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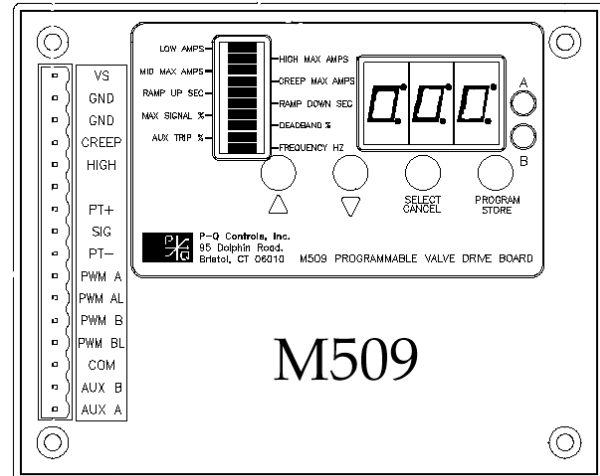
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OPERATIONS MANUAL

MODEL 509 / 519

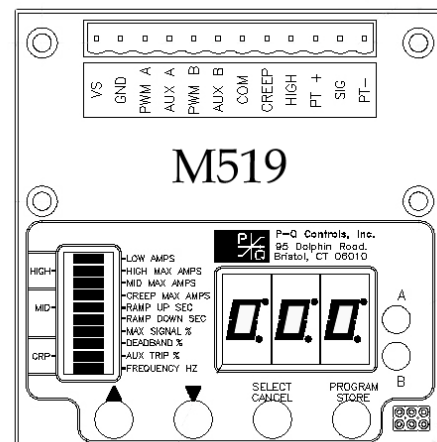
Features

- ◆ On-board, on the fly, programming capability
- ◆ On -board current meter
- ◆ Push Button Programming – No Trimpots!
- ◆ Completely independent adjustments
- ◆ Low Drop MOSFET Outputs
- ◆ Independently adjustable RAMP Rate
- ◆ Adjustable PWM Frequency
- ◆ Three PWM Output Ranges
- ◆ Three auxiliary outputs w/2.5 Amp current rating
- ◆ RAMP between CRP, MID and HI Ranges
- ◆ Drives both low and high current valves
- ◆ Epoxy Encapsulated Electronics
- ◆ Current Sourcing w/Feedback Outputs
- ◆ Password Protection (M519)
- ◆ Over-Signal Protection
- ◆ Short Circuit Protection
- ◆ Broken Lead Protection
- ◆ Reverse Polarity Protection
- ◆ Voltage Supply Transient Protection
- ◆ EMI and RFI Hardened



Programmable Parameters

- ◆ PWM Frequency
- ◆ Command Signal Input
- ◆ Neutral Deadband trip point
- ◆ Auxiliary output trip point
- ◆ Coil A/B Minimum current
- ◆ Coil A/B Creep current
- ◆ Coil A/B Mid current
- ◆ Coil A/B High current
- ◆ Independent A/B Ramp Up
- ◆ Independent A/B Ramp Down



Description

The Model 509/519 series of valve drive boards are an electronic interface between a command source (potentiometer, joystick, foot pedal, etc.) and an electrohydraulic valve or pump. The board receives analog signals from the command source, and provides Pulse Width Modulated Output (PWM) to drive most electrically modulated valves and pumps available today. The board also provides solid-state On/Off Outputs and other features to smoothly stroke a valve or pump with greater control and flexibility over conventional hydraulic components. The 509/519 valve drive boards are designed for use on mobile equipment

where extreme environments (both weather and electrical) are encountered. The boards also offer features used in many industrial applications. The boards can be remotely mounted up to 100 feet from the command source. The 519 board can also be mounted directly to P-Q single axis joysticks.

Output from the proportional channels is Pulse Width Modulated (PWM) with current monitoring. The boards can be configured to drive single and dual grounded proportional solenoids. The proportional current output will remain fixed within 2% during supply voltage swings and coil resistance changes, (which occurs as the valve coil temperature rises). Light emitting diodes (LED's) are lit whenever the command signal exceeds the board's deadband and the board begins to output. Should any of the outputs become shorted, they will shut down automatically.

In addition to the proportional outputs, On/Off (digital) outputs are available to energize dump valves, blocking valves, brakes, buzzers, etc. These solid-state auxiliary outputs utilize field effect transistors (FET's) to provide continuous loads up to 2.5 Amps.

Ordering Information

The 509/519 boards are shipped with factory default values and require "fine tuning" before initial use. The on-board display and buttons provide easy adjustment and can be tuned with or without the load connected. The specific PWM output for your application should be supplied with your valve or pump. A P-Q Applications Engineer can assist you with the proper values if needed.

Part Number: M509

10-30VDC Supply PWM Range of 10-250mA (Low Current Coils) 100-2500mA (High Current Coils) 40-400Hz

The 509 is larger than the M519 and will not mount directly to a P-Q joystick. The M509 has the added capability of driving low current grounded coils.

Part Number: M519

10-30VDC Supply PWM Range of 100-2500mA 40-400Hz

The M519 will mount directly to a single axis M115 P-Q joystick. The 519 will not drive low current grounded coils. The M519 has an added protection feature that requires a specific push button sequence to enter into the program mode. The M519 has the same mounting footprint as many other PQ valve drive boards.

Mating connector: A mating connector is required for either board. This type of card edge connector allows the wiring to remain fixed to the mating connector, making board changes fast and easy. To order mating connectors directly from P-Q Controls, the part numbers are:

For M509 P-Q # A-09014-16 This is a right angle screw type connector made by PCD, part number ELFP16210.

For M519 P-Q # A-09014-12 This is a right angle screw type connector made by PCD, part number ELFP12210.

To mount an M519 board to an M115 joystick, order the mounting kit P-Q # C-05716.

Many connector styles are available. The pin spacing is .200".

Installation

1. Voltage Supply

Power and ground should come directly to the board from the battery or power supply. A power source between 10-30VDC is required for proper operation. The power supply must be clean and free of spikes and DC ripple. A dedicated direct connection from the battery, fuse block or power supply is strongly recommended to ensure a clean supply. Remember that the board can source as much as 8.5 amps through the voltage supply with three outputs (PWM, common and directional auxiliary) active. The power supply wiring should be sized appropriately to handle the maximum current draw anticipated. Contact P-Q for assistance as required.

2. Command Connection

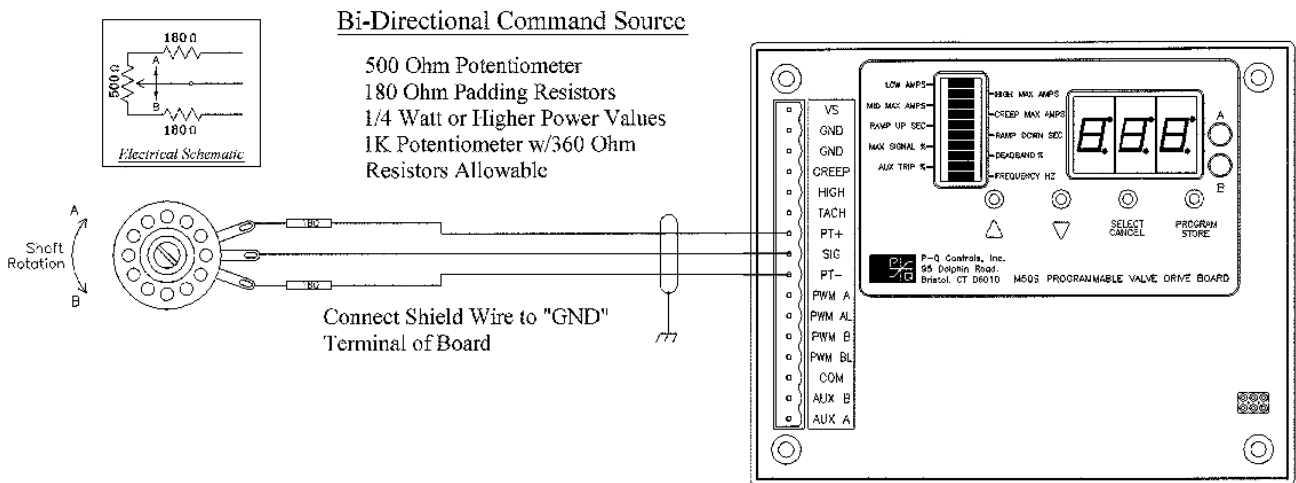
The PT+ and PT- terminals of the board provide the voltage supply for the command source. The PT+ is 5VDC and the PT- is ground. This voltage source is adequate to power single and multi-axis joysticks, foot pedals, sensors, etc., (approx. 100mA). An external signal source (such as from a PLC) supplying the proper signal swing can also be used.

Wiring between the command source and board should be 22 gauge or larger and must be shielded. The shield should be connected to the GND terminal of the board. Do not connect the shield on the command source end. The 509/519 can be mounted up to 100 feet from the command source. Larger size wire is required for remote mounting (generally 18-20ga.). Contact P-Q Controls for assistance.

NOTE: Interference can occur where command leads are run parallel to PWM or AC leads. Mobile radios and high power AC equipment or transmission lines are other potential sources of interference. If interference is a problem and shielded cable is used properly, mount the board in a metal enclosure and ground the enclosure to chassis ground. Contact P-Q for further assistance.

Bi-Directional Command Connection

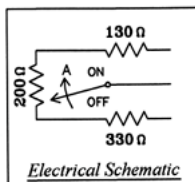
(Single axis joystick, foot pedal, or potentiometer)



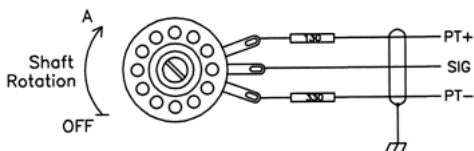
Unidirectional Command Connection & Switched Command Configurations

(Single Axis Joystick, potentiometer, foot pedal, or switch)

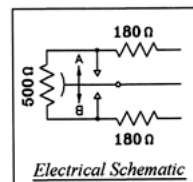
Uni-Directional Command Source



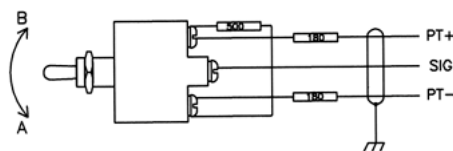
Potentiometer and resistors to be 1/4 watt or larger.



Switched Command Source

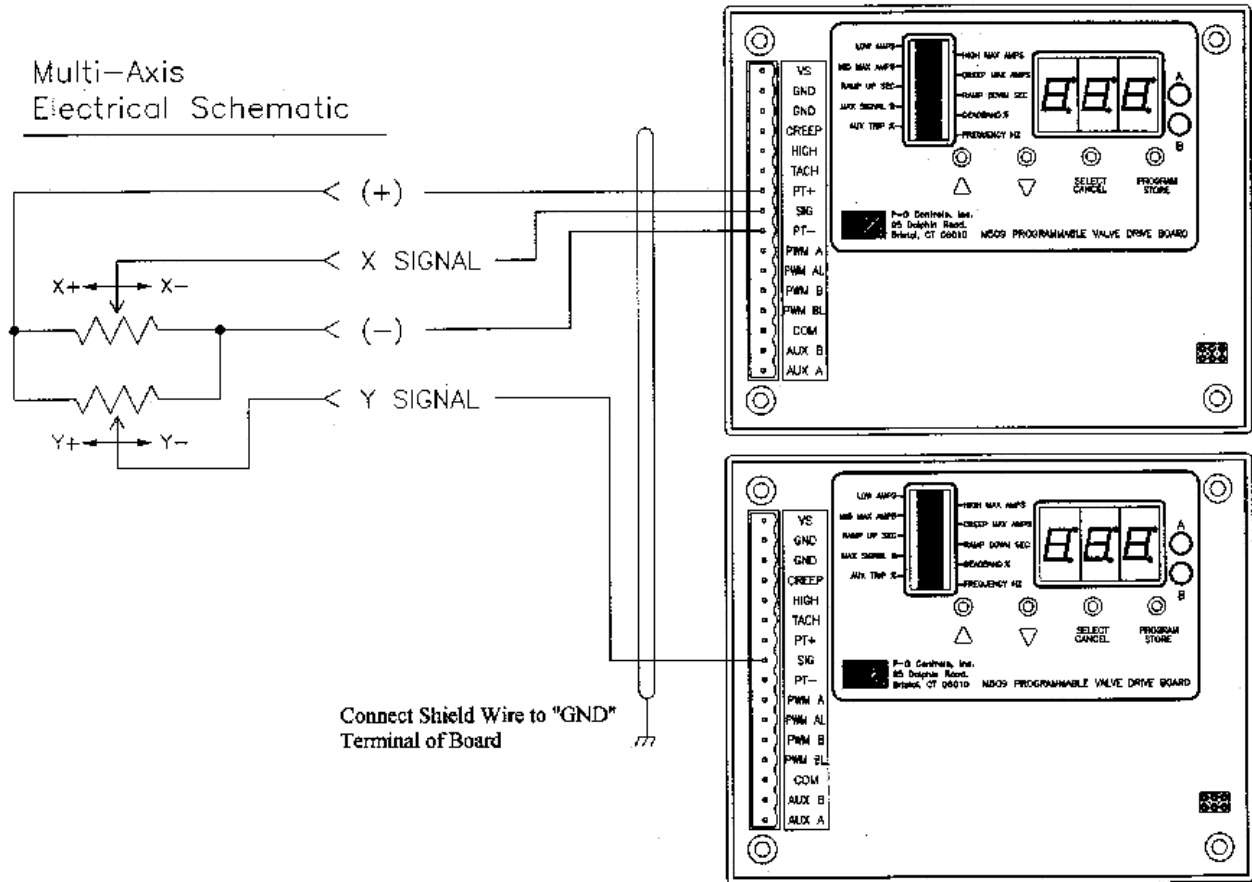


Potentiometer and resistors to be 1/4 watt or larger.



Multi-Axis Joystick Command Connection

(M212/M215/ M220/M225 Joysticks and M425 Angle Sensor)



One PT+ /PT- power supply from one board is sufficient to power a complete multi-axis joystick.

3. Valve Coil Connection

The valve coils should be grounded to a single wire that is carried back to the ground terminal of the board. The system can then be grounded from the power supply to the board, to frame ground, if required. The coil ground must be connected to the same ground potential as board ground or damage to the board may occur. A single point grounding scheme will eliminate differences in ground potential. See the P-Q installation drawing for details on single point grounding.

NOTE: In most cases, grounding the valve coils to the vehicle frame will not cause a problem. But in using an external battery to "jump" power into the system with the coils frame grounded, be sure to connect the external battery negative to the frame of the vehicle being jumped. This is to keep the external battery ground and the vehicle frame at the same ground potential.

PWM outputs A and B should not be tied together with either the M509 or the M519. Although damage will not occur, the boards will not operate properly. P-Q offers many other valve drive boards to drive flow and pressure control valves.

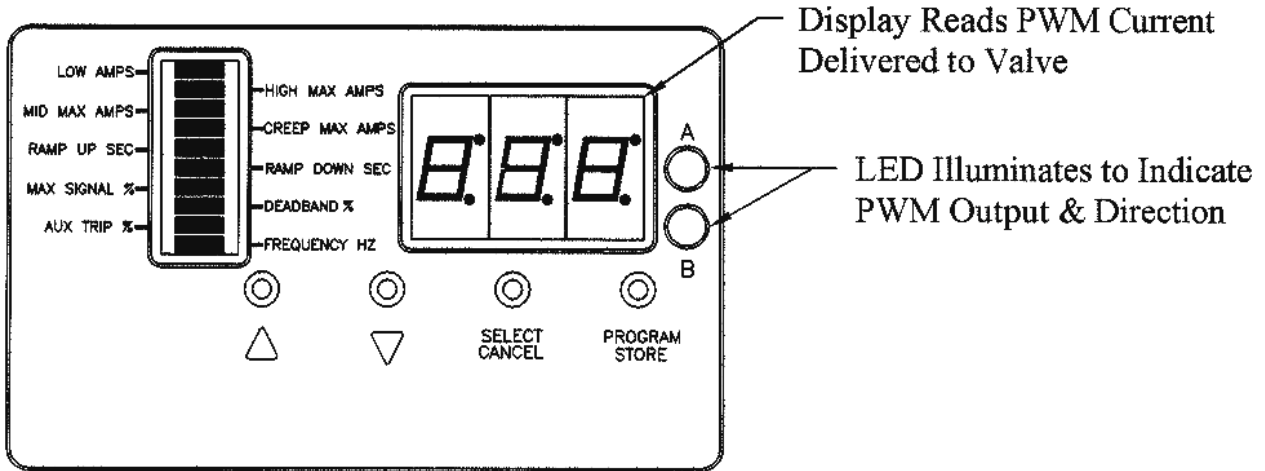
External flyback diodes may not be used on the proportional outputs. This diode arrangement will defeat the current source circuit. The board is already equipped with reverse polarity protection (feedback diodes) at the PWM output terminals.

4. Output Adjustment (Fine Tuning)

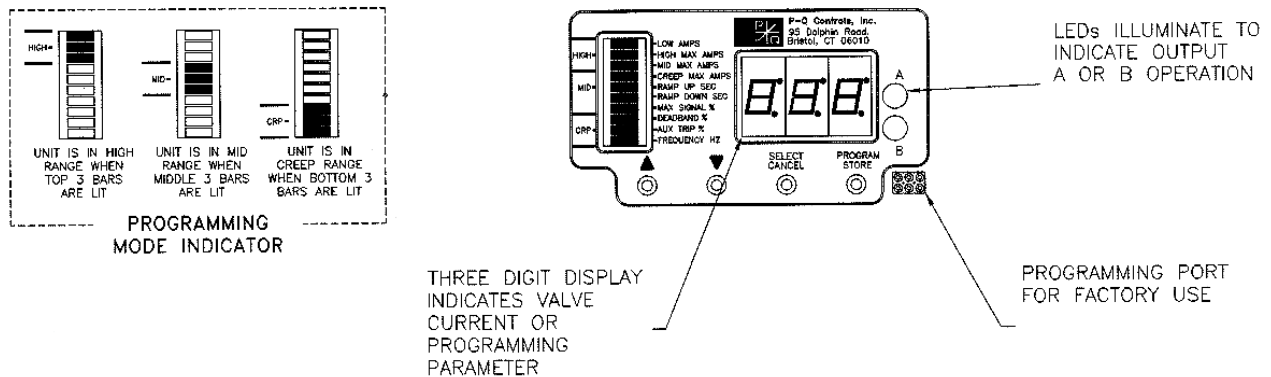
The 509/519 boards are extremely versatile. One board can be adjusted to operate a number of different valves by a number of different valve manufacturers at various voltages. However, each application requires adjusting the board's PWM outputs to match the valve to be driven in each particular application. If the application changes, the board can be re-tuned within its minimum and maximum ranges as shown in the Ordering Information section.

To adjust the output of the board, to either fine-tune the valve operation, or to re-adjust the outputs to drive a different valve, a programming interface consisting of (4) pushbutton switches and a display are provided on the board:

M509 Operation Mode



M519 Operation Mode



LOW AMPS (Threshold): Low adjusts the PWM output when the board first begins to output current. The board begins to output when the signal generated by the command source exceeds the deadband % setting of the board. To adjust “on the fly”, move the command source slightly to its “just on” position (observe that the “A” or “B” light on the board just turns on). Adjust the Low Amps setting to obtain slight motion of the function.

HI MAX AMPS: Adjusts the maximum PWM output to achieve full flow of the valve or pump. Fully throw the command source and adjust the Hi Max Amps to the desired level. The max PWM is typically the hardest setting to achieve. To eliminate excess current delivered to the valve, lower the HI MAX AMPS to a point where speed just starts to drop; then raise the setting slightly to ensure full utility of the command signal swing.

MID MAX AMPS: Adjusts the midrange PWM output. The midrange must be set between the Low and High settings. The 509/519 boards default to the midrange mode unless the “creep” or “high” terminals are connected to the voltage supply.

When in the midrange mode, the PWM output will range from the Low Amps setting to the Mid Max Amps setting as the command source is actuated. Move the command source to the maximum position and adjust MID MAX AMPS to desired speed.

CREEP MAX AMPS: Adjusts the creep PWM output. Energize the “Creep” terminal with voltage supply to place the board in the creep mode. When in the creep mode, the PWM output will range from the Low Amps setting to the Creep Max Amps setting as the command source is actuated. Move the command source to the maximum position and adjust CREEP MAX AMPS to desired speed.

RAMP UP SEC: Ramp is provided to smooth abrupt changes of the command signal. Ramp Up will adjust the output duration from the Low Max Amps to the High Max Amps. Ramp is factory preset to Off for ease of fine tuning. Ramp is adjustable from 0-10 seconds. Adjust the RAMP time to obtain the desired ramping effect.

RAMP DOWN SEC: Ramp Down will adjust the output duration from the High Max Amps to the Low Max Amps. Ramp is factory preset to Off for ease of fine tuning. Ramp is adjustable from 0-10 seconds. Adjust the RAMP time to obtain the desired ramping effect.

RAMP NOTE 1: Since the circuitry has delay for both accelerating and decelerating a load, it is important to note that the only means of stopping the output quickly will be with a switch. The switch should interrupt the command signal or voltage supply to the board, disconnect the valve coil(s) from the board, or energize a dump or blocking valve. See the P-Q applications bulletin 940208J1.DWG for specific instructions.

RAMP NOTE 2: Ramp is a rate of change. As an example, if the Low setting was 200mA and the High setting was 1400mA, and the ramp was set to 1 second, the ramp rate would be $1400 - 200 = 1200\text{mA}/\text{sec}$. This will not change as long as the low, high and ramp settings do not change. Any sudden changes in the command source will be ramped to a rate of 1200mA/sec. Adjustments made to ramp are in relationship to the Low and High settings only. If the board was in the midrange mode, and Mid Max Amps was set to 800mA, the time it would take to ramp from low to mid would be .5 seconds since low (200mA) to mid (800mA) is a 600mA span, and the ramp rate remains at 1200mA/sec.

MAX SIGNAL %: This feature allows for the adjustment of the signal required to control the board. For most applications, this setting should remain at 100%. Max Signal % may require a change where the command signal is generated by some external source or when less than full throw of the command source is needed for full output from the board. With a P-Q joystick as the command source, lowering the Max Signal % will reduce the amount of joystick throw to achieve full output from the board. Max Signal is adjustable from 100% down to 1% above the dead band setting.

DEADBAND %: The M509/M519 boards have a built-in dead band region around the neutral area. This is provided so that the command source has some “dead play” when in neutral. Since most command sources are a joystick, the dead band is needed so that any mechanical tolerances within the joystick do not cause the board to turn On and begin outputting. The standard dead band is 20% and is recommended for most applications. The 10% setting is popular for leveling applications. The dead band is adjustable from 10%-50%.

AUX TRIP %: The boards are equipped with three digital (On/Off) outputs that are each capable of 2.5 amps continuous. These outputs use MOSFET type transistors for high efficiency and superior protection. The AUX A and AUX B outputs energize simultaneously with the PWM outputs, which occurs once the dead band setting is reached. A common auxiliary output (COM) energizes in both the A and B directions of the command source and is adjustable from 5% to 100% of the signal input. This output is generally set at the dead band setting to energize a dump or blocking valve as the PWM begins to output.

FREQUENCY Hz: This feature provides an adjustment to the PWM frequency. This adjustment allows the PWM frequency to be matched to the valve or pump specifications for the application. The ability to change the frequency easily is one of the keys to creating a versatile board. The frequency setting is the only setting that cannot be adjusted independently for the A and B sides. All changes to the frequency must be done on the A side (A LED is lit).