TECHNICAL DATASHEET #TDAX021210

CAN to 10 Output Valve Controller

12Vdc or 24Vdc
10 Universal Outputs (2.5A)
CAN (SAE J1939)
Developed with Simulink®
with Electronic Assistant

P/N: AX021210

Features:

- Command messages are received through the CAN network (no physical inputs)
- 10 universal outputs of up to 2.5A are user selectable from the following types (up to a maximum of 7A of controller power supply intake at one time).
  - Output Disabled
  - Proportional Current
  - Hotshot Digital
  - On/Off Digital
  - Proportional Voltage
  - PWM Duty Cycle
- 12V or 24V nominal input power
- 1 CAN port (SAE J1939)
- CANopen® module (P/N: AX021211)
- Hardware is also available as a platform for application-specific software
- Rugged packaging and connectors
- CE mark
- User configurable using Axiomatic Electronic Assistant
- Developed with Simulink®

Description: The controller features 1 CAN port for controlling the outputs and diagnostics over the CAN bus. It accepts a nominal input power supply voltage of 12Vdc or 24Vdc. Using the CAN network, it can provide control of up to ten outputs, configured for a wide variety of responses and up to 2.5A per channel (max 7A per module). For example, it can drive proportional valves, on/off valves or provide a hotshot control profile. PWM signal or proportional voltage outputs are also user selectable. Standard software is provided. The sophisticated microprocessor can accommodate complex application-specific control algorithms for advanced machine control on request. Rugged packaging and power supply surge protection suits the harsh environment of mobile equipment with on-board battery power. Settings are user configurable via a *Windows*-based Electronic Assistant configuration tool, AX070502.

Applications:

- Off-highway construction equipment
- Municipal vehicles

Ordering Part Numbers:

SAE J1939 Controller: For baud rate, refer to the table below for the appropriate P/N.

Model P/N	*Baud Rate*	*Standard Reference*
AX021210	250 kBit/s	J1939/11, J1939/15.
AX021210-01	500 kBit/s	J1939/14. New standard
AX021210-02	1Mbit/s	Non-standard

Electronic Assistant® Configuration KIT: **AX070502**

CANopen® Controller: **AX021211**

Accessories: **PL-DTM06-12SA-12SB** Mating Plug Kit

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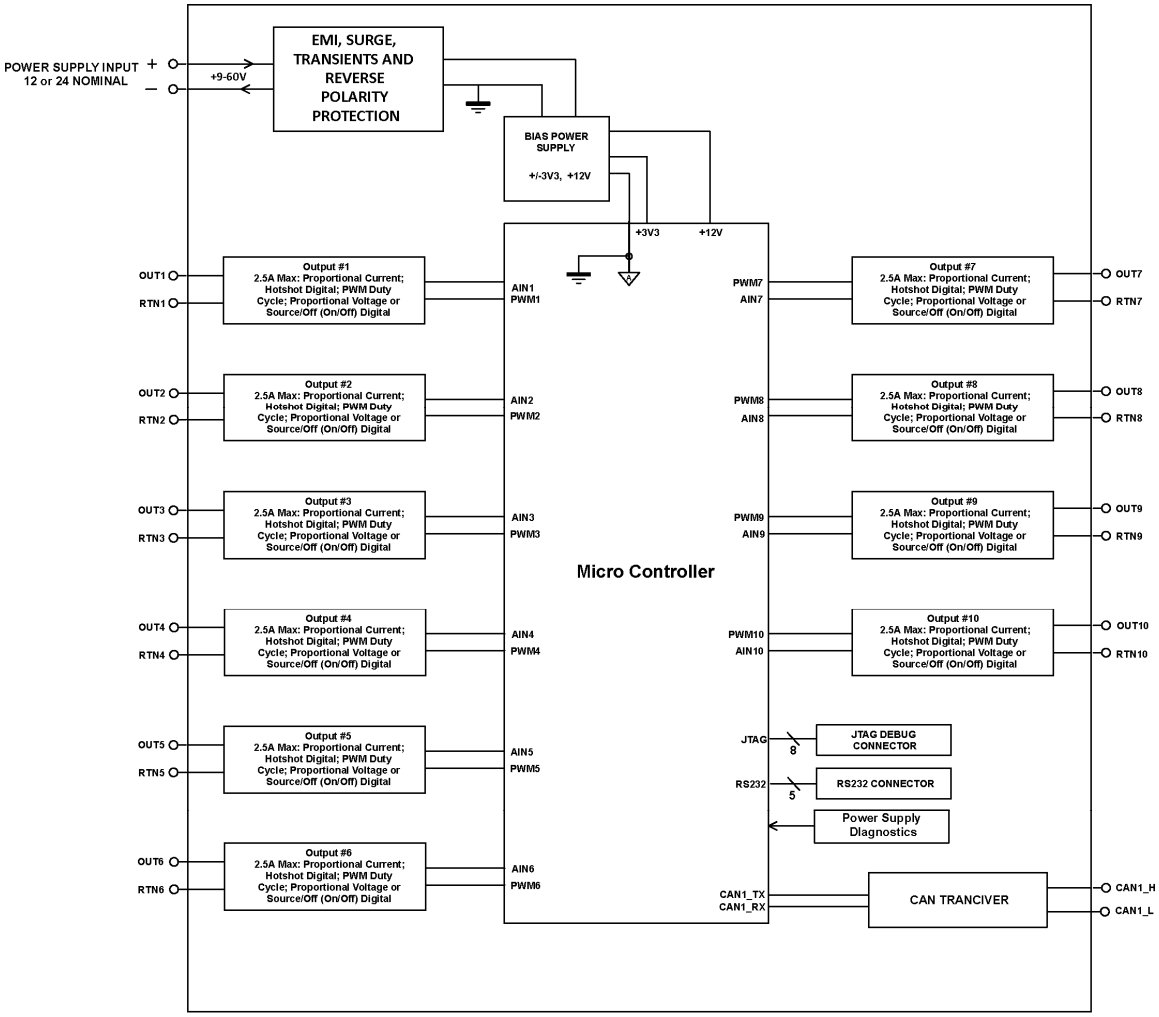
Hardware Block Diagram:



Technical Specifications:

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.

Input Power Supply Specifications

Power Supply Input - Nominal	12Vdc or 24Vdc nominal (9…40Vdc) NB. The maximum total current draw permitted on the power supply input pins is 7 Amps @ 24VDC, at one time.
Protections	Surge and transient protection is provided. Reverse polarity protection is provided. Over-voltage protection is provided. Under-voltage protection is provided.
Supply Current	110 mA @ 12Vdc Typical; 60 mA @ 24Vdc Typical; 40 mA @ 48Vdc Typical

WARNING: The 10 outputs are user selectable from 0 to 2000 mA but the unit can only handle a maximum of 7A of controller power supply intake at one time. At no time should the total intake current of the controller exceed 7A due to the rating of the connector. Failure to do so will result in unpredictable damage to unit.

Input Specifications

CAN commands (no physical inputs available)	SAE J1939 {CANopen® (model AX020211)}

Output Specifications

Universal Outputs	High side (sourcing) Half-bridge, current sensing, grounded load. 10 outputs, 12 or 24V Fully independent, software controlled High Frequency Drive at 25 kHz Each output is configurable up to 2.5A. Notes: Load at supply voltage must not draw more than 2.5A. The number of outputs ON at one time is limited by the rating of the Deutsch IPD contacts (pins on the connector). The maximum total current draw permitted on the power supply input pins is 7 Amps @ 24VDC, at one time.
Output Type	The user can select between the following outputs. **Output Disabled** **Proportional Current** (0…2.5A) **Hotshot Digital** (0…2.5A, 0…10000 mSec.) **On/Off Digital** (0…2.5A) Sourcing from power supply or output off **Proportional Voltage** (0…60V) **PWM Duty Cycle** (150Hz…5000Hz, 0 to 100%)
Output Adjustments	Digital Current: 0 to 2500 mA Hotshot Hold Time: 0 to 10000 ms Proportional Current: 0 to 2500 mA Proportional Voltage: 0 to 60V PWM Duty Cycle: 0 to 100% PWM Frequency: 150 Hz to 5000 Hz Ramp Up: 0 to 10000 ms Ramp Down: 0 to 10000 ms Dither Frequency: 50 to 400 Hz Dither Amplitude: 0 to 500 mA
Resolution and Accuracy	Current Outputs: 1 mA resolution; +/- 1% error Voltage Outputs: 0.1V resolution; +/- 5% error PWM Outputs: 0.1% resolution, +/- 0.1% error
Control Logic	By default, any output on the controller uses a Proprietary B message to receive command messages to control the output, and to send feedback data to the network bus. There are multiple setpoints per channel that are associated with the output and how it responds. There are multiple setpoints per channel that are associated with the J1939 feedback message that can be sent by the ECU to the network bus.
Protection	Overcurrent protection is provided. Short circuit protection is provided. NB. Outputs are separately protected against short circuits to both power and GND. If the current at the output exceeds 6A, the protection circuitry will shut off the output signal, regardless of what type of output mode had been selected for that channel.
Error Detection	The controller can detect and flag open and short circuit loads, which can be read via the J1939 network for diagnostic purposes.

Output Response Profiles:

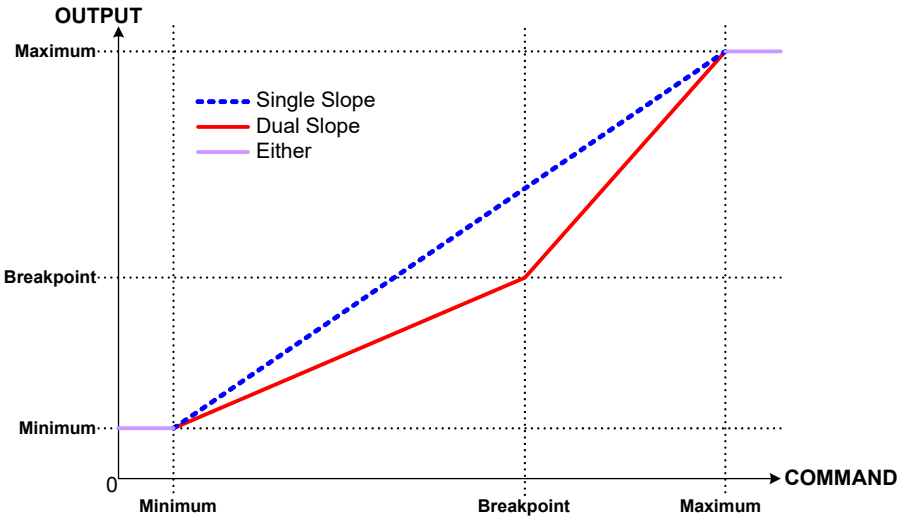


Figure 1 – Proportional Output vs. Command Profile

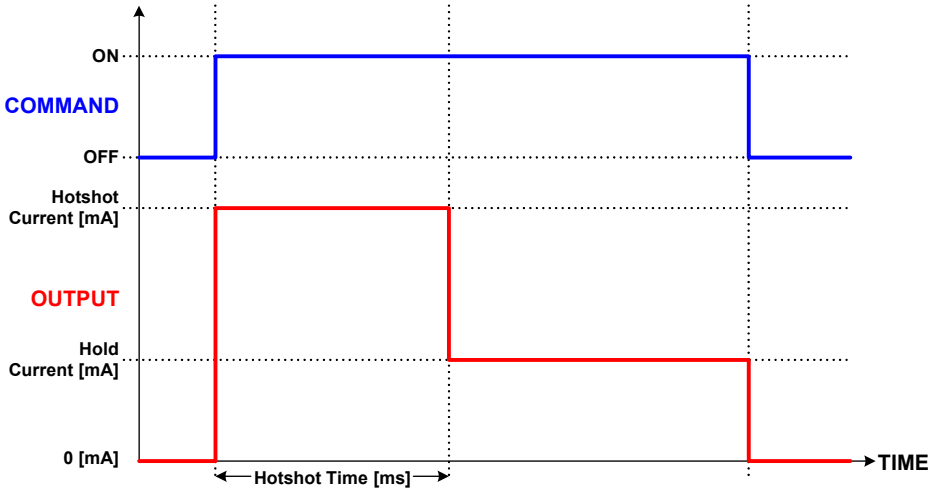


Figure 2 –Hotshot Digital Profile

General Specifications

Microprocessor	STM32F205VGT6
Compliance	CE mark Compliant to the EMC Directive Compliant to the RoHS Directive
Vibration	MIL-STD-202G, Test 204D and 214A 10.86 Grms (Random) 15 g peak (Sine)
Control Logic	Standard embedded software. Configurable properties of the controller are divided into function blocks, namely Output Function Block, Diagnostic Function Block, PID Control Function Block, Lookup Table Function Block, Programmable Logic Function Block, Math Function Block, DTC React Function Block, CAN Transmit Message Function Block and CAN Receive Message Function Block. For details refers to the User Manual. *Application-specific software is available on request.*
Communications	1 CAN port (2.0B, SAE J1939) 500 kbps and 1 Mbps models are available. See Ordering Part Numbers.

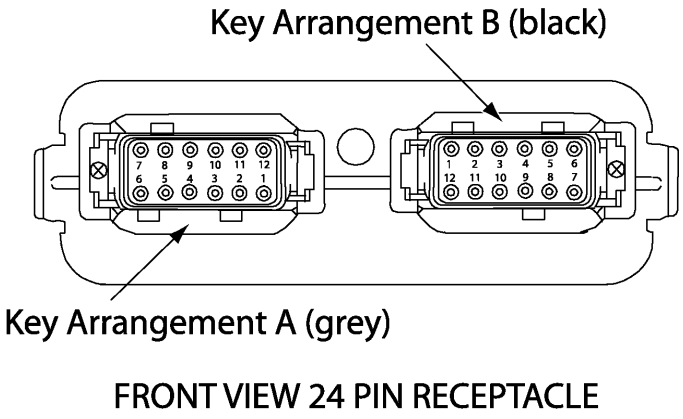
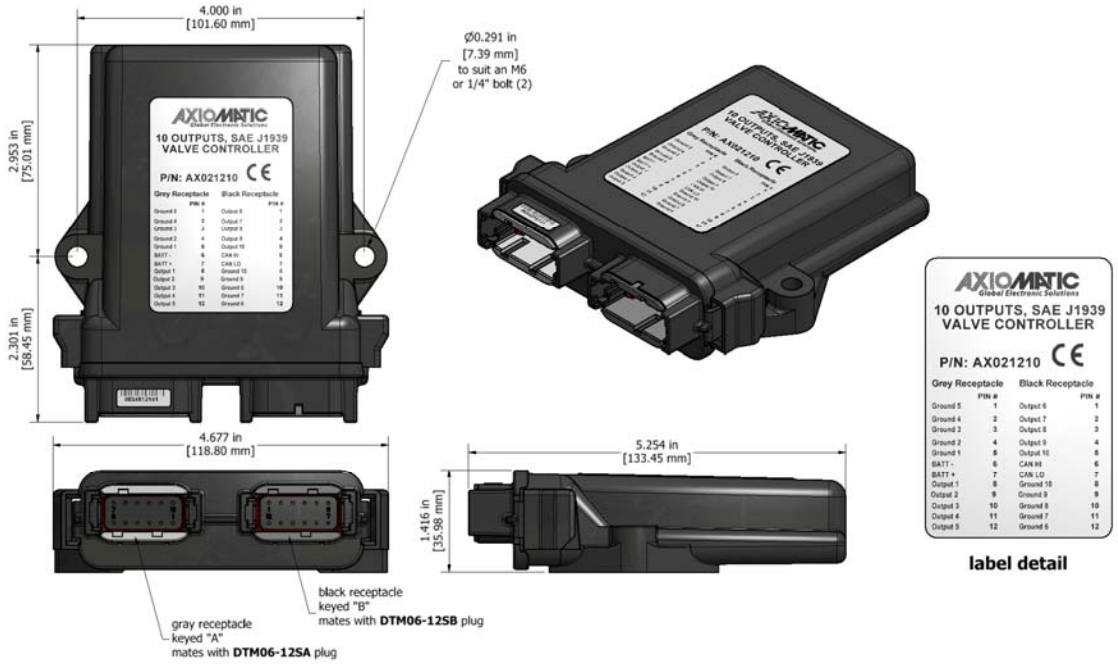
User Interface	User configuration and diagnostics are provided with the Axiomatic Electronic Assistant. The Axiomatic Service Tool is a *Windows*-based graphical user interface that allows easy configuration of the controller setpoints.
Diagnostics – CAN Network	Each output channel can be configured to send diagnostic messages to the network if the load goes out of range. There are four setpoints per output channel, and ten per fault channel, that are associated with if and how diagnostic messages will be sent to the network bus. Alternatively, if the Axiomatic Proprietary B scheme is used, the status byte of the feedback message could be used to recognize an error at the output. How the controller detects a fault for a channel will depend on the output type. In addition to the output channels, three other types of fault channels can be reported to the network using diagnostic messaging. They are Over Temperature (of the processor), Over Voltage and Under Voltage (of the power supply).
Simulink®	Model **AX021210** was developed using Simulink®. **Simulink®** is a model-based design tool from Mathworks®. Using Simulink®, the OEM machine designer is able to design the data conversion rules between the module interfaces using an Axiomatic Simulink library. Refer to the User Manual *Axiomatic Hardware Interface Library for Mathworks Simulink* for details.
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)
Weight	0.60 lb. (0.27 kg)
Protection	IP67, Unit is conformal coated in the housing.
Electrical Connections	TE Deutsch DTM series 24 pin receptacle (DTM13-12PA-12PB-R008) Mating plug: Deutsch DTM06-12SA and DTM06-12SB with 2 wedgelocks (WM12S) and 24 contacts (0462-201-20141). 20 AWG wire is recommended for use with contacts 0462-201-20141.  **Refer to Table 4.0 for the pin out.**

Table 4.0 – Pin out: AX021210

Grey Connector		Black Connector	
Pin #	**Function**	**Pin #**	**Function**
1	Ground 5	1	Output 6
2	Ground 4	2	Output 7
3	Ground 3	3	Output 8
4	Ground 2	4	Output 9
5	Ground 1	5	Output 10
6	BATT -	6	CAN HI
7	BATT +	7	CAN LO
8	Output 1	8	Ground 10
9	Output 2	9	Ground 9
10	Output 3	10	Ground 8
11	Output 4	11	Ground 7
12	Output 5	12	Ground 6

Enclosure and Dimensions	High Temperature Nylon housing – TE Deutsch PCB Enclosure (EEC-325X4B) 4.67 x 5.25 x 1.42 inches 118.80 x 133.45 x 35.98 mm (W x L x H excluding mating plugs) Refer to drawing below.
Mounting	Mounting holes sized for ¼ inch or M6 bolts. The bolt length will be determined by the end-user's mounting plate thickness. The mounting flange of the controller is 0.63 inches (16 mm) thick. If the module is mounted without an enclosure, it should be mounted to reduce the likelihood of moisture entry. 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. All field wiring should be suitable for the operating temperature range of the module. 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).

DIMENSIONAL DRAWING:



Notes:
CANopen® is a registered community trademark of CAN in Automation e.V.
Simulink® is a registered trademark of The Mathworks, Inc.

Form: TDAX021210- 03/02/20