

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

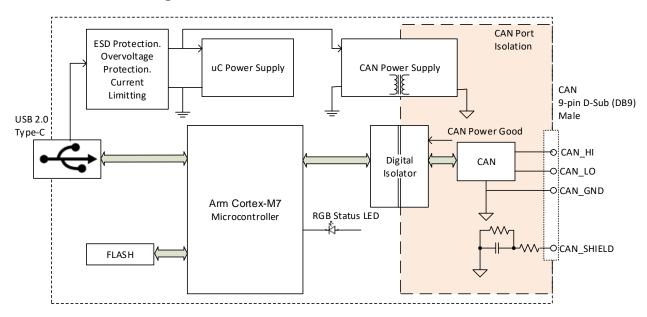


Figure 1 – Hardware Block Diagram for USB to CAN Converter, AX070506

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/.

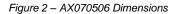
General Specifications

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

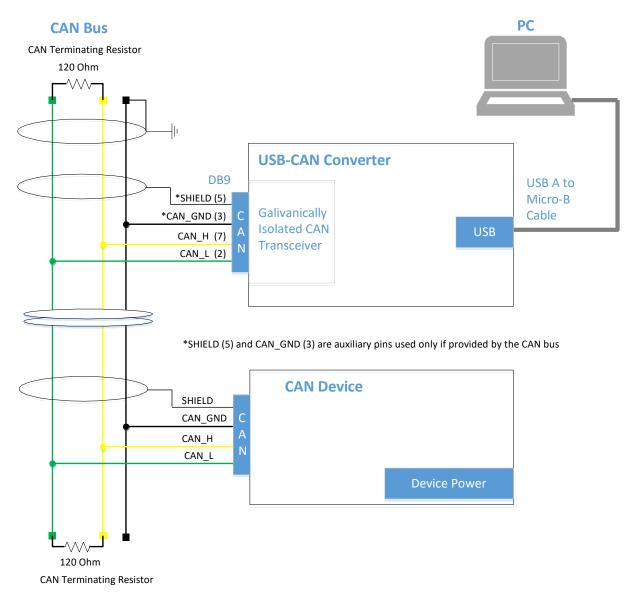
Connections and Acces					
USB-A to USB-C Configuration Cable	Generic USB 2.0 Type-C to Type-C Cable, 1 m (3 ft.) P/N: CBL-USB2.0AM-CM-S-1M (included in the KIT AX070506K)				
USB-C to USB-C Configuration Cable	Generic USB 2.0 Type-C to Type-C Cable, 1 m (3 ft.) P/N: CBL-USB2.0CM-CM-S-1M (optional)				
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			

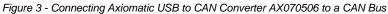
Software

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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

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-	🗊 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			
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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

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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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