Preliminary
TECHNICAL DATASHEET #TDAX031220

21 Inputs, 6 Outputs CAN Analog I/O Module, SAE J1939

21 Inputs (Analog, Digital, Encoder, and Magnetic Pick-Up)
6 Outputs (4 Isolated Analog, 2 Relay)
2 CAN (SAE J1939)
Configurable with the Axiomatic Electronic Assistant
P/N: AX031220

Features:

- 9 Analog (0-5V or 0-10V, 0-20mA, or 4-20mA) or Digital Inputs
- 4 Universal Inputs (0-1V, 0-2.5V, 0-5V or 0-10V, 0-20mA, 4-20mA, Frequency, RPM, or PWM)
- 5 Digital, Frequency, or PWM Inputs
- 2 Encoder Inputs
- 1 Magnetic Pick-Up Input
- 4 isolated Analog outputs (-5 to 5V, 0-5V, -10 to 10V, 0-10V, 4-20 mA, or 0-20 mA)
- 2 Relay outputs (Max. 2A, 250Vdc, NO contact)
- 12, 24, or 48 Vdc nominal input power with surge and transient, reverse polarity, over-voltage, under-voltage, and short circuit protection
- Complete isolation between power, input, output, and CAN
- 2 isolated SAE J1939 CAN ports
- -40°C to 85°C operating temperature
- 48-pin TE Deutsch enclosure and connectors
- IP67 rating, suitable for moist and vibrating environments
- Configurable with the Axiomatic Electronic Assistant

Applications:

- Power Gen Set Engine Control Systems
- Oil and Gas Equipment Automation
- Off-highway Machine Automation

Ordering Part Number:

21 Input, 6 Output CAN Analog I/O Module, SAE J1939, Auto-Baud-Rate Detection: **AX031220**

Accessories:
Mating Plug Kit: **AX070123**
Axiomatic Electronic Assistant: **AX070502** or **AX070506K**

Axiomatic Technologies Oy
Höytämöntie 6
33880 LEMPÄÄLÄ, Finland
Tel. +358 103 375 750
salesfinland@axiomatic.com
www.axiomatic.fi

Axiomatic Technologies Corporation
1445 Courtneypark Dr. E.
Mississauga, ON Canada L5T 2E3
Tel. 1 905 602 9270
sales@axiomatic.com
www.axiomatic.com

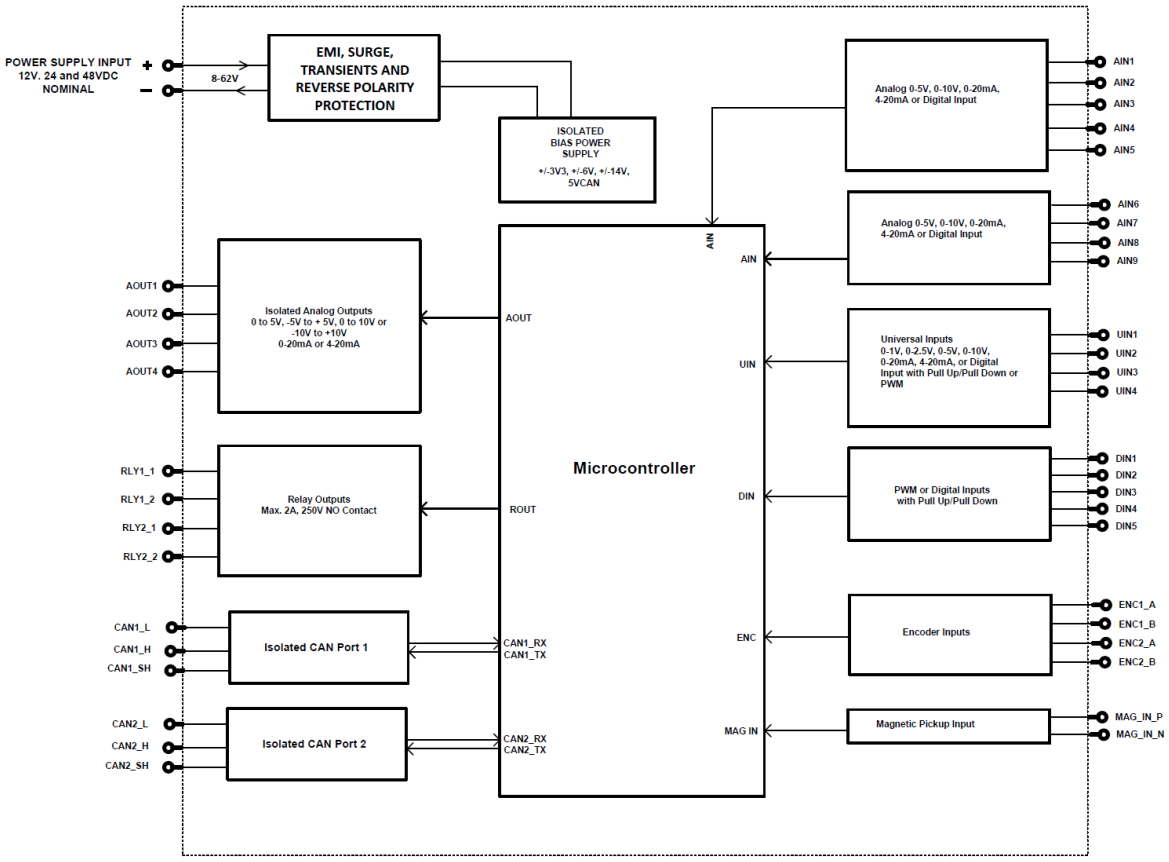
Description:

The controller features complete isolation between power, inputs, outputs and CAN. It operates with 12V, 24V or 48VDC power input. It accepts multiple inputs including: 9 analog (0-5V or 0-10V, 0-20mA, or 4-20mA) or digital signal inputs; 4 universal inputs (0-1V, 0-2.5V, 0-5V or 0-10V, 0-20mA, 4-20mA, frequency, RPM, or PWM); 5 digital, frequency, or PWM Inputs; 2 encoder inputs; and 1 magnetic pick-up sensor input. It provides multiple outputs, including: 4 isolated analog outputs (-5 to 5V, 0-5V, -10 to 10V, 0-10V, 4-20 mA, or 0-20 mA); and 2 relay outputs (max. 2A, 250Vdc, NO contact).

The AX031220 belongs to a family of Axiomatic smart I/O modules with configurable internal architecture. This provides users with flexibility, allowing them to build their own custom controller with required functionality from a set of predefined internal functional blocks using the PC-based Axiomatic Electronic Assistant software tool. Application configuration is performed through CAN interface, without disconnecting the controller from the user's system.

The controller is rugged with an IP67 rating and is suitable for engine applications.

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 Limitations & Return Materials Process as described on https://www.axiomatic.com/service/.

Input Power Supply

Input Power Supply	12, 24, or 48 Vdc nominal 8 to 62 Vdc power supply range, isolated up to 400 Vdc
Quiescent Current Draw	140 mA @ 12 Vdc; 80 mA @ 24 Vdc; 46 mA @ 48 Vdc (typical)
Protection	Surge and transient protection up to 202 Vdc Reverse polarity protection up to 400 Vdc Undervoltage protection provided. Hardware shutdown at 7.5 Vdc. Overvoltage protection provided. Hardware shutdown at 63 V.

Inputs

Inputs	21 Inputs classified as follows: • 9 Analog or Digital Inputs • 4 Universal Inputs • 5 Digital or PWM Inputs • 2 Encoder Inputs • 1 Magnetic Pick-Up Input Refer to Table 1.0 for details.

Table 1.0 – Inputs – User Programmable Options

Analog or Digital Inputs	Nine inputs selectable as Voltage, Current, or Digital types 12-bit Analog to Digital (voltage, current) Inputs sampled every 1 ms Protected against shorts to Ground or +Vcc
Voltage Type	Range: 0 to 5 V, 0 to 10 V Resolution: 1 mV Accuracy: ±1% error
Current Type	Range: 0 to 20 mA, 4 mA to 20 mA Resolution: 1 µA Accuracy: ±1% error Current Sense Resistor: 124 Ω
Digital Type	Active High Amplitude: 0 to 36 Vdc
Universal Inputs	Four inputs selectable as Voltage, Current, Digital, Frequency, RPM, or PWM types 12-bit Analog to Digital (voltage, current) 15-bit timer (RPM, PWM, frequency) Protected against shorts to Ground or +Vcc
Voltage Type	Range: 0 to 1 V, 0 to 2.5 V, 0 to 5 V, 0 to 10 V Resolution: 1 mV Accuracy: ±1% error
Current Type	Range: 0 to 20 mA, 4 mA to 20 mA Resolution: 1 µA Accuracy: ±2% error Current Sense Resistor: 124 Ω
Digital Type	Active High or Active Low
Frequency and RPM Types	Range: 0.5 Hz to 50 Hz Resolution: 0.1 Hz Range: 10 Hz to 1 kHz Resolution: 0.1 Hz Range: 100 Hz to 10 kHz Resolution: 1 Hz Accuracy: ±1% error Impedance: 1 MΩ
PWM Type	Range: 0.5 Hz to 10 kHz Resolution: 0.01% Accuracy: ±1% error Impedance: 1 MΩ

Digital or PWM Inputs	Five inputs selectable as Digital, Frequency, or PWM types Digital Type: Active High; Amplitude: 0 to 36 Vdc; Configurable 10 kΩ pull-up or pull-down resistor Frequency Type: Range: 0.5 Hz to 10 kHz; Accuracy: ±1% error; Impedance: 1 MΩ PWM Type: Range: 0.5 Hz to 10 kHz; Accuracy: ±1% error; Impedance: 1 MΩ
Encoder Input	Two A and B signal encoder input pairs Frequency Input Range: 0.5 Hz to 20 kHz Accuracy: ± 0.5% error Active High Input Threshold Low to High: 3.5 V Hysteresis: Min. 0.5 V, Max. 1.5 V 10 kΩ pull-down resistor
Magnetic Pick-Up Input	One input Range: 0.5 Hz to 10 kHz Amplitude: 100 mV to 100 V RMS

Outputs

Outputs	4 isolated Analog outputs 2 Relay outputs Refer to Table 2.0 for details.

Table 2.0 – Outputs

Analog Outputs	Four isolated analog outputs as: Voltage or Current 16-bit Digital to Analog (voltage, current) Voltage Type: Range: -5 V to 5 V, 0 to 5 V, -10 V to 10 V, 0 to 10 V; Resolution: 1 mV; Accuracy: ±0.5% error Current Type: Range: 0 to 20 mA, 4 mA to 20 mA; Resolution: 0.5 µA; Accuracy: ±0.5% error
Relay Outputs	Two Relay outputs Max. 5 A, 250 V, NO contact
Protection	Protected against short circuit to Ground and +Vcc.

General Specifications

Microcontroller	STM32H723ZGT6, 32-bit, 1 Mbyte flash memory, 564 Kbytes SRAM
Isolation	400 Vdc Power, inputs, outputs, and CAN are isolated from each other.
Control Logic	Standard embedded software is provided. *(Application-specific control logic or factory programmed set point file on request)*
Communications	2 Isolated CAN ports (SAE J1939) Up to 400 V isolation
Baud Rate	CAN Baud rate: 250, 500, 667 kbit/s, 1 Mbit/s. Automatic baud rate detection.
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.
User Interface	Axiomatic Electronic Assistant P/Ns: **AX070502** or **AX070506K**
Operating Conditions	-40 to 85 °C (-40 to 185 °F)
Storage Temperature	-55 to 125 °C (-67 to 257°F)
Protection	IP67
Weight	1.29 lbs. (585 g)
Compliance	RoHS

Enclosure and Dimensions	High Temperature Nylon Enclosure (TE Deutsch P/N: EEC-5X650B) 5.67 in x 7.92 in x 2.15 in (144.0 mm x 201.3 mm x 54.6 mm) L x W x H including integral connector Refer to the dimensional drawing.
Installation	For mounting information, refer to the dimensional drawing. 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 0.25 inches (6.35 mm) thick. If the module is mounted without an enclosure, it should be mounted to reduce the likelihood of moisture entry. 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). Wires should be of the appropriate gauge to meet requirements of applicable electrical codes and suit the specifications of the connector. The module must be mounted in an enclosure in hazardous locations. All field wiring should be suitable for the operating temperature range of the module. All chassis grounding should go to a single ground point designated for the machine and all related equipment.
Electrical Connections	48-pin Connector (TE Deutsch P/N: **DT13-48PABCD-R015**)

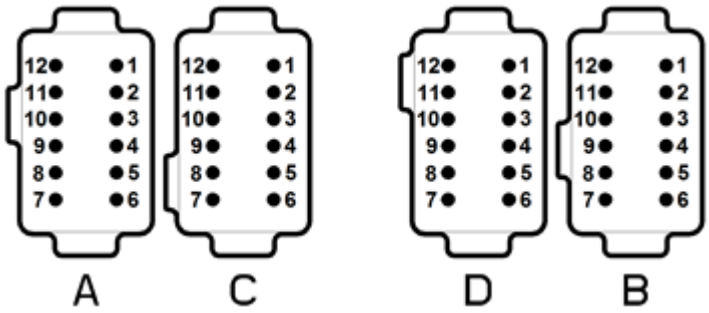


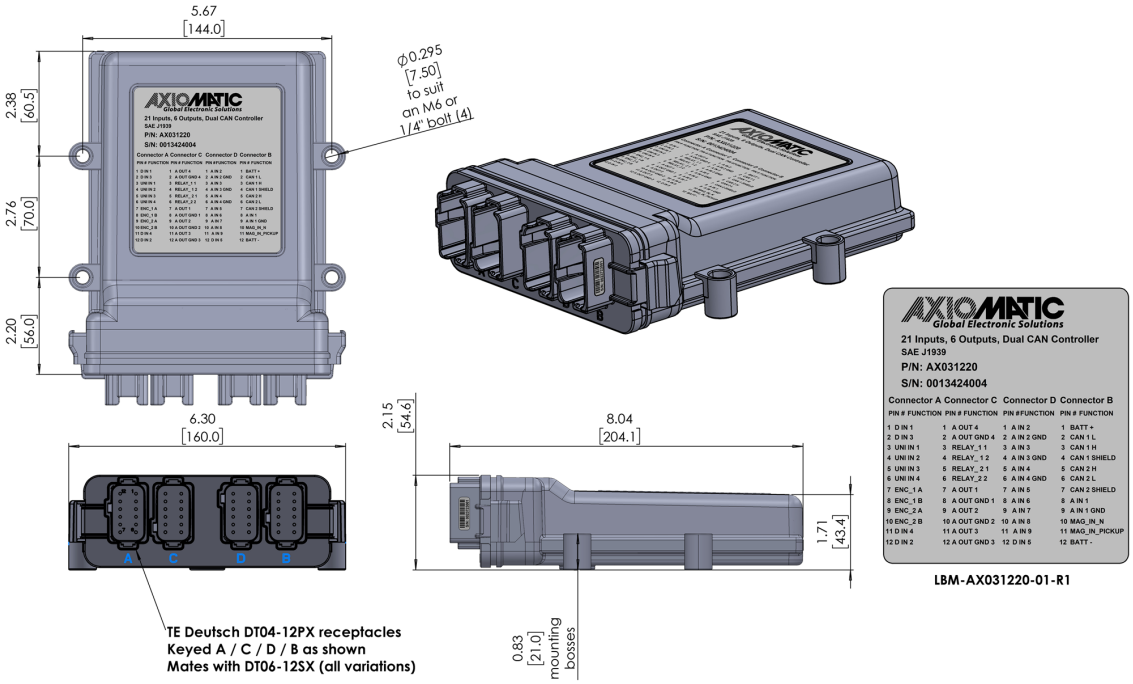
Table 3 - Electrical Pin Out

Connector A		Connector C	
Pin #	**Function**	**Pin #**	**Function**
1	Digital Input 1	1	Analog Output 4
2	Digital Input 3	2	Ground B
3	Universal Input 1	3	Relay Output 1_1
4	Universal Input 2	4	Relay Output 1_2
5	Universal Input 3	5	Relay Output 2_1
6	Universal Input 4	6	Relay Output 2_2
7	Encoder Input 1 A	7	Analog Output 1
8	Encoder Input 1 B	8	Ground B
9	Encoder Input 2 A	9	Analog Output 2
10	Encoder Input 2 B	10	Ground B
11	Digital Input 4	11	Analog Output 3
12	Digital Input 2	12	Ground B

Connector D		Connector B	
Pin #	**Function**	**Pin #**	**Function**
1	Analog Input 2	1	Battery +
2	Ground A	2	CAN 1 L
3	Analog Input 3	3	CAN 1 H
4	Ground A	4	CAN 1 Shield
5	Analog Input 4	5	CAN 2 H
6	Ground A	6	CAN 2 L
7	Analog Input 5	7	CAN 2 Shield
8	Analog Input 6	8	Analog Input 1
9	Analog Input 7	9	Ground A
10	Analog Input 8	10	Magnetic Input N
11	Analog Input 9	11	Magnetic Input P
12	Digital Input 5	12	Battery -

Mating Plugs	Mates with the following TE Deutsch P/N equivalents: DT06-12SA Plug, DT 12 Way A Key DT06-12SB Plug, DT 12 Way B Key DT06-12SC Plug, DT 12 Way C Key DT06-12SD Plug, DT 12 Way D Key A set of these mating plugs is available from Axiomatic under P/N: AX070123.

Dimensional Drawing



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