TECHNICAL DATASHEET #TDAX020530

7 INPUTS, 5 OUTPUTS VALVE CONTROLLER

Up to 4 Resistive, Digital, Analog, or PWM Command Inputs
1 Magnetic Pick-Up Sensor Input
2 PWM Inputs (Encoder)
5 Independent Proportional or On/Off Outputs
1 +5 V, 100 mA Reference Voltage
CAN (SAE J1939)
with Axiomatic Electronic Assistant
P/N: AX020530

Features:

- 5 independent outputs for hydraulic valves (0 to 2.5 A) are user selectable:
  - Proportional current
  - Hotshot digital
  - PWM duty cycle
  - Proportional voltage
  - On/off digital
- Provides 1 +5 V, 100 mA reference voltage to power an input device
- 7 command inputs from joysticks, sensors, switches, or engine ECMs are user selectable:
  - 4 analog (0-5 V, 0-10 V, 4-20 mA or 0-20 mA), resistive, digital, PWM, or frequency/RPM
  - 2 frequency/RPM, PWM signal, 16-bit counter, or digital
  - Magnetic Pick-Up sensor
- Robust 8 to 36 VDC power supply interface with reverse polarity protection
- Under and overvoltage, and reverse polarity protection provided
- Operational from -40°C to 85°C (-40°F to 185°F)
- CAN (SAE J1939) port with auto-baud-rate detection (or CANopen® in model AX020531)
- Easy configuration using Axiomatic Electronic Assistant
- Rugged IP67 enclosure
- CE/ UKCA marking

Applications:

- The controller is designed for harsh operating environments.
- Typical applications include industrial, off-highway (mobile), and marine applications for the control of hydraulic proportional poppet or spool valves.

Ordering Part Numbers:

7 inputs, 5 outputs valve controller, SAE J1939 with auto-baud-rate detection, P/N: **AX020530**

7 inputs, 5 outputs valve controller, CANopen®, P/N: **AX020531**

Accessories:
PL-DTM06-12SA-12SB Mating Plug KIT (includes 1 plug DTM06-12S, 1 plug DTM06-12SB, 2 wedgelocks W12S, 18 sealing plugs 0413-204-2005, 24 contacts 0462-201-20141)

Axiomatic Electronic Assistant Configuration KIT: **AX070502**, or **AX070506K**

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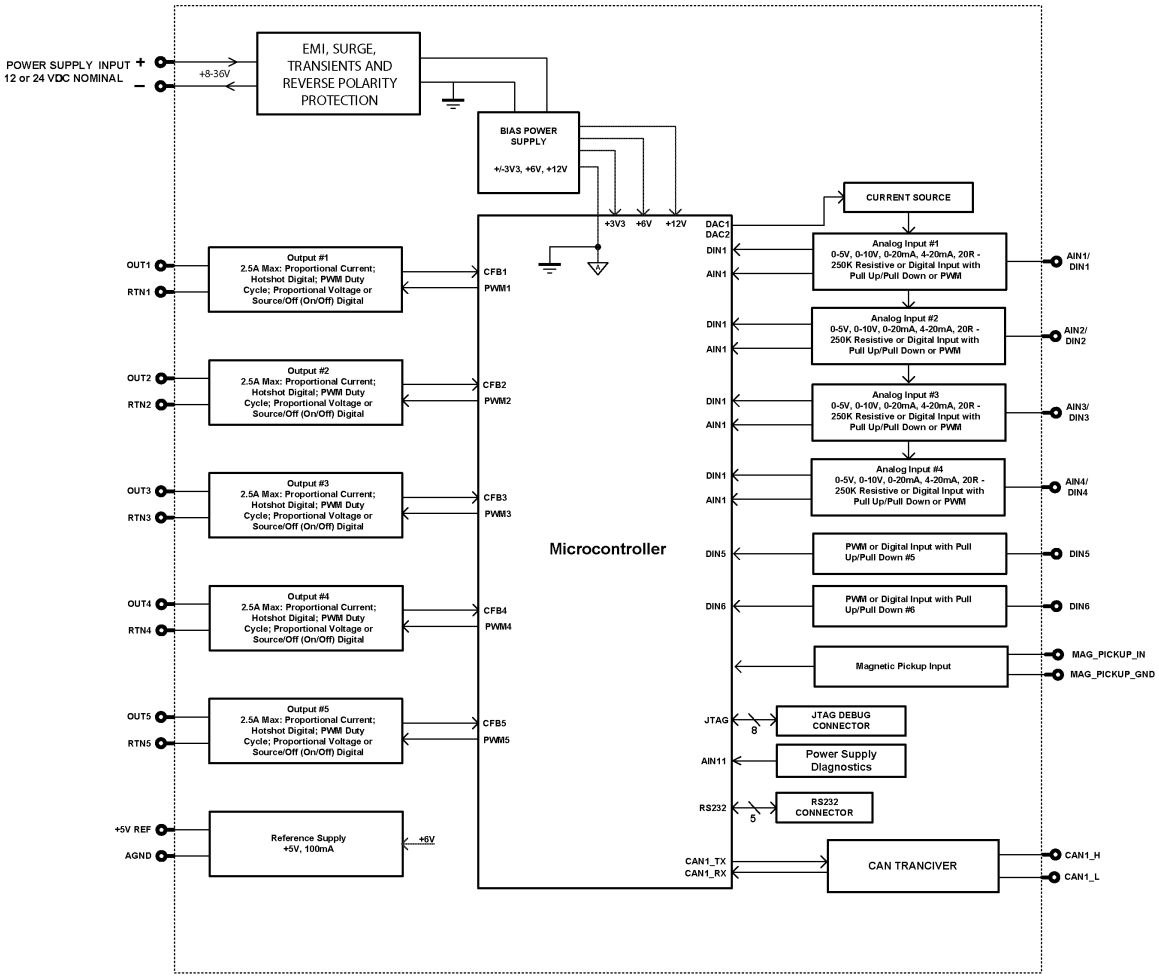
Description:

The valve controller provides precise, repeatable control of 5 proportional or on/off solenoids over an SAE J1939 network. PWM signal, frequency/RPM, or digital inputs as well as analog voltage, current, and resistive inputs are accepted for interface to a PLC, Engine Control Module (ECM), or command potentiometers. A Magnetic Pick-Up sensor input or interface with an encoder is also provided. Multiple switched inputs are provided to suit a range of applications. Each input can be configured to measure the input value and send the data to an SAE J1939 CAN network. In addition, any output on the controller could be configured to use any of the onboard inputs as either a control signal or an enable signal, instead of taking the control information from the CAN bus. Diagnostic messages are provided over the CAN network for the status of inputs or outputs. Settings are user configurable to suit many applications. Configuration is done via *Windows*-based Axiomatic Electronic Assistant.

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/.

Input

<table>
<tr><td>Power Supply Input</td><td>12 or 24VDC nominal (8 to 36 VDC range)
Note: The maximum total current draw permitted on the power supply input pins is 7.5 A @ 24 VDC, at one time.</td></tr>
<tr><td>Quiescent Current Draw</td><td>97 mA @ 12 VDC; 59 mA @ 24 VDC Typical</td></tr>
<tr><td>Reverse Polarity Protection</td><td>Provided up to 80 VDC</td></tr>
<tr><td>Surge and Transient Protection</td><td>Provided</td></tr>
<tr><td>Under-Voltage Protection</td><td>Provided (hardware shutdown @ 6 V)</td></tr>
<tr><td>Over-Voltage Protection</td><td>Provided (hardware shutdown @ 41 V)</td></tr>
<tr><td>All Inputs</td><td>Up to 7 inputs are selectable by the user from the following.
• 4 voltage, current, resistive, frequency, PWM, or digital
• 1 Magnetic Pick-Up sensor
• 2 PWM signal
All inputs, except for frequency and counter, are sampled every 10 ms.</td></tr>
<tr><td>Magnetic Pick-Up Sensor Input</td><td>1 input is configurable as the following.
• Frequency range: 0.5 Hz to 20000 Hz
• Amplitude: 100 mVAC to 100 VAC (RMS)</td></tr>
<tr><td>Minimum and Maximum Ratings</td><td>
<table>
<tr><th colspan="4">Table 1.0. Absolute Maximum and Minimum Ratings</th></tr>
<tr><th>Characteristic</th><th>Min</th><th>Max</th><th>Units</th></tr>
<tr><td>Power Supply</td><td>8</td><td>36</td><td>VDC</td></tr>
<tr><td>Voltage Input</td><td>0</td><td>36</td><td>VDC</td></tr>
<tr><td>Current Input</td><td>0</td><td>21</td><td>mA</td></tr>
<tr><td>Current Input – Voltage Level</td><td>0</td><td>12</td><td>VDC</td></tr>
<tr><td>Digital Type Input – Voltage Level</td><td>0</td><td>36</td><td>VDC</td></tr>
<tr><td>PWM Duty Cycle</td><td>0</td><td>100</td><td>%</td></tr>
<tr><td>PWM Frequency</td><td>1</td><td>20 000</td><td>Hz</td></tr>
<tr><td>PWM Voltage pk-pk</td><td>0</td><td>36</td><td>VDC</td></tr>
<tr><td>RPM Frequency</td><td>1</td><td>20 000</td><td>Hz</td></tr>
</table>
</td></tr>
<tr><td>Input Impedance</td><td>Voltage: 0-5 V range: 204 kΩ
0-10 V range: 136 kΩ

Current: 124 Ω

Resistive: 2 GΩ

PWM/Frequency/RPM: 1 MΩ</td></tr>
<tr><td>Input Accuracy and Resolution</td><td>
<table>
<tr><th colspan="3">Table 2.0. Input Accuracy</th></tr>
<tr><th>Input Type</th><th>Accuracy</th><th>Resolution</th></tr>
<tr><td>Voltage</td><td>±1%</td><td>1 mV</td></tr>
<tr><td>Current</td><td>±4%</td><td>1 µA</td></tr>
<tr><td>Resistive</td><td>±12%</td><td>0.1%</td></tr>
<tr><td>PWM</td><td>±0.16% (<5kHz)
±1% (>5kHz)</td><td>0.01%</td></tr>
<tr><td>Frequency/RPM</td><td>±1.5%</td><td>0.01%</td></tr>
</table>
</td></tr>
<tr><td>Analog Ground</td><td>1 analog ground connection is provided.</td></tr>
<tr><td>Reference Voltages</td><td>1 +5 V, 100 mA maximum
Regulation at ±0.5% accuracy is provided.</td></tr>
</table>

Output

<table>
<tr><td>All Outputs</td><td>High side (sourcing) up to 2.5 A
Half-bridge output, current sensing, grounded load
High frequency PWM

5 independent outputs (0 to 2.5 A) are user selectable as:
Disabled output
Proportional current (See Table 3.0)
Hotshot digital
PWM duty cycle (Outputs 1 to 4 run on the same output frequency. Output 5 can have a different frequency setting.)
Proportional voltage
On/off digital (Normal, inverse, latched, blinking logic are selectable.)
Outputs 1 & 3 share a timer, so they run on the same frequency.
Outputs 2 & 4 share a timer and run on the same frequency.

Current outputs: 1 mA resolution
Voltage outputs: 0.1 V resolution
PWM outputs: 0.1% resolution
Digital on/off: Sourcing from power supply or output off
(Note: Load at supply voltage must not draw more than 2.5 A)

Note: The maximum total current draw permitted on the power supply input pins is 7.5 A @ 24 VDC, at one time.

Table 3.0: Proportional Output Adjustments<table><tr><th>Adjustable Parameter</th><th>Description</th></tr><tr><td>Output Current Adjustments</td><td>0 to Imax (2.5 A)
Both minimum and maximum current settings are user configurable.</td></tr><tr><td>Superimposed Dither</td><td>Dither adjustments are configurable for each channel.
Dither Amplitude:
0 mA (factory default)
Adjustable from 0-500 mA
Dither Frequency:
200 Hz (factory default)
Adjustable from 50-400 Hz
Note: Outputs 1 to 4 run on the same dither frequency.</td></tr><tr><td>Ramp Rates</td><td>Ramp adjustments are configurable for each channel.
1,000 ms (default)
Adjustable from 0 to 10,000 ms</td></tr></table></td></tr>
<tr><td>Output Accuracy</td><td>Current outputs ±0.01%
Voltage outputs ±0.01%
PWM outputs ±0.02%</td></tr>
<tr><td>Protection</td><td>Overcurrent protection is provided on all outputs.
Short circuit protection is provided all outputs.</td></tr>
<tr><td>Error Conditions</td><td>If an error on the input is detected, the output of the controller shuts off.</td></tr>
</table>

General Specifications

Microcontroller	STM32F427VIT7
Communication	1 CAN port (SAE J1939) 250 kbit/s, 500 kbit/s, 667 kbit/s, 1 Mbit/s auto-baud-rate detection
Control Logic	Standard embedded software is provided and is configurable using the Axiomatic Electronic Assistant (EA). Setpoint configuration files can be saved and used to program additional controllers. (Application-specific control logic is available on request.) Refer to the User Manual UMAX020530.
Diagnostics	Refer to the User Manual.
User Interface	User configuration and diagnostics are provided with the Axiomatic Electronic Assistant KIT, P/N: **AX070502**, or **AX070506K**.
Network Termination	It is necessary to terminate the network with external termination resistors. The resistors are 120 Ω, 0.25 W minimum, metal film or similar type. They should be placed between CAN_H and CAN_L terminals at both ends of the network.

Compliance	CE/ UKCA marking
Vibration	MIL-STD-202G, Test 204G and 214A (Sine and Random) 12.5 g peak (Sine) 9.4 Grms peak (Random)
Operating Conditions	-40°C to 85°C (-40°F to 185°F)
Storage Temperature	-50°C to 125°C (-58°F to 257°F)
Weight	0.55 lb. (0.25 kg)
Protection	IP67; Unit is conformal coated within the housing.
Enclosure and Dimensions	High Temperature Nylon housing TE Deutsch equivalent Enclosure (EEC-325X4B) Flammability rating: UL 94 HB 4.677 in x 5.254 in x 1.417 in 118.80 mm x 133.45 mm x 35.99 mm (W x L x H excluding mating plug) Refer to Figure 1.0.
Electrical Connections	TE Deutsch DTM series equivalent 24-pin receptacle (DTM13-12PA-12PB-R008) Refer to Table 4.0.
Mating Connectors	Mating plugs kits are available on request and include TE Deutsch plugs DTM06-12SA and DTM06-12SB with 2 wedgelocks (WM12S), 18 sealing plugs (0413-204-2005) and 24 contacts (0462-201-20141). 20 AWG wire is recommended for use with contacts 0462-201-20141.

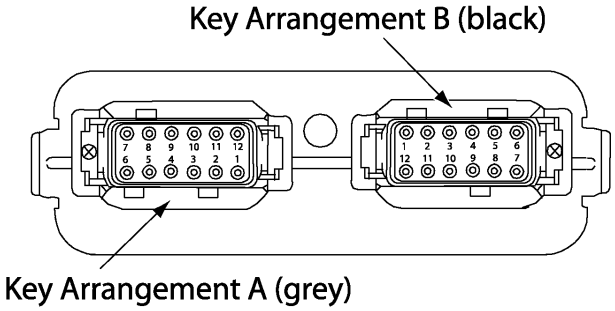


Table 4.0 – Pin-Out

Grey Connector		Black Connector	
Pin #	**Function**	**Pin #**	**Function**
1	BATT +	1	CAN H
2	Output 1	2	CAN L
3	Output 2	3	Universal Input 1
4	Output 3	4	Universal Input 2
5	Output 4	5	Universal Input 3
6	Output 5	6	Universal Input 4
7	Output 5 GND	7	Magnetic Pickup Sensor Input
8	Output 4 GND	8	Magnetic Pickup Sensor GND
9	Output 3 GND	9	Analog GND
10	Output 2 GND	10	+5 V Reference
11	Output 1 GND	11	PWM Input 1
12	BATT -	12	PWM Input 2

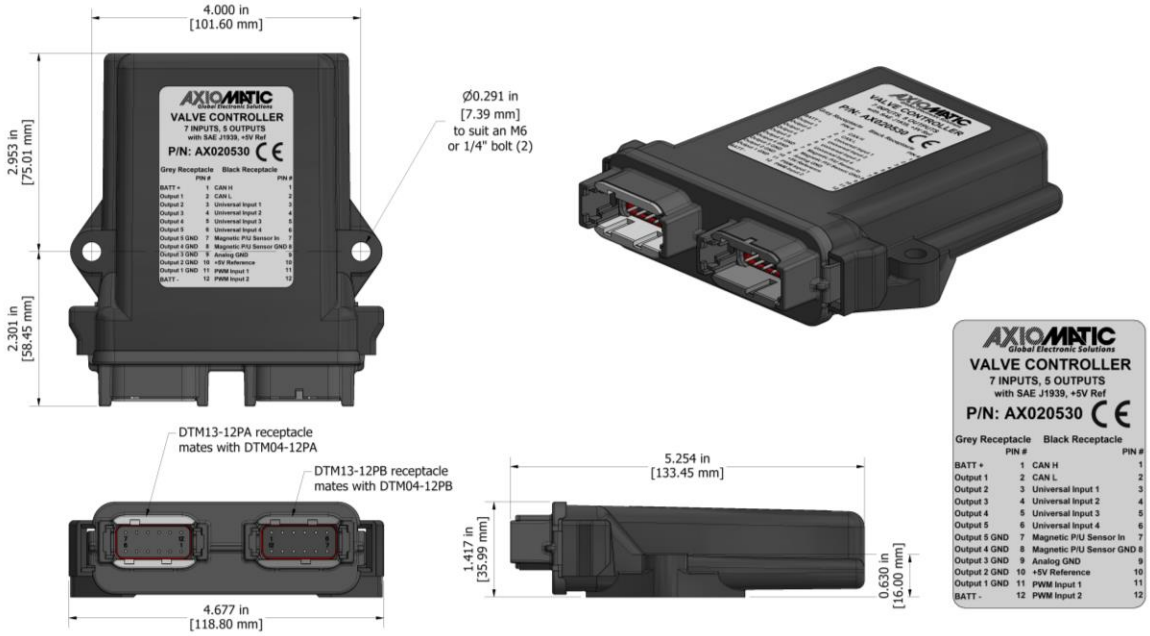


Figure 1.0 – Dimensional Drawing

Form: TDAX020530-07/28/23