

# 8 Input, 5 Output Valve Controller

7 Universal Analog Inputs  
1 Magnetic Pickup Sensor Input  
5 On/Off or 2.5A Proportional Outputs  
CANopen®  
P/N: AX021911

## Features

- 8 Inputs:
  - 7 universal analog signal inputs (current, voltage, resistive, frequency, digital or PWM)
  - 1 magnetic pickup sensor input (RPM)
- 5 Outputs:
  - 5 proportional or on/off valve drivers up to 2.5 A
  - Open or closed loop (PID) drive is user configurable
  - Fully protected
- 1 CANopen® port (SAE J1939 model available)
- 12 or 24 Vdc nominal
- PID control logic is user configurable
- Time delays can be programmed using Look Up Tables
- Powerful H7 microcontroller for advanced programming features
- Rugged IP67 protection for harsh environments
- CE / UKCA marking
- Vibration compliance for mobile equipment



## Applications

Typical applications can include:

- Industrial, off-highway and marine applications - control of hydraulic proportional poppet or spool valves
- Closed loop control of hydraulic valves
- Interface with a diesel engine's electronic control module PWM signal to drive accessories
- Transmission controls
- Fan drive controls (on request)
- Vehicle traction control (on request)

## Ordering Part Numbers

8 Input, 5 Output Valve Controller, CANopen® - P/N: **AX021911**

8 Input, 5 Output Valve Controller, SAE J1939 with Auto-Baud-Rate Detection – P/N: **AX021910**

### Accessories:

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

EDS File

## Description

The 8 Input, 5 Output Valve Controller is designed for versatile control of up to five proportional outputs to directly drive coils or other loads. Its flexible circuit design gives the user a wide range of configurable input or output types. The powerful H7 microcontroller and control algorithms allow the user to program the controller for a wide range of applications without the need for custom software.

The controller has seven fully programmable universal inputs that can be set up to read voltage, current, resistive, frequency, or digital input signals. For added flexibility, it also has a magnetic sensor circuit that can read AC signals and convert them into a frequency (RPM) pickup.

There are five universal outputs that can be setup to drive proportional current (up to 2.5 A each), hotshot digital current, proportional voltage (up to supply), proportional PWM, or straight on/off digital loads.

The AX021911 valve controller is highly programmable and allows the user to configure it for their application. Its control algorithms allow for open or closed loop drive of the proportional outputs. It can be operated as either a self-contained control system, driving the outputs directly from the on-board inputs, and/or it can be integrated into a CAN network of controllers. All I/O and logical function blocks on the unit are inherently independent from one another but can be programmed to interact in several ways. Refer to the block diagram, Figure 1, for the hardware features.

It has a number of built-in protections features that can shut off the outputs in adverse conditions. They include hardware shutoffs to protect the circuits from being damaged as well as software shutdown features that can be enabled in safety critical systems.

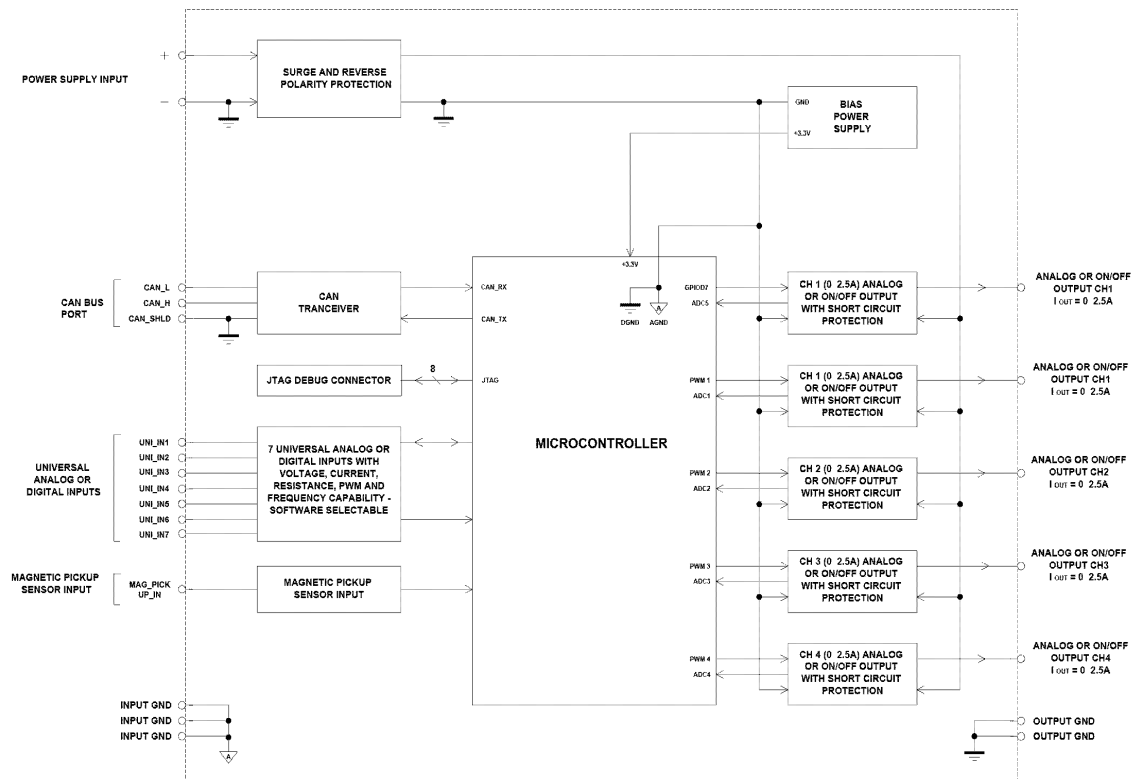


Figure 1 – Hardware Block Diagram

## 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 <https://www.axiomatic.com/service/>.

### Inputs

Power Supply Input	12 or 24 Vdc nominal (9 to 60 Vdc power supply range)
Protection	Reverse polarity protection is provided. Surge protection up to 75 Vdc is provided. Under-voltage protection is provided (Shutdown at 6.5 Vdc). Over-voltage protection is provided (Shutdown at 64.5 Vdc).
Input Grounds	3 Ground connections provided
RPM Input	1 Magnetic Pickup Sensor Input Range: 0.5 Hz to 10 kHz 100 mV to 100 V RMS
Universal Signal Inputs	7 universal inputs are provided. Refer to Table 1.0. All input types are user selectable using the Axiomatic EA as: <ul style="list-style-type: none"> <li>• Voltage</li> <li>• Current</li> <li>• Resistive</li> <li>• Frequency</li> <li>• RPM</li> <li>• PWM</li> <li>• or Digital</li> </ul> Inputs are sampled every 1 msec. Protected against shorts to Ground or +Vcc

Table 1.0 – Universal Input – User Selectable Parameters	
Analog Input Functions	Voltage Input, Current Input or Resistive Input 12-bit Analog to Digital
Voltage Input	1 mV resolution, accuracy $\pm 1\%$ error 0-1V (1 M $\Omega$ impedance) 0-2.5V (1 M $\Omega$ impedance) 0-5V (150 K $\Omega$ impedance) 0-10V (133 K $\Omega$ impedance)
Current Input	1 $\mu$ A resolution, accuracy $\pm 2\%$ error Current sense resistor 124 $\Omega$ 0-20mA 4-20mA
Resistive Input	1 $\Omega$ resolution, accuracy $\pm 1\%$ error Self-calibrating for a range of 30 $\Omega$ to 250 k $\Omega$
Digital Input Functions	Discrete Input, PWM Input, Frequency Input 15-bit Timer
PWM Input	0.01% resolution, accuracy $\pm 1\%$ error 1 M $\Omega$ impedance 0 to 100% Low frequency < 1 KHz High frequency > 100 Hz
Frequency Input	Accuracy $\pm 1\%$ error 1 M $\Omega$ impedance 0.5 Hz to 50 kHz range: 0.01 Hz resolution 10 Hz to 1 kHz range: 0.1 Hz resolution 100 Hz to 10 kHz range: 1 Hz resolution
Digital Input	1 M $\Omega$ impedance Active High Debouncing provided at 1 ms resolution

## Outputs

<p>Universal Outputs</p>	<p>Five fully independent software-controlled outputs selectable using the Axiomatic EA as:</p> <ul style="list-style-type: none"> <li>• Proportional Current</li> <li>• Hotshot Digital (See Figure 2.)</li> <li>• PWM Duty Cycle</li> <li>• On/Off Digital</li> </ul> <p>Half-bridge outputs, current sensing, grounded load. High side sourcing up to 2.5 A</p> <p>Current Outputs: 1 mA resolution, accuracy <math>\pm 2\%</math> error Software controlled PID current, not accessible to user Fully configurable dither from 50 to 400 Hz. High frequency drive at 25 kHz</p> <p>Voltage Outputs: 0.1 V resolution, accuracy <math>\pm 5\%</math> error Average output based on unit power supply High frequency drive at 25 kHz</p> <p>PWM Outputs: 0.1% resolution, accuracy <math>\pm 0.1\%</math> error Configurable frequency ONLY if no voltage or current output types are used.</p> <p>Digital On/Off: Load at supply voltage must not draw more than 2.5 A.</p>
<p>Output Ground</p>	<p>2 Ground connections are provided.</p>
<p>Protection</p>	<p>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.</p>

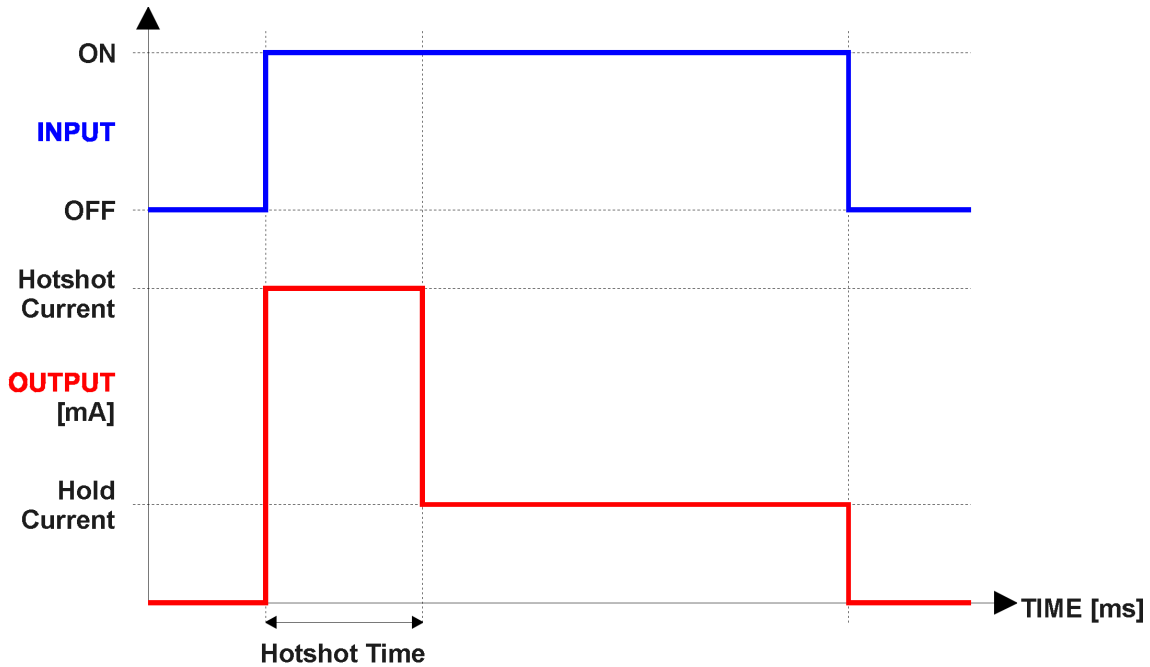
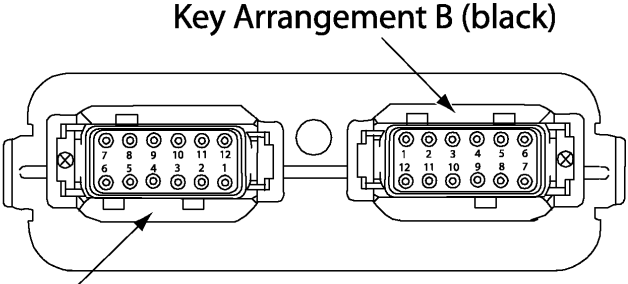


Figure 2 – Hotshot Digital Output (User selectable)

## General Specifications

Microcontroller	STM32H723ZGT6 1 MB Program Space 32-bit, 1MB Flash Program Memory, 64 KB EEPROM
Quiescent Current Draw	82.6 mA @ 12 V 58.8 mA @ 24 V
Control Logic	Standard software is provided.
Communications	1 CAN port (CANopen®) Baud-rates: 250 kbit/s, 500 kbit/s, 667 kbit/s, and 1 Mbit/s  SAE J1939 Model, P/N: AX021910
User Interface	EDS file is provided for use with standard CANopen® tools.
Diagnostics	Each input and output channel can be configured to send diagnostic messages to the CAN network if the I/O goes out of range. Diagnostic data is stored in a non-volatile log.
Additional Fault Feedback	There are several types of faults that the controller will detect and provide a response: unit power supply under-voltage and over-voltage, and lost communication. They can be sent to the CAN bus.
Operating Conditions	-40 to 85 °C (-40 to 185 °F)
Weight	0.55 lb. (0.25 kg)
Vibration	MIL-STD-202H, method 204, test condition C 10g peak (Sine component)  MIL-STD-202H, method 214A, test condition I/B 7.56 Grms (Random component)
Shock	MIL-STD-202H, method 213B, test condition A 50 g peak
Compliance	EMC: ISO 13766-1:2018 CE / UKCA marking RoHS
Protection	IP67 rating for the product assembly
Electrical Connections	24-pin receptacle (equivalent TE Deutsch P/N: DTM13-12PA-12PB-R008)  Mating plug – equivalent to the TE Deutsch P/Ns: 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.  <div style="text-align: center;"> <p><b>Key Arrangement B (black)</b></p>  <p><b>Key Arrangement A (grey)</b></p> <p><b>FRONT VIEW 24 PIN RECEPTACLE</b></p> </div> <p>Refer to Table 2.0 for the pin out.</p>
Enclosure	High Temperature Nylon PCB Enclosure - (TE Deutsch P/N: EEC-325X4B) 5.254 in x 4.68 in x 1.42 in (138.4 mm x 119 mm x 36 mm) (W x L x H excluding mating plugs) Refer to Figure 3.

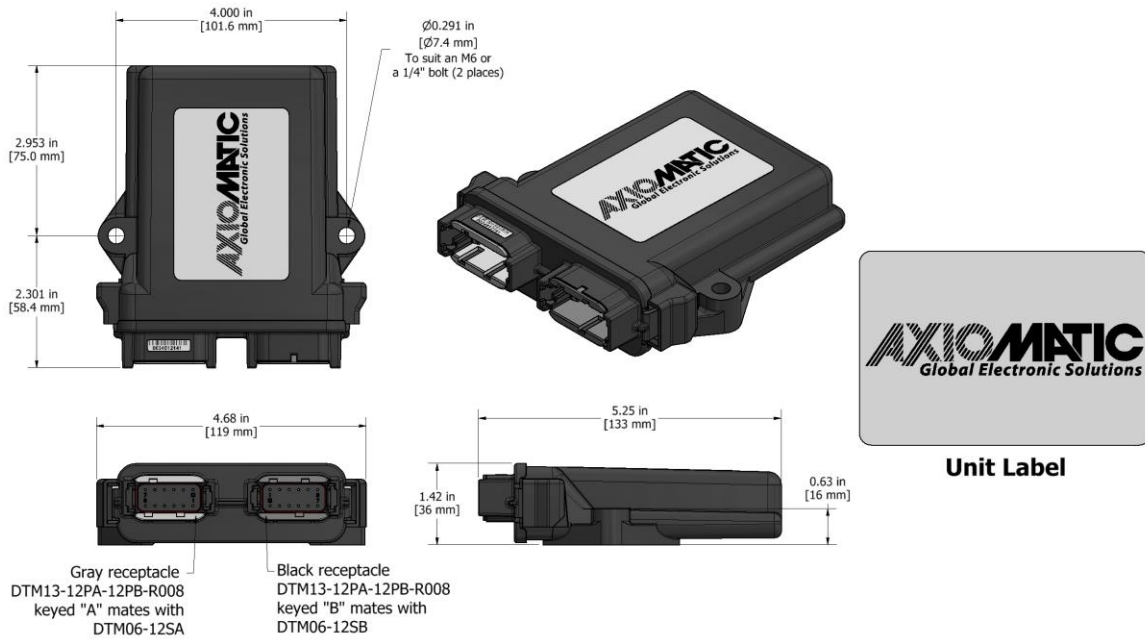


Figure 3 – Enclosure Dimensions

Table 2.0 – Pin out

Grey Connector		Black Connector	
Pin #	Function	Pin #	Function
1	CAN_H	1	Universal Input 1
2	CAN_L	2	Universal Input 2
3	CAN Shield	3	Universal Input 3
4	Output 2 Ground	4	Universal Input 4
5	Output 1 Ground	5	Universal Input 5
6	Battery- (Output Ground)	6	Universal Input 6
7	Battery +	7	Universal Input 7
8	Output 5	8	Magnetic Pick-Up Sensor Input
9	Output 4	9	Magnetic Pick-Up Sensor Ground
10	Output 3	10	Input Ground 1
11	Output 2	11	Input Ground 2
12	Output 1	12	Input Ground 3

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Form: TDAX021911-09/25/2024