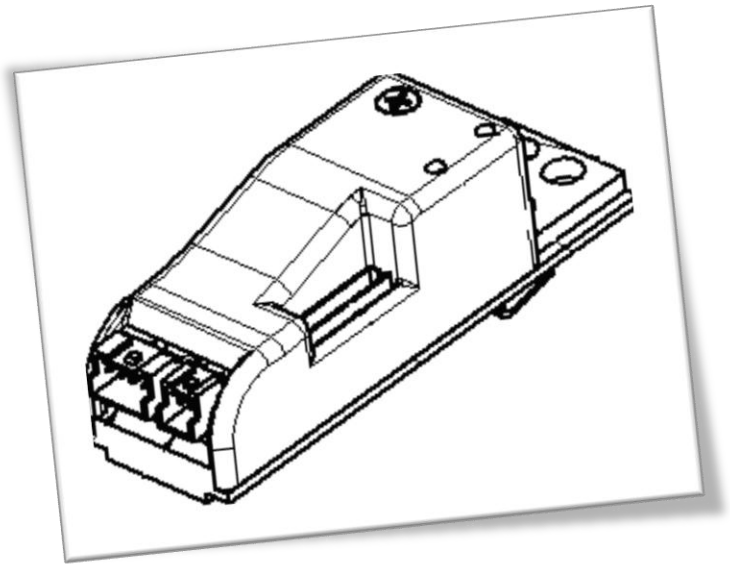
Parker Hannifin Corporation

P2™ Stepper Drive

Product Manual and User Guide



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3/1/13

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User Information

Warning - Motion control products are used to control electrical and mechanical components of motion control systems. You should test your motion system for safety under all potential conditions. Failure to do so can result in damage to equipment and/or serious injury to personnel.

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Since Parker Hannifin constantly strives to improve all of its products, we reserve the right to change this user guide and software and hardware mentioned therein at any time without notice.

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Revision Notes

Revision 1
Original Document

Revision 2 – 2/8/2011
Spelling correction

Revision 3 – 3/24/2011
Clarified the equations for setting the drive current.

Revision 4 – 6/27/2011
Added section "System Installation Overview" with information for Electromagnetic Compatibility (or EMC).

Revision 5 – 7/07/2011
Added vibration specification.

Revision 6 – 3/1/13
Rebranded as the P2™ Drive

The P2™ Stepper Drive

The Parker P2 Stepper Drive is a complete step and direction indexer for Hybrid step motors. The P2™ is designed to operate stepper motors in full, half, quarter, and sixteenth step modes with an output drive capacity up to 24VDC and ±2.0Amps. In an 80mm x 25mm x 25mm package, the P2™ can be installed by using two of the four mounting holes (the additional mounting holes are for different mounting orientations) or with the optional din rail mount the P2™ can be installed on a standard 35mm din rail.

Key Features

- Supply Voltage 12 to 24VDC
- 2 Amp chopper stepper driver
- ENABLE, STEP & DIRECTION inputs are 14V tolerant
- Adjustable Run Current and Standby Current with Potentiometers
- Adjustable Current up to 2.0Amps
- Differential and Single Ended inputs for the ENABLE, STEP & DIRECTION
- Din Rail Mountable (Optional)
- Resolutions of 200, 400, 800 & 3200 steps/rev (with 1.8° Step Motor)
- Small package (80mm x 25mm x 25mm)
- Automatically goes into standby current in 1.5seconds after last step signal goes low
- Disable standby current by ending move with step signal high.

Specifications

- Supply Input: 12-24VDC
- Max Motor Output Current: 2.0Amps
- Differential input voltages up to ±14VDC (low/high input) Absolute MAX of ±14VDC
- Enable, Step & Direction input levels: <0.8V Low, >2V High
- Minimum STEP Pulse Width: 1.0µs
- Minimum STEP Pulse Low Time: 1.0µs
- Operating Temperature: 0 to 40°C with natural convection
- Relative Humidity: 5 to 95% non-condensing
- Vibration not to exceed 18G

Mechanical Specifications

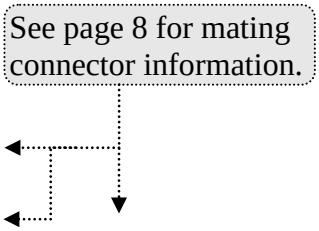

Figure 1: Mechanical Specifications

Mounting Accessories

Mounting Kit to Mount P2™ to LCR22, LCR30 or LCR45

Figure 2: Optional P2™ to LCR Mounting Kit

Connector Locations & Pin-Out Description

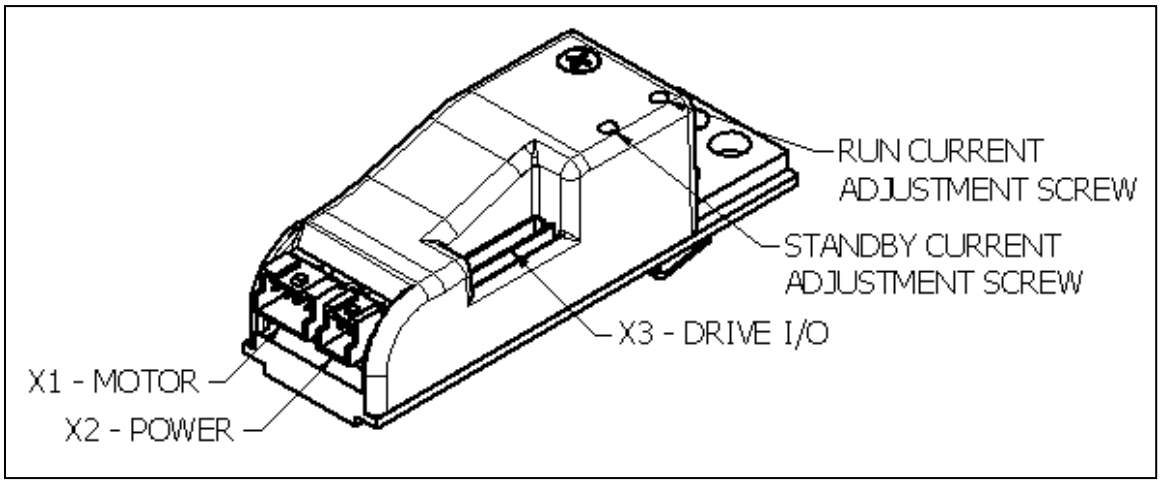

Figure 5: Connection Diagram & Current Adjustment

Warning - Do not unplug motor while power is on!

Warning - The motor output is **NOT** short circuit protected. Before enabling the drive verify each phase of the motor is properly connected.

Figure 6: Pin-Out Diagram

X3 – DRIVE I/O Function Description

Reference Output (REF). Current reference measurement taken from this pin (see Current Setup).

Direction Input (DIR). The state of the DIR input determines the direction of rotation of the motor. Any changes made to this input does not take effect until the next rising edge of the step command input signal.

Enable Input (ENABLE). A differential low enables the drive outputs. A differential high disables the drive outputs. Disconnecting the ENABLE signal also disables the outputs.

Step Input (STEP). A low-to-high transition on the STEP input advances the motor one increment. With a high signal the Standby mode is disabled.

Ground (GND). Logic ground.

Note:

The Drive I/O will accept differential or single-ended STEP, DIRECTION & ENABLE signals. To use single ended mode with an active high connect STEP+, DIR+ & ENABLE- and leave STEP-, DIR- & ENABLE+ disconnected. To use single ended mode with an active low connect STEP-, DIR- & ENABLE+ and leave STEP+, DIR+ & ENABLE- disconnected. Other combinations of active low and active high can also be used.

Mating Connectors

- X1 – Connector Housing, Mfg. JST, Part # PAP-04V-S(P) (Digikey Part # 455-1488-ND)
  - Pins, Mfg. JST Part # SPHD-001T-P0.5 (Digikey Part # 455-1325-1-ND) for 26-22AWG wire or Mfg. JST Part # SPHD-002T-P0.5 (Digikey Part # 455-1313-1-ND) for 24-28AWG wire
  - Crimp Tool, Mfg. JST Part # YC-610R (Digikey Part # 455-1906-ND) for SPHD-001T-P0.5 or Mfg. JST Part # WC-620 (Digikey Part # WC-620-ND) for SPHD-002T-P0.5
- X2 – Connector Housing, Mfg. JST, Part # PAP-02V-S(P) (Digikey Part # 455-1486-ND)
  - Pins, Mfg. JST Part # SPHD-001T-P0.5 (Digikey Part # 455-1325-1-ND) for 26-22AWG wire or Mfg. JST Part # SPHD-002T-P0.5 (Digikey Part # 455-1313-1-ND) for 24-28AWG wire
  - Crimp Tool, Mfg. JST Part # YC-610R (Digikey Part # 445-1906-ND) for SPHD-001T-P0.5 or Mfg. JST Part # WC-620 (Digikey Part # WC-620-ND) for SPHD-002T-P0.5
- X3 – Connector Housing, Mfg. JST, Part # ZHR-10 (Digikey Part # 455-1197-ND)
  - Pins, Mfg JST Part # SZH-003T-P0.5 (Digikey Part # 455-1281-1-ND) for 32-28AWG or Mfg JST Part # SZH-002T-P0.5 (Digikey Part # 455-1130-1-ND) for 28-26AWG
  - Crimp Tool, Mfg. JST Part # WC-490 (Digikey Part # 445-1259-ND) for SZH-003T-P0.5 or Mfg. JST Part # YRS-491 (Digikey Part # YRS-491-ND) for SZH-002T-P0.5

A Highly-Immune, Low-Emission Installation – Meeting the Requirements of the Electromagnetic compatibility (EMC) Directive

The following information was compiled to aid the machine builder or systems integrator in gaining EMC compliance. For effective control of Conducted and Radiated Emissions, along with maximizing the P2™ Stepper Drive's inherent noise immunity, the following recommendations should be followed.

- Mount the Drive and all components to a clean (not painted), earthed, metal panel. **Important!** To reduce the risk of electrical noise entering your system you must properly earth ground the metal panel, and remove all paint and other non-conductive surface coatings from the panel mounting surface and RF earth bonding locations.

- Install a Main supply filter. The P2™ Stepper Drive requires an EMC main supply filter to meet EMC emission requirements. It is recommended that the drive is mounted on a conductive panel which is shared with the EMC filter. If the panel has a paint finish, it will be necessary to remove the paint in certain areas to ensure filters and drive make a good large-area metal to metal contact between filter case and panel. The recommended EMC main supply filter is manufactured by **Corcom part number 3EB1 (Tyco Electronics part number 6609020-5).**

Use shielded cables. Parker P2™ Stepper Drive cabling—requires no additional cable preparation. All motor connections must be made using a high quality braided-screen cable. Cables using a metalized plastic bandage for an earth screen are unsuitable and in fact provide very little screening. Care must be taken when terminating the cable screen, the screen itself is comparatively fragile; bending it around a tight radius can seriously affect the screening performance. All cables must maintain high integrity 360 degree shielding. Parker P2™ Stepper Drive cables are fully shielded and provide the required screening.

- Install a P-Clip with 360° connection on the shields of the motor and the power cables and bond them to the aluminum base of the P2™ Stepper Drive. A P-Clip kit is available from Parker that will accommodate both the motor extension cable (006-2357-x.0) and the power cable (006-2342-x.0). Provisions have been made for attaching the P-Clip to either side of the base via two M3 holes with a 6mm screw. The **P-Clip kit part number is 002-3313-01**.

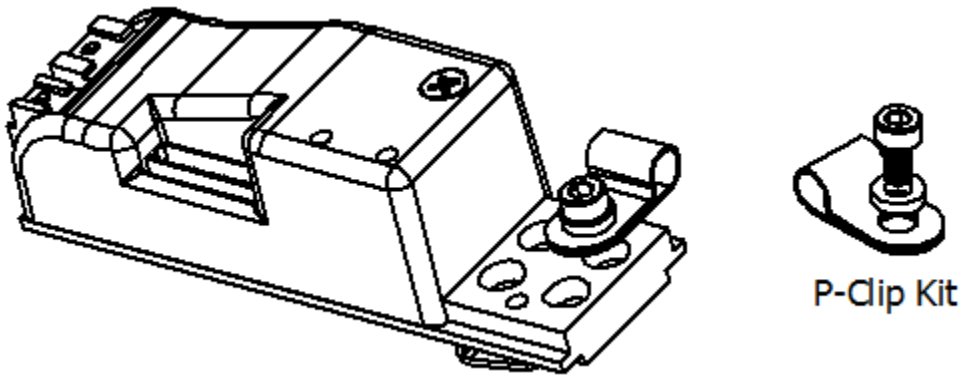

Figure 11. P-Clip Kit

- Install a ferrite on the motor lead after the P-Clip with 2 turns. The recommended ferrite is available from **Fair-Rite part number 0431164181**.

Troubleshooting

Symptoms	Probable Causes	Solutions
The drive loses pulses at high speed	Controller is sending pulsed to fast	Verify that the controller has a minimum STEP Pulse Width of 1.0µs and a minimum STEP Pulse Low Time of 1.0µs
	Motor is out of torque	Verify that the motor is sized correctly for you application
The motor stalls at high speeds	The velocity is too high	Decrease the velocity
	Motor current is not set correctly	Check the current settings
	Motor is under sized for application	Verify that the motor is sized correctly for your application
The motor stalls during the acceleration	Motor current is not set correctly	Check the current settings
	The acceleration is set too high	Decrease the acceleration
	Motor is under sized for application	Verify that the motor is sized correctly for your application
Motor does not move commanded distance	Motor resolution is set incorrectly	Determine the resolution on your controller and verify that the drive resolution setting is the same.
Controller moves motor in wrong direction	There is a direction conflict within the controller	Verify controller direction
	Motors is wired incorrectly	Change direction by swapping motor leads A+ and A-
	Control cable is wired incorrectly	Verify the controller leads for DIR+ and DIR-
There is little or no holding torque during move and/or holding position	Run current is not set correctly	Check the Run current settings
	Standby current is not set correctly	Check the Standby current settings

Frequently Asked Questions

What communication protocols are available?
At this point the **P2™** drive only accepts a step and direction input; it does not offer a bus network option yet.

Can I get the stepper drive as a board only, without the cover and mounting kit?
Yes, it is available as a board only for OEM use. Please contact the factory for more details.

Does the P2™ have any of the active damping or electronic viscosity patented features that the Zeta or GT offer?
No, this is a basic board level amplifier. Users must be careful when sizing the motor / drive combination to account for resonance zones.

Will the P2™ work with the LV or HV Series stepper motors?
The **P2™** is a 2 amp drive so it will work with the LV Series of stepper motors, but will not be high enough power for the HV Series.

Can I use an P2™ for any other mechanical actuators other than the LCR?
Yes, you must be sure that the motor running torque and breakaway torque do not exceed the available current output of the drive though.

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