

BLDC Motor Drive

Drives a 12V, 24V or 48V BLDC motor


Bidirectional, up to 25A

Smooth speed control using Hall Sensors

CAN (SAE J1939)

with Electronic Assistant® 

Features:

- Speed control of one BLDC motor (12/24/48V, up to 25A)
- User configurable to suit various motor specifications
- Interface with integral Hall Effect commutation sensors
- Regenerative braking supported
- Motor enable input (digital input)
- Digital input for motor direction control
- Accepts one 0-5V or 0-10V or 0-20mA or 4-20mA input for speed command (user configurable)
- CAN (SAE J1939) can alternatively provide all command inputs.
- Bridge-type inverter uses Pulse Width Modulation
- 1 digital output acts as a mirrored Hall output for monitoring RPM
- Robust 9...60VDC power supply interface with transient surge and reverse polarity protection
- Thermal overload, over-voltage, under-voltage, and over-current protections
- Self-recoverable hardware short-circuit protection provides extra safe operation
- Detects and reports on loss-of-sensor and motor-fail-to-start faults
- 1+5V reference (+12V available on request)
- 1 RS-232 port, 1 CAN port (SAE J1939) (CANopen® on request)
- Serial port allows for user monitoring of controller status
- User configurable J1939 status report messages provide for network based monitoring
- Rugged IP67 rated packaging with watertight plug-in connections
- Operational from -40 to 85°C (-40 to 185°F)
- Suitable for moist, high shock and vibration environments
- **Electronic Assistant®**  runs on a *Windows* operating system for user configuration. An Axiomatic USB-CAN converter links the PC to the CAN bus.



Applications: The Axiomatic motor drive controls a variety of low power, low voltage brushless (BLDC) motors. It can be used in applications, such as:

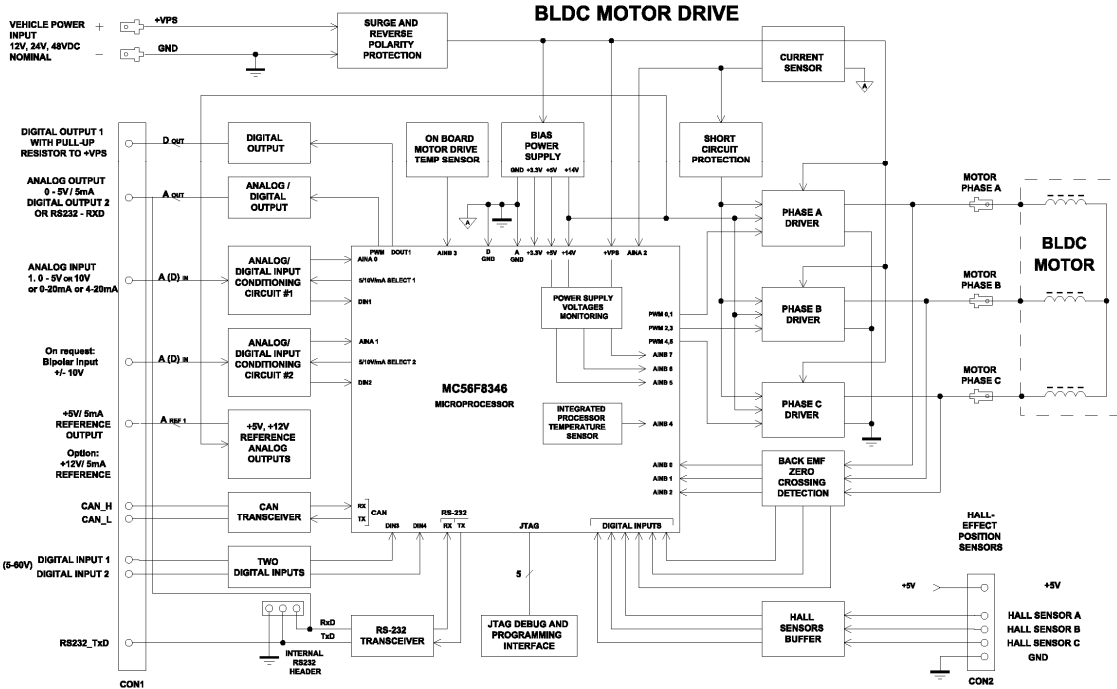
- Transportation power plants
- Mobile equipment (off-highway)
- Fuel cells
- Material handling equipment, electric vehicles
- Industrial automation

<p>Ordering Part Numbers:</p>	
<p>Motor Controller P/N: AX100200 <i>For options to be implemented, contact Axiomatic.</i></p> <p>Accessories: Mating Connector KIT P/N: AX070400 (ITT Cannon connectors: CB6E16-11P, CB6E16-10P, CB6E14S-5P, CB6E20-11P)</p>	<p>AX070502 Configuration KIT includes the following. USB-CAN Converter P/N: AX070501 1 ft. (0.3 m) USB Cable P/N: CBL-USB-AB-MM-1.5 12 in. (30 cm)CAN Cable with female DB-9 P/N: CAB-AX070501 AX070502IN CD P/N: CD-AX070502, includes: Electronic Assistant® software; EA & USB-CAN User Manual UMAX07050X; USB-CAN drivers & documentation; CAN Assistant (Scope and Visual) software & documentation; and the SDK Software Development Kit. NOTE: To order this kit, you need only to specify P/N: AX070502.</p>

Configuration:

The BLDC motor drive is user configurable via the Electronic Assistant® by either setting up different controller parameters one by one or downloading a pre-programmed setpoint file at once.

Block Diagram



Technical Specifications:

Input Specifications

Power Supply Input - Nominal	12V, 24V or 48V nominal power supply (9..60V range) Transient surge protection is provided. Regenerative energy absorbing is provided.
Reverse Polarity Protection	Provided
Discrete Control Inputs	1 analog input (0-5V, 0-10V, 0-20mA or 4-20mA) for speed command User configurable Option: 2 nd analog input on hardware (Contact Axiomatic for customization.) 2 digital inputs for enable and direction control with 5-60V operating range (Factory default is both active high.)
Position Feedback with Sensor	Interfaces to 3 Hall Effect position sensors integrated into the motor.

Output Specifications

Motor Output	Outputs to one BLDC motor (12V/24/48V, up to 25A) High Frequency PWM output 37.5A @ 24VDC nominal for 5 minutes 30A @ 24VDC nominal for 10 minutes 25A @ 24VDC nominal for 2 hours continuously at room temperature
PWM Frequency	10kHz
Digital Output	1 Pulse Frequency Modulation (PFM) output (at battery voltage level) for reading and monitoring RPM (Active low with pull-up) User configurable as controlled from software or acting as a mirrored Hall position sensing signal for external speed reading (Default: mirrored Hall output)

Protection	Overcurrent, Short circuit protection Driver over-temperature protection Over-voltage, under-voltage protection Loss-of-sensor, motor-fail-to-start fault shutdown
Reference Voltage	+5 Volts, 5 mA (Option: +12V on request)

Operating Mode

Basic Operation	Open loop or closed loop speed control (user configurable)
Regenerative Braking	Inherent braking mode (not designed for continuous regenerating operation)

General Specifications

Microprocessor	Motorola MC56F83546 128 Kbytes program flash 8 Kbytes data flash 8 Kbytes data RAM 8 Kbytes boot flash Clock 60 MHz
Control Logic	Standard embedded software is provided.
RS-232 Interface	RS232 serial communication is available for interface to a serial port (i.e. COM1) on a PC Tera Term or Microsoft HyperTerminal™ or an equivalent data terminal A wire harness with a built-in RS-232 connector must be used with the following pinout. Controller Connector, RS-232 TXD -> female DB-9 Pin 2 Controller Connector, RS-232 RXD -> female DB-9 Pin 3 Controller Connector, RS-232 GND -> female DB-9 Pin 5
CAN port	SAE J1939 (CANopen® on request)
CAN User Interface	Electronic Assistant® for <i>Windows</i> operating systems It comes with a royalty-free license for use. The Electronic Assistant® requires the Axiomatic USB-CAN converter to link the device's CAN port to a <i>Windows</i> -based PC for initial configuration. Order the EA and USB-CAN as a kit (P/N AX070502), which includes all interconnecting cables.

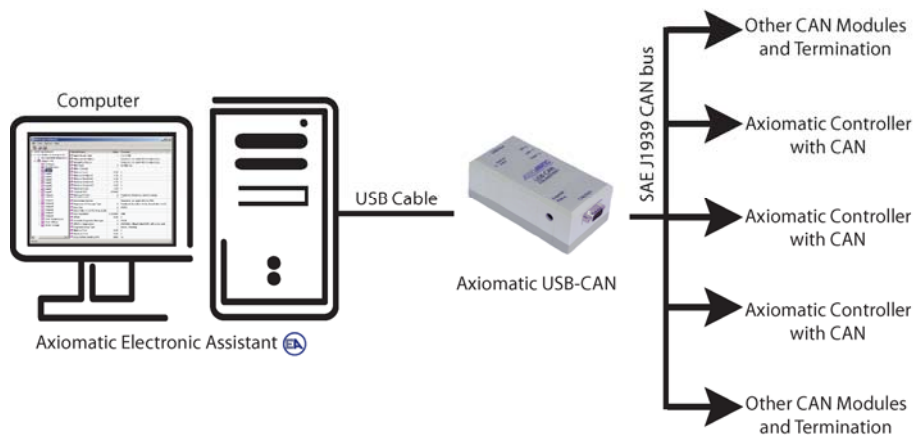
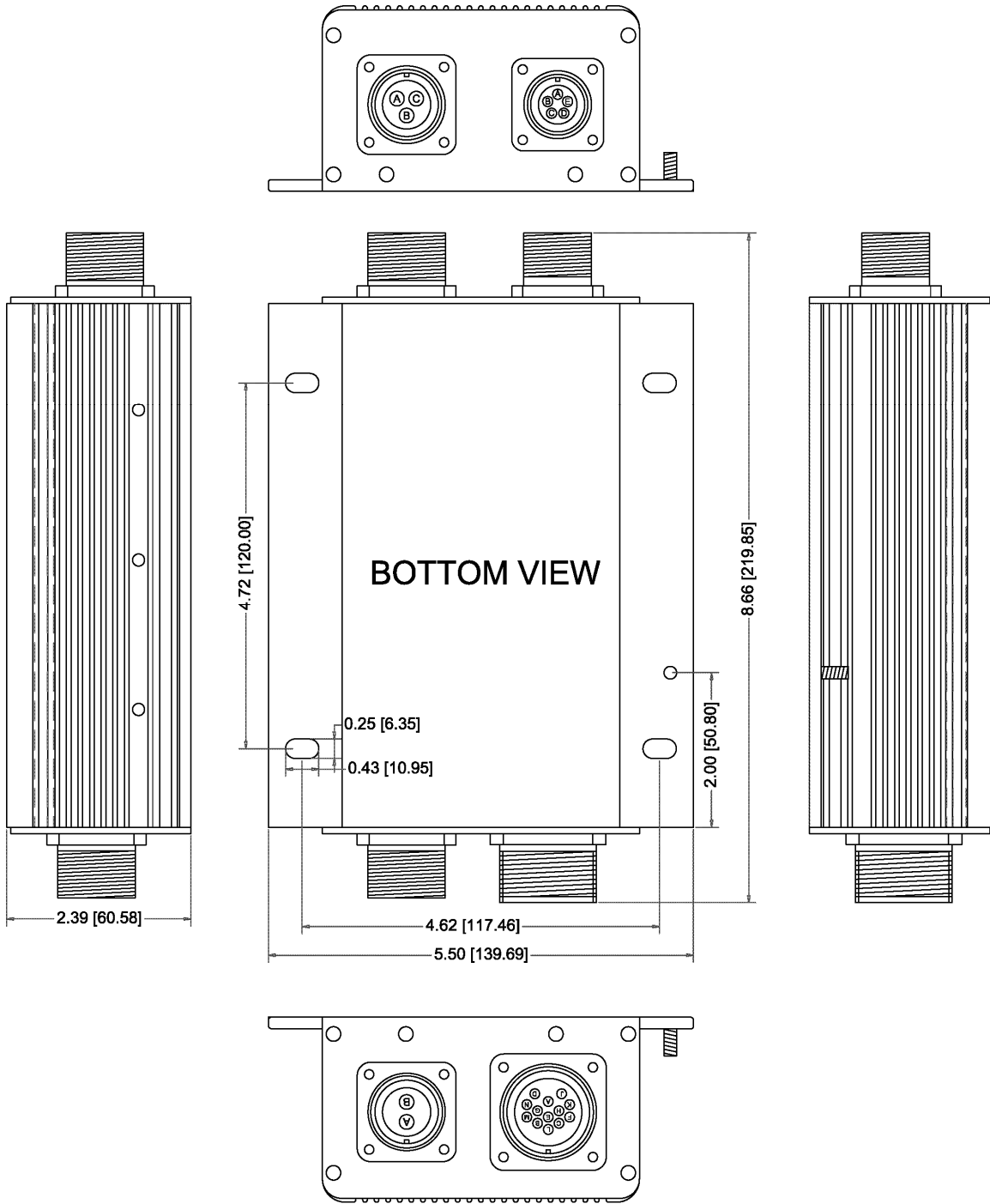


Figure 1 - User Configuration Using Electronic Assistant® (EA)

Electrical Connections	<p>Power input connector (C1): ITT Cannon P/N CT2R16-11S (Mating connector: ITT Cannon CT6E16-11P) A: Batt+ B: Batt-</p> <p>Motor output connector (C2): ITT Cannon P/N CT2R16-10S (Mating connector: ITT Cannon CT6E16-10P) A: Phase A B: Phase B C: Phase C</p> <p>Hall sensor connector (C3): ITT Cannon P/N CT2R14S-5S (Mating connector: ITT Cannon CT6E14S-5P) A: Hall Sensor A B: Hall Sensor B C: Hall Sensor C D: +5V E: GND</p> <p>Signal connector (C4): ITT Cannon P/N CT2R20-11S (Mating connector: ITT Cannon CT6E20-11P) A: +5V Reference B: GND C: Digital In 1 (Enable) D. Analog In 1 (Speed Command) E. OPTION: Analog Input 2 F. Digital Input 2 (Direction) G. GND Analog H. CAN_H J. CAN_L K. CAN_GND L. Digital Output (Speed monitoring) M. RS-232 TXD N. RS-232 RXD Note: 1 – Either GND or CAN-GND can be used as RS-232 GND.</p> <p>Wires should be of the appropriate gauge to meet requirements of applicable electrical codes and suit the specifications of the connector(s).</p>
Mounting	<p>The motor controller should be mounted as close to the battery and/or the motor as possible. Install the unit with appropriate space available for servicing and for adequate wire harness access and strain relief.</p> <p>Mounting ledges include holes sized for M6 or ¼ inch bolts. The bolt length will be determined by the end-user's mounting plate thickness. Typically 20 mm (3/4 inch) is adequate.</p>
Packaging and Dimensions	<p>Encapsulated Packaged in an aluminum extrusion with stainless steel end plates 5.50 x 6.77 x 2.39 inches (W x L x H excluding connectors) 139.7 x 172.0 x 60.6 mm Refer to the dimensional drawing.</p>
Weight	4.20 lbs. (1.90 kg)
Operating Conditions	Operating: -40 to 85°C (-40 to 185°F)
Protection Rating	IP67



Dimensional Drawing (inches [mm])

Note: CANopen® is a registered community trade mark of CAN in Automation e.V.

Specifications are indicative and subject to change. Actual performance will vary depending on the application and operating conditions. Users should satisfy themselves that the product is suitable for use in the intended application. All our products carry a limited warranty against defects in material and workmanship. Please refer to our Warranty, Application Approvals/Limitations and Return Materials Process as described on www.axiomatic.com/service.html.

Form: TDAX100200-02/03/12