User Manual AX140510
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USER MANUAL

Protocol Converter

with J1939 & J2497

P/N: AX140510

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ACRONYMS

CAN	Controller Area Network
EA	Electronic Assistant
MID	Message Identification
MSB	Most Significant Byte (or Bit)
PID	Parameter Identification Character
PLC	Power Line Communications
RO	Read Only Object
RW	Read/Write Object
SID	Sub-system Identification Number
WO	Write Only Object

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1. INTRODUCTION

This user manual outlines the general configuration and operation of the AX140510 Protocol Converter. The AX140510 Protocol Converter has a CAN interface supporting J1939 messaging and a PLC transceiver for implementing J2497 Power Line Communications.

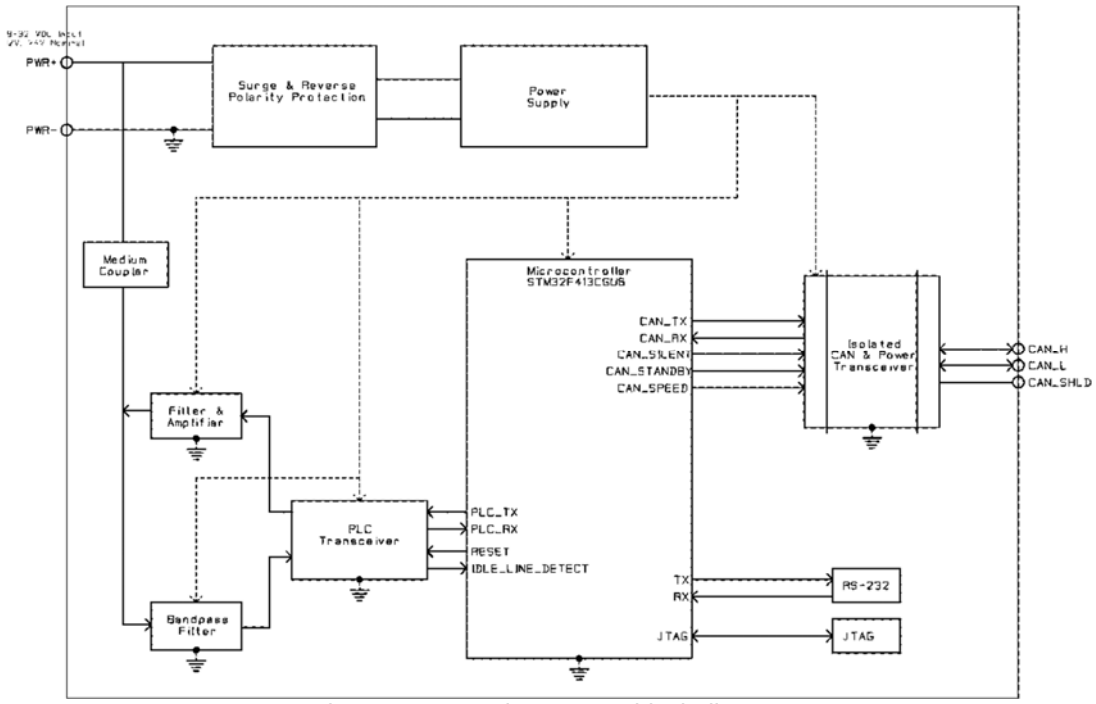


Figure 1: Protocol Converter block diagram

2. PROTOCOL CONVERTER USER INTERFACE

The Protocol Converter can be configured using the Electronic Assistant (EA) tool from Axiomatic Technologies. In general, the configuration should be done using the most recent version of Electronic Assistant (can be downloaded from www.axiomatic.com).

The main network configuration options include setting CAN communication parameters (baud rate, etc.). From communication protocol point of view, both J1939 and J2497 receive and transmit configurations and diagnostics can be defined.

The message routing can be configured rather freely. The Protocol Converter can be also configured to actively request data from remote J1939 and J2497 nodes.

3. CONFIGURATION USING ELECTRONIC ASSISTANT

The following sections describe the different configuration options in detail.

3.1 *J1939 Network Parameters*

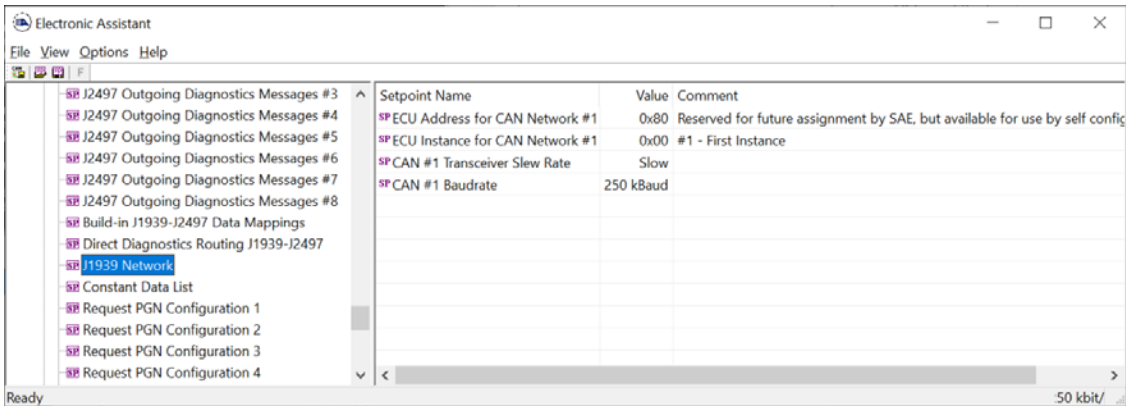


Figure 2: J1939 network parameters

The J1939 Network Parameters consist of *ECU Instance*, *ECU Address* and *CAN Transceiver Slew Rate* settings. Also, a custom baud rate for J1939 interface can be set (available selections include 250k, 500k and 1000k).

Note, if ECU Instance/Address parameters are changed, the Protocol Converter will restart its communication functionality. New baud rate will be taken into use at next boot up.

3.1.1 Note on J1939 network baud rate setting

The Protocol Converter device supports configurable baud rate on its J1939 interface. The new baud rate will be taken into use on next boot-up.

The AX140510 is also auto-baud rate capable. The current baud rate used by the auto-baud rate function will be shown in the *CAN #1 Baudrate* setpoint.

3.2 *CAN Output Message Specification*

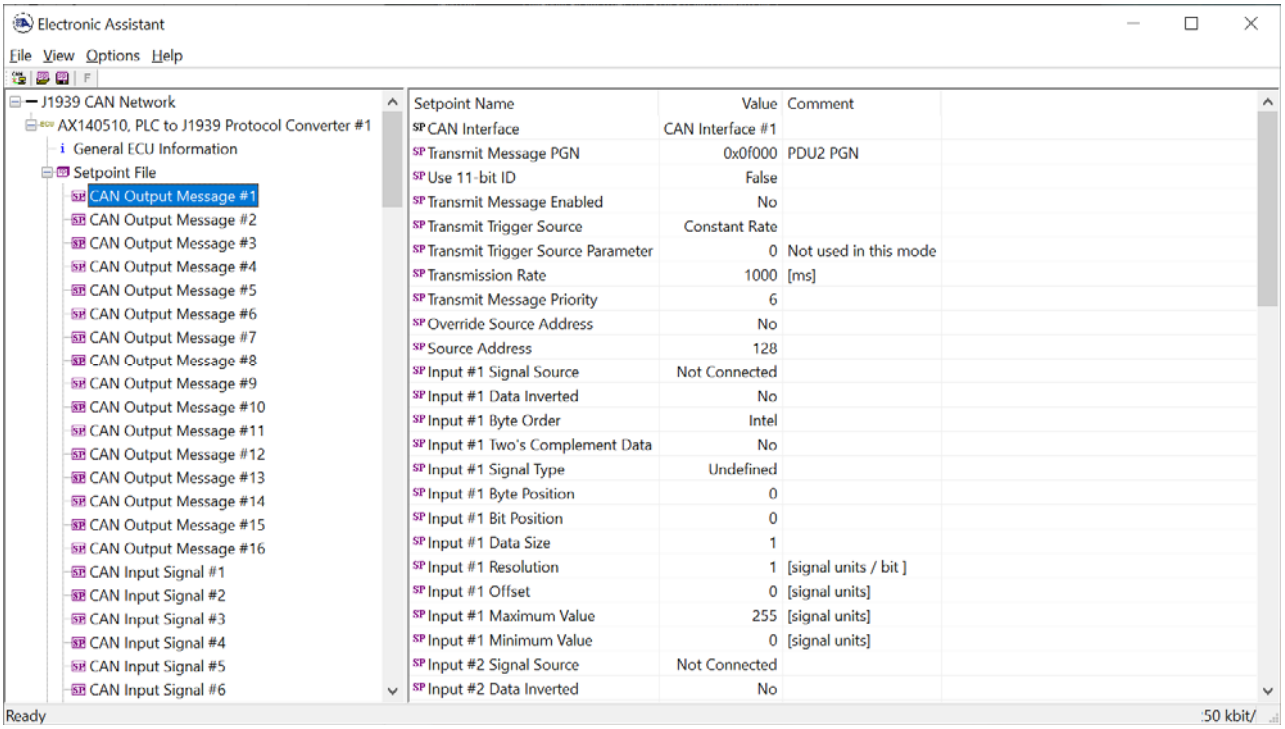


Figure 3: CAN output message definition

AX140510 supports up to 16 CAN output messages. Each message can hold up to 5 signals.

3.2.1 Output message specific settings

Parameter name	***Value range***	***Comment***
CAN Interface	1	Read-only
Transmit Message PGN	0x0000 – 0x3FFFF	PGN for the output message
Use 11-bit ID	No, Yes	Use 11 bit ID instead of the standard 29 bit ID (only for custom messaging!). The 11 bit ID to use is specified using the *Transmit Message PGN* setpoint.
Transmit Message Enabled	No, Yes	Disable / enable the message.
Transmit Trigger Source	Constant rate, J1939 Rx Msg reception, J2497 Rx Msg reception	Transmit triggering method to use. Constant rate is defined by the *Transmission Rate* parameter.
Transmit Trigger Source Parameter	<uint8>	In case of J1939 Rx Msg triggering, this field specifies the J1939 Rx Msg definition number (1-32) for triggering the transmission. In case of J2497 Rx Msg triggering, this field specifies the J2497 Rx Msg definition number (1-32) for triggering the transmission.
Transmission Rate	0-60000	Periodic transmission rate in milliseconds

Transmit Message Priority	0-7	Priority bits for the J1939 message
Override Source Address	No, Yes	Should the source address be set to a specific value (by default the protocol converter's claimed address shall be used).
Source Address	0x00 – 0xFF	The new source address to use, if above is set to '1'.

Note, if transmission rate is set to 0ms, the message is sent only on request or on a configured trigger event.

3.2.2 Output signal specific settings

Parameter name	***Value range***	***Comment***
Signal Source	Control not used … CAN Input data … J2497 Input data … Proprietary J2497 data … Constant data	The data source for this signal. J2497 data specifies that the data is routed from the J2497 interface, CAN data specifies the CAN input message data to use.
Data Inverted	No, Yes	Whether to invert data.
Byte Order	Intel, Motorola	Intel – LSB first/little endian data, Motorola – MSB first/big endian data
Signal Type	0 – 2	CAN data type: 0 – not used, 1 – discrete data, 2 – continuous data
Byte Position	0 – 7	The byte position in the message data field to use for signal data.
Bit Position	0 – 7	The bit position within the above byte position to use for signal data.
Data Size	1 – 32	Width of data in bits.
Resolution	<float>	Data resolution to use.
Offset	<float>	Data offset to use.
Minimum Value	<float>	Minimum value for data.
Maximum Value	<float>	Maximum value for data.

3.3 *CAN Input Message Specification*

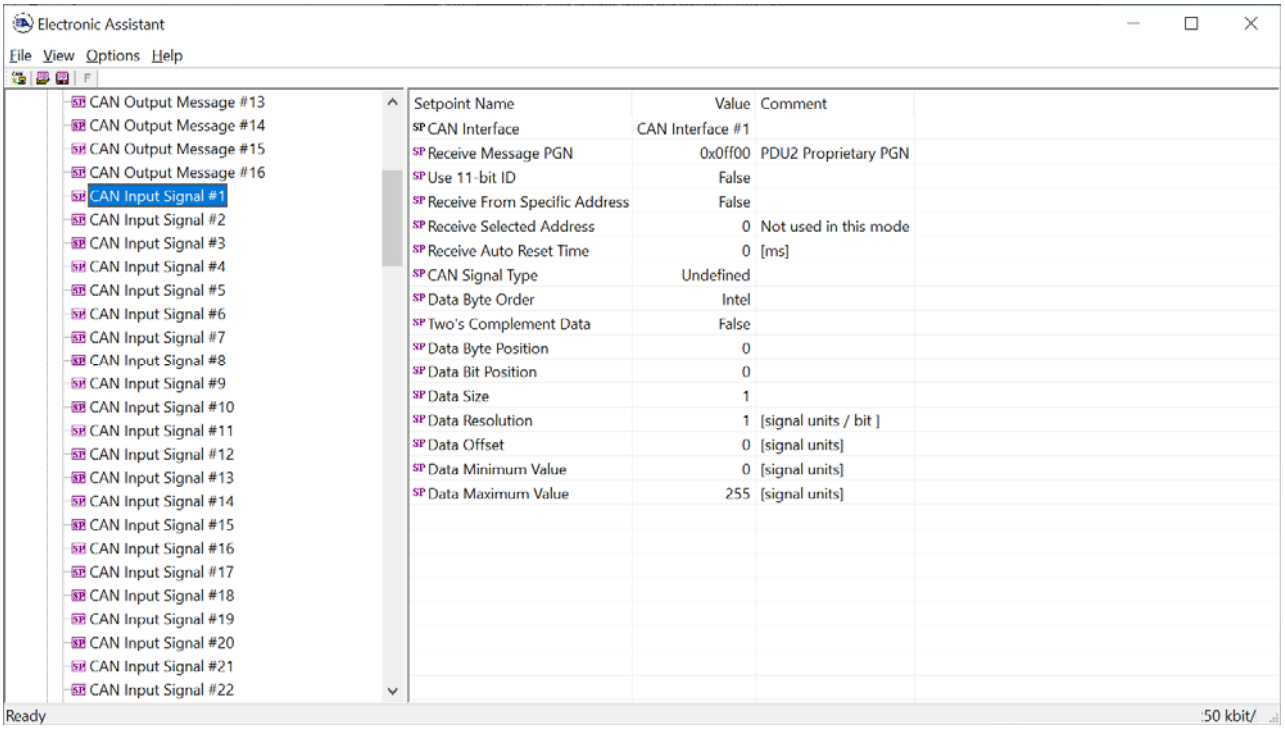


Figure 4: CAN input message definition

AX140510 supports up to 32 CAN input messages. Each message can hold one input signal.

Parameter name	***Value range***	***Comment***
CAN Interface	1	Read only parameter.
Receive Message PGN	0x0000 – 0x3FFFF	The PGN to listen to.
Use 11-bit ID	No, Yes	Use 11 bit ID instead of the standard 29 bit ID (only for custom messaging!). The 11 bit ID to use is specified using the *Receive Message PGN* setpoint.
Receive From Specific Address	No, Yes	Whether to match the message source address with a specific address value.
Receive Selected Address	0x00 – 0xFF	The source address to match for this PGN, valid only if *Receive From Specific Address* is set to '1'.
Receive Auto Reset Time	0 – 60000	Received data reset time in milliseconds. If set to a non-zero value, the received data is zeroed after the specified time has elapsed.
CAN Signal Type	0 – 2	CAN data type: 0 – not used, 1 – discrete data, 2 – continuous data
Data Byte Order	Intel, Motorola	Intel – LSB first/little endian data, Motorola – MSB first/big endian data
Data Byte Position	0 – 7	The byte position in the message data field to use for signal data.

Data Bit Position	0 – 7	The bit position within the above byte position to use for signal data.
Data Size	1 – 32	Width of data in bits.
Data Resolution	<float>	Data resolution to use.
Data Offset	<float>	Data offset to use.
Data Minimum Value	<float>	Minimum value for data.
Data Maximum Value	<float>	Maximum value for data.

It must be noted that in case multiple CAN Input Signals are listening the same PGN, only the last one with the same PGN will send a trigger signal to the other Protocol Converter function blocks. For example, if CAN Input Signals #1, #2 and #4 are configured to receive the same PGN, only CAN Input Signal #4 can be used as a trigger source in other Protocol Converter functions.

3.4 *J1939 Diagnostics To Monitor*

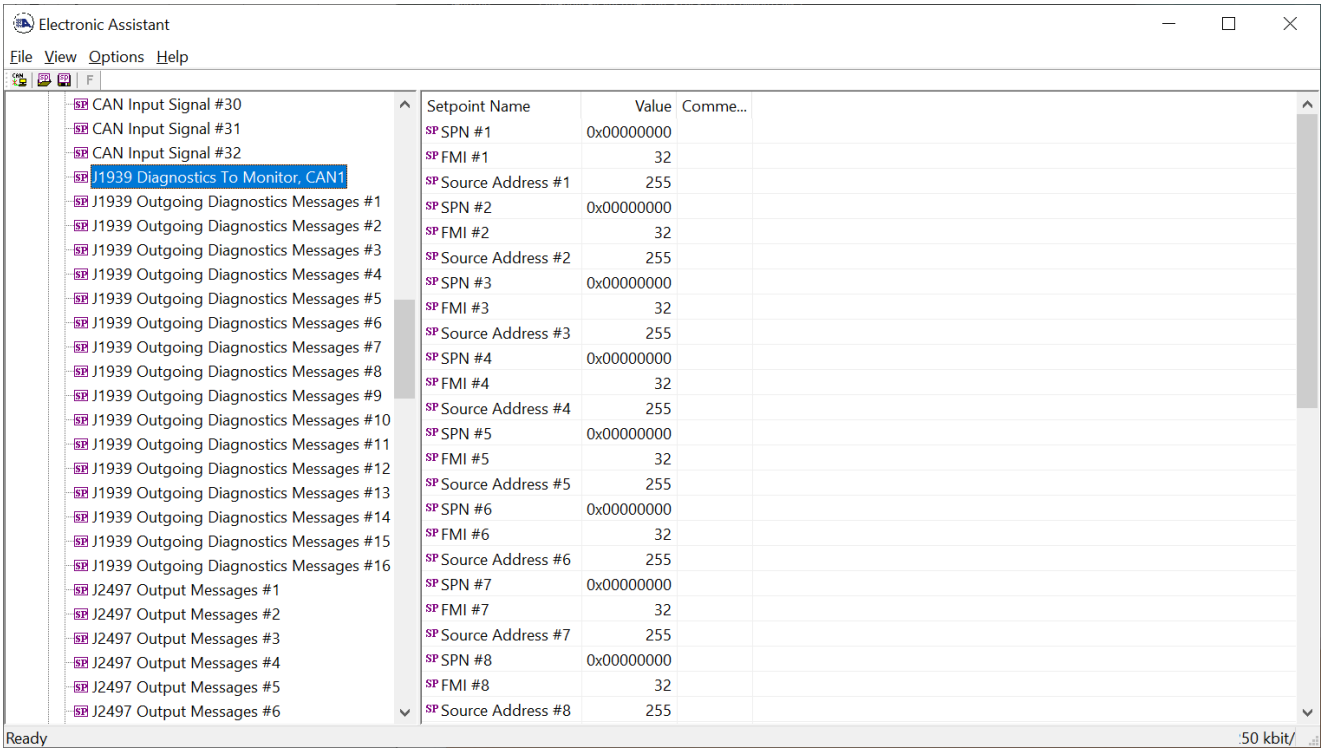


Figure 5: J1939 Diagnostics to monitor

Parameter name	***Value range***	***Comment***
SPN #x	0 … 0x7FFFF	Defined the SPN to read in from received DM1 messages.
FMI #x	0 … 32*	The FMI for the DM1 with the above SPN to listen.
Source Address #x	0 … 255**	The source address for the DM1 with the above SPN to listen.

* In case FMI 32 is specified, received DM1 messages with ALL FMI codes will be processed.
** In case address 255 is specified as Source address, received DM1 messages from ALL nodes will be processed.

3.5 *J1939 Outgoing Diagnostics Messages #x*

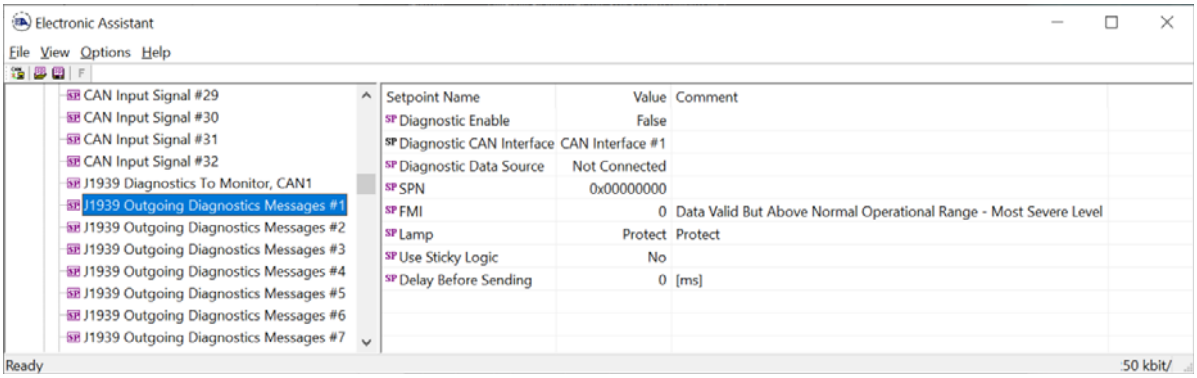


Figure 6: J1939 Outgoing Diagnostics Messages definition

Parameter name	***Value range***	***Comment***
Diagnostic Enable	False, true	
Diagnostic CAN Interface	CAN Interface #1	Read only parameter
Diagnostic Data Source	Not connected, J1939 Rx Diagnostics 1…16, J2497 Rx Diagnostics 1…16	The diagnostic data source for this J1939 diagnostic message.
SPN	0…0x7FFFF	The SPN to use in this diagnostic signal. In case this is set to 0, the SPN, FMI and OC values are copied over from Diagnostic Data Source. If this is set to a non-zero value, then the SPN and FMI are set as specified and OC is taken from an internal counter.
FMI	0...31	The FMI to use.
Lamp	0…3	The Lamp to use.
Use Sticky Logic	False, true	If this is set, the Diagnostic Status is not reset automatically. Instead a DM3 message is needed (or power cycle).
Delay Before Sending	0…60000ms	The delay before the DM1 is sent after the diagnostic condition has become active.

3.6 *J2497 Output Messages #x*

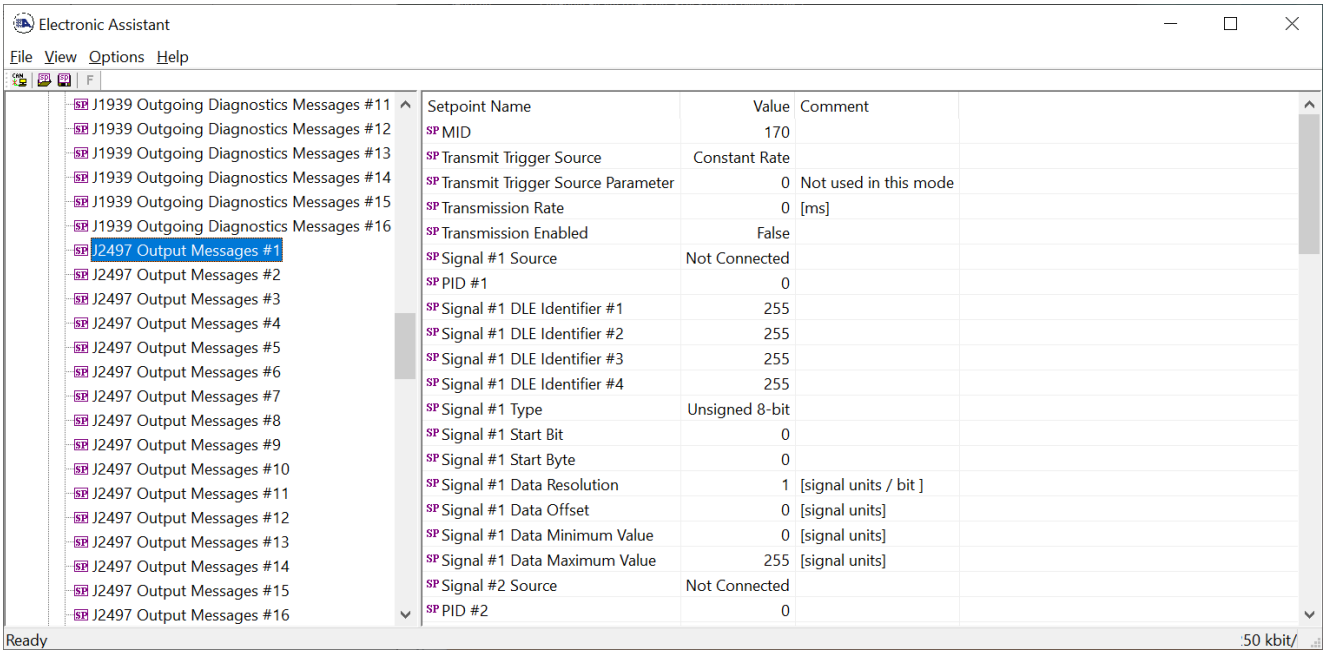


Figure 7: J2497 Output Message definition

Parameter name	***Value range***	***Comment***
MID	0…255	
Transmit Trigger Source	Constant rate, J1939 message reception, J2497 message reception	The message transmission event trigger source. Constant rate or message reception-based triggering.
Transmit Trigger Source Parameter	1…32	In case message reception-based triggering is selected, this defines the corresponding message number.
Transmission Rate	0…60000	In case constant rate is selected, this defines the message transmission interval in milliseconds.
Transmission Enabled	True, false	Enables the message transmission.
Signal #x Source	Not connected, J1939 Rx message 1…32, J2497 Rx message 1…32, Proprietary J2497 message, Constant data	Data source to use for this message.
PID #x	0…1024	The PID to use.
Signal #x DLE Identifier #1	0…255	Data Link Escape / custom data. The transmitted message will contain these bytes if these values are configured to 0…254.
Signal #x DLE Identifier #2	0…255	
Signal #x DLE Identifier #3	0…255	
Signal #x DLE Identifier #4	0…255	
Signal #x Type	undefined (0),	Signal data type to use.

	uint8 (1), uint16 (2), uint32 (3), sint8 (4), sint16 (5), sint32 (6), float16 (7), float32 (8), 1-bit (9), 2-bit (10), 3-bit (11), 4-bit (12)	
Signal #x Data Resolution	0…(*MAX FLOAT*)	Data resolution to use, how many units / bit.
Signal #x Data Offset	(*MIN FLOAT*) …(*MAX FLOAT*)	Data offset to use.
Signal #x Data Minimum Value	(*MIN FLOAT*) … Signal Data Maximum Value	Data minimum value.
Signal #x Data Maximum Value	Signal Data Minimum Value … (*MAX FLOAT*)	Data maximum value.

3.7 *J2497 Input Signals #x*

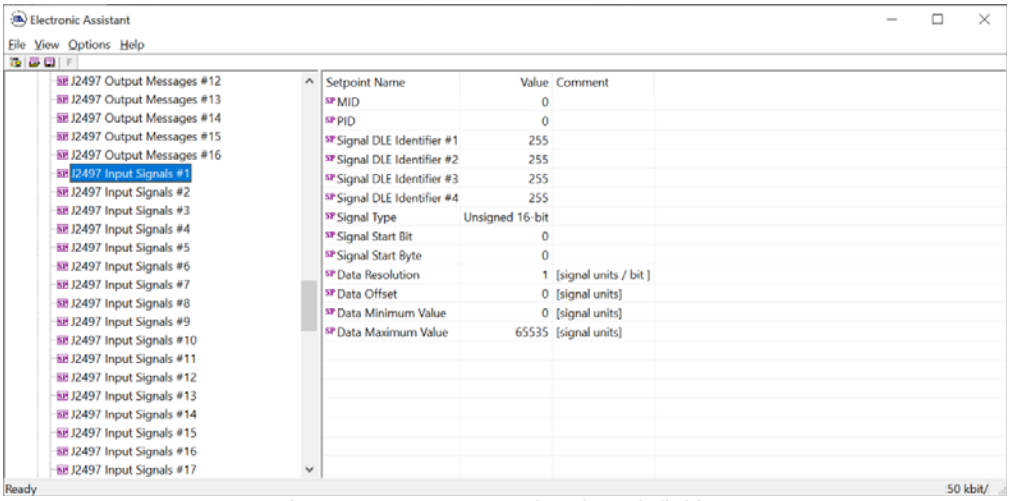


Figure 8: J2497 Input Signal #1 definitions

Parameter name	***Value range***	***Comment***
MID	0…255	Defines the MID to listen.
PID	0…1024	The PID to read in from a message with MID defined above.
Signal #x DLE Identifier #1	0…255	Data Link Escape / custom data. The received message needs to contain matching bytes if these values are configured to 0…254.
Signal #x DLE Identifier #2	0…255	
Signal #x DLE Identifier #3	0…255	
Signal #x DLE Identifier #4	0…255	
Signal Type	undefined (0), uint8 (1), uint16 (2), uint32 (3), sint8 (4), sint16 (5), sint32 (6), float16 (7), float32 (8), 1-bit (9), 2-bit (10), 3-bit (11), 4-bit (12)	Signal data type to use.
Data Resolution	0…(*MAX FLOAT*)	Data resolution to use, how many units / bit.
Data Offset	(*MIN FLOAT*) …(*MAX FLOAT*)	Data offset to use.
Data Minimum Value	(*MIN FLOAT*) … Signal Data Maximum Value	Data minimum value.
Data Maximum Value	Signal Data Minimum Value … (*MAX FLOAT*)	Data maximum value.

3.8 *J2497 Diagnostics to Monitor*

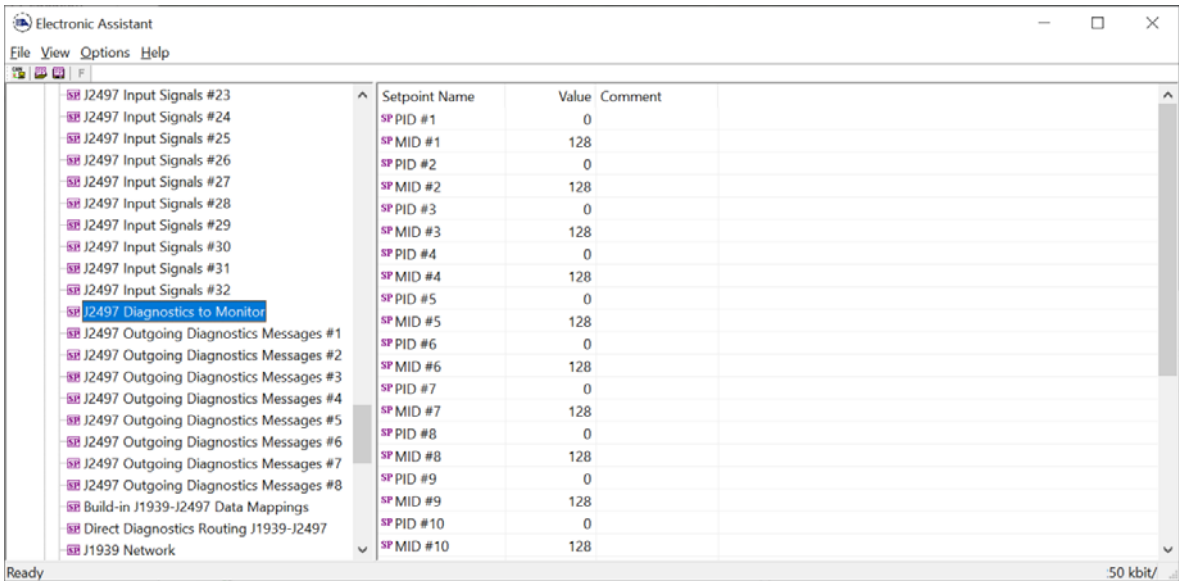


Figure 9: J2497 Diagnostics to Monitor definitions

Parameter name	***Value range***	***Comment***
PID #x	0…1024	Defines the diagnostic PID to listen from received PID194 messages.
MID #x	0…255	Defines the MID for the PID194 messages to listen.

3.9 *J2497 Outgoing Diagnostics Messages #x*

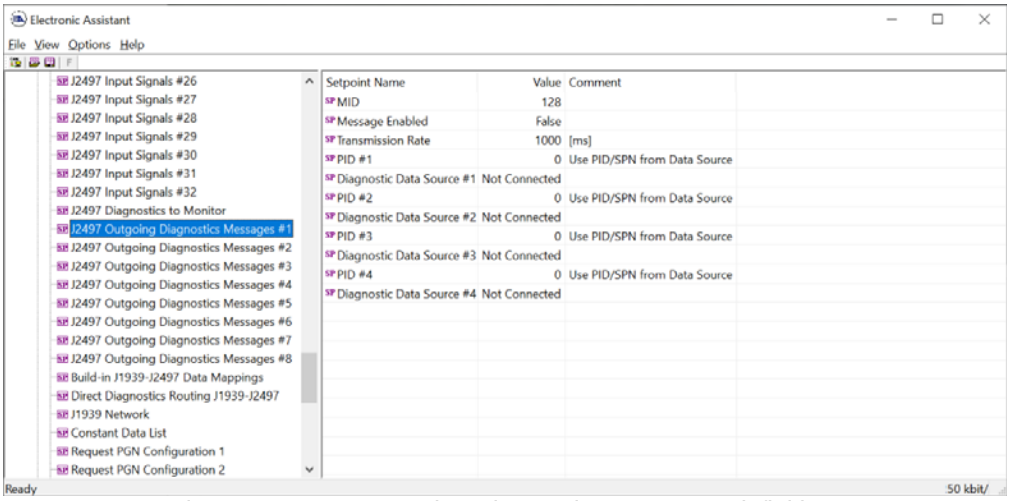


Figure 10: J2497 Outgoing Diagnostics Messages definitions

Parameter name	***Value range***	***Comment***
MID	0…255	Defines the MID to use in the diagnostic message.
Message enabled	True, false	Enables the transmission of the diagnostic message.
Transmission Rate	0…60000	In case constant rate is selected, this defines the message transmission interval in milliseconds.
PID #x	0…1024	The PID to include into this diagnostic message.
Diagnostic Data Source #x	Not connected, J1939 Rx Diagnostics 1…16	The diagnostic data source for this J2497 diagnostic message.

3.10 ***Build-in J1939-J2497 Data Mappings***

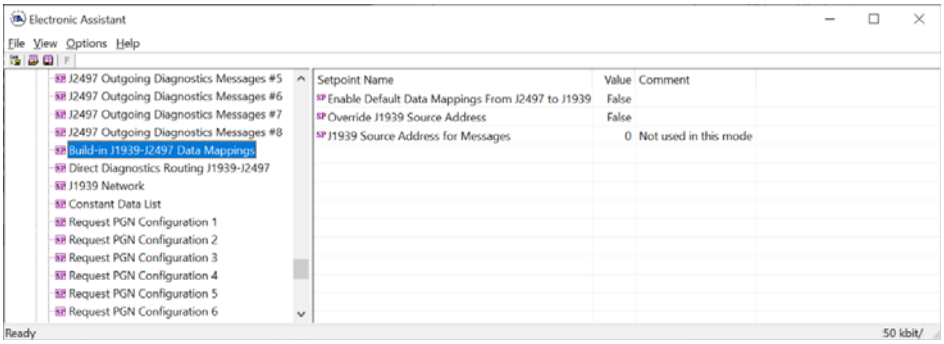


Figure 11: Build-in J1939-J2497 Data Mappings definitions

Parameter name	***Value range***	***Comment***
Enable Default Data Mappings from J2497 to J1939	False, true	Selects whether the default data mappings from J2497 to J1939 are enabled. See section 4.3 for details.
Override J1939 Source Address	False, true	Enables the overriding of Source Address in the forwarded messages.
J1939 Source Address for Messages	0…255	In case Source Address override is enabled, this sets the Source Address to use.

3.11 *Direct Diagnostics Routing J1939-J2497*

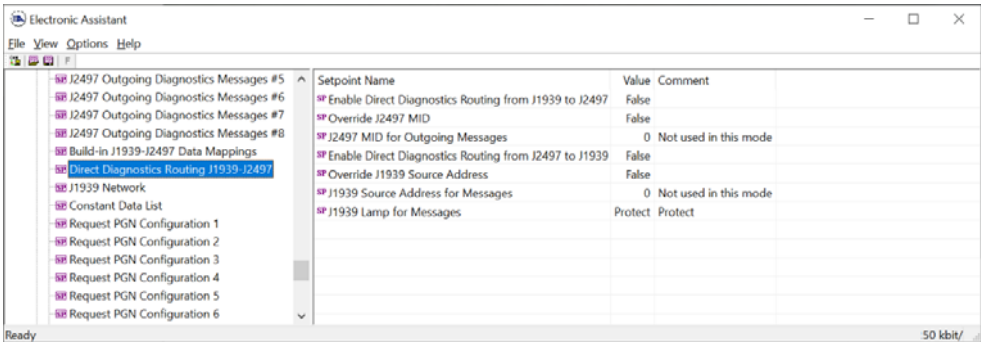


Figure 12: Direct Diagnostics Routing J1939-J2497

Parameter name	***Value range***	***Comment***
Enable Direct Diagnostics Routing from J1939 to J2497	False, true	Selects whether the direct diagnostics routing from J1939 to J2497 is enabled. See section 0 for details.
Override J2497 MID	False, true	Enables the overriding of MID in the forwarded diagnostics messages.
J2497 MID for Outgoing Messages	0…255	In case MID override is enabled, the MID to use can be specified using this setpoint.
Enable Direct Diagnostics Routing from J2497 to J1939	False, true	Selects whether the direct diagnostics routing from J2497 to J1939 are enabled. See section 0 for details.
Override J1939 Source Address	False, true	Enables the overriding of Source Address in the forwarded diagnostics messages.
J1939 Source Address for Messages	0…255	In case Source Address override is enabled, this sets the Source Address to use.
J1939 Lamp for Messages	0=Protect, 1=Amber, 2=Red stop, 3=Malfunction	This defines the Lamp code to use with the J2497 messages that are forwarded into J1939.

3.12 ***Constant Data List***

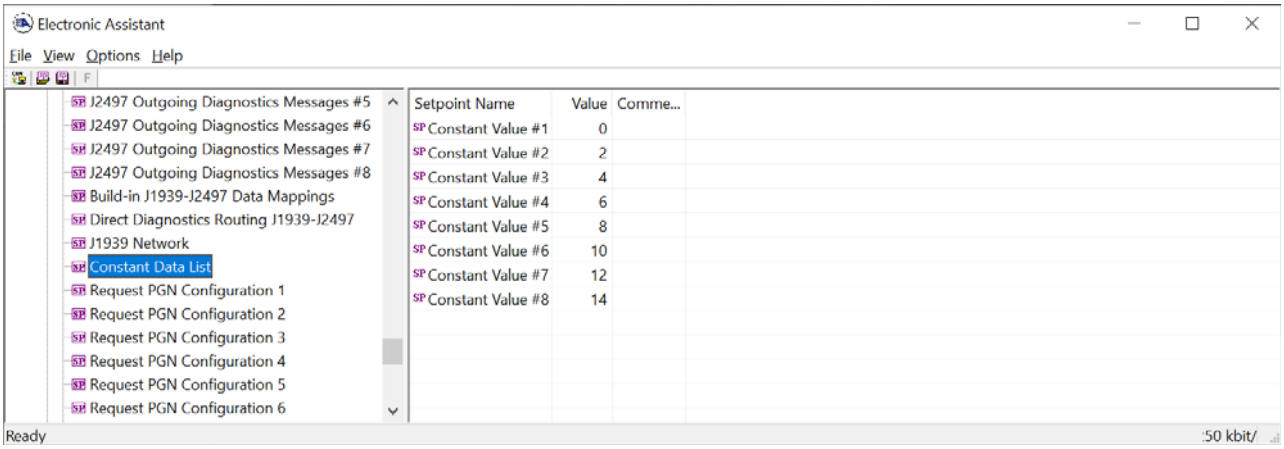


Figure 13: Constant Data List

Parameter name	***Value range***	***Comment***
Constant Value 1	<float>	User configurable constant data
Constant Value 2	<float>	User configurable constant data
Constant Value 3	<float>	User configurable constant data
Constant Value 4	<float>	User configurable constant data
Constant Value 5	<float>	User configurable constant data
Constant Value 6	<float>	User configurable constant data
Constant Value 7	<float>	User configurable constant data
Constant Value 8	<float>	User configurable constant data

The constant data values can be used in CAN transmit message and J2497 Message data sources. The values are user configurable to suit the application in question.

3.13 ***Request PGN Configuration #x***

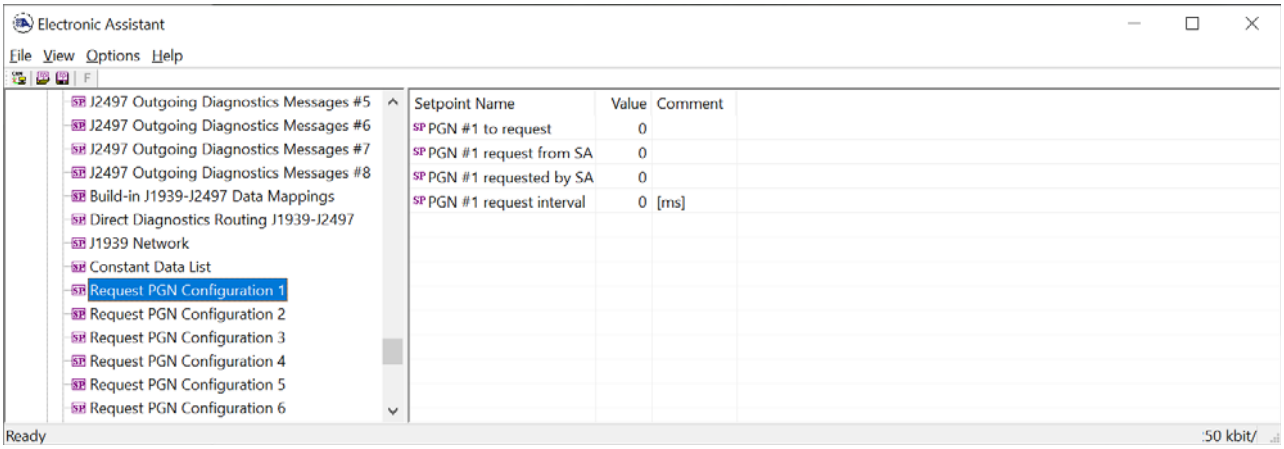


Figure 14: Request PGN Configuration

Parameter name	***Value range***	***Comment***
PGN #x to request	0x0000 – 0x3FFFF	The PGN to request
PGN #x request from SA	0…255	The remote node to request the PGN from
PGN #x requested by SA	0…255	The node requesting the PGN
PGN #x request interval	0…60000	Request interval in milliseconds

4. DATA ROUTING BETWEEN INTERFACES

4.1 *J1939 Data scaling*

J1939 data is stored locally in variables (of real32 type). When an J1939 input message is received, the data stored in the message is scaled and stored into the local variable using the following equations:

$$scaledValue_{Local} = \left(MsgData * Resolution_{J1939,RX}\right) + Offset_{J1939,RX}$$

The data will be limited to the range configured using min and max setpoints.

$$Data_{Local} = \text{MinMax}\left[MIN_{J1939,RX}, scaledValue_{Local}, MAX_{J1939,RX}\right]$$

When building a J1939 output message, the output message functions use the local variables' (J1939/J2497) data. The data from the local storage is scaled into a J1939 output message signal using the following equations:

$$scaledValue_{J1939} = \frac{Data_{Local}}{Resolution_{J1939,TX}} - Offset_{J1939,TX}$$

The data will be limited to the range configured using min and max setpoints.

$$Data_{J1939} = \text{MinMax}\left[MIN_{J1939,TX}, scaledValue_{J1939}, MAX_{J1939,TX}\right]$$

As an example of J1939 to J1939 data routing and scaling, consider the following situation in which an incoming message having 4 byte data would be scaled and transmitted out as 2 byte data in another PGN.

J1939 input message:
ID: 18FF00F8, len: 8, data: 00 00 02 00 FF FF FF FF
CAN input signal parameters: signal type: *2* (continuous), data width 32, resolution: *2^(-16)*, CAN min: *0.0*, CAN max: *65535.0*.
CAN output signal parameters: signal type *2* (continuous), data width 16, resolution: *1.0*, CAN min: *0.0*, CAN max: *65535.0*.

The above would yield the following J1939 output message:
ID: 18FF0180, len: 8, data: 02 00 FF FF FF FF FF FF

Note: When setting very small values in EA (like the resolution 2^{-16} in the example above), the value shown on the PC screen stays at **0.000**. The value is still programmed to the protocol converter device, EA just shows the first three decimals on the PC screen.

4.2 *J2497 Data scaling*

J2497 data is scaled using the Resolution and Offset parameters, like the corresponding J1939 ones. The Minimum and Maximum setpoints define the minimum and maximum limits for the scaled data. In case the result of data scaling (using resolution and offset parameters) is out of range, the value will saturate either to Minimum or Maximum setpoint value.

$$scaledValue_{J2497} = \frac{fValue}{Resolution_{J2497}} + Offset_{J2497}$$

in which fValue is the internal value of the data (received from another J2497 message or from J1939 bus).

The data will be further compared to the configured Minimum and Maximum values and saturate in case it is out of range.

$$Data_{J2497} = \mathrm{MinMax}\left[MIN_{J2497}, scaledValue_{J2497}, MAX_{J2497}\right]$$

4.3 *Build-in J1939-J2497 Data Mappings*

The built-in, fixed data mappings as described in Table 1: Built-in data mappings between J1939 and J2497 are available in AX140510. In order to enable these mappings, the corresponding setpoint needs to be set to ‘true’ in “Build-in J1939-J2497 Data Mappings” setpoint group.

Please note that currently only J2497->J1939 data mappings are implemented. Future firmware releases may contain more mappings. The built-in mappings expect to see J2497 messages sent by a Trailer ABS Controller, MID 137.

It is possible to override the J1939 Source Address (and the J2497 MID in the other data routing direction in the future AX140510 firmware releases) of the forwarded messages with a user specified value.

Table 1: Built-in data mappings between J1939 and J2497

Name	PGN	SPN	Width	Pos.	Res.	Offset	Min	Max	PID	Res.	Offset	Min	Max
Road Speed	0xFEF1	84	16bits	2	1.0/256.0	0.0	0.0	250.996	84	0.805	0.0	0.0	205.2
Battery Voltage	0xFEF7	168	16bits	4	0.05	0.0	0.0	3212.75	168	0.05	0.0	0.0	3276.75
Trip Distance	0xFEDF	244	32bits	1	0.125	0.0	0.0	526385151.875	244	0.16	0.0	0.0	691207984.6
Total Vehicle Distance	0xFEDF	245	32bits	5	0.125	0.0	0.0	526385151.875	245	0.161	0.0	0.0	691207984.6

4.4 *Direct Diagnostics Routing J1939-J2497*

The AX140510 can route diagnostics messages between J1939 and J2497. When forwarding diagnostics messages from J1939 to J2497 using the Direct Diagnostics Routing function, the J1939 SPN is used as J2497 diagnostic code (PID) in diagnostics message (PID 194). In order to enable the diagnostic routing functionality, the corresponding setpoint needs to be set to ‘true’ in “Direct Diagnostics Routing J1939-J2497” setpoint group. Please see section 3.11 for setpoint details.

In the other direction, the J2497 diagnostic code PID is used as J1939 SPN.

The FMI and OC values are forwarded as received.

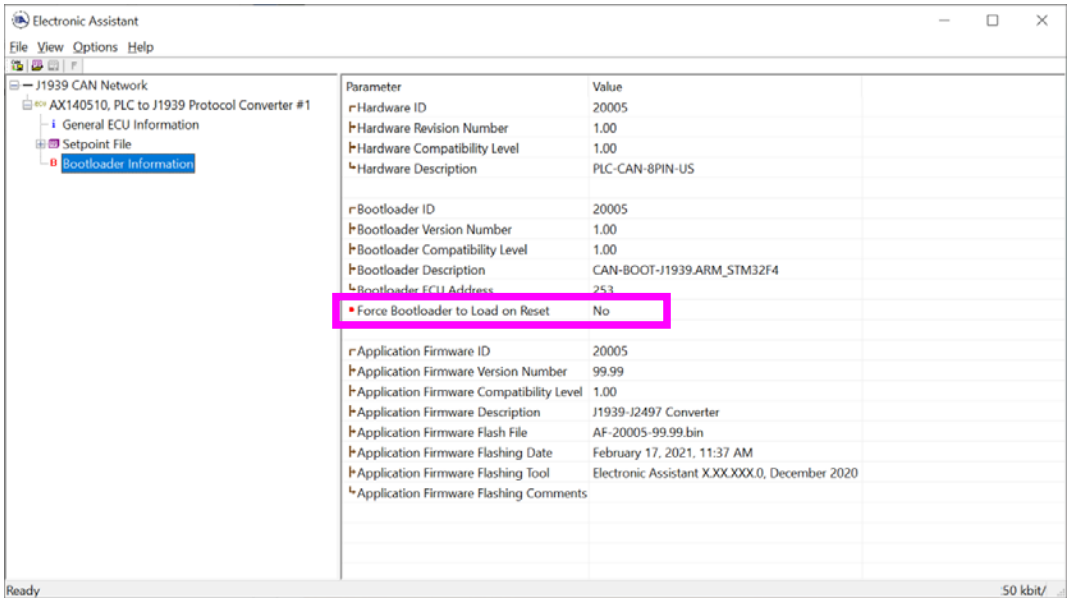
It is possible to override the J1939 Source Address and J2497 MID for the forwarded diagnostics messages with a user specified value.

5. REFLASHING INSTRUCTIONS

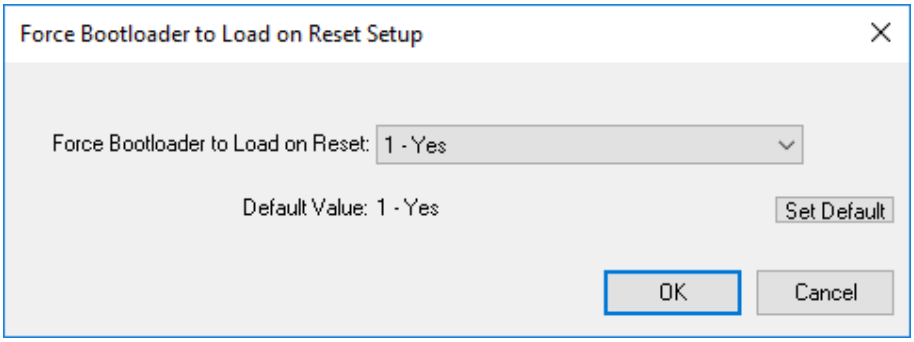
The AX140510 can be upgraded with new application firmware using the **Bootloader Information** section. This section details the simple step-by-step instructions to upload new firmware provided by Axiomatic onto the unit via CAN, without requiring it to be disconnected from the J1939 network.

Note: To upgrade the firmware use Electronic Assistant V<TBD> or higher.

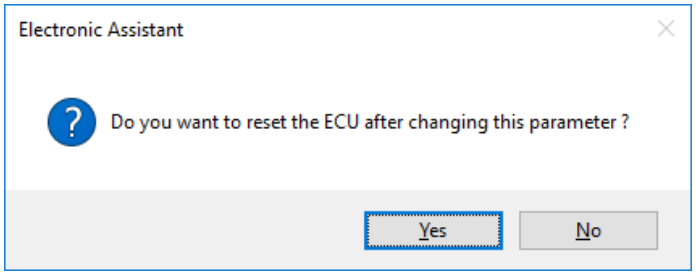
1. When EA first connects to the ECU, the **Bootloader Information** section will display the following information.



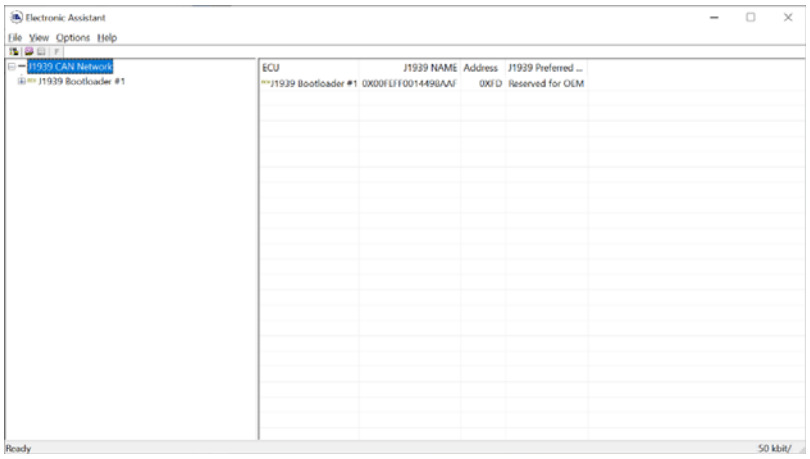
2. To use the bootloader to upgrade the firmware running on the ECU, change the variable **"Force Bootloader To Load on Reset**" to *Yes.*

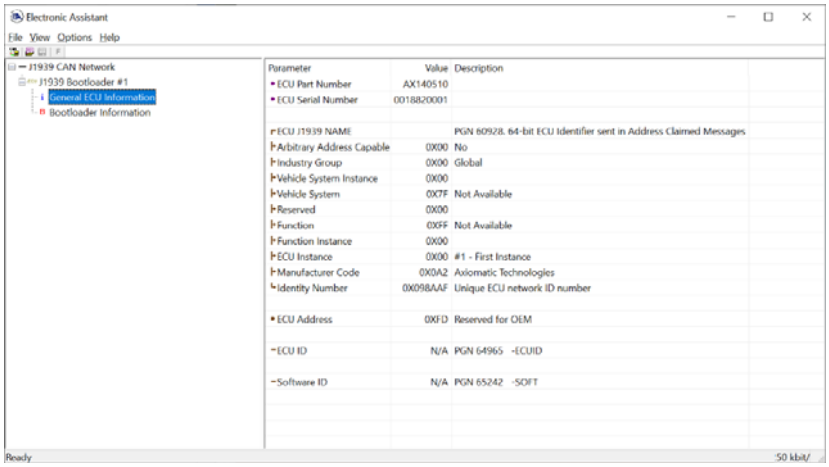


3. When the prompt box asks if you want to reset the ECU, select *Yes*.



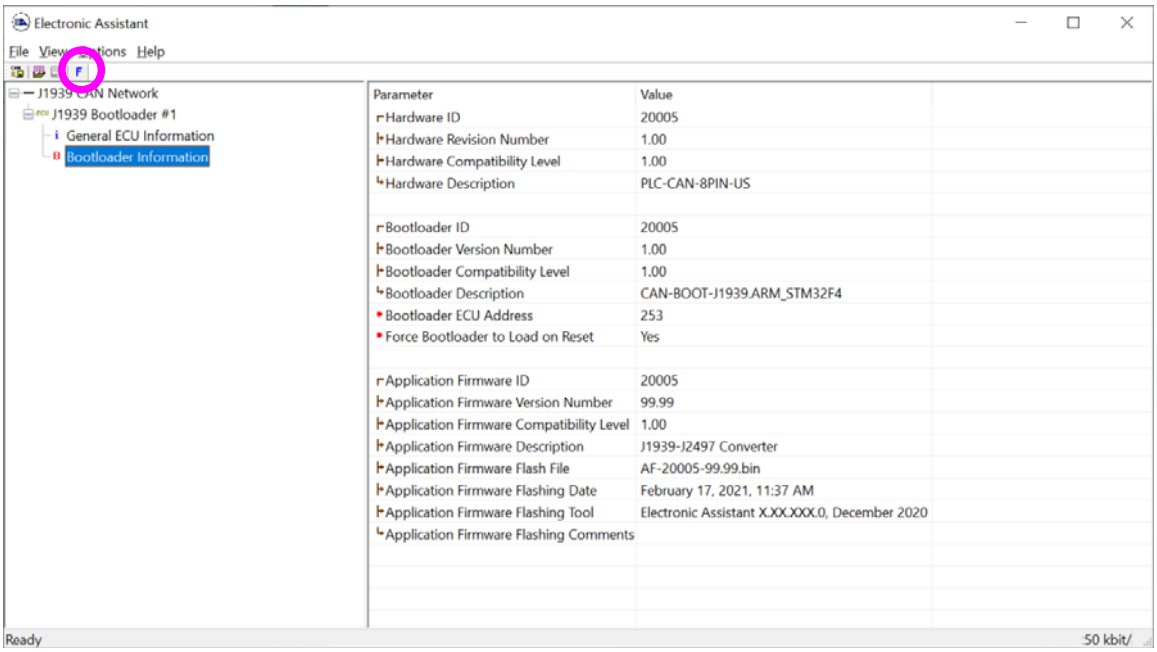
4. Upon reset, the ECU will no longer show up on the J1939 network as an AX140510 but rather as **J1939 Bootloader #1**.





Note that the bootloader is NOT Arbitrary Address Capable. This means that if you want to have multiple bootloaders running simultaneously (not recommended) you would have to manually change the address for each one before activating the next, or there will be address conflicts. And only one ECU would show up as the bootloader. Once the 'active' bootloader returns to regular functionality, the other ECU(s) would have to be power cycled to re-activate the bootloader feature.

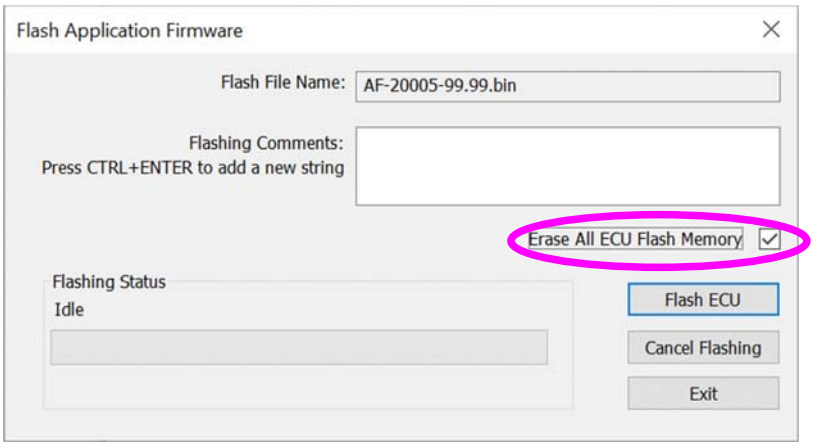
5. When the **Bootloader Information** section is selected, the same information is shown as when it was running the AX140510 firmware, but in this case the **F**lashing feature has been enabled.



6. Select the **F**lashing button and navigate to where you had saved the **AF-20005-x.xx.bin** file sent from Axiomatic. (Note: only binary (.bin) files can be flashed using the EA tool.)

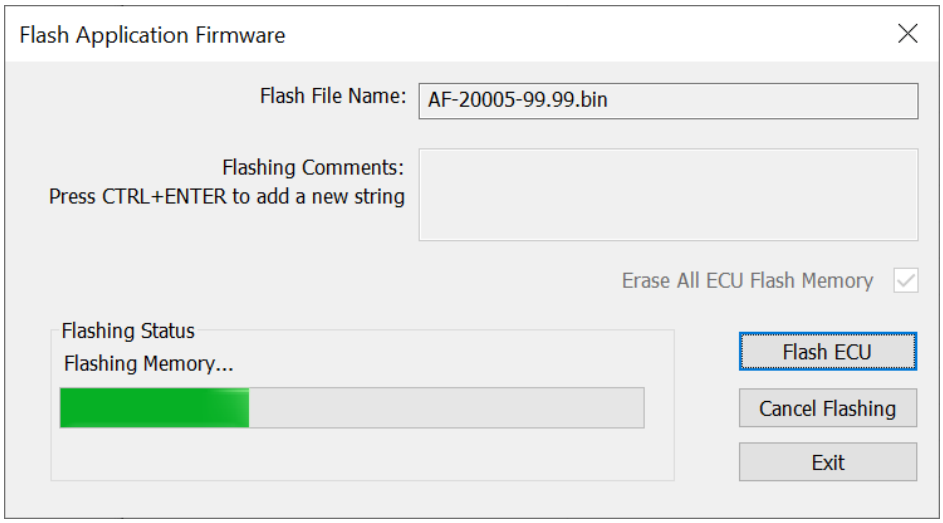
7. Once the Flash Application Firmware window opens, you can enter comments such as “Firmware upgraded by [Name]” if you so desire. This is not required, and you can leave the field blank if you do not want to use it.

   Note: You do not have to date/time-stamp the file, as the EA tool automatically does this when you upload the new firmware.

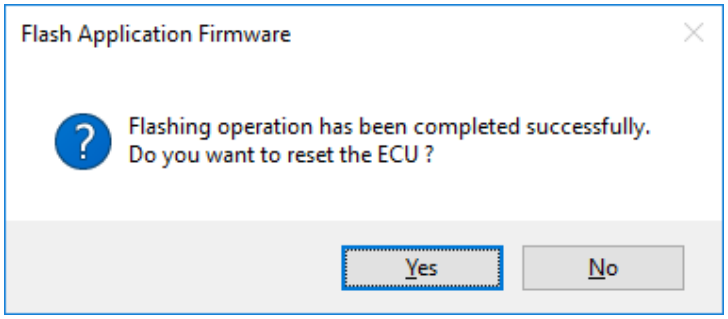


NOTE: It is good practice to tick the “Erase All ECU Flash Memory” box. Please note, That selecting this option will **erase ALL data stored in non-volatile flash**. It will also erase any configuration of the setpoints that might have been done to the ECU and reset all setpoints to their factory defaults. In case the controller contains custom settings, those settings need to be saved to PC before reflashing.

A progress bar will show how much of the firmware has been sent as the upload progresses. The more traffic there is on the J1939 network, the longer the upload process will take.



Once the firmware has finished uploading, a message will pop up indicating the successful operation. If you select to reset the ECU, the new version of the AX140510 application will start running, and the ECU will be identified as such by EA. Otherwise, the next time the ECU is power-cycled, the AX140510 application will run rather than the bootloader function.



Note: If at any time during the upload the process is interrupted, the data is corrupted (bad checksum) or for any other reason the new firmware is not correct, i.e. bootloader detects that the file loaded was not designed to run on the hardware platform, the bad

corrupted application will not run. Rather, when the ECU is reset or power-cycled the **J1939 Bootloader** will continue to be the default application until valid firmware has been successfully uploaded into the unit.

6. VERSION HISTORY

Revision	Date	Author	Changes
Rev. A	19.Feb.2021	Antti Keränen	Initial version.
-	19.Feb. 2021	A. Wilkins	Added quiescent current and auto-baud-rate

APPENDIX – TECHNICAL SPECIFICATIONS

Power

Power Supply Input - Nominal	12 V or 24 Vdc nominal; 9…32 Vdc The minimum allowable supply voltage for the power pin is 6 Vdc.
Surge Protection	120 Vdc
Reverse Polarity Protection	Provided

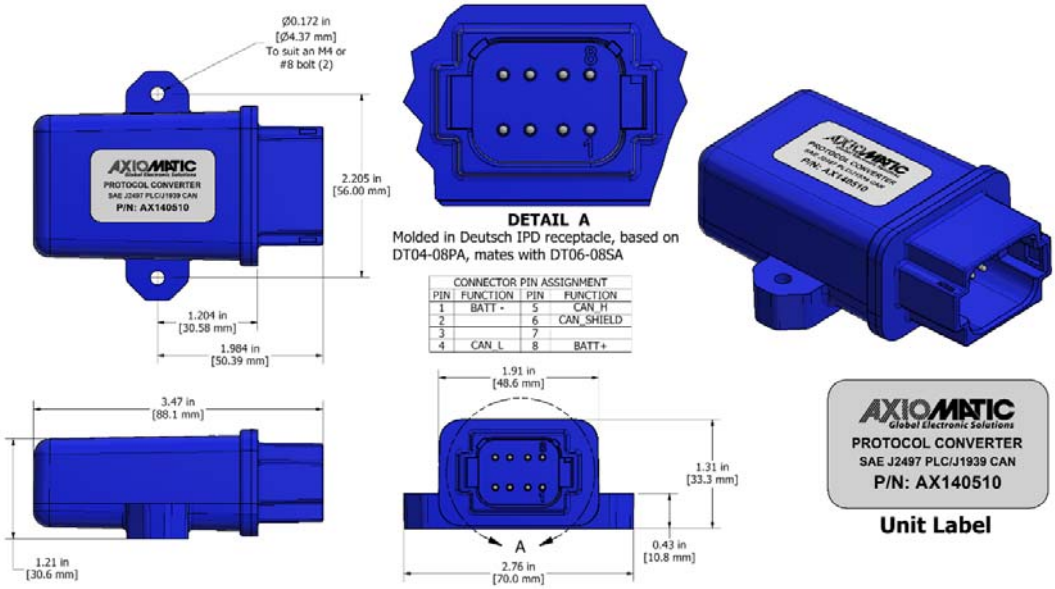
Control Logic

Software Platform	AX140510 implements message conversion from SAE J2497 to SAE J1939.

General Specifications

Memory	STM32F413CGU6 32-bit, 1 MByte Flash Program Memory
CAN Port	1 Isolated CAN 2.0B (SAE J1939 Protocol) 250kbit/s, 500kbit/s, 667kbit/s, 1Mbit/s. Automatic Baud Rate Detection
Isolation	300 Vrms
Power Line Communications	SAE J2497
Configuration	Electronic Assistant P/N: **AX070502**
Firmware Reflashing	Electronic Assistant P/N: **AX070502**
Quiescent Current Draw	107mA @ 12V; 65mA @ 24V Typical
Vibration	MIL-STD-202G, Method 204D test condition C (Sine) and Method 214A, test condition B (Random) 10 g peak (Sine) 7.68 Grms peak (Random)
Shock	MIL- STD-202G, Method 213B, test condition A 50g (half sine pulse, 9ms long, 8 per axis)
Operating Conditions	-40 to 85°C (-40 to 185°F)
Storage Temperature	-55 to 85°C (-67 to 185°F)
Enclosure and Dimensions	Molded Enclosure, integral connector Nylon 6/6, 30% glass, ultrasonically welded 3.47 x 2.75 x 1.31 inches (88.2 x 70.0 x 33.3 mm) L x W x H including integral connector Refer to the dimensional drawing.

Dimensional Drawing



<table>
<tr><td>Electrical Connections</td><td>Integral TE Deutsch 8 pin receptacle (P/N: DT04-08PA)
18 AWG wire is recommended for use with contacts 0462-201-16141.

A mating plug kit is available. Ordering P/N: AX070112 is comprised of 1 DT06-08SA, 1 W8S, 8 0462-201-16141, and 3 114017.

<table>
<tr><td>PIN #</td><td>FUNCTION</td></tr>
<tr><td>1</td><td>BATT -</td></tr>
<tr><td>2</td><td>Not Used</td></tr>
<tr><td>3</td><td>Not Used</td></tr>
<tr><td>4</td><td>CAN_L</td></tr>
<tr><td>5</td><td>CAN_H</td></tr>
<tr><td>6</td><td>CAN_SH</td></tr>
<tr><td>7</td><td>Not Used</td></tr>
<tr><td>8</td><td>BATT +</td></tr>
</table>
</td></tr>
<tr><td>Weight</td><td>0.15 lb. (0.068 kg) preliminary.</td></tr>
<tr><td>Protection Rating</td><td>IP67</td></tr>
<tr><td>Installation</td><td>Mounting holes are sized for #8 or M4 bolts. The bolt length will be determined by the end-user’s mounting plate thickness. The mounting flange of the controller is 0.425 inches (10.8 mm) thick. It should be mounted with connectors facing left or right to reduce likelihood of moisture entry. All field wiring should be suitable for the operating temperature range. 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).</td></tr>
</table>

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 www.axiomatic.com/service.html.

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Battery Chargers

CAN bus Controls

CAN/Wifi, CAN/Bluetooth

Current/Voltage Converters

DC/DC Power Converters

Engine Temperature Scanners

Ethernet/CAN Converters, Switches

Fan Drive Controllers

Gateways, CAN/Modbus Protocols

Gyroscope Inclinometers

Hydraulic Valve Controllers

Inclinometers, Triaxial

I/O Controls

LVDT Simulators

Machine Controls

Modbus Controls

Motor Controls

Power Supplies

PWM Signal Converters/Isolators

Resolver Signal Conditioners

Service Tools

Signal Conditioners, Converters

Strain Gauge CAN Controls

Surge Suppressors

OUR COMPANY

Axiomatic provides electronic machine controls, components, and systems to the off-highway, commercial vehicle, electric vehicle, power generator set, material handling, renewable energy and industrial OEM markets.

We innovate with engineered and off-the-shelf machine controls that add value for our customers. We emphasize service and partnership with our customers, suppliers, and employees to build long term relationships and mutual trust.

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Axiomatic in Canada operates an ISO 9001:2015 registered design and manufacturing facility.

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All products to be returned to Axiomatic require a Return Materials Authorization Number (RMA#). Please request an RMA# from sales@axiomatic.com.

Please provide the following information when requesting an RMA number:

- Serial number, part number
- Axiomatic invoice number and date
- Hours of operation, description of problem
- Wiring set up diagram, application
- Other comments as needed

All products should be serviced by Axiomatic. Do not open the product and perform the service yourself.

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