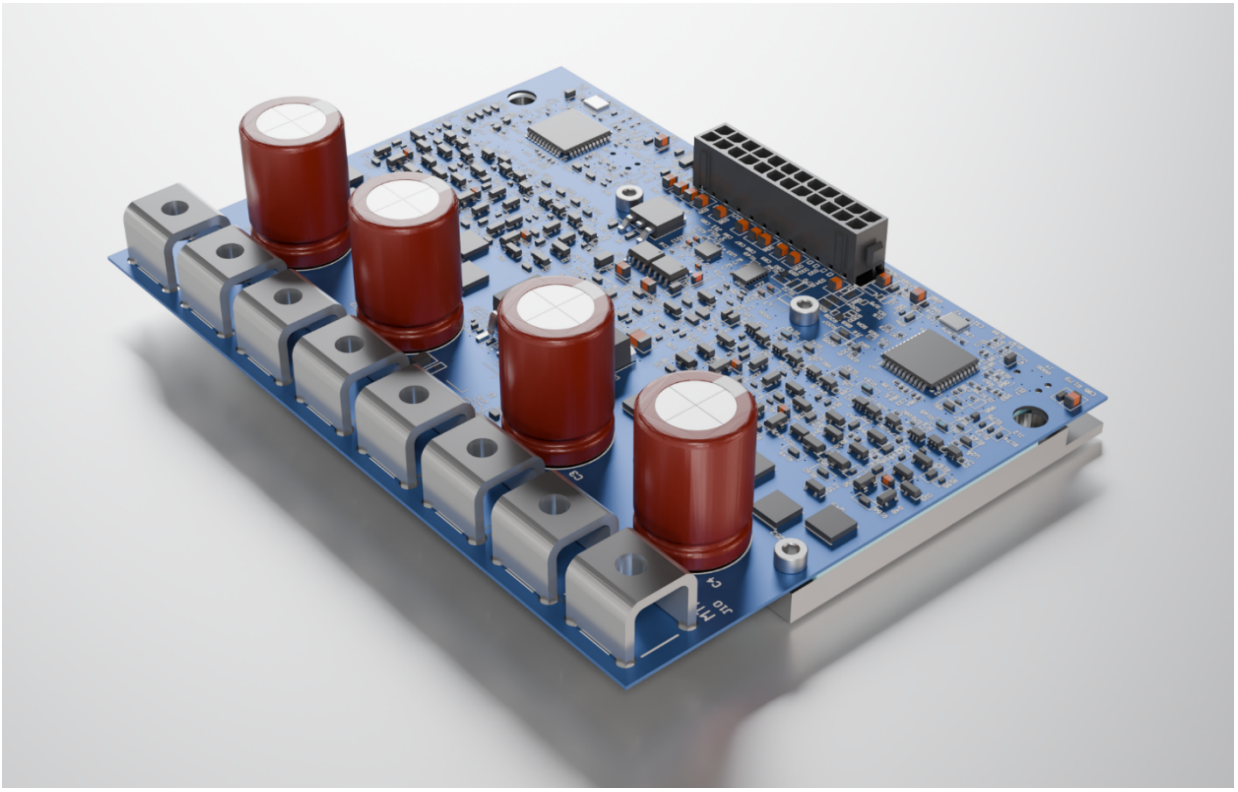
P75D Dual Motor Controller

User Manual



Control Solutions LLC
2520 Diehl Road
Aurora, Illinois 60502
Tel: (630) 806-7062
Fax: (630) 806-7065
Web: www.controls.com

DOC0004432A

Table Of Contents

Warranty

For warranty information please refer to the following website: http://www.controls.com/warranty/

Disclaimer

Control Solutions LLC reserves the right to update this manual at any time without notice. This manual supersedes all previous issues, which must no longer be used. Control Solutions LLC reserves the right to change this product without any notification.

Control Solutions LLC and the Control Solutions logo are trademarks of Control Solutions LLC.

All other brand and product names, company names, and logos are trademarks or registered trademarks of their respective companies.

All materials contained within this manual, in printed or electronic format, are protected by copyright laws and other intellectual property laws.

About This Manual

Before using the P75D Dual Motor Controller, please read this entire manual carefully to become familiar with the Controller's features, benefits and operation.

This manual provides the information necessary to understand, connect, and successfully configure the P75D Dual Motor Controller. It explains the Controller's functions, parameters, and usage, and provides general care and maintenance information as well as basic troubleshooting data. The document is intended for individuals who use the P75D Dual Motor Controller and for technicians performing maintenance.

The P75D Dual Motor Controller is based on the Phoenix Motor Controller and this manual is structured to explain the unique features and information of the P75D while making references and including links to the relevant sections of the Phoenix manual.

Precautions

This document contains hazard statements for your safety. Hazard statements are provided where safety consequences to personnel, equipment, and operation can exist. Failure to follow these statements can have profound consequences.

Icons are used to draw your attention to the appropriate type of statement. Refer to Figure 1 Precaution Statements for a sample of icons and statements.

Note

Notes provide supporting information on installation, configuration, and use of the product. Not following the instructions given in notes or other precautions can lead to equipment failure.

Caution

A caution statement indicates the presence of a hazard that can or will cause minor injury or property damage.

Danger

Danger Notices provide important information that must be followed to install, configure, and use the product safely and efficiently. Failure to follow the instructions given in a Danger Notice can potentially lead to equipment failure, damage to surrounding property, injury, or death.

Figure 1 Precaution Statements

Terms and Definitions

Table 1 defines the abbreviations and acronyms used in this document.

Table 1 Abbreviations and Acronyms

Term / Abbreviation / Acronym	Definition
BLDC	Brushless Direct Current
CAN	Controller Area Network
CSLLC	Control Solutions Limited Liability Company
DC	Direct Current
EM	Electromagnetic
ESD	Electro-Static Discharge
GPIO	General Purpose Input/Output
I/O	Input/Output
IEC	International Electrotechnical Commission
LED	Light Emitting Diode
PCB	Printed Circuit Board
POD	Power on Demand
PWM	Pulse Width Modulation

UL	Underwriters' Laboratories

Safety

Working with electric vehicles and batteries can be dangerous. Take proper precautions when setting up an electric vehicle or when working with batteries.

Caution: Vehicle Runaways

Malfunctions regarding operating conditions can occur when working with electric vehicles that can cause them to run. When working with or setting up an electric-powered vehicle, it is highly recommended that you support the vehicle in a safe manner with the drive wheels off the ground or disconnect the motor wires.

Danger: Battery Arcs

Short-circuiting the battery terminals or connections can cause an electric arc. Always disconnect the battery connections when installing or working with high-current vehicle batteries. It is recommended that you use insulated tools and wear safety glasses when working with high-power batteries.

Danger: Battery Precautions

Normal charging and discharging of lead acid batteries produces hydrogen gas, which is extremely flammable and explosive. Follow the battery manufacturer's safety precautions and recommendations when working with lead acid batteries. Always wear safety glasses.

1 Introduction to the P75D Dual Motor Controller

The P75D dual motor controller is a fully configurable microprocessor-based controller for light- to medium-duty DC motors. The controller is ideal for use in light industrial and commercial applications such as floor sweepers/scrubbers, material handling carts and personal mobility equipment. This module enables control of dual BLDC or brushed motors at a continuous current output of 30A per motor at 24V(DC) or 36V(DC) nominal. The platform also has a dedicated configuration and diagnostic interface. The P75D is designed with a CAN bus interface that allows communication, configuration of field-settable parameters and control of the unit by an external CAN capable device.

Be aware that the P75D does not feature brake control. For traction motor applications that require a brake, any brake control must be managed by an external controller.

Note:

All specifications stated within this document are subject to change without notice.

1.1 Features

The P75D includes the following features:

- 24V-36V sensor dependent BLDC motor control
- 24V-36V brushed motor control
- User Programmable I/O Configuration
- Programmable acceleration, deceleration and speed settings
- Throttle support
- Programmable throttle configuration (supports analog, hall effect and digital throttle(via CAN))
- RPM maintaining speed control
- Stall detection
- Throttle Fault Detection
- Low/high voltage limiting/cut-back
- Over-temperature protection
- Multiple current limiting modes
- Programmable motor current limit
- Power-up diagnostics
- Status LEDs on module
- Battery and motor connection terminals
- Optional UL Safety Function (Meets UL 60730-1)
- CAN communication supporting J1939 protocol
- Settable CAN node ID for applications that use more than one unit

2 Features and Specifications

2.1 Electrical Specifications

Table 2 sets out the P75D electrical specifications.

Table 2 Electrical Specifications

Electrical Specifications	Minimum	Nominal	Maximum	Units
Operating voltage(V_{BATT+})	18	24/36	60	V(DC)
Unit current draw	---	60	90	A(DC)
Continuous current per motor	---	---	30	A(rms)
Peak current per motor (2 Minutes)	---	---	45	A(rms)
Standby Current@36V(DC)	---	---	150	mA
Regulated 5V(DC) output current	---	---	30	mA

2.2 Mechanical Specifications and Physical Features

Table 3 Mechanical Specifications and Physical Features

Mechanical Specification or Physical Feature	Minimum	Nominal	Maximum	Units
Operating Ambient Temperature	–10	25	50	°C
Physical Size	4.9 x 3.6 x 1.2			Inches
Weight	0.58			lbs.
Heat sink	Integrated (requires mounting to metal framework for higher current applications)			---
Environmental protection	Conformally Coated			---
Power Connections (Motor & Battery)	M5X0.8 threaded terminals			---
Signal Connector (J11)	24-pin TE Connectivity Micro-MATE-N-LOK P/N 5-794630-4			---

2.3 Connectors

2.3.1 Connectors Diagram and Locations

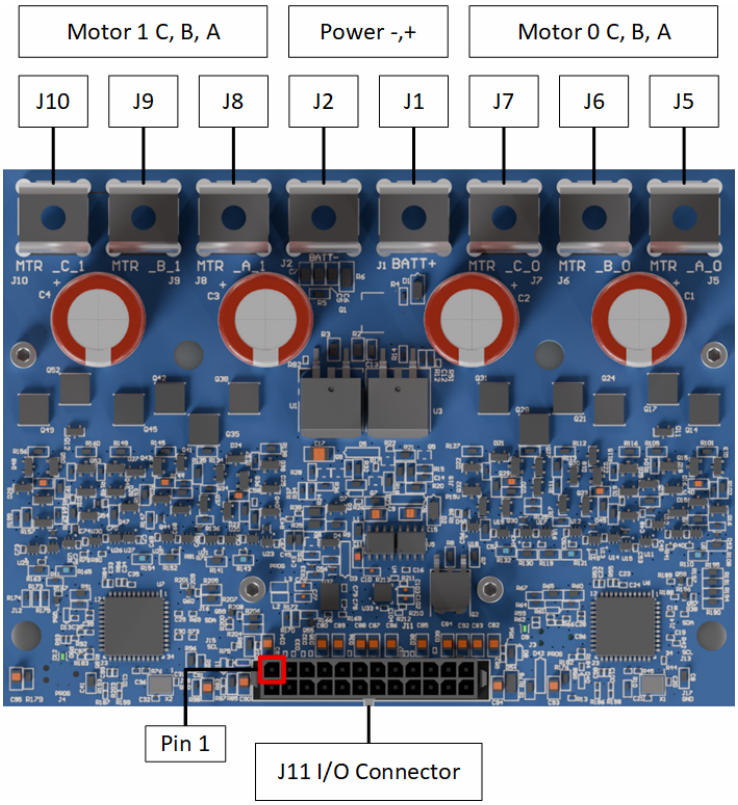


Figure 2 P75D Connectors

Figure 2 show the arrangement and location of each connector on the P75D. Table 4 lists the P75D connectors, their functions and the type of connector.

Table 4 P75D Connectors

Label	Connector Type	Connector Function
J1 BATT+	M5x0.8 threaded terminal	Battery + high current connection
J2 BATT–	M5x0.8 threaded terminal	Battery – high current connection
J5 MTR_A_0	M5x0.8 threaded terminal	High current connection to motor 0, phase A(U)
J6 MTR_B_0	M5x0.8 threaded terminal	High current connection to motor 0, phase B(V)
J7 MTR_C_0	M5x0.8 threaded terminal	High current connection to motor 0, phase C(W)
J8 MTR_A_1	M5x0.8 threaded terminal	High current connection to motor 1, phase A(U)
J9 MTR_B_1	M5x0.8 threaded terminal	High current connection to motor 1, phase B(V)
J10 MTR_C_1	M5x0.8 threaded terminal	High current connection to motor 1, phase C(W)
J11	24-Pin TE Micro MATE-N-LOK	I/O such as throttle, CAN, and other controls

2.3.2 Battery and Motor Terminals

The power connections are M5x0.8 threaded terminals. Table 5 describes the power terminals.

Table 5 Power Terminals Specification

Printed Label	Power Ratings	Additional Information
J1 BATT+	• 60 A(DC) Continuous • 90 A(DC) Peak(2 mins) • 24/36V(DC) Nominal	None
J2 BATT–	• 60 A(DC) Continuous • 90 A(DC) Peak(2 mins) • 0 V(DC) Nominal	None
J5 MTR_A_0	• 30 A(RMS) Continuous • 45 A(RMS) Peak(2 mins) • 0-V_{BATT+} PWM output	BLDC motor control terminal Brushed motor control terminal
J6 MTR_B_0	• 30 A(RMS) Continuous • 45 A(RMS) Peak(2 mins) • 0-V_{BATT+} PWM output	BLDC motor control terminal
J7 MTR_C_0	• 30 A(RMS) Continuous • 45 A(RMS) Peak(2 mins) • 0-V_{BATT+} PWM output	BLDC motor control terminal Brushed motor control terminal
J8 MTR_A_1	• 30 A(RMS) Continuous • 45 A(RMS) Peak(2 mins) • 0-V_{BATT+} PWM output	BLDC motor control terminal Brushed motor control terminal
J9 MTR_B_1	• 30 A(RMS) Continuous • 45 A(RMS) Peak(2 mins) • 0-V_{BATT+} PWM output	BLDC motor control terminal
J10 MTR_C_1	• 30 A(RMS) Continuous • 45 A(RMS) Peak(2 mins) • 0-V_{BATT+} PWM output	BLDC motor control terminal Brushed motor control terminal

2.3.3 24-Pin Input/Output Connector (J11)

Figure 3 and Table 6 describe the J11 24-pin input/output connectors.

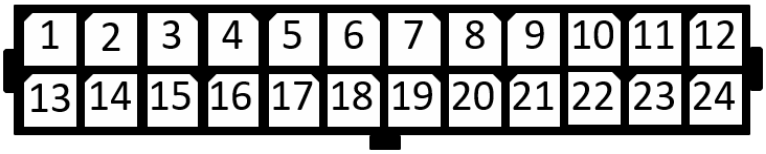


Figure 3 24-Pin Input/Output Connector (J5)

Connector: TE Connectivity Micro MATE-N-LOK P/N 5-794630-4
Mate(s): TE Connectivity P/N 2-794617-4

Table 6 24-Pin Input/Output Connectors Specification

Pin	Name/Function	Electrical Specifications	Additional Information
1	**CAN_ID_1** CAN bus ID select	• Switch to GND to change state • Internal 5V pull-up • 0-5V(DC)	4 Different CAN ID pairs can be assigned with different ON-OFF combinations of CAN_ID_0 and CAN_ID_1. See Section 2.5.1 for more information.
2	**CANH** CAN bus high signal	• Bi-directional communication signal • 0-5V(DC)	- CAN bus communication line. Can be connected to fully-terminated CAN Bus. - Differential signal with CANL.
3	**CANL** CAN bus low signal	• Bi-directional communication signal • 0-5V(DC)	- CAN bus communication line. Can be connected to fully-terminated CAN Bus. - Differential signal with CANH.
4	**CAN_ID_0** CAN bus ID select	• Switch to GND to change state • Internal 5V pull-up • 0-5V(DC)	4 Different CAN ID pairs can be selected with different ON-OFF combinations of CAN_ID_0 and CAN_ID_1. See Section 2.5.1 for more information.
5	**GP_DIN1_1** General purpose digital input 1 – Motor 1	• Switch to GND to change state • Internal 5V pull-up • 0-5V(DC)	- Can be used to activate Quickstop or inhibit motion. - Quickstop function is default. - Dependent on configuration parameters.
6	**GP_DIN1_0** General purpose digital input 1 – Motor 0	• Switch to GND to change state • Internal 5V pull-up • 0-5V(DC)	- Can be used to activate Quickstop or inhibit motion. - Quickstop function is default. - Dependent on configuration parameters.
7	**RELAY_OD** Relay control – open drain output	• Sinking open drain output • V_{BATT+} max • 1.25A max	- Provides external relay control if one is used. - Connect to low side of relay. - Flyback diode on external relay required

8	**BATT+_PRECHARGE** Bulk capacitor pre-charge input	• V_{BATT+} input • 1A(max)	- Used to charge bulk caps through a current limiting device to prevent contact damage. - Connect to V_{BATT+} to charge bulk caps with a controlled current.
9	**GP_DIN2_1** General purpose digital input 2 – Motor 1	• Switch to GND to change state • Internal 5V pull-up • 0-5V(DC)	- Can be used to activate indoor/outdoor mode, seat switch, Quickstop or inhibit motion. - indoor/outdoor mode select is default. - Flexible Input. - Dependent on configuration parameters.
10	**GP_DIN2_0** General purpose digital input 2 – Motor 0	• Switch to GND to change state • Internal 5V pull-up • 0-5V(DC)	- Can be used to activate indoor/outdoor mode, seat switch, Quickstop or inhibit motion. - indoor/outdoor mode select is default. - Flexible Input. - Dependent on configuration parameters.
11	**EXT_5V** 5V(DC) regulated power output	• 5V(DC) Output • 30mA (max) Short circuit protected	Positive 5V(DC) regulated output which can be used to supply external circuitry. Typically supplies 5V(DC) Power for hall-effect position sensors, or to throttle potentiometers.
12	**TPOTC_0** Throttle potentiometer input – Motor 0	• 0-5V(DC) Input • Typically used with analog output or 5KΩ potentiometer	Analog input used to control motor speed. Use of a throttle is a configurable option. Throttle type and acceptable voltage range is dependent on configuration parameters.
13	**TPOTC_1** Throttle potentiometer input – Motor 1	• 0-5V(DC) Input • Typically used with analog output or 5KΩ potentiometer	Analog input used to control motor speed. Use of a throttle is a configurable option. Throttle type and acceptable voltage range is dependent on configuration parameters.
14	**ANIN_1** Analog input – Motor 1	• 0-5V(DC) Input	- Analog input commonly used with temperature sensors, potentiometers, signals from other devices, etc. - Can be used as a flexible digital input to activate indoor/outdoor mode, seat switch, Quickstop or inhibit motion. - Analog input is default.
15	**POS_SENSE_C_1** Motor 1 position sensor input C – (W)	• Switch to GND to change state • Internal 5V pull-up	Digital input to receive position sensor signals from half-effect sensors within the motor.
16	**POS_SENSE_B_1** Motor 1 position sensor input B – (V)	• Switch to GND to change state • Internal 5V pull-up	Digital input to receive position sensor signals from half-effect sensors within the motor.

17	**POS_SENSE_A_1** Motor 1 position sensor input A – (U)	• Switch to GND to change state • Internal 5V pull-up	Digital input to receive position sensor signals from half-effect sensors within the motor.
18	**LOGIC_RTN** Logic ground	• Do not connect to battery negative.	Ground reference that is isolated to mitigate EMI noise on sensor inputs.
19	**POS_SENSE_C_0** Motor 0 position sensor input C – (W)	• Switch to GND to change state • Internal 5V pull-up	Digital input to receive position sensor signals from half-effect sensors within the motor.
20	**POS_SENSE_B_0** Motor 0 position sensor input B – (V)	• Switch to GND to change state • Internal 5V pull-up	Digital input to receive position sensor signals from half-effect sensors within the motor.
21	**POS_SENSE_A_0** Motor 0 position sensor input A – (U)	• Switch to GND to change state • Internal 5V pull-up	Digital input to receive position sensor signals from half-effect sensors within the motor.
22	**ENABLE** Input that turns controller on	• Tolerant to V_{BATT+}(max) • Switch to >2V to Power On	Asserted high, so controller switches from Off to On when positive voltage >2V(DC) is applied.
23	**ANIN_0** Analog input – Motor 0	• 0-5V(DC) Input	- Analog input commonly used with temperature sensors, potentiometers, signals from other devices, etc. - Can be used as a flexible digital input to activate indoor/outdoor mode, seat switch, Quickstop or inhibit motion. - Analog input is default.
24	**BATT_PROTECT** Battery voltage output	• ~BATT+, <1A. Current Protected Battery (+) Output	Current limited connection to battery voltage for use with keyswitch and other application circuits.

2.4 UL 60730-1 Functional Safety

If optioned accordingly, the P75D will implement safety functions to comply with UL 60730-1.

The safety function performed by the controller in this configuration to meet this standard is removing power and ground from the motor output terminals to prevent a fire if the motor begins to overheat. This action occurs with redundant circuitry to ensure that the safety function is performed successfully even in the event of a single point failure.

2.5 CAN Bus

The P75D uses the CAN protocol to communicate with other system devices and for debugging / testing purposes. Most of the CAN communication and control features of the P75D are common to the Phoenix motor controller family - with a key difference: the P75D has 2 CAN IDs and should be treated as if each motor and associated (volatile and non-volatile) configuration is independent of the other motor on the same unit.

Below are links to the CAN relevant sections of the Phoenix online manual.

Overview
Digital Control
Messages

2.5.1 CAN Address Selection

The CAN IDs used by the P75D are assigned by its non-volatile (EE) configuration and optionally one or two I/O pins (CAN_ID_0 and CAN_ID_1). The least significant bit of the CAN ID is fixed: Motor_0 is '0', Motor_1 is '1'. The upper 7 bits are typically set identically in the individual EE memories associated with each motor. This is not required though. The controller determines the new IDs during start-up, so if a change to the I/O occurs during operation, the unit will continue to use the current IDs until the Enable signal is toggled or power is cycled.

In the simplest case, the upper 7 bits of the CAN ID are hard coded in the EE memory. In applications where multiple P75D controllers are deployed within the same system or across different customer products, a common EE configuration coupled with 1 or 2 "slot" ID pins is used. In the same-system case, up to 4 identically configured (from a CAN ID perspective) P75D controllers can share the same CAN Bus, provided each P75D has a unique setting of its CAN_ID_1 and CAN_ID_0 pins. Table *7* shows an example of a P75D configured for a base address of 0x80 and using both CAN ID pins. The EE configuration locations that determine CAN ID are described in more detail in the CAN Bus EEPROM section of the Phoenix online manual. Please contact Control Solutions LLC for further assistance.

Table 7 CAN ID Selection Reference

Pin(s) Connected to Ground	Motor 0 CAN ID	Motor 1 CAN ID
None	0x86	0x87
CAN_ID_0(J11-4)	0x84	0x85
CAN_ID_1(J11-1)	0x82	0x83
CAN_ID_0(J11-4) and CAN_ID_1(J11-1)	0x80	0x81

Note:

The above table shows an example of the CAN ID range available when the CAN Bus configuration register at hex address 0402 is set to 0x80.

2.5.2 Bus Termination

The P75D does not have the capability to internally terminate the CAN Bus, either natively or through available I/O pins. This termination must be external to the P75D.

3 Installation

The P75D Dual Motor Controller should be mounted within an enclosure for protection against moisture and dust/dirt. Use the following guidelines when installing your motor controller.

3.1 General Recommendations

For general recommendations on installation and wiring, please observe the following guidelines.

3.2 Motor Considerations

The P75D can independently drive two Brushless DC (BLDC) or two Brushed DC motors, or one of each. From connection, configuration, and operation perspectives, there are similarities and differences between the types. Most of the operational behavior and features apply equally to both types; although some concepts such as speed/RPM are only relevant for Brushless motors.

3.2.1 Motor Direction

Internally, the P75D controller has a concept of "forward" and "reverse". Each direction is independently configured with identical configurability and features. In many applications, these terms have physical meaning and it's often simplest to associate this physical meaning (usually dictated by the user's throttle or digital control) with the designated P75D configurable parameters. Aligning the actual motor direction (CW / CCW) with these terms is solved differently for Brushless and Brushed motors.

3.2.2 Brushless Motors

The P75D employs trapezoidal commutation using 3 digital sensor inputs (often Hall Effect sensors). This method is suitable for both Permanent Magnet Brushless DC and AC motors and applications that do not require or prefer sinusoidal commutation. Other members of the Phoenix line of motor controllers support sinusoidal and FOC based commutation and control. Similarly, support for other rotor position schemes (e.g., sine/cosine) and sensorless operation are found in other controllers.

As a sensored implementation, the connections and configuration must match. A typical configuration is shown below:

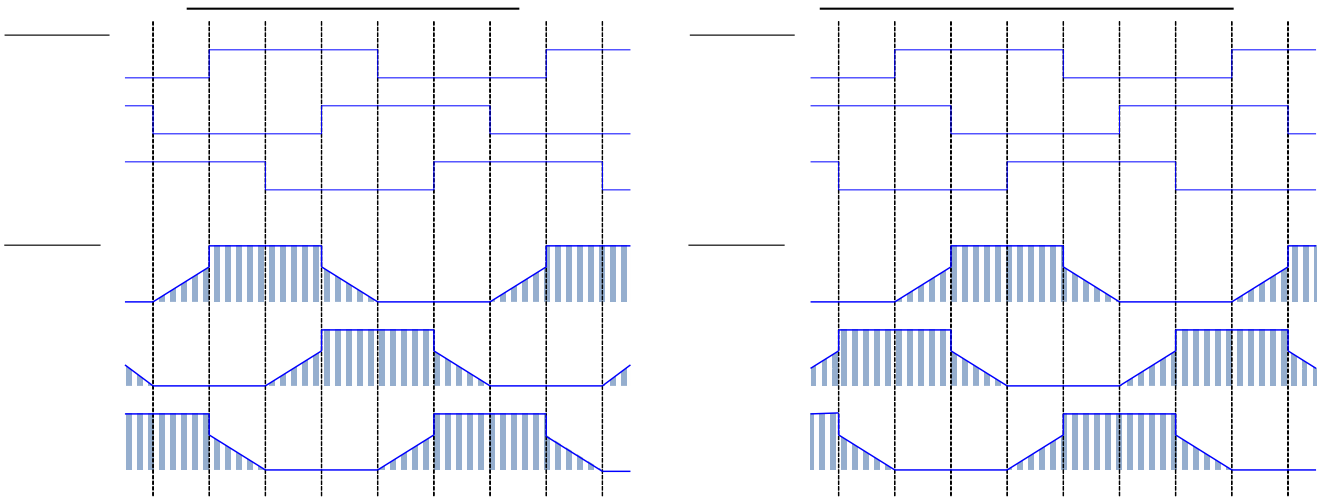


Figure 4 Power and Sensor BLDC Commutation Waveforms

Different motor manufacturers may construct the motor (windings, sensor placement) and label the sensor and motor wires differently. And the actual rotation (CW/CC) may be different than shown. As a starting point, it is recommended that the designations used by the motor manufacturer guide the connections to the P75D. Afterwards, the P75D is configured to properly commutate the motor. Please contact Control Solutions LLC for assistance.

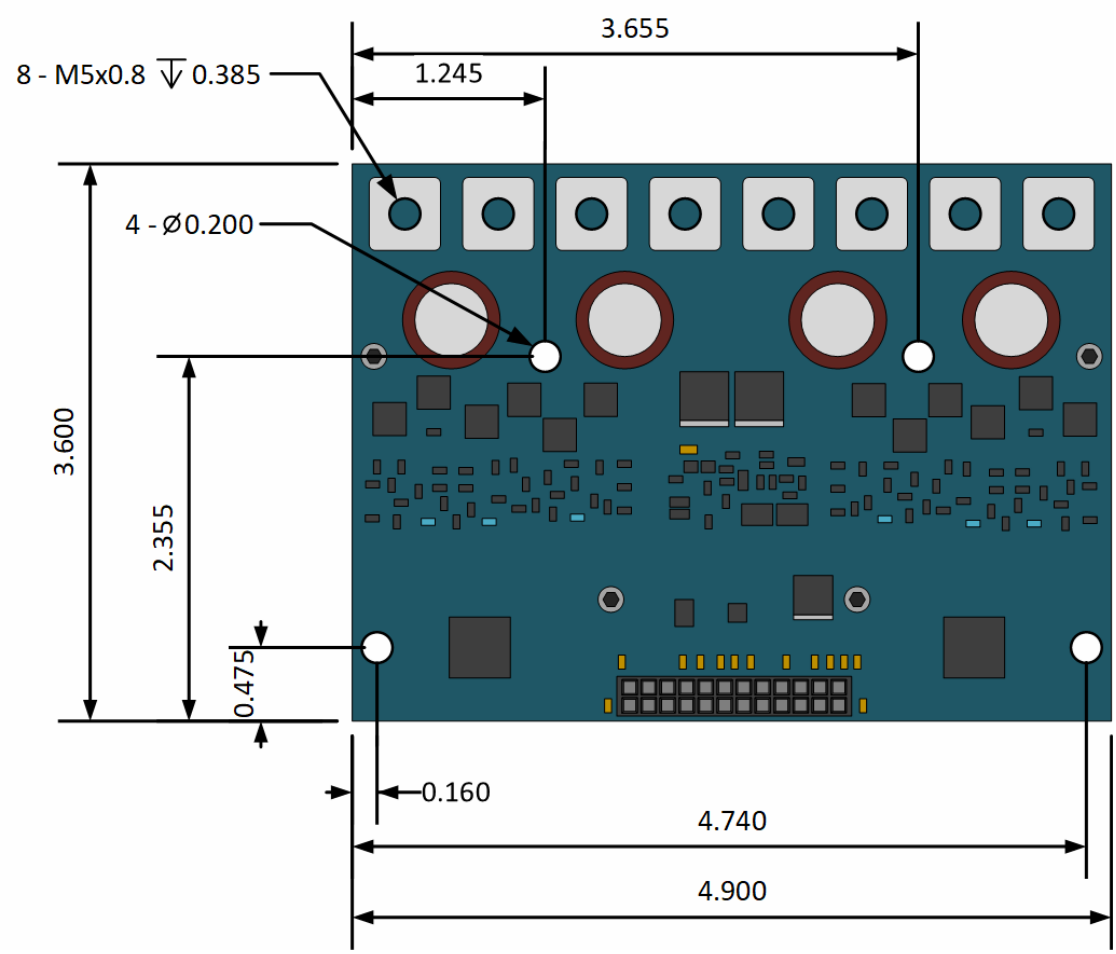
The final configuration step is to match the motor's CW/CCW operation with the intended direction of motion. Because this is a sensored implementation, this final step involves a configuration value in EE memory. Do not attempt to "invert" BLDC motor rotation via a wiring change.

3.2.3 Brushed Motors

Each motor controller on the P75D can be configured for a Brushed DC motor. In this case, the two motor leads are connected to MTR_A and MTR_C, with MTR_B and the POS_SENSE_a inputs left unconnected. For a Brushed motor, it is often the practice to wire up the two motor wires to the controller in an orientation that produces the desired direction of motion. For reference, the P75D will drive "forward" as motor lead C (high) -> motor lead A (low). As is the case with Brushless motors, it is possible to "invert" motor rotation via EE configuration but it is more common with Brushed motors to wire the motor leads to the controller appropriately.

3.3 Mounting the Controller

The P75D Dual Motor Controller is equipped with four through-holes for mounting. Secure the controller using M5 socket head cap screws tightened to a torque of 3 in-lb. Screws must conform to ISO 4762 specifications, and the head diameter must not exceed 8.5 mm to avoid interference with adjacent board components. The controller can be oriented in any position, but consideration must be taken when identifying mounting location to ensure that the controller is positioned away from excessive dirt and moisture to prevent damage. Additionally, the physical location of the unit should have proper airflow to keep the ambient temperature below 50° C. The underside aluminum baseplate of the controller must maintain firm, continuous contact with the mounting surface to ensure efficient heat transfer and prevent thermal cutback. Figure 5 shows the mounting pattern and location of the mounting holes.

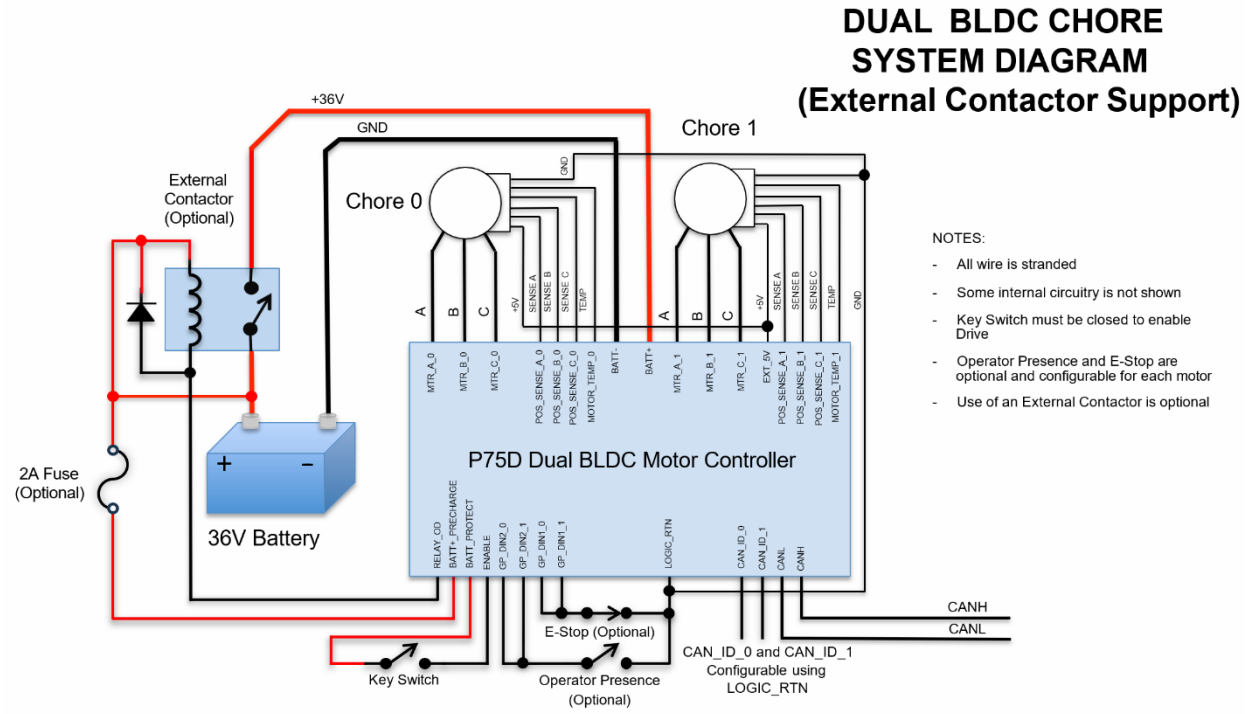


3.3.1 Mounting Pattern and Dimensions

Figure 5 Mounting Pattern and Dimensions of the P75D

3.4 Application Wiring Example

Error! Reference source not found. shows a wiring diagram of an example P75D Motor Controller in a



36V chore motor application.

3.4.1 Relay Control

When a contactor/relay is being controlled by the RELAY_OD output, the control method is such that the relay is only closed while the motors are being driven.

3.4.2 Power-on Sequence When Using Pre-charge Function

Power to the P75D controller must be applied in a specific sequence if controller pre-charge is needed. When power is applied to the controller without pre-charge, there is a sudden inrush of current that charges the onboard bulk capacitors. This high current inrush can cause damage to the contacts in a switch, relay or contactor if they are not rated for higher current. The pre-charge function allows the capacitors to be charged with a lower and more controlled current. To use the pre-charge function, power is to be applied in the following sequence:

1. Apply Battery Voltage to BATT+_PRECHARGE*
2. Apply Battery Voltage to KSI(ENABLE)**
3. Apply Battery Voltage to BATT+(BATT_POS)

*It is recommended to connect BATT+_PRECHARGE directly to BATT+.
**KSI(ENABLE) minimum voltage is 2V.

3.5 I/O Wiring

This section describes select wiring configurations.

3.5.1 Throttle Wiring

A three-wire potentiometer throttle can be used to control the motor speed of each motor. The figures below show various throttle potentiometer wiring configurations for applications that use an analog signal to control motors instead of CAN commands.

Figure 7 shows how to wire a throttle potentiometer for a standard configuration.

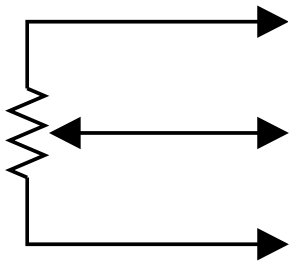


Figure 7 Throttle Control Configuration Wiring

Figure 8 shows how to wire the throttle potentiometer when a max speed pot is used. In this configuration, a second potentiometer is used to scale the throttle and limit the maximum speed.

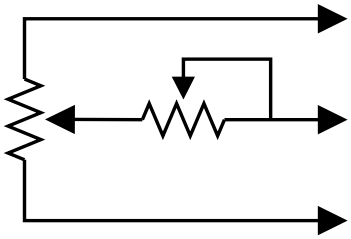


Figure 8 Maximum Speed Potentiometer Throttle Wiring

Figure 9 shows how to wire the throttle potentiometer when the analog input is used to limit the minimum or maximum speed of a motor.

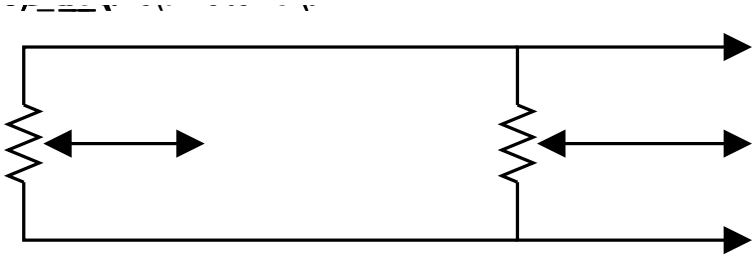


Figure 9 Maximum/Minimum Application Wiring

Note:

The controller must be specifically configured for these options.

3.5.2 Key Switch

Figure 10 shows how to wire a key switch to the controller. When the switch is closed, the controller is powered **on**. When the switch is open, the controller is powered **off**. It should be noted that when the controller is powered on and there is no motor activity, the Standby Current in Table 2 applies. The controller initiates a shutdown sequence when the key switch is transitioned from closed to open. This sequence typically takes less than 1 second but may extend slightly longer if there is motor activity at this transition.

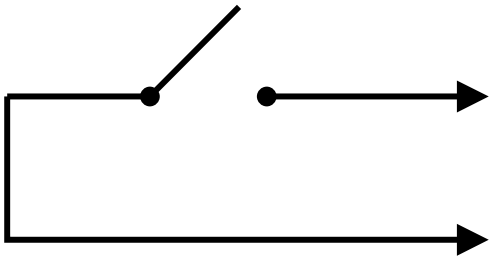


Figure 10 Key Switch Wiring

3.5.3 General Purpose Digital Inputs

Figure 11 shows how to wire a switch to the general purpose digital inputs.

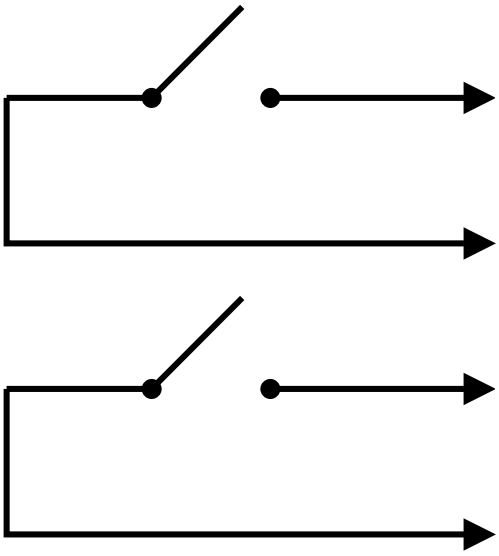


Figure 11 General Purpose Digital Input Wiring Diagram

4 Configuration and Diagnostic Software

P75D Dual Motor Controllers are supported by the Phoenix Diagnostics PC software to allow loading, editing, and saving of configuration parameters, as well as diagnostic status reporting. In order to use this software, it must be connected to the controller using a supported USB CAN Bus adapter.

Below are links to the Phoenix online manual sections that contain instructions on installation and usage of the Phoenix Diagnostics app.

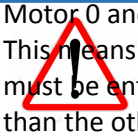
Software
Firmware

Note:
The P75D can only be used with the USB CAN Bus adapter. Disregard the section on using the CS1816 bluetooth dongle.

Figure 12 shows a P75D controller that has a motor correctly connected to the motor 0 connections and with no motor connected to the motor 1 connections.

5 Configuration

Motor 0 and Motor 1 each have their own configuration that are entirely independent of each other. This means that changes to a configuration on one motor will not carryover to the other. Any changes must be entered into both configurations. This also means that each motor can be configured differently than the other depending on the applications needs.



Danger

Before performing the setup procedures, it is important that you support the vehicle on jacks or blocks to prevent the drive wheels from touching the ground, allowing them to spin freely without obstruction. Doing so will prevent unattended dangerous vehicle movement. Double-check all wiring to ensure there are no shorts and that everything is properly wired.

Be sure to wear proper eye protection in case of lead acid battery failure.

Below are links to the Phoenix manual sections that are relevant to configuration setup for the P75D dual motor controller.

Calibration
Identity
Input/Output
Motor
Brake
Throttle
Performance
Limits
Register List
CANBUS

Note:
This section provides parameter information for features that may not be available on the P75D(brake, integrated charging, etc). Please contact Control Solutions LLC for P75D specific configuration setup information.

Note:
I/O pin labels in the Phoenix Diagnostics app do not match the actual pins used on the P75D. Refer to section 2.3.3 24-Pin Input/Output Connector (J11) for I/O connector pin information.

6 Troubleshooting and Diagnostics

In this section, common operating problems are listed, with troubleshooting steps. Still having trouble? Contact Us

Motor Won't Move

- Verify correct wiring
- Verify that throttle input is at an appropriate level
- Check for fault codes (indicated by a flashing LED or reported by diagnostic software).
- Check for Stop Diagnostics reported by CAN Bus 10FF03 status message. Also see System Status Message and Special Diagnostic Commands.

The links below to the Phoenix motor controller manual explain troubleshooting steps, diagnostics monitoring, faults and fault codes.

Diagnostics
Faults

Note:
This section provides fault information for features that may not be available on the P75D(brake, integrated charging, etc). Please contact Control Solutions LLC for P75D specific fault information.

6.1 Diagnostic LEDs

To provide a visual method of identifying faults during operation, the P75D dual motor controller features two diagnostic LEDs. During normal operation, the green LEDs are continuously on. During a fault condition, the LED corresponding to the affected motor will behave as follows:

1. blink a certain number of times
2. short pause
3. blink a certain number of times
4. long pause
5. restart cycle

The first and second number of blinks correspond to the first and second digits of the fault codes shown in the fault code table. The locations of the LEDs are shown in Figure 13.

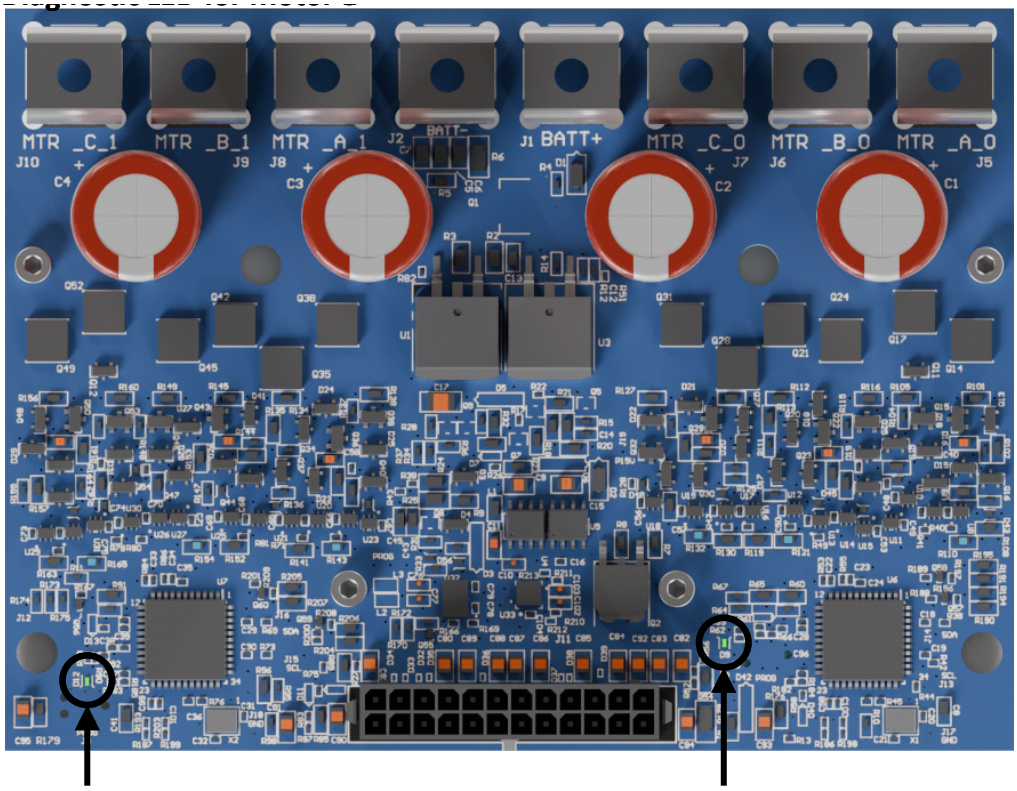


Figure 13 Diagnostic LED Locations on P75D

Contacting Customer Service

Customer Service is a top priority at Control Solutions. We are committed to being a leader in our industries, while providing our customers with superior quality, value, and service. We are here to help you find answers to your Control Solutions LLC-related questions.

If you have any questions, experience technical problems, or need any parts or service, contact Control Solutions LLC Customer Service during normal business hours (Monday-Friday, 8:00 a.m. – 5:00 p.m. Central Time) at (630) 806-7062.