

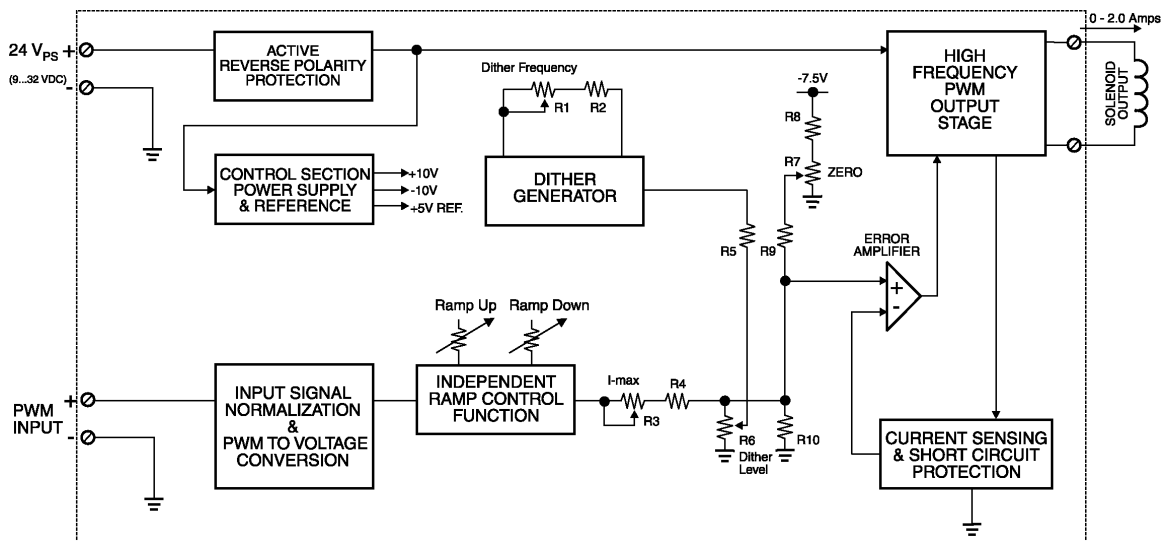
# PWM Controlled Solenoid Driver (DIN rail mount)

P/N: PWMC-DR-2A, PWMC-DR-1.2A

**Description:** The PWM Controlled Solenoid Driver supplies a proportional solenoid with current proportional to a digital pulse width modulated (PWM) input signal. It accepts power supply voltages from 9 to 32 VDC. This linear solenoid driver utilizes high frequency switching output (PWM) to provide a DC current output of 2 Amps (1.2 A available). A current sensing circuit maintains output current regardless of changes in input voltage and coil resistance. The user can adjust the zero setting, maximum output current, dither frequency and dither level as well as the independent rising and falling ramps to suit their application. The circuit board is conformal coated and packaged in a DIN rail mount housing. A metal box with 1.5 m (5 ft.) cable and PCB versions are available for remote mounting. The Driver complies with CE directives for EMC.



## Block Diagram



## Features:

- DIN rail mount
- Stand alone PCB Board or enclosed in a metal housing with cable versions available
- Maximum current adjustment does not affect zero setting
- Current sensing circuit maintains output current regardless of input voltage and coil resistance
- Broad range of supply voltages (9 to 32 VDC) with no degradation in performance
- Modern technology utilizing high frequency switching output (PWM)
- Energy efficient design (no heat sink is required)
- Accepts a PWM input from a PLC or other source
- Options for maximum current output include 2 A and 1.2 A
- Electronic limiting circuit means no internal fuses
- Short circuit proof (in case of solenoid failure or miswiring)
- Reverse polarity protected
- Filter eliminates electrical noise
- CE certified for EMC (metal box and DIN rail versions)

## Technical Specifications: Typical at nominal input voltage and 25 degrees C unless otherwise specified.

<b>Input Specifications:</b>	
<i>PWM</i>	Non-isolated Accepts PWM inputs from 250 to 5,000 Hz PWM range 5-95% ( <i>other ranges can be specified</i> )
<i>Input Voltage</i>	Low <1.5V High >3.5V (50V max.) TTL and CMOS compatible
<i>Input Impedance</i>	200kOhm
<b>Output Specifications:</b>	
<i>Maximum Current Output</i>	2A or 1.2A ( <i>Other outputs up to 2A are available. – contact manufacturer</i> )
<i>PWM Output</i>	High frequency switching
<i>Short Circuit Protection</i>	Provided
<b>General Specifications:</b>	
<i>Power Supply</i>	9-32 VDC Transient protection is provided.
<i>Reverse Polarity Protection</i>	Provided
<i>EMI Compliance</i>	Emission EN 50081-2 Immunity EN 50082-2
<i>Approvals</i>	CE (DIN rail and metal box versions)
<i>Operating Conditions</i>	-40 to 85 degrees C (-40 to 185 degrees F)
<i>Electrical Connection</i>	Screw terminals accept 14-20 AWG wire
<i>Enable</i>	When enable is left open, the unit is operational. When enable terminals (7 and 9) are connected, the unit is disabled with no current output.
<i>Packaging and Dimensions (W x H x D)</i>	DIN rail mount (75 x 98.5 x 22.5 mm or 2.95 x 3.87 x 0.88 inches)

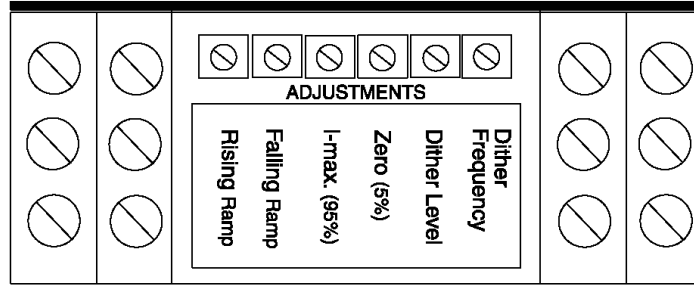
Note 1: For proper operation, match the power supply voltage with rating of solenoid coil. Operating the driver with a supply voltage lower than the solenoid rated voltage may result in reduced maximum current output.

Note 2: The coil should have no polarity or protection diodes for proper operation of the device.

Note 3: The max. current output of the driver should not exceed the current rating of the solenoid coil.

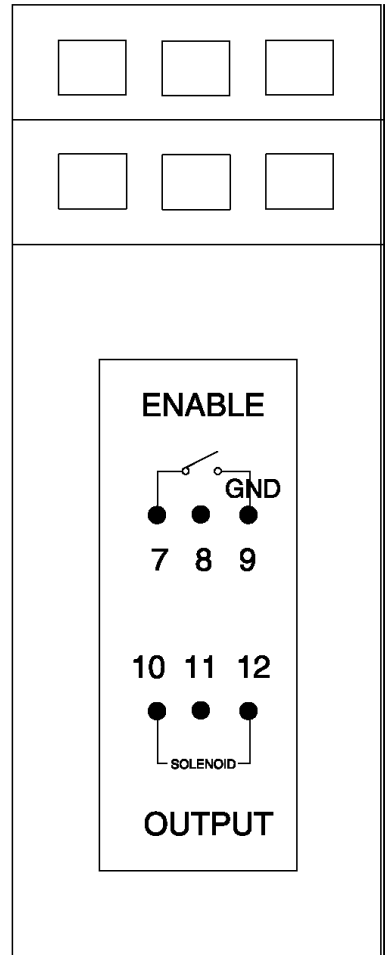
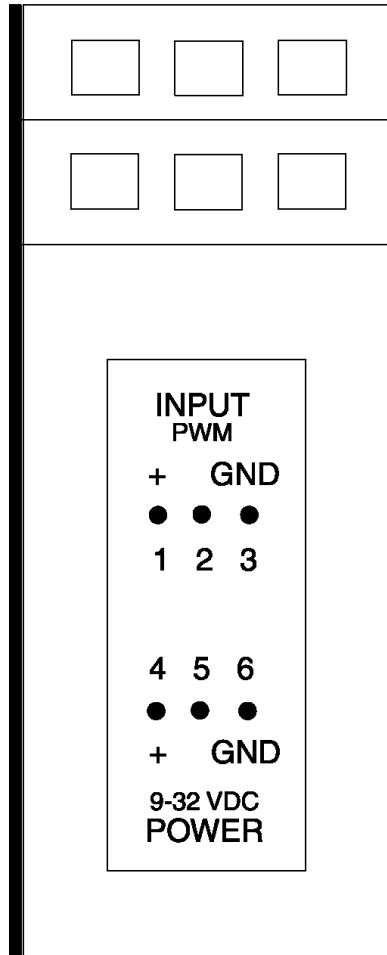
# CONNECTION DIAGRAM

(DIN rail mount version)



SCREW TERMINALS

SCREW TERMINALS



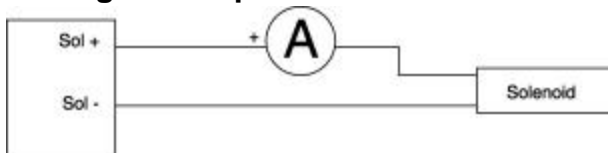
<b>Adjustments:</b>		
<i>Single turn trim pots</i>	<b>Range of Adjustment</b>	<b>Factory Setting</b>
<i>Dither Frequency</i>	70 to 350 Hz (+/- 10% of full scale) Dither waveform is triangular. CW = increasing Set dither frequency to match solenoid rating.	Minimum (70 Hz) (CCW)
<i>Dither Level</i>	0 to 10% of maximum current CW = increasing Choose the smallest effective dither amplitude. This is achieved when small changes in input register similar changes in current output.	Minimum (0%) (CCW)
<i>Zero</i>	CW = increasing Adjustment range of Zero trim pot is 0 to 150 mA.	Factory calibrated (5% PWM input provides 0A output)
<i>I-max</i>	CW = increasing Adjustment range is 0.4 to 2.0A (2A version). Adjustment range is 0.36 to 1.2A (1.2A version).	Maximum (depends on rating) (CW)
<i>Rising Edge (Ramp)</i>	0.01 to 5.0 seconds independent CW = increasing	0.01 seconds (CCW)
<i>Falling Edge (Ramp)</i>	0.01 to 5.0 seconds independent CW = increasing	0.01 seconds (CCW)

CW = clockwise, CCW = counterclockwise

## Calibration Steps

Units are shipped from the factory calibrated. Use this procedure to confirm accuracy as needed. If no calibration is necessary, proceed to setting an offset (if required) and setting the maximum current output (I-max.). Note: Factory calibration sets the controller to 0A output when 5% PWM is applied and full scale current output when 95% PWM is applied. The unit accepts a PWM input of 250 - 5000 Hz (5 - 95%).

## Setting the Output Current

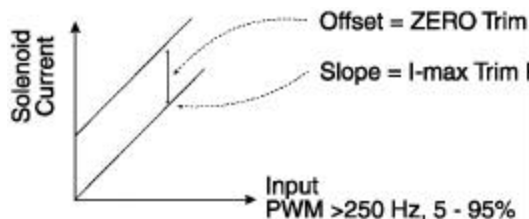


Current output is measured by an ammeter set up in series with the driver and the load. Connect the Solenoid + output to the + terminal on the Ammeter and the Ammeter to the Solenoid. Connect the Solenoid - output to the Solenoid.

The maximum current setting is adjusted to meet the customer's working pressure or flow range to the full scale signal input range. This provides maximum control for a specific application.

### Using the ZERO setting to provide an offset

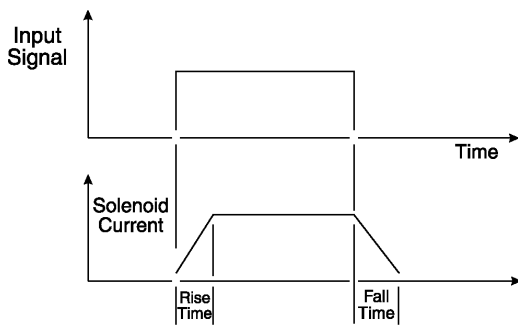
The zero setting can be used to take into account the mechanical valve deadband and provide desired offsets from zero to allow full control within the functional range of the specific valve.



### Output Current Calibration Steps:

1. Apply 95% PWM input and adjust the SPAN (I-max) trim pot counterclockwise (CCW) to the desired maximum current output for the solenoid rating.
2. Apply 5% PWM input. Adjust the ZERO trim pot clockwise (CW) until the current output reading is less than 5 mA but greater than 0 mA (or the desired offset value).
3. Re-apply 95% PWM input to confirm actual maximum current output matches the value generated in Step 1. Repeat Steps 1 and 2 until calibration is achieved.

NB. The unit must be recalibrated every time the I-max. setting is altered to ensure accuracy.



Ramp Times

### Setting the Ramp Times

- The factory setting for ramp times is the minimum (0.01 seconds) or fully CCW.
- **If the ramp time settings are not needed, leave the setting at the minimum value.**
- To change the ramp times, adjust the trim pot CW to increase the time.
- Note that rising and falling ramp times are independent. Ramp times are application dependent. They limit the rate of change or how fast the operation happens. Note that if the input signal is not applied long enough for the ramp time set, the desired solenoid current will not be reached.

### Setting the Dither Amplitude

- The factory setting for dither amplitude is 0% (CCW).
- To adjust dither amplitude, turn the trim pot CW until small changes in the input signal register similar changes in current output.
- Choose the smallest effective dither amplitude.

Dither amplitude is adjustable from 0 to 10% of the rated maximum current. Dither amplitude and frequency are dependent on the specific valve. The effects of static friction on the operation of the solenoid are reduced by the application of a small AC current. The hysteresis and repeatability of the valve are improved by this practice. The optimum dither amplitude is attained when small input signal changes register similar changes in current output (pressure or flow through the valve).

### Setting the Dither Frequency

- The factory setting for dither frequency is the minimum or 0% (CCW).
- To adjust dither frequency, turn the trim pot CW until the desired frequency is set.
- The valve manufacturer will provide the desired dither frequency rating for their product.

<b>Ordering Part Number:</b> <ul style="list-style-type: none"> <li>• Single solenoid driver</li> <li>• 2A output or 1.2A output</li> </ul>	<b>2 A output, DIN rail mount packaging - PWMC-DR-2A</b> <b>1.2A output, DIN rail mount packaging – PWMC-DR-1.2A</b> <i>Other current outputs up to 2A are available.</i> <i>Refer to Technical Datasheet #TD1404AX for metal box and PCB versions.</i>
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Specifications are subject to change without notice.

Form: TD1400AX-06/04/04