TECHNICAL DATASHEET #TDAX070506K

AXIOMATIC ELECTRONIC ASSISTANT CONFIGURATION KIT III

for Configuration of Axiomatic SAE J1939 Controllers and Firmware Reflashing

P/N: AX070506K

Features

- Intended to provide communication link between a computer USB port and a CAN network to allow PC software to communicate with Axiomatic controls on the CAN network.
- Designed to be a drop-in replacement for the Axiomatic USB-CAN Converter, P/N AX070501, but with smaller enclosure and a faster USB port.

Description

The converter contains a high-speed USB 2.0 Type-C port (up to 480Mbit/s) and one DB9 high-speed CAN port with configurable baud rates up to 1Mbit/s. All standard and extended CAN frames, including data and remote frames, are supported. Galvanic isolation of the CAN port ensures no electrical interference between the PC and equipment connected to the CAN port. The converter is powered from the USB port. The internal state of the converter is displayed by an LED indicator on the housing. The industrial temperature range (-40°C to 85°C) is suitable for a field environment.

The converter uses a proprietary communication protocol and requires Axiomatic drivers to be installed on the user's PC. All software from the Axiomatic Electronic Assistant suite: Electronic Assistant (EA); CAN Assistant – Scope; and CAN Assistant – Visual; supports this converter. Axiomatic provides CAN Assistant – SDK (Software Development Kit) to support third-party software development.

The Axiomatic **Electronic Assistant** (EA) is a software configuration tool that runs on the *Windows*® operating system and is connected to a J1939 bus via a USB to CAN converter, AX070506. Upon being connected to the bus, the EA will find all Electronic Control Units (ECU) on the bus and recognize those manufactured by Axiomatic. Using this tool, a user can quickly configure an Axiomatic ECU for the desired performance over a wide variety of applications. Configurable properties of an Axiomatic ECU are divided into function blocks, namely Input Function Block, 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. Final setpoint configuration can be saved in a file which can be used to easily program the same configuration into another Controller.

Axiomatic **CAN Assistant – Scope** software monitors CAN messages in a text format and can send single frames to the CAN bus. It is useful for PC-based debugging of J1939, CANopen® or proprietary CAN devices. The Axiomatic **CAN Assistant – Visual** software presents J1939 application data in a user-friendly graphic and text format. The Axiomatic **CAN Assistant – SDK** is designed to allow independent software developers and system integrators to use Axiomatic USB-CAN Converter in their own applications.

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

Ordering Part Number

Axiomatic Electronic Assistant Configuration KIT III, P/N: **AX070506K**

The kit includes:

1. P/N: **AX070506**, USB to CAN Converter
2. P/N: **CBL-USB2.0AM-CM-S-1M**, Generic USB 2.0 Type-A to Type-C Cable, 1m (3 ft.)
3. **CAB-AX070501**, 12 in. (30 cm) CAN Cable with female DB-9 *(The cable is provided for test bench purposes only and is not intended for permanent machine installation.)*
4. Installation instructions to download the Axiomatic Electronic Assistant software, Axiomatic EA User Manual UMAX07050X, USB-CAN Converter User Manual UMAX070506, USB-CAN drivers & documentation, CAN Assistant (Scope and Visual) software & documentation, and the SDK (Software Development Kit) from the Axiomatic website www.axiomatic.com.

Optional Accessory:

5. P/N: **CBL-USB2.0CM-CM-S-1M**, Generic USB 2.0 Type-C to Type-C Cable, 1m (3 ft.)

Hardware Block Diagram

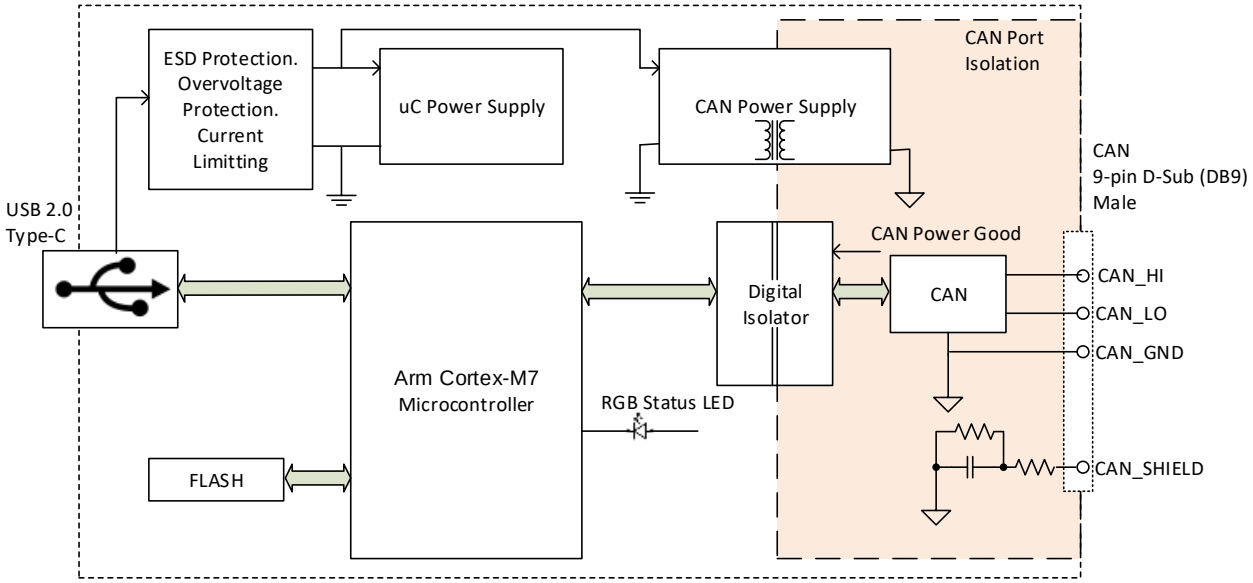


Figure 1 – Hardware Block Diagram for USB to CAN Converter, AX070506

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/.

General Specifications

Microcontroller	STM ARM Cortex-M7
LED Indicator	3-color RGB LED Displays the status of operation, USB, CAN, Bootloader Mode, etc. Refer to User Manual UMAX070506 for details.
Compliance	RoHS
Operating Temperature	-40°C to 85°C (-40°F to 185°F)
Weight	AX070506K KIT: 0.65 lb. (0.295 kg) USB to CAN Converter, AX070506: 0.30 lb. (0.136 kg)
Environmental Protection	IP40 (IEC 60529)
Dimensions	Hammond P/N: 1553WBGY ABS Plastic Enclosure with Soft Plastic Grip, UV stabilized, Flame Rating UL94-V-0 5.62 in x 3.11 in x 0.98 in (117 mm x 79 mm x 25 mm) L x W x H excluding DB-9 connector. Refer to Figure 2.

Dimensional Drawing

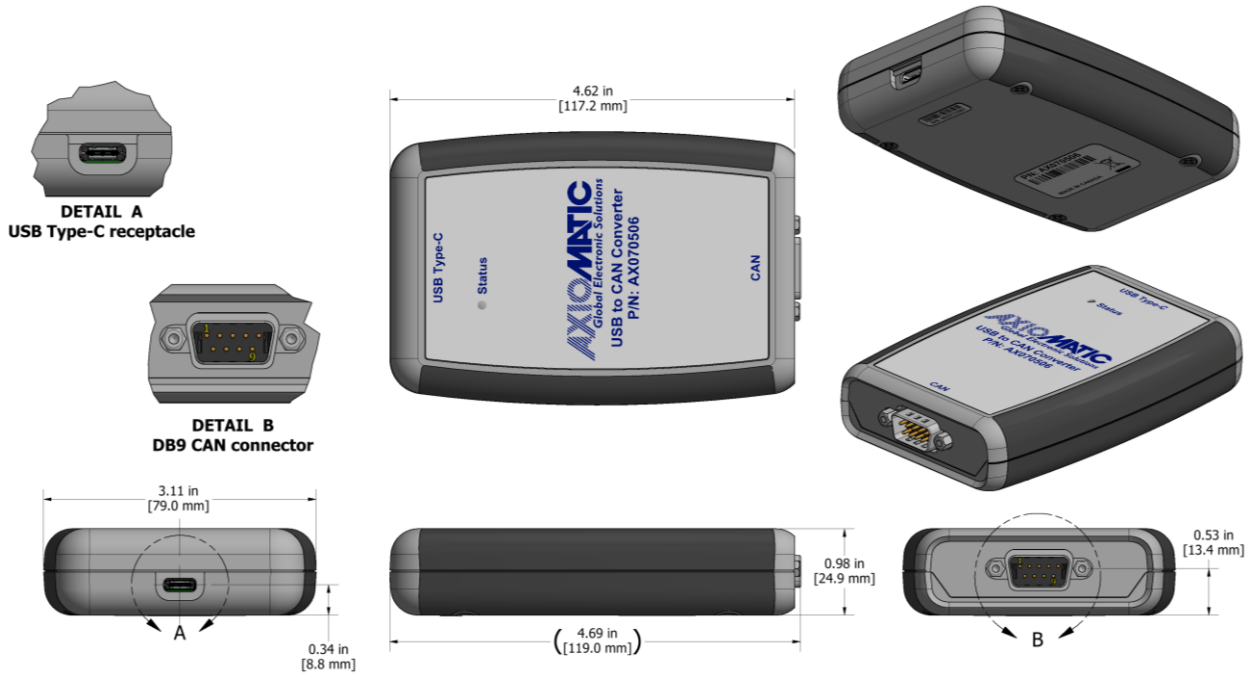


Figure 2 – AX070506 Dimensions

USB Port

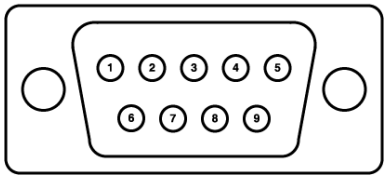
Parameter	Value	Remarks
USB Standard	USB 2.0 High-Speed (HS) or Full-Speed (FS)	Data rate: In HS - up to 480 Mb/s In FS - up to 12 Mb/s
Connector	USB Type-C receptacle	USB 2.0 Type-C
Supply Voltage	4.3 V to 5.5 V	5 V nominal Provided by USB port
Supply Current	100 mA / 300 mA	Current limit in Non-Configured / Configured states
	150 mA	Maximum steady current in Configured state at 5 V
	2.5 mA	Maximum current in Suspended state at 5 V
Overvoltage Protection	22 V	Maximum overvoltage protection voltage
ESD Protection	±8 kV / ±15 kV	IEC 61000-4-2, Contact / Air, Data lines
	±30 kV	IEC 61000-4-2, Contact, Power lines
Communication Protocol	Proprietary[1]	Supported by Axiomatic Electronic Assistant (EA) suite. *Windows* drivers and SDK are provided.

[1]Described in O. Bogush, "USB to CAN Converter Communication Protocol. Document version: 3," Axiomatic Technologies Corporation, April 12, 2022.

CAN Port

Parameter	Value	Remarks
Number of Ports	1	Galvanically isolated
Port Isolation	400 VAC 3 kV DC	Functional isolation, IEC 60950-1 Isolation withstand voltage, 1 minute
ESD Protection	±15 kV	IEC 61000-4-2, contact
Maximum Bus Fault Voltage	±32 V	Maximum steady-state voltage on the CAN bus the transceiver can tolerate
Common Voltage	±30 V	Maximum receiver common mode input voltage
Connector	9-pin D-sub (DB9), Male	DIN 41652, IEC 60807-3
Pinout	CANopen®	CIA 303-1
Port Type	High Speed, ISO 11898-2 compatible	Connected to 120 Ω terminated twisted pair, baud rate up to 1 Mbit/s. External 120 Ω terminating resistor is required. Shield connection is provided if shielded cable is used.
Baud Rate	1000, 800, 667, 500, 250, 125, 100, 50, 20, 10 or a custom value	kbit/s
Protocol	CAN Bosch 2.0A and 2.0B	Data frames and remote frames with Standard and Extended IDs are supported

Connections and Accessories

<table>
<tr><td>USB-A to USB-C
Configuration Cable</td><td>Generic USB 2.0 Type-C to Type-C Cable, 1 m (3 ft.)
P/N: CBL-USB2.0AM-CM-S-1M (included in the KIT AX070506K)</td></tr>
<tr><td>USB-C to USB-C
Configuration Cable</td><td>Generic USB 2.0 Type-C to Type-C Cable, 1 m (3 ft.)
P/N: CBL-USB2.0CM-CM-S-1M (optional)</td></tr>
<tr><td>CAB-AX070501
CAN Configuration Cable</td><td>Cable with female DB-9 and three loose CAN wires, 12 in (30 cm)
The wires have the following marking:
<table>
<tr><th>Color</th><th>Description</th></tr>
<tr><td>Green (or Red)</td><td>CAN_L</td></tr>
<tr><td>Yellow (or White)</td><td>CAN_H</td></tr>
<tr><td>Black</td><td>CAN_GND</td></tr>
</table>
This is a temporary cable for initial configuration and is not suitable for use during machine operation. It is provided for evaluation purposes only. The user is responsible for connecting the converter to the CAN network using a reliable wire harness with electrical parameters compatible with the CAN network.</td></tr>
<tr><td>Mating CAN Connector</td><td>9-pin D-Sub (DB-9), male connector
<table>
<tr><th>Pin #</th><th>Description</th></tr>
<tr><td>1, 4, 6, 8, 9</td><td>Not Connected</td></tr>
<tr><td>2</td><td>CAN_L</td></tr>
<tr><td>3</td><td>CAN_GND</td></tr>
<tr><td>5</td><td>CAN_SHIELD</td></tr>
<tr><td>7</td><td>CAN_H</td></tr>
</table>

</td></tr>
</table>

Software

<table>
<tr><td>Drivers, Firmware Updater, and SDK</td><td>The converter uses a proprietary communication protocol and requires Axiomatic drivers to be installed on the user's PC.

The following Windows software is used together with the USB to CAN converter and available for download from Axiomatic website www.axiomatic.com. Contact sales@axiomatic.com for the password.

1. USBCANDrivers, USB-CAN Converter Drivers

2. USB-CAN Converter Firmware Updater

3. CAN Assistant – SDK (Software Development Kit)</td></tr>
<tr><td>Axiomatic Electronic Assistant Software</td><td>The following software and documentation can be downloaded from the Axiomatic website www.axiomatic.com. Contact sales@axiomatic.com for the password.

1. Axiomatic Electronic Assistant (EA) and its user manual (UMAX07050X)
EA runs on any modern PC with the Windows® 10 or higher operating system. It comes with a royalty-free license for use.

2. USB-CAN drivers & documentation:

3. CAN Assistant – Scope software & documentation
This software monitors CAN messages in a text format.

4. CAN Assistant – Visual software & documentation
This software graphs J1939 application messages in real time.

5. CAN Assistant – SDK (Software Development Kit) & documentation for Windows® operating system</td></tr>
</table>

Installation and Use

For more details on installation and use, refer to the user manual, UMAX070506.

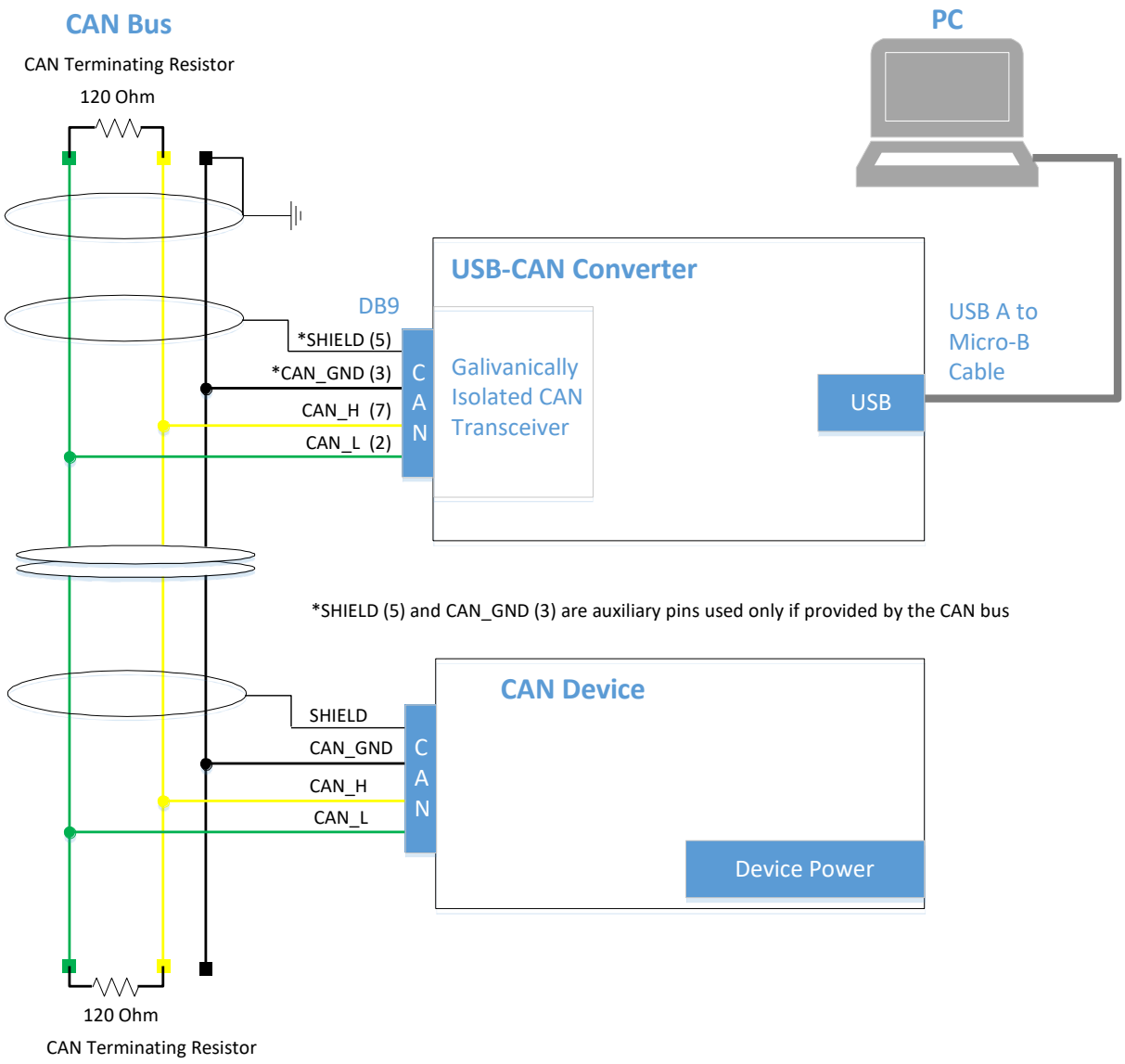


Figure 3 - Connecting Axiomatic USB to CAN Converter AX070506 to a CAN Bus

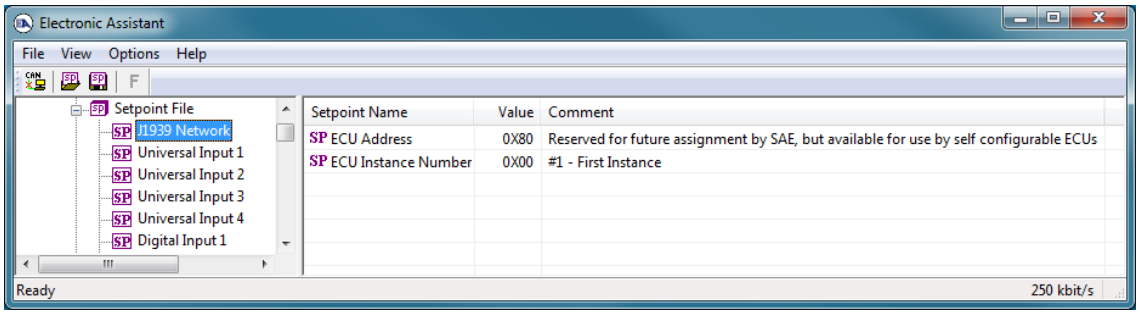


Figure 4 – Configuring an Axiomatic Controller for ECU Instance Number and Address using the Axiomatic Electronic Assistant

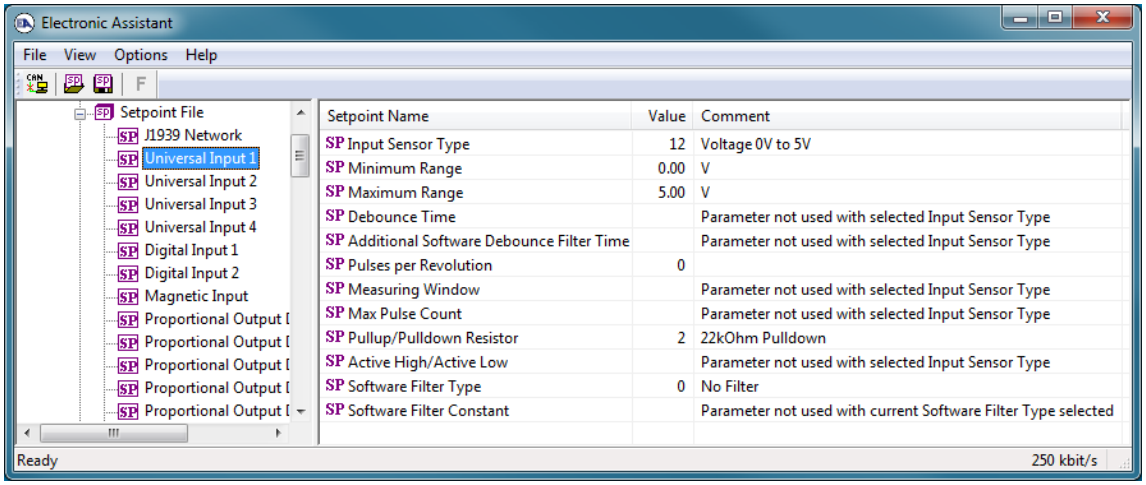


Figure 5 – Configuring an Axiomatic Controller's Universal Signal Inputs using the Axiomatic Electronic Assistant

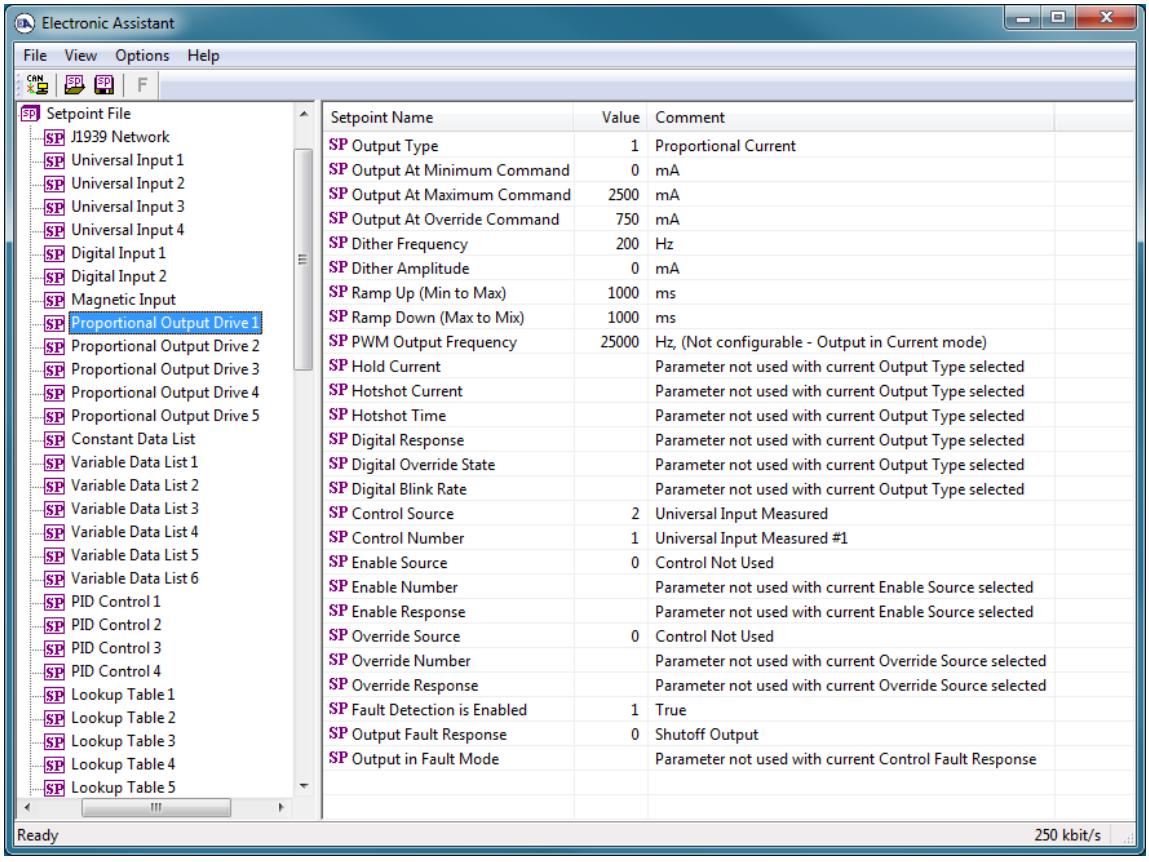
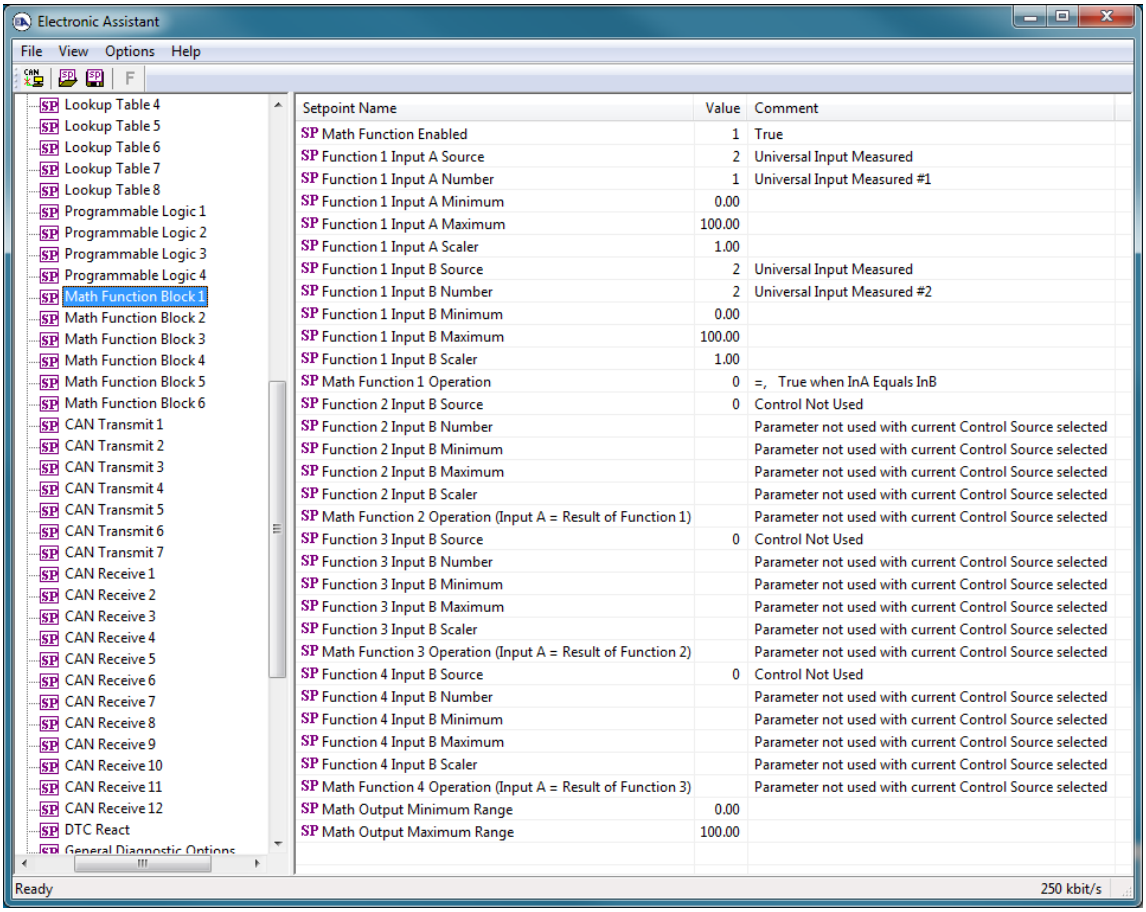


Figure 6 – Configurating an Axiomatic Controller's Outputs using the Axiomatic Electronic Assistant



Setpoint Name	Value	Comment
SP Math Function Enabled	1	True
SP Function 1 Input A Source	2	Universal Input Measured
SP Function 1 Input A Number	1	Universal Input Measured #1
SP Function 1 Input A Minimum	0.00	
SP Function 1 Input A Maximum	100.00	
SP Function 1 Input A Scaler	1.00	
SP Function 1 Input B Source	2	Universal Input Measured
SP Function 1 Input B Number	2	Universal Input Measured #2
SP Function 1 Input B Minimum	0.00	
SP Function 1 Input B Maximum	100.00	
SP Function 1 Input B Scaler	1.00	
SP Math Function 1 Operation	0	=, True when InA Equals InB
SP Function 2 Input B Source	0	Control Not Used
SP Function 2 Input B Number		Parameter not used with current Control Source selected
SP Function 2 Input B Minimum		Parameter not used with current Control Source selected
SP Function 2 Input B Maximum		Parameter not used with current Control Source selected
SP Function 2 Input B Scaler		Parameter not used with current Control Source selected
SP Math Function 2 Operation (Input A = Result of Function 1)		Parameter not used with current Control Source selected
SP Function 3 Input B Source	0	Control Not Used
SP Function 3 Input B Number		Parameter not used with current Control Source selected
SP Function 3 Input B Minimum		Parameter not used with current Control Source selected
SP Function 3 Input B Maximum		Parameter not used with current Control Source selected
SP Function 3 Input B Scaler		Parameter not used with current Control Source selected
SP Math Function 3 Operation (Input A = Result of Function 2)		Parameter not used with current Control Source selected
SP Function 4 Input B Source	0	Control Not Used
SP Function 4 Input B Number		Parameter not used with current Control Source selected
SP Function 4 Input B Minimum		Parameter not used with current Control Source selected
SP Function 4 Input B Maximum		Parameter not used with current Control Source selected
SP Function 4 Input B Scaler		Parameter not used with current Control Source selected
SP Math Function 4 Operation (Input A = Result of Function 3)		Parameter not used with current Control Source selected
SP Math Output Minimum Range	0.00	
SP Math Output Maximum Range	100.00	

Figure 7 – Configuring an Axiomatic Controller's Math Function Block using the Axiomatic Electronic Assistant

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