


TECHNICAL DATASHEET #TDAX021600  
**Single Channel Valve Controller**

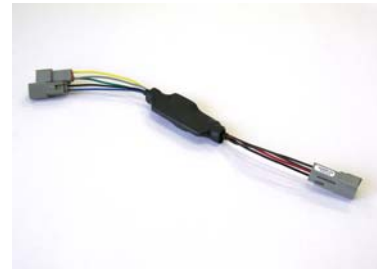
Universal Input, 2A Output  
 CAN (SAE J1939)  
 Inline

with Electronic Assistant® 

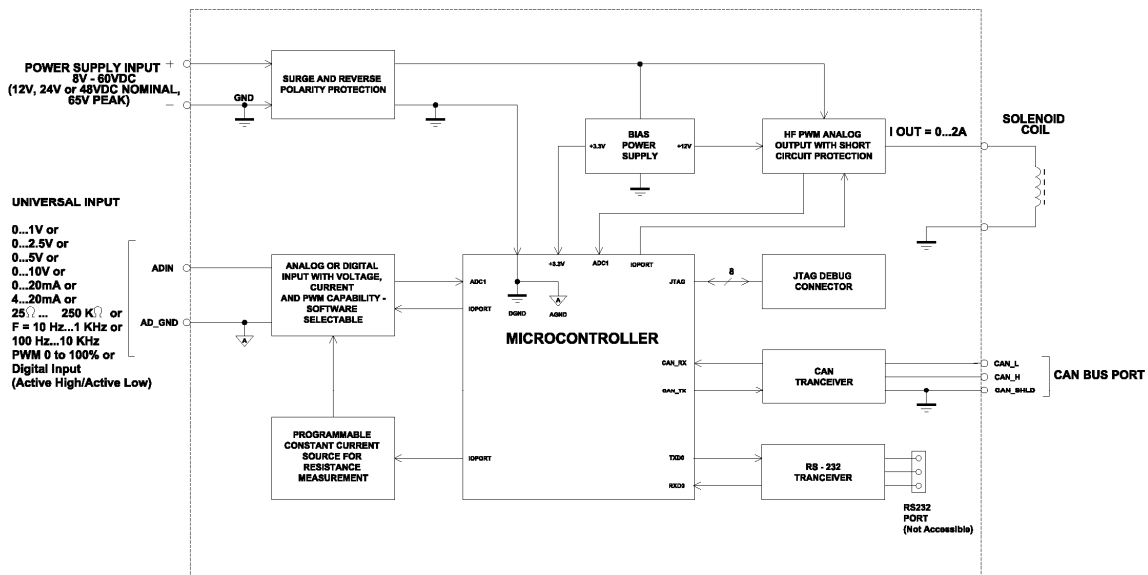
P/N: AX021600K

**Features:**

- 1 universal signal input
- 1 output up to 2 A
- Wide power supply range (8...60VDC), 12V, 24V or 48V nominal
- 1 CAN (SAE J1939) port
- CANopen® module is available on request.
- P/N: AX021600 (shown): PCB is enclosed in heat shrink wrap with 6 inch lead wires terminated in 3 Deutsch IPD DT06 plugs.
- P/N: AX021601: IP67 aluminum packaging with integral Deutsch IPD connector
- **Electronic Assistant®**  together with an Axiomatic USB-CAN converter links a PC to the CAN bus for user configuration.
- Flexible user programming for application-specific control logic via the CAN based Electronic Assistant.



**BLOCK DIAGRAM**



## Ordering Part Numbers:

SAE J1939 version	
Controller KIT (Shrink wrapped model with lead wires and mating plug kits included): <b>AX021600K</b>	
Or you can order the items separately. Controller (Shrink wrapped with lead wires/connectors): AX021600	
<b>Accessories:</b> AX070106 4-socket Mating Plug Kit AX070107 2-socket Mating Plug Kit AX070104 3-socket Mating Plug Kit	
Controller (Aluminum enclosure with integral connector - IP67): <b>AX021601</b>	
<b>AX070502 Configuration KIT</b> 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: <b>Electronic Assistant®</b> software; EA & USB-CAN User Manual UMAX07050X; USB-CAN drivers & documentation; CAN Assistant (Scope and Visual) software & documentation; and the SDK Software Development Kit. <b>NOTE: To order this kit, you need only to specify P/N: AX070502.</b>	

## Technical Specifications:

### Inputs

Power Supply Input - Nominal	12V, 24V or 48VDC nominal (8...60 VDC power supply range)
Protection	Reverse polarity protection is provided. Overvoltage protection up to 65V is provided. Overvoltage (undervoltage) shutdown of the output load is provided.
CAN	SAE J1939 Commands
Universal Signal Input	Refer to Table 1.0 All inputs are user selectable.

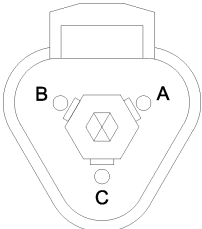
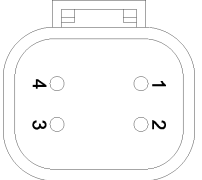
Table 1.0 – Input – User Selectable Options	
Analog Input Functions	Voltage Input, Current Input or Resistive Input
Voltage Input	0-1V (Impedance 1 MOhm) 0-2.5V (Impedance 1 MOhm) 0-5V (Impedance 200 KOhm) 0-10V (Impedance 133 KOhm for 0-5V, 133 to 20 KOhm for 5-10V)
Current Input	0-20 mA (Impedance 124 Ohm) 4-20 mA (Impedance 124 Ohm)
Resistive Input	25Ω to 250 kΩ
Digital Input Functions	Discrete Input, PWM Input, Frequency Input
Digital Input Level	5V CMOS
PWM Input	0 to 100% 10 Hz to 1kHz 100 Hz to 10 kHz
Frequency Input	10 Hz to 1kHz 100 Hz to 10 kHz
Digital Input	Active High, Active Low
Input Impedance	1 MOhm High impedance, 10KOhm pull down, 10KOhm pull up to +5V
Input Accuracy	≤1%
Input Resolution	12-bit

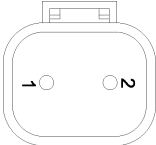
### Outputs

CAN	SAE J1939 Messages
Output	Up to 2A 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"> <li>• Output Disable</li> <li>• Discrete Output</li> <li>• Output Current (PID loop*, with current sensing)</li> <li>• Output Voltage</li> <li>• Output PWM Duty Cycle</li> </ul> *Parameters are password protected. Refer to the user manual for details.
Output Accuracy	Output Current mode ≤2% Output Voltage mode ≤3% Output PWM Duty Cycle mode ≤3%

### General Specifications

Microprocessor	32-bit, 128 KByte program memory
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Control Logic	User programmable functionality using Electronic Assistant® Refer to the user manual for details.
Communications	1 CAN port (SAE J1939) CANopen® is available on request.
User Interface	Electronic Assistant® for <i>Windows</i> operating systems comes with a royalty-free license for use. The Electronic Assistant® requires a 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.  <b>P/N: AX070502</b> , 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.
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.
Operating Conditions	-40 to 85 °C (-40 to 185 °F)
Packaging	P/N: AX021600 - PCB assembly (conformal coated PCB in heat shrink wrap) with 6 inch (153 mm) 18 WG lead wires terminated with 3 Deutsch IPD DT06 plugs made of thermoplastic with silicone seals and using #16 sized nickel contacts. 1.52 x 17.76 x 0.66 inches or 38.6 x 451.1 x 16.7 mm (W x L x H excluding mating connectors) P/N: AX021601 - Aluminum Enclosure with integral Deutsch IPD connector – Refer to TDAX021601 for dimensional drawing.
Protection	P/N : AX021600 - IP50 (PCB conformal coated and housed in heat shrink wrap) P/N : AX021601 - IP67 rating for the product assembly (Aluminum enclosure with integral connector) 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.
Weight	P/N: AX021600 0.20 lbs. (0.09 kg)
Electrical Connections	<b>P/N: AX021600</b>  <u>CAN Connector:</u> 3 pin Deutsch IPD P/N: DT04-3P  <ul style="list-style-type: none"><li>A: CAN_H (Yellow)</li><li>B: CAN_L (Green)</li><li>C: CAN Shield (Grey)</li></ul> <p>Mates with P/N: DT06-3S including W3S wedgelock and sockets. A mating plug kit is available from Axiomatic. Use ordering P/N: AX070104. (The mating plug kit is comprised of Deutsch IPD P/N: DT06-3S, W3S and 3 contact sockets 0462-201-16141.)</p> <u>Power and Output Connector:</u> 4 pin Deutsch IPD P/N: DT04-4P  <ul style="list-style-type: none"><li>1: Power Input (Red)</li><li>2: Power GND (Black)</li><li>3: Solenoid + (White/Red)</li><li>4: Solenoid – (Internally connected to Power GND) (Brown)</li></ul> <p>Mates with P/N: DT06-4S including W4S wedgelock and sockets. A mating plug kit is available from Axiomatic. Use ordering P/N: AX070106. (The mating plug kit is comprised of Deutsch IPD P/N: DT06-4S, W4S and 4 contact sockets 0462-201-16141.)</p> <u>Signal Input Connector:</u> 2 pin Deutsch IPD P/N: DT04-2P

		<p>1: Signal Input (Blue) 2: Signal GND (Black)</p>
<p>Mates with P/N: DT06-2S including W2S wedgelock and sockets. A mating plug kit is available from Axiomatic. Use ordering P/N: AX070107. (The mating plug kit is comprised of Deutsch IPD P/N: DT06-2S, W2S and 2 contact sockets 0462-201-16141.)</p> <p><b>P/N: AX021601</b> Refer to TDAX021601 for details.</p>		

The network part of the controller is compliant with Bosch CAN protocol specification, Rev.2.0, Part B, and the following J1939 standards.

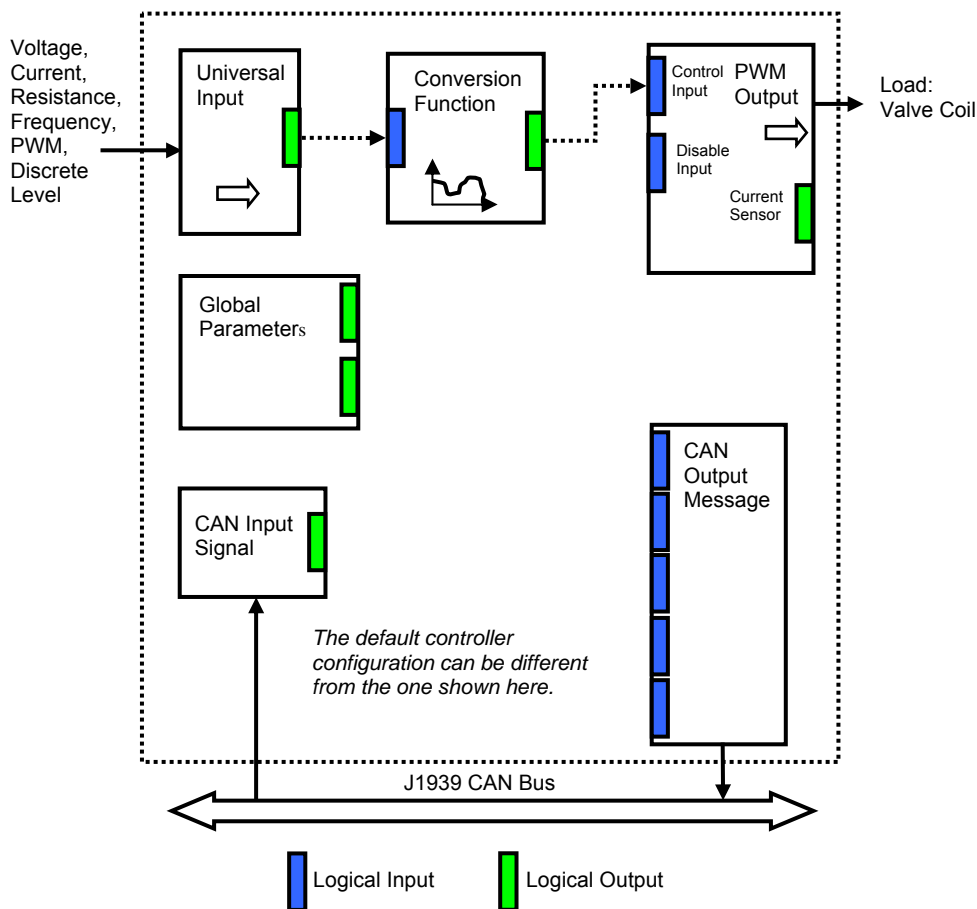
ISO/OSI Network Model Layer	J1939 Standard
Physical	J1939/11 – Physical Layer, 250K bit/s, Twisted Shielded Pair. Rev. SEP 2006. J1939/15 - Reduced Physical Layer, 250K bits/sec, Un-Shielded Twisted Pair (UTP). Rev. AUG 2008.
Data Link	J1939/21 – Data Link Layer. Rev. DEC 2006 The controller supports 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. FEB 2010. 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. FEB 2010 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. FEB 2010 Memory access protocol (MAP) support: DM14, DM15, DM16 messages used by EA to program setpoints.

## 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. For additional flexibility, in a majority of functional blocks, logical input signals can be inverted.

Each functional block is absolutely independent and has its own set of parameters, or setpoints, used to control its functionality. The setpoints are accessible through CAN using Axiomatic Electronic Assistant® (EA) software. There are two types of the controller functional blocks. One type represents the controller hardware resources, for example: universal input or PWM output. The other type is purely logical – these functional blocks are included to program the user defined functionality of the controller.

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.



As an example, Universal Input is connected to the Conversion Function and the Conversion Function to the PWM Output, providing a path for the signal from input to output through the Conversion Function. CAN Input Signal and CAN Output Message functional blocks are not used in this example.

Figure 1. The Controller Internal Structure

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](http://www.axiomatic.com/service.html).

Form: TDAX021600-06/16/10