


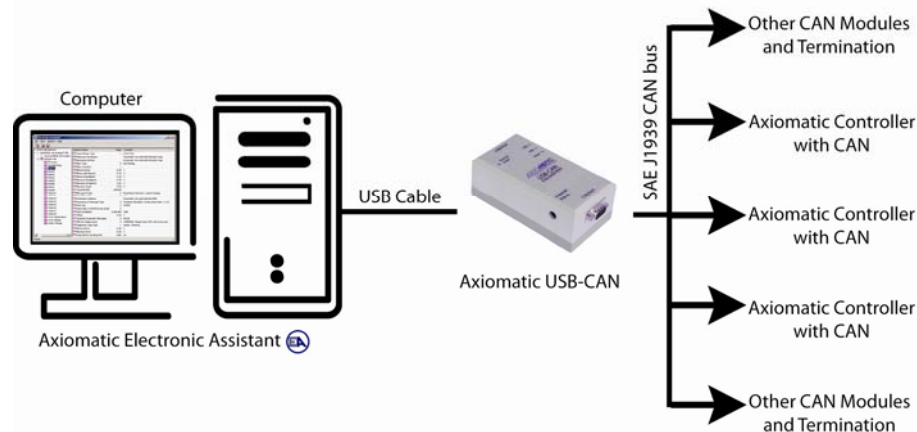
Distributed I/O for Machine Control Systems

Features:

- 1 proportional or on/off output up to 3 A
- 12V/24V/48VDC input power (nominal) with rugged surge protection
- 1 CAN (SAE J1939)
- CANopen® module available on request
- Rugged packaging and connectors
- **Electronic Assistant®**  runs on a *Windows* operating system for user configuration and programming. An Axiomatic USB-CAN converter links the PC to the CAN bus.

Applications:

- Distributed controls for machine control
- Distributed controls for commercial vehicles, off-highway equipment, industrial equipment, etc.



The controller belongs to a family of Axiomatic smart controllers with programmable internal architecture. This provides users with flexibility, allowing them to build their own custom controller with a required functionality from a set of predefined internal functional blocks using the PC-based Axiomatic Electronic Assistant® software tool. Application programming is performed through the CAN interface, without disconnecting the controller from the user's system.

Ordering Part Numbers:

Controller: **AX022200**

Accessories: **AX070112** (Comprised of DT06-8SA, W8S, 7 pcs. 0462-201-16141, 1 pc. 114017)

AX070502 Configuration KIT includes the following.

USB-CAN Converter P/N: AX070501

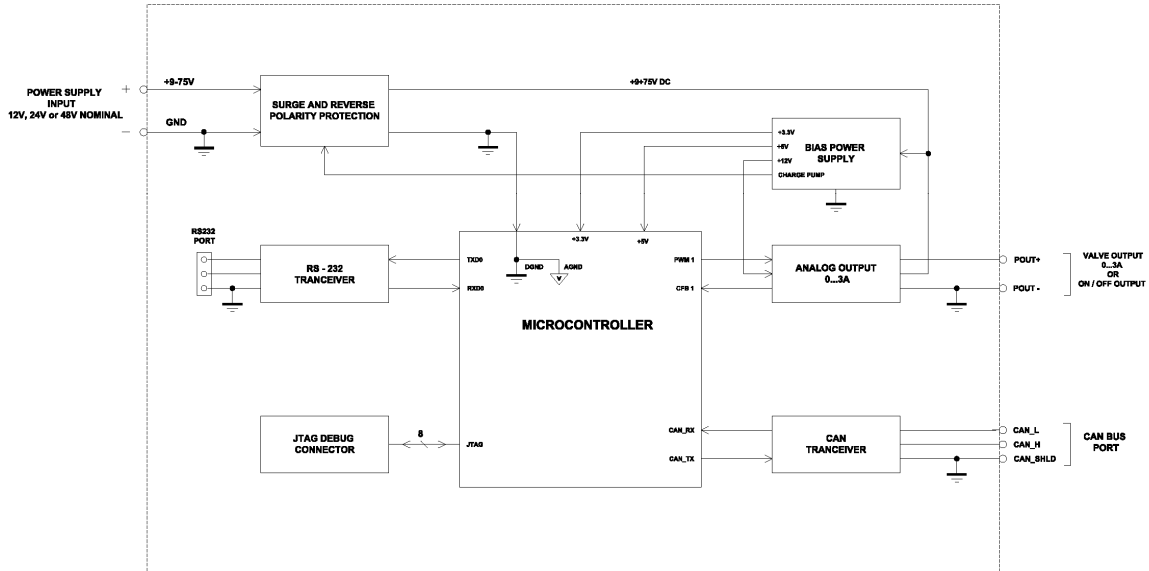
1 ft. (0.3 m) USB Cable P/N: CBL-USB-AB-MM-1.5

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.

BLOCK DIAGRAM




Technical Specifications: Input Specifications

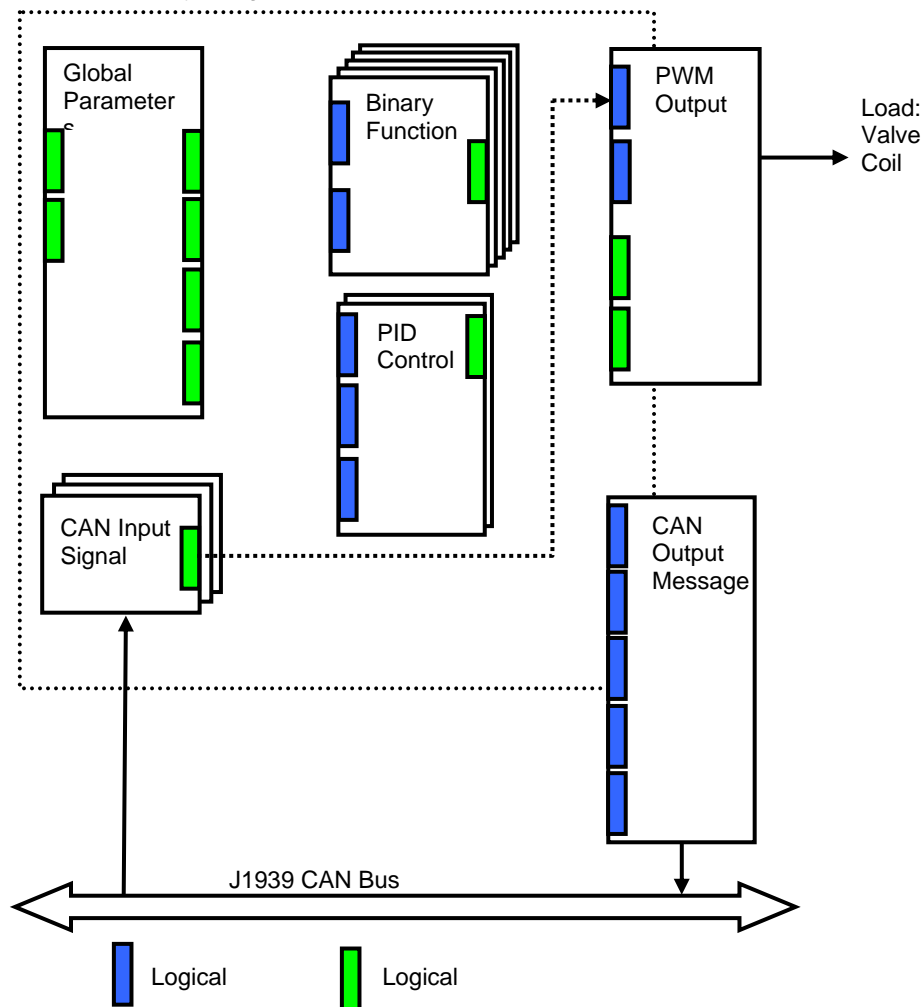
Power Supply Input	12V, 24V or 48VDC nominal (9...75 VDC power supply range)
Protection	Transient and reverse polarity protection is provided. Overvoltage (undervoltage) shutdown of the output load is provided.
CAN	SAE J1939 Command The controller can receive a single frame application specific CAN message to control the output. Using the EA, the user can configure this feature.

Output Specifications

Output	1 Proportional or On/Off Outputs (Up to 3A) High Side Switch, Current Sensing, Grounded Load The user can select the following options for output using the EA. <ul style="list-style-type: none"> • Output Disable • Discrete Output (On, Off) • Output Current (PID loop*, with current sensing) • Output Voltage • Output PWM Duty Cycle *Parameters are password protected.
Output Accuracy	Output Current mode $\leq 2\%$ Output Voltage mode $\leq 3\%$ Output PWM Duty Cycle mode $\leq 3\%$
Protection for Output + Terminal	Fully protected against short circuit to ground and short circuit to power supply rail. Unit will fail safe in the case of a short circuit condition, self-recovering when the short is removed.

Control Logic

The controller consists of a set of internal functional blocks, which can be individually programmed and arbitrarily connected together to achieve the required system functionality, Fig. 1. The AX022200 is user programmable for functionality using the Electronic Assistant® .



As an example, the logical output of the CAN Input Signal functional block is connected to the logical input of the PWM Output functional block, providing a direct path for the CAN input signal to the controller output.

Figure 1. The Controller Internal Structure

There are two types of the controller functional blocks. One type represents the controller hardware resources, for example the analog signal input block. The other type is purely logical – these functional blocks are included to program the user defined functionality of the controller. The number and functional diversity of these functional blocks are only limited by the system resources of the internal microcontroller. They can be added or modified on the customer's request to accommodate user-specific requirements.

The user can build virtually any type of a custom control by logically connecting inputs and outputs of the functional blocks. This approach gives the user an absolute freedom of customization and an ability to fully utilize the controller hardware resources in a user's application.

Depending on the block functionality, a functional block can have: logical inputs, logical outputs or any combinations of them. The connection between logical inputs and outputs is defined by logical input setpoints. The following rules apply:

- A logical input can be connected to any logical output using a logical input setpoint.
- Two or more logical inputs can be connected to one logical output.
- Logical outputs do not have their own setpoints controlling their connectivity. They can only be chosen as signal sources by logical inputs.

Each functional block of the controller is presented by its own folder in the Setpoint File root folder in the Electronic Assistant®.

Refer to the User Manual for more details.

General Specifications

Microprocessor	32-bit, 128 KByte flash program memory
Control Logic	<p>Standard embedded software is provided. Refer to Figure 1.0. (Application-specific control logic or factory programmed setpoints are available on request.)</p> <p>The controller belongs to a family of Axiomatic smart controllers with programmable internal architecture. This provides users with an ultimate flexibility, allowing them to build their own custom controller with a required functionality from a set of predefined internal functional blocks using the PC-based Axiomatic Electronic Assistant® software tool. Application programming is performed through CAN interface, without disconnecting the controller from the user's system.</p>
CAN	1 CAN port (SAE J1939), CANopen is available on request.
Slew Rate	To adjust the controller to the CAN physical network, the slew rate can be configured as fast or slow. Refer to the User Manual for details.
User Interface	<p>The controller setpoints can be viewed and programmed using the standard J1939 memory access protocol through the CAN port and the PC-based Axiomatic Electronic Assistant®. For default setpoints, refer to the User Manual.</p> <p>The EA can store all controller setpoints in one setpoint file and then flash them into the controller in one operation.</p> <p>The setpoint file is created and stored on disk using a command <i>Save Setpoint File</i> from the EA menu or toolbar. The user then can open the setpoint file, view or print it and flash the setpoint file into the controller.</p> <p>The Electronic Assistant® for <i>Windows</i> operating systems comes with a royalty-free license for use on multiple computers.</p> <p>It requires an USB-CAN converter to link the device's CAN port to a <i>Windows</i>-based PC. An Axiomatic USB-CAN Converter AX070501 is available as part of the Axiomatic Configuration KIT.</p> <p>P/N: AX070502, the Axiomatic 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.</p>
Quiescent Current Draw	Typical 33 mA @ 12V, 19 mA @ 24V, 13 mA @ 48V
Weight	Contact Axiomatic.
Operating Conditions	-40 to 85 °C (-40 to 185 °F)
Storage Temperature	-55 to 125 °C (-67 to 257°F)
Protection	IP67 rating for the product assembly NOTE : Deutsch IPD connectors are rated at IP67 for submersion (3 ft., 0.9 m) and IP69K for high pressure, high temperature wash down applications.
Packaging	Encapsulated Cast Aluminum housing with mounting holes 4.56 x 1.85 x 1.36 inches (115.83 x 46.99 x 34.59 mm) L x W x H excluding integral connector

Dimensional Drawing

Contact Axiomatic.

Mounting	<p>Mounting holes – The controller accepts 2 #10 or M4 screws.</p> <p>The CAN wiring is considered intrinsically safe. The power wires are not considered intrinsically safe and so in hazardous locations, they need to be located in conduit or conduit trays at all times. The module must be mounted in an enclosure in hazardous locations for this purpose.</p> <p>No wire or cable harness should exceed 30 meters in length. The power input wiring should be limited to 10 meters.</p> <p>All field wiring should be suitable for the operating temperature range.</p> <p>Install the unit with appropriate space available for servicing and for adequate wire harness access (6 inches or 15 cm) and strain relief (12 inches or 30 cm).</p>
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Network Termination	It is necessary to terminate the network with external termination resistors. The resistors are 120 Ohm, 0.25W minimum, metal film or similar type. They should be placed between CAN_H and CAN_L terminals at both ends of the network.																		
Electrical Connections	<p>Deutsch DT series 8 pin plug (DT15-8PA)</p> <p>Mating plug KIT: Axiomatic P/N AX070112 (Comprised of Deutsch IPD P/n's: DT016-8SA socket, wedge W8S, 7 solid contact sockets 0462-201-16141 and 1 sealing plug 114017.)</p> <p>16-18 AWG wire is recommended for use with sockets 0462-201-16141.</p> <p>Use dielectric grease on the pins when installing the controller. Wiring to these mating plugs must be in accordance with all applicable local codes. Suitable field wiring for the rated voltage and current must be used. The rating of the connecting cables must be at least 70°C. Use field wiring suitable for both minimum and maximum ambient temperature.</p> <table border="1"> <thead> <tr> <th>PIN #</th> <th>FUNCTION</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>VALVE OUTPUT +</td> </tr> <tr> <td>8</td> <td>POWER +</td> </tr> <tr> <td>2</td> <td>VALVE OUTPUT -</td> </tr> <tr> <td>7</td> <td>POWER -</td> </tr> <tr> <td>3</td> <td>NOT USED</td> </tr> <tr> <td>6</td> <td>CAN L</td> </tr> <tr> <td>4</td> <td>CAN Shield</td> </tr> <tr> <td>5</td> <td>CAN HI</td> </tr> </tbody> </table>	PIN #	FUNCTION	1	VALVE OUTPUT +	8	POWER +	2	VALVE OUTPUT -	7	POWER -	3	NOT USED	6	CAN L	4	CAN Shield	5	CAN HI
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The network part of the controller is compliant with Bosch CAN protocol specification, Rev.2.0, Part B, and the following J1939 standards:

ISO/OSI Network Model Layer	J1939 Standard
Physical	J1939/11 – Physical Layer, 250K bit/s, Twisted Shielded Pair. Rev. SEP 2006. J1939/15 - Reduced Physical Layer, 250K bits/sec, Un-Shielded Twisted Pair (UTP). Issued NOV 2003.
Data Link	J1939/21 – Data Link Layer. Rev. APR 2001. The controller supports Transport Protocol for Commanded Address messages (PGN 65240) and software identification -SOFT messages (PGN 65242). It also supports responses on PGN Requests (PGN 59904).
Network	J1939, Appendix B – Address and Identity Assignments. Rev. 2005-01. J1939/81 – Network Management. Rev. 2003-05. The controller is an Arbitrary Address Capable ECU. It can dynamically change its network address in real time to resolve an address conflict with other ECUs. The controller supports: Address Claimed Messages (PGN 60928), Requests for Address Claimed Messages (PGN 59904) and Commanded Address Messages (PGN 65240).
Transport	N/A in J1939.
Session	N/A in J1939.
Presentation	N/A in J1939.
Application	J1939/71 – Vehicle Application Layer. Rev. NOV 2006 The controller can receive application specific PGNs with input signals and transmit application specific PGNs with up to five output signals. All application specific PGNs are user programmable. J1939/73 – Application Layer – Diagnostics. Rev. SEP 2006 Memory access protocol (MAP) support: DM14, DM15, DM16 messages used by EA to program setpoints.

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: TDAX022000-01/25/10