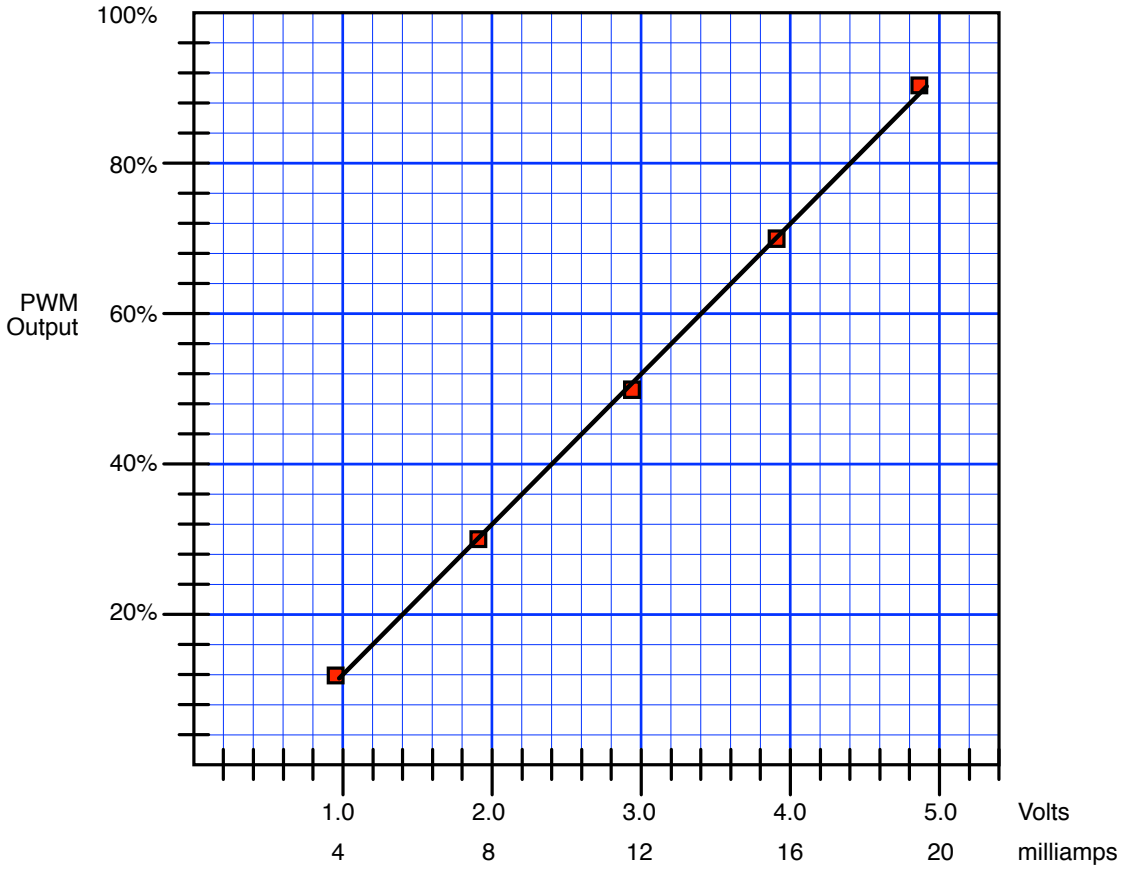

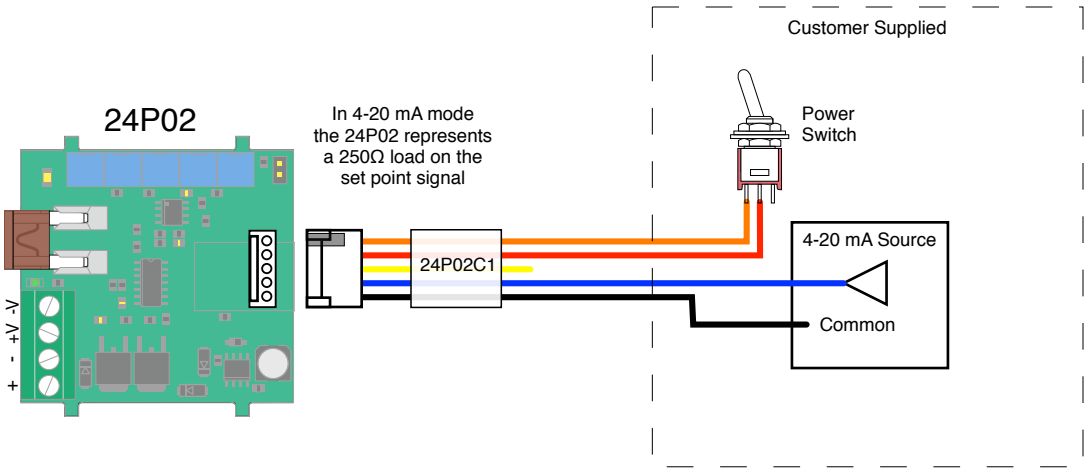

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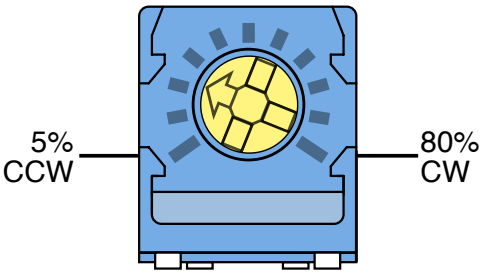
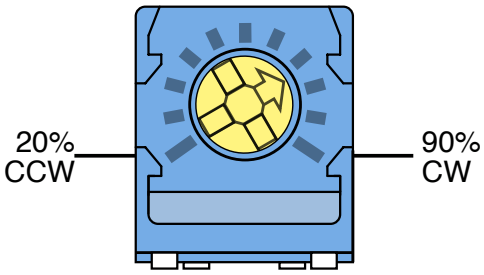
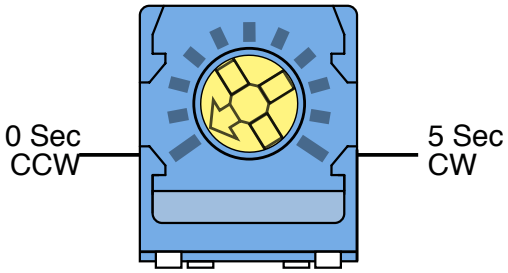
Min Valve Drive
Preset for 25%



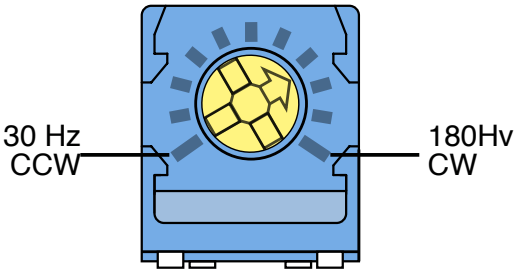
Max Valve Drive
Preset for 25%

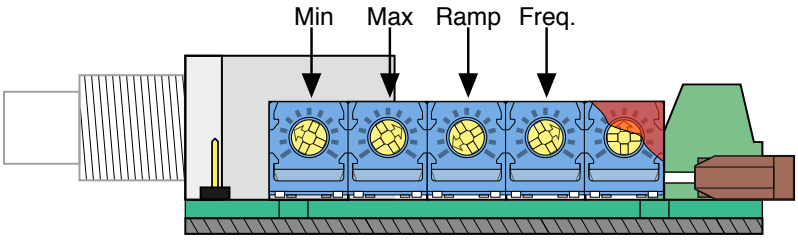


Ramp Adjustment
Preset for 0 seconds



PMW Freq. Adjustment
Preset for 100 hz





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