

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.

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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.

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

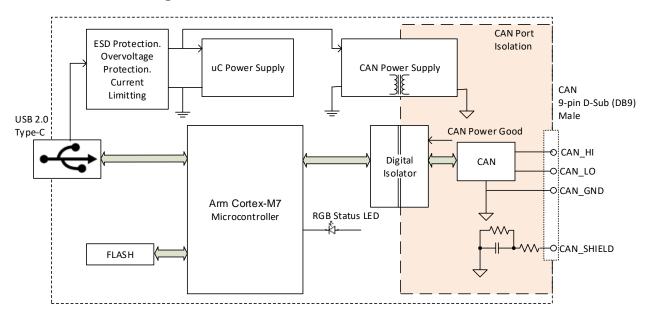


Figure 1 – Hardware Block Diagram for USB to CAN Converter, AX070506

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/.

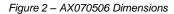
General Specifications

| 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. |

Optional Accessory:

Dimensional Drawing





USB Port

| Parameter Value | | Remarks | | | |
|------------------------|----------------------------|---|--|--|--|
| USB Standard | USB 2.0 High-Speed (HS) or | Data rate: | | | |
| | Full-Speed (FS) | 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. | | | |

¹Described 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 | Functional isolation, IEC 60950-1 | | | |
| | 3 kV DC | 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 | Connected to 120 Ω terminated twisted pair, baud rate up to | | | |
| | compatible | 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, | kbit/s | | | |
| | 100, 50, 20, 10 or a custom | | | | |
| | value | | | | |
| Protocol | CAN Bosch 2.0A and 2.0B | Data frames and remote frames with Standard and Extended | | | |
| | | IDs are supported | | | |

Connections and Accessories

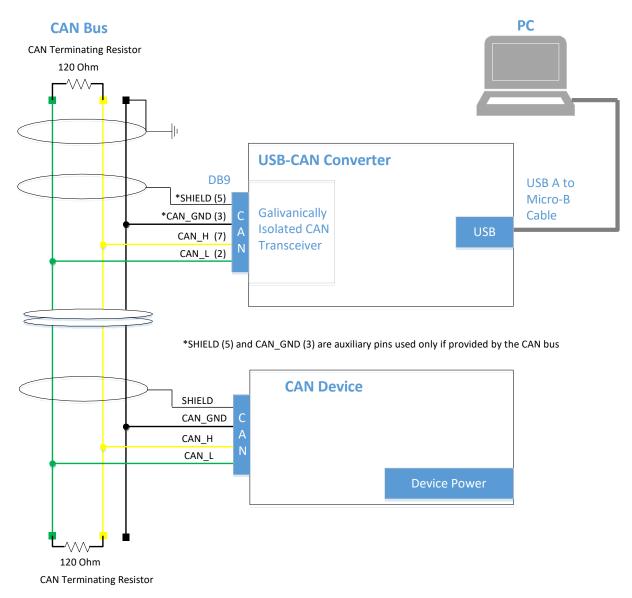
| Connections and Acces | | | | | |
|---|---|---|---------------------|--|--|
| USB-A to USB-C Configuration Cable | Generic USB 2.0 Type-C to Type-C Cable, 1 m (3 ft.) P/N: CBL-USB2.0AM-CM-S-1M (included in the KIT AX070506K) | | | | |
| USB-C to USB-C Configuration Cable | Generic USB 2.0 Type-C to Type-C Cable, 1 m (3 ft.) P/N: CBL-USB2.0CM-CM-S-1M (optional) | | | | |
| CAB-AX070501 CAN Configuration Cable | Cable with female DB- The wires have the foll | 9 and three loose CAN wi lowing marking: | ires, 12 in (30 cm) | | |
| | Color | Description | | | |
| | Green (or Red) | CAN_L | | | |
| | Yellow (or White) | CAN_H | | | |
| | Black | CAN_GND | | | |
| | 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 th converter to the CAN network using a reliable wire harness with electrical parameters compatible with the CAN network. | | | | |
| Mating CAN Connector | 9-pin D-Sub (DB-9), m | ale connector | | | |
| | Pin # | Description | | | |
| | 1, 4, 6, 8, 9 | Not Connected | | | |
| | 2 | CAN_L | │ | | |
| | 3 | CAN_GND | | | |
| | 5 | CAN_SHIELD | | | |
| | 7 | CAN_H | | | |

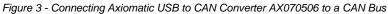
Software

| Juliwale | |
|--|---|
| Drivers, Firmware Updater, and SDK | 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 <u>www.axiomatic.com</u> . Contact <u>sales@axiomatic.com</u> for the password. |
| | 1. USBCANDrivers, USB-CAN Converter Drivers |
| | 2. USB-CAN Converter Firmware Updater |
| | 3. CAN Assistant – SDK (Software Development Kit) |
| Axiomatic Electronic Assistant Software | The following software and documentation can be downloaded from the Axiomatic website <u>www.axiomatic.com</u> . Contact <u>sales@axiomatic.com</u> for the password. |
| | 1. Axiomatic Electronic Assistant (EA) and its user manual (UMAX07050X) EA runs on any modern PC with the <i>Windows</i> ® 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. |
| | CAN Assistant – Visual software & documentation This software graphs J1939 application messages in real time. |
| | 5. CAN Assistant – SDK (Software Development Kit) & documentation for <i>Windows</i> ® operating system |

Installation and Use

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





| Electronic Assistant | | | | |
|--|---|---|------|--|
| File View Options Help | | | | |
| Setpoint File 57 1939 Network 57 Universal Input 1 57 Universal Input 2 57 Universal Input 3 57 Universal Input 4 57 Digital Input 1 | • | Setpoint Name SP ECU Address SP ECU Instance Number | 0X80 | Comment Reserved for future assignment by SAE, but available for use by self configurable ECUs #1 - First Instance |
| Ready | | | | 250 kbit/s |

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

| ile View | Options Help | | | |
|----------|----------------------------|---|-------|--|
| 📴 🔛 I | P F | | | |
| - | 🗊 Setpoint File 🦯 | Setpoint Name | Value | Comment |
| | SP Universal Input 1 | SP Input Sensor Type | 12 | Voltage 0V to 5V |
| | JI CHITCHIGHT PUT | SP Minimum Range | 0.00 | V |
| | SP Universal Input 2 | SP Maximum Range | 5.00 | V |
| | SP Universal Input 4 | SP Debounce Time | | Parameter not used with selected Input Sensor Type |
| | SP Digital Input 1 | SP Additional Software Debounce Filter Time | | Parameter not used with selected Input Sensor Type |
| | SP Digital Input 2 | SP Pulses per Revolution | 0 | |
| | SP Magnetic Input | SP Measuring Window | | Parameter not used with selected Input Sensor Type |
| | SP Proportional Output [| SP Max Pulse Count | | Parameter not used with selected Input Sensor Type |
| | SP Proportional Output [| SP Pullup/Pulldown Resistor | 2 | 22kOhm Pulldown |
| | | SP Active High/Active Low | | Parameter not used with selected Input Sensor Type |
| | | SP Software Filter Type | 0 | No Filter |
| | SP Proportional Output [🔻 | SP Software Filter Constant | | Parameter not used with current Software Filter Type selecte |
| | 4 111 | | | |

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

| View Options Help | | | |
|--|-----------------------------------|-------|--|
| : 🕮 🔛 F | _ | | |
| Setpoint File | Setpoint Name | Value | Comment |
| SP J1939 Network | SP Output Type | 1 | Proportional Current |
| SP Universal Input 1 | SP Output At Minimum Command | 0 | mA |
| SP Universal Input 2 SP Universal Input 3 | SP Output At Maximum Command | 2500 | mA |
| sp Universal Input 3 | SP Output At Override Command | 750 | mA |
| SP Digital Input 1 | SP Dither Frequency | 200 | Hz |
| P Digital Input 2 | SP Dither Amplitude | 0 | mA |
| P Magnetic Input | SP Ramp Up (Min to Max) | 1000 | ms |
| Proportional Output Drive 1 | SP Ramp Down (Max to Mix) | 1000 | ms |
| SP Proportional Output Drive 2 | SP PWM Output Frequency | 25000 | Hz, (Not configurable - Output in Current mode) |
| SP Proportional Output Drive 3 | SP Hold Current | | Parameter not used with current Output Type selected |
| SP Proportional Output Drive 4 | SP Hotshot Current | | Parameter not used with current Output Type selected |
| SP Proportional Output Drive 5 | SP Hotshot Time | | Parameter not used with current Output Type selected |
| SP Constant Data List | SP Digital Response | | Parameter not used with current Output Type selected |
| SP Variable Data List 1 | SP Digital Override State | | Parameter not used with current Output Type selected |
| Variable Data List 2 | SP Digital Blink Rate | | Parameter not used with current Output Type selected |
| 😰 Variable Data List 3 | SP Control Source | 2 | Universal Input Measured |
| P Variable Data List 4 | SP Control Number | 1 | Universal Input Measured #1 |
| P Variable Data List 5 | SP Enable Source | 0 | Control Not Used |
| P Variable Data List 6 | SP Enable Number | | Parameter not used with current Enable Source selected |
| PID Control 1 | SP Enable Response | | Parameter not used with current Enable Source selected |
| PID Control 2 PID Control 3 | SP Override Source | 0 | Control Not Used |
| SP PID Control 3 SP PID Control 4 | SP Override Number | | Parameter not used with current Override Source selected |
| SP Lookup Table 1 | SP Override Response | | Parameter not used with current Override Source selected |
| P Lookup Table 2 | SP Fault Detection is Enabled | 1 | True |
| P Lookup Table 3 | SP Output Fault Response | 0 | Shutoff Output |
| P Lookup Table 4 | SP Output in Fault Mode | | Parameter not used with current Control Fault Response |
| P Lookup Table 5 | * | | |

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

|) Electronic Assistant | | | | |
|--|----|---|--------|---|
| ile View Options Help | | | | |
| 🕒 📴 🖺 🛛 F | | | | |
| SP Lookup Table 4 | * | Setpoint Name | Value | Comment |
| | | SP Math Function Enabled | 1 | True |
| SP Lookup Table 6 | | SP Function 1 Input A Source | 2 | Universal Input Measured |
| SP Lookup Table 7 | | SP Function 1 Input A Number | | Universal Input Measured #1 |
| SP Lookup Table 8 | | SP Function 1 Input A Minimum | 0.00 | |
| | | SP Function 1 Input A Maximum | 100.00 | |
| | | SP Function 1 Input A Scaler | 1.00 | |
| <u>SP</u> Programmable Logic 3 <u>SP</u> Programmable Logic 4 | | SP Function 1 Input B Source | 2 | Universal Input Measured |
| SP Math Function Block 1 | | SP Function 1 Input B Number | | Universal Input Measured #2 |
| SP Math Function Block 2 | | SP Function 1 Input B Minimum | 0.00 | |
| SP Math Function Block 3 | | SP Function 1 Input B Maximum | 100.00 | |
| SP Math Function Block 4 | | SP Function 1 Input B Scaler | 1.00 | |
| SP Math Function Block 5 | | SP Math Function 1 Operation | 0 | =, True when InA Equals InB |
| SP Math Function Block 6 | | SP Function 2 Input B Source | | Control Not Used |
| SP CAN Transmit 1 | | SP Function 2 Input B Number | | Parameter not used with current Control Source selected |
| SP CAN Transmit 2 | | SP Function 2 Input B Minimum | | Parameter not used with current Control Source selected |
| SP CAN Transmit 3 | | SP Function 2 Input B Maximum | | Parameter not used with current Control Source selected |
| SP CAN Transmit 4 | | SP Function 2 Input B Scaler | | Parameter not used with current Control Source selected |
| SP CAN Transmit 5 | | SP Math Function 2 Operation (Input A = Result of Function 1) | | Parameter not used with current Control Source selected |
| SP CAN Transmit 6 | = | SP Function 3 Input B Source | 0 | Control Not Used |
| SP CAN Transmit 7 | | SP Function 3 Input B Number | | Parameter not used with current Control Source selected |
| SP CAN Receive 1 | | SP Function 3 Input B Minimum | | Parameter not used with current Control Source selected |
| SP CAN Receive 2 | | SP Function 3 Input B Maximum | | Parameter not used with current Control Source selected |
| SP CAN Receive 3 | | SP Function 3 Input B Scaler | | Parameter not used with current Control Source selected |
| SP CAN Receive 4 | | SP Math Function 3 Operation (Input A = Result of Function 2) | | Parameter not used with current Control Source selected |
| SP CAN Receive 5 | | SP Function 4 Input B Source | 0 | Control Not Used |
| SP CAN Receive 7 | | SP Function 4 Input B Number | | Parameter not used with current Control Source selected |
| SP CAN Receive 8 | | SP Function 4 Input B Minimum | | Parameter not used with current Control Source selected |
| SP CAN Receive 9 | | SP Function 4 Input B Maximum | | Parameter not used with current Control Source selected |
| SP CAN Receive 10 | | SP Function 4 Input B Scaler | | Parameter not used with current Control Source selected |
| SP CAN Receive 11 | | SP Math Function 4 Operation (Input A = Result of Function 3) | | Parameter not used with current Control Source selected |
| SP CAN Receive 12 | | SP Math Output Minimum Range | 0.00 | |
| SP DTC React | | SP Math Output Maximum Range | 100.00 | |
| General Diagnostic Ontions | Ψ. | | | |
| ady | P | | | 250 kbit/s |

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

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