

1x Relay & 2x Universal Outputs Controller, SAE J1939

USER MANUAL

P/N: AX130790

VERSION HISTORY

Version	Date	Author	Modification
0.1.0	Oct. 7, 2026	Peter Sotirakos	Initial draft; Preliminary
0.1.1	Oct 20, 2026	C Yang	Reformatting

ACRONYMS

ACK	Positive Acknowledgement (from SAE J1939 standard)
BATT +/-	Battery positive (a.k.a. Vps) or Battery Negative (a.k.a. GND)
DM	Diagnostic Message (from SAE J1939 standard)
DOUT	Digital Output
DTC	Diagnostic Trouble Code (from SAE J1939 standard)
EA	Axiomatic Electronic Assistant (A Service Tool for Axiomatic ECUs)
ECU	Electronic Control Unit (from SAE J1939 standard)
FMI	Failure Mode Identifier
GND	Ground reference (a.k.a. BATT-)
I/O	Inputs and Outputs
MAP	Memory Access Protocol
NAK	Negative Acknowledgement (from SAE J1939 standard)
OC	Occurrence Count
PDU1	A format for messages that are to be sent to a destination address, either specific or global (from SAE J1939 standard)
PDU2	A format used to send information that has been labeled using the Group Extension technique and does not contain a destination address.
PGN	Parameter Group Number (from SAE J1939 standard)
PropA	Message that uses the Proprietary A PGN for peer-to-peer communication.
PropB	Message that uses a Proprietary B PGN for broadcast communication.
PWM	Pulse Width Modulation
RPM	Rotations per Minute
SPN	Suspect Parameter Number (from SAE J1939 standard)
TP	Transport Protocol
Vps	Voltage Power Supply (a.k.a. BATT+)
%dc	Percent Duty Cycle (Measured from a PWM input)

REFERENCES

J1939	Recommended Practice for a Serial Control and Communications Vehicle Network, SAE, April 2011
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J1939/21	Data Link Layer, SAE, December 2010
J1939/71	Vehicle Application Layer, SAE, March 2011
J1939/73	Application Layer-Diagnostics, SAE, February 2010
J1939/81	Network Management, SAE, March 2017
TDAX130790	Technical Datasheet, 1x Relay & 2x Universal Outputs Controller, SAE J1939, Axiomatic Technologies
UMAX07050x	User Manual, Axiomatic Electronic Assistant and USB-CAN, Axiomatic Technologies

This document assumes the reader is familiar with the SAE J1939 standard. Terminology from the standard is used but not described in this document.



NOTE:

This product is supported by Axiomatic Electronic Assistant
An Axiomatic Electronic Assistant KIT may be ordered as P/N: AX070502 or AX070506K

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1. OVERVIEW OF CONTROLLER

This User Manual describes the architecture and functionality of the 1x Relay & 2x Universal Outputs Controller, SAE J1939. Throughout the document this controller may be referred to as the Electronic Control Unit (ECU), or simply as the Controller.

The ECU is designed to use data received over a SAE J1939 CAN Network to then drive the control of its configurable set of outputs, including one isolated Relay Output and two Universal Outputs. These outputs are capable of being independently configured to suit many types of applications. The controller additionally provides a comprehensive set of configurable settings, allowing users to create custom configurations without the need for reprogramming. This versatile set of controls enables users to program the ECU for a broad spectrum of applications without needing custom software.

Axiomatic Electronic Assistant (EA) is used to configure the Controller. Programming configurable parameters, or EA setpoints, are listed in Section 4. Setpoint configuration can be saved in a file which can then be utilized to program the same configuration to different units of the same ECU. Throughout this document, setpoint names are referred to with bolded text in double-quotes, and the setpoint option is referred to with italicized text in single-quotes. For example, the “**Output Type**” setpoint can be configured to the option ‘*Frequency Output*’.

The 1x Relay & 2x Universal Outputs Controller, SAE J1939 can be ordered using part number AX130790.

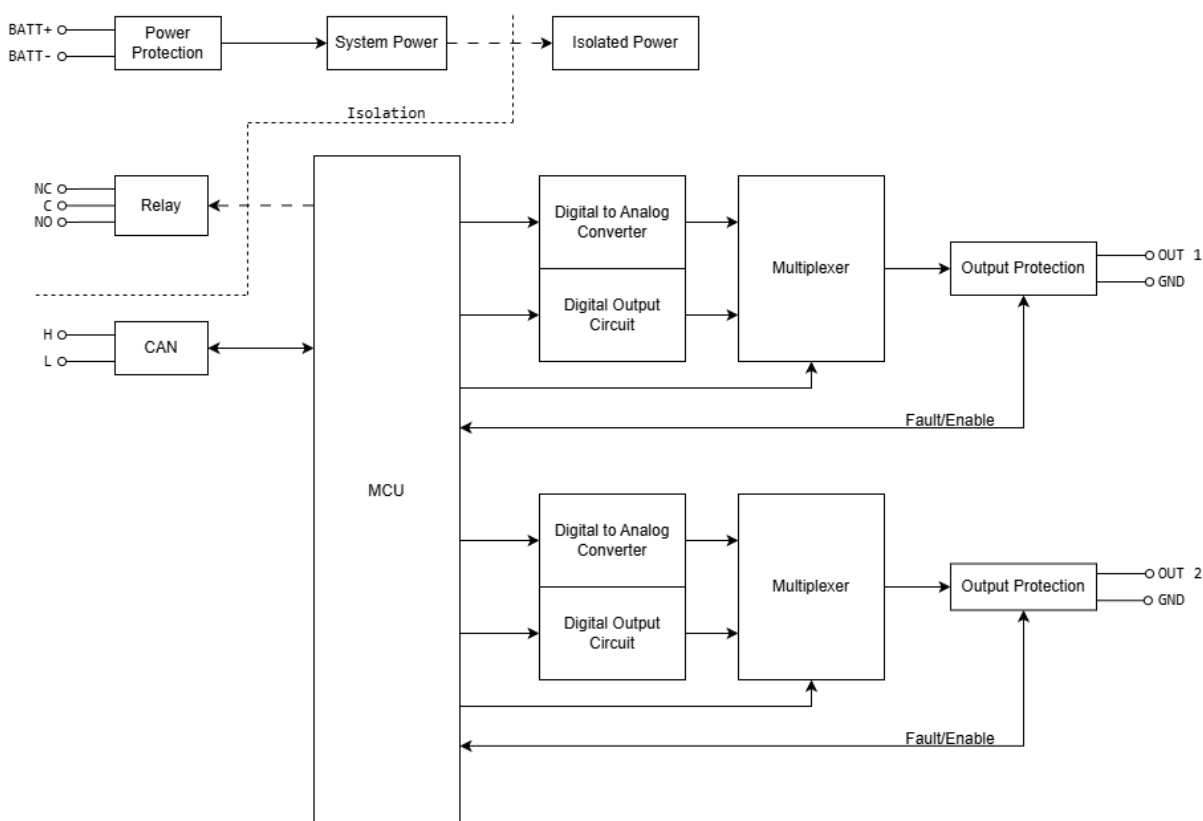


Figure 1 – Block Diagram for the 1x Relay & 2x Universal Outputs Controller, SAE J1939

1.1. Control Sources

The different function blocks in the ECU are commanded by a set of Control Sources, which are defined in every case using a “**Source**” setpoint and accompanying “**Number**” setpoint. The source will define which type of signal is selected, and the number will determine the index of the selected type. This section lists the different available control sources for these functions and their respective ranges. Most internal function blocks require sources to be selected to drive the block’s functionality. However, not all sources are logical to use as a source in some cases. Table 1 below lists the available control sources defined in the controller, along with the unique value used internally to define each source, and the range of available sources for each item listed.

Index	Value	Control Source	Range
0	0	No Source	[0...0]
1	75	Universal Output	[1...2]
2	76	Relay Output	[1...1]
3	176	CAN Receive	[1...15]
4	150	Constant Data	[1...15]
5	153	Math Function Block	[1...5]
6	154	Conditional Logic Block	[1...10]
7	155	Lookup Table	[1...10]
8	156	Programmable Logic Block	[1...4]
9	157	Set-Reset Latch Logic Block	[1...5]
10	159	DTC React	[1...16]
11	29	Global Temperature	[1...1]
12	30	Global Power Supply Voltage	[1...1]
13	200	Power Supply Voltage Fault State	[1...1]
14	204	Received CAN Message Timeout	[1...15]

Table 1 – Control Source List

If a non-digital signal is selected, the signal is interpreted to be OFF at or below the minimum of selected source and ON at or above the maximum of the selected source, and it will not change in between those points. Thus, non-digital to digital interpretation has a built-in hysteresis defined by minimum and maximum of the selected source, as shown in Figure 2. For example, a Universal Output signal is interpreted to be ON at or above its “**Maximum Range**” and OFF at or below its “**Minimum Range**”.

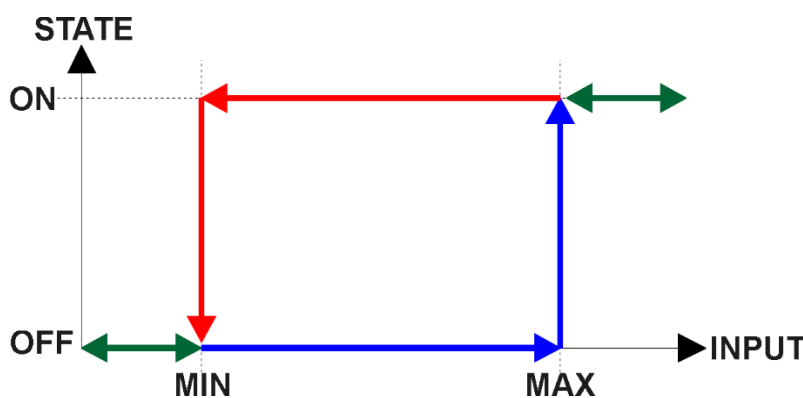


Figure 2 – Non-digital source to Digital Input

Control Constant Data does not have a unit, or minimum / maximum value assigned to it, so the user must select these sources with this in mind.

1.2. CAN Common Function Block

This ECU has a single CAN port and includes a “**CAN Baud Rate**” setpoint which determines the baud rate CAN connection. Table 2 lists the available options for this parameter.

0	<i>Auto Baud Rate Detection</i>
1	<i>1000 kbps</i>
2	<i>667 kbps</i>
3	<i>500 kbps</i>
4	<i>250 kbps</i>
5	<i>125 kbps</i>

Table 2 – Baud Rates

If the ‘*Auto Baud Rate Detection*’ setting is selected, the CAN port will detect the baud rate that is currently present on the connected CAN network and adjust to operate at that rate given that it is supported.

1.3. Output Function Block

The ECU is equipped with configurable outputs, which share common features and parameters to drive their functionality. Among the outputs, there are two types of output block types, listed as follows: 1 Relay Output, and 2 Universal Outputs.

This section describes the various parameters used to configure each output block.

1.3.1. Output Type

The type of output set by the ECU is determined by the “**Output Type**” parameter. It’s important to select this type first before configuring other setpoints for the output, because other setpoints will be enabled or disabled and will have different interpretations depending on the type selected.

Table 3 outlines the possible output types selectable for the output.

Universal Output Types	Value	Min Range	Max Range	Units
Output Disabled	0	-	-	-
Analog Voltage	10	-10	10	V
Analog Current	15	0	20	mA
Frequency	40	0	10,000	Hz
PWM Duty Cycle	50	0	100	%
Frequency & PWM Duty Cycle	52	0	10,000	Hz
		0	100	%
Digital Normal Logic	60	0	1	-
Digital Inverse Logic	61	0	1	-
Digital Latched Logic	62	0	1	-
Digital Inverse Latched Logic	63	0	1	-
Relay Output Types	Value	Min Range	Max Range	Units
Output Disabled	0	-	-	-
Normal Logic	1	0	1	-
Inverse Logic	2	0	1	-
Latched Logic	3	0	1	-
Inverse Latched Logic	4	0	1	-
Toggle Logic	5	0	1	-

Table 3 – Output Types

1.3.2. Minimum and Maximum Ranges

The “**Minimum Range**” and “**Maximum Range**” setpoints are used to create the overall useful range of the outputs. For example, if “**Minimum Range**” is set to 0V and “**Maximum Range**” is set to 10V, the overall useful range (0-100%) is between 0 and 10V. Anything below the “**Minimum Range**” will saturate at “**Minimum Range**”. Similarly, anything above the “**Maximum Range**” will saturate at “**Maximum Range**”. For Universal Outputs set with Digital Logic and Relay Outputs the ranges are fixed to 0 and 1. In order to generate a fault if the target output value falls outside of the designated range, the Diagnostics function block can be used.

1.3.3. Common Output Parameters

Among all three types of outputs, a common set of parameters are used to drive the output behaviour and values. The output value is determined using three different sets of data sources: **Control**, **Enable**, and **Override**. Each source can be selected from Table 1. The “**Control Source**” must first be selected to allow the other parameters to become available. The “**Control Number**”

parameter is used alongside the source to determine which input is selected. This logic follows for the Enable and Override sources as well. However, the Control is the default driver of the output value with no other source selected.

The “**Enable Source**” is used to disable the output. The source will be resolved to either ON or OFF logic, and the “**Enable Response**” setpoint is used to select the response to the source. The available responses are shown in Table 4 and Table 5 below, varying between Output Types.

0	<i>Enable When ON Else Shut Off</i>
1	<i>Enable When ON Else Ramp Off</i>
2	<i>Enable When ON Else Keep</i>
3	<i>Enable When OFF Else Shut Off</i>
4	<i>Enable When OFF Else Ramp Off</i>
5	<i>Enable When OFF Else Keep</i>

Table 4 – Universal Output Enable Responses

0	<i>Enable When ON</i>
1	<i>Enable When OFF</i>
2	<i>Disable When ON</i>
3	<i>Disable When OFF</i>
4	<i>Enable When ON Else Keep State</i>
5	<i>Enable When OFF Else Keep State</i>

Table 5 – Relay Output Enable Responses

The “**Override Source**” is used to supersede all other output logic. The resulting output is determined using the “**Override Response**” parameter to select whether the input source is read as either active high or low described in Table 6 below, and the “**Override Value**” parameter which is used to fix the output to any value within the range of the selected output type.

0	<i>Override When ON</i>
1	<i>Override When OFF</i>

Table 6 – Override Response Options

If all three inputs are configured and in use, the output will be determined in the following order of precedence; Override, Enable, then Control. The output logic will be determined by the next input if the condition of the source is determined false, i.e. if the Override source has ON logic, and the response is set to ‘Override When OFF’ then the Override Source will not drive the output, and it will instead use the Enable Source. Following the same pattern, if the Enable Source resolves to false, the Control Source will then drive the output logic.

Where applicable the outputs will respond in a linear manner to changes in the Control Source per the calculation shown in Equation 1.

$$y = mx + a$$

$$m = \frac{Y_{\max} - Y_{\min}}{X_{\max} - X_{\min}}$$

$$a = Y_{\min} - m * X_{\min}$$

Where X and Y are defined as:

Xmin = Control Input Minimum

Ymin = **“Minimum Range”**

Xmax = Control Input Maximum

Ymax = **“Maximum Range”**

1.3.4. Universal Outputs

The ECU contains 2 Universal Outputs, which can be configured with the setpoints described in this section. They use the common output parameters, and some additional parameters that vary between the selected Output Type. Each output has two sets of parameters, labelled as ‘1’ and ‘2’, specifically for the *‘Frequency & PWM Duty Cycle’* type which drives two independent values at the same time, with set 1 controlling the frequency and set 2 controlling the PWM duty cycle. For all other types, only the first set of parameters is used.

The **“Delay Time”** setpoint is used to add a period of delay before the affected output logic is evaluated. To prevent abrupt changes at the output due to sudden changes in the command input, the user can choose to use the independent up or down ramps to smooth out the response. The **“Ramp Up Time (Min to Max)”** and **“Ramp Down Time (Max to Min)”** parameters are set in milliseconds, and the step size of the output change will be determined by taking the absolute value of the output range and dividing it by the ramp time.

In addition to the Control parameter described in Section 1.3.3, the **“Control Response”** parameter is used to determine how the output will respond to the evaluated Control data. When set to *‘Single Out Profile’*, if the input control data is below the associated minimum range it will be clamped to that minimum, and if above the maximum range it will be clamped to that maximum value and the output value will be calculated as normal. However, if either the *‘OFF When Below Minimum’* or *‘OFF When Above Maximum’* is selected as the response, the output value will instead be forced to a shutoff value when the appropriate condition is met.

0	<i>Single Out Profile</i>
1	<i>OFF When Below Minimum</i>
2	<i>OFF When Above Maximum</i>

Table 7 – Control Response Options

The **“Fault Response”** setpoint is used to determine how the output will act in the event that a fault occurs. This will be triggered if a proportional output is monitored with a Diagnostic Block and the set configuration generates a fault. The output will either be set to Shutoff, set to the configured **“Fault Value”**, or set to the hold the last value before the fault occurred.

0	<i>Shutoff Output</i>
1	<i>Apply Fault Value</i>
2	<i>Hold Last Value</i>

Table 8 – Fault Response Options

The **“Default Output Value”** parameter is used to establish a baseline or default output value for the selected output. Typically, this value will only be applied to the output when either no control source is configured or the set control logic is not able to process any valid data.

1.3.4.1. Analog Voltage and Current Output

When the “**Output Type**” is set to ‘*Analog Voltage*’ the Universal Output will produce a voltage output. When set to ‘*Analog Current*’ the output will instead be a current output.

1.3.4.2. Frequency & PWM Duty Cycle Output

When the “**Output Type**” is set to ‘*Frequency*’, ‘*PWM Duty Cycle*’, or ‘*Frequency & PWM Duty Cycle*’, the output will serve as a signal with three configurable components: frequency, duty cycle, and voltage. The component that matches the type will be controlled by the parameter set, while the other components will be fixed. Depending on the type, the “**Fixed Output Frequency**”, “**Fixed Output Duty Cycle**”, or “**Fixed Output Voltage**” will be available to set the appropriate components. When the output is set to ‘*Frequency & PWM Duty Cycle*’, there will be two sets controls and only one the voltage may be fixed.

1.3.5. Digital and Relay Output

When Universal Outputs have the “**Output Type**” parameter selected as any of the digital types, the output will be set to either the OFF or ON. In the ON state, the output will produce a voltage level according to the “**Fixed Output Voltage**” parameter. When the output type is set to ‘*Digital Output Blink Logic*’, the “**Blink Rate**” is used to determine the period between the logic blink ON. Additionally, the “**Unlatch Source**” and “**Unlatch Number**” parameters are only available with either of the Latched logic types and can be used to have a separate source force the output to unlatch from its latched state.

The Controller also has one configurable Relay Output, which use many of the common output parameters, as well as the parameters listed above. The Relay Output has 3 pins associated with it: Normally Closed (NC), Normally Open (NO), and Common (C). When the Relay Output resolves to the ON state, the C and NO pins will be connected. When resolved to the OFF state, the C and NC pins will be connected. There are also two separate parameters, the “**ON State Delay Time**” and “**OFF State Delay Time**” which can be used to add a period of delay when switching to either state.

1.4. Constant Data

The Constant Data Block contains 2 fixed (False/True) and 13 configurable constant data setpoints which can be used as a control source for other functions. While they are available as a control source for all functions, it is recommended not to use constant data as a control source for the Set-Reset Latch Block.

1.5. Math Function Block

There are five Math Function Blocks that allow the user to define basic algorithms. A math function block can take up to four input signals. Each input is then scaled according to the associated limit and scaling setpoints.

Inputs are converted into a percentage value based on the “**Input X Minimum**” and “**Input X Maximum**” values selected. For additional control the user can also adjust the “**Input X Decimal Digits**” setpoint to increase the resolution of the input data and the min and max values.

A math function block includes three selectable functions, in which each function implements equation A operator B, where A and B are function inputs and operator is function selected with a setpoint “**Math Function X**”. Setpoint options are presented in Table 9. The functions are connected, so that result of the preceding function goes into Input A of the next function. Thus Function 1 has both Input A and Input B selectable with setpoints, where Functions 2 to 4 have only Input B selectable. Input is selected by setting “**Function X Input Y Source**” and “**Function X Input Y Number**”. If “**Function X Input B Source**” is set to 0, a ‘No Source’ signal goes through the function unchanged.

$$\text{Math Block Output} = (((A1 \text{ op1 } B1) \text{ op2 } B2) \text{ op3 } B3) \text{ op4 } B4$$

0	=, True when InA equals InB
1	!=, True when InA not equal InB
2	>, True when InA greater than InB
3	>=, True when InA greater than or equal InB
4	<, True when InA less than InB
5	<=, True when InA less than or equal InB
6	OR, True when InA or InB is True
7	AND, True when InA and InB are True
8	XOR, True when either InA or InB is True, but not both
9	+, Result = InA plus InB
10	-, Result = InA minus InB
11	x, Result = InA times InB
12	/, Result = InA divided by InB
13	MIN, Result = Smallest of InA and InB
14	MAX, Result = Largest of InA and InB

Table 9 – Math Function X Operator Options

For logic operations (6, 7, and 8), a scaled input greater than or equal to 1 is treated as TRUE. For logic operations (0 to 8), the result of the function will always be 0 (FALSE) or 1 (TRUE). For the arithmetic functions (9 to 14), it is recommended to scale the data such that the resulting operation will not exceed full scale (0 to 100%) and saturate the output result.

When dividing, a zero divider will always result in a 100% output value for the associated function.

The resulting calculation, presented as a percentage value, can be scaled into the appropriate physical units using the “**Math Output Minimum Range**” and “**Math Output Maximum Range**” setpoints. These values are also used as the limits when the Math Function is selected as the input source for another function block.

1.6. Conditional Logic Function Block

Conditional Logic Blocks compare up to four different input sources with different logical or relational operators. The result of each block can therefore only be true (1) or false (0). Figure 3 demonstrates the connections between all parameters.

Each Conditional Block offers two conditions. Both compare two inputs, which can hold a logical value or an integer value. The output of the conditions can only be true or false and will be compared by Operator 3 with a logical operator. This comparison is the result of the Conditional Block and can control any output source.

The value of each source will then be compared to each other with an operator of Table 10. If no source is selected, the output value of an Input will be zero.

Operator 1 and Operator 2 are configured to OR by default. The table above cannot be used for comparing the conditions because they can only be compared with logical operators, which are listed in Table 11.

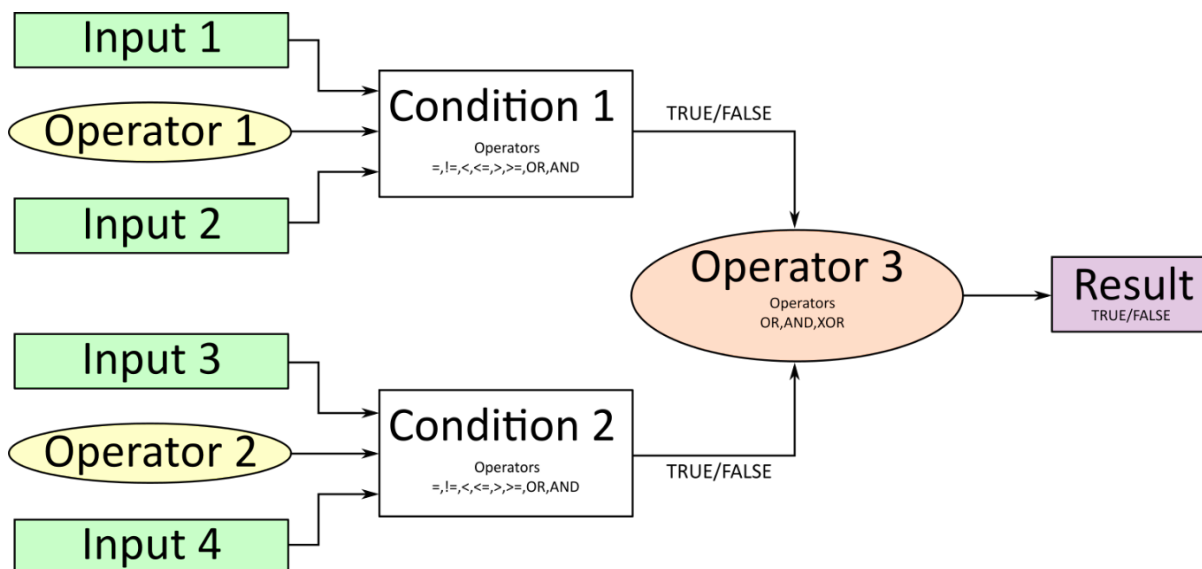


Figure 3 – Conditional Block Diagram

0	==, True when Argument 1 is equal to Argument 2
1	!=, True when Argument 1 is not equal to Argument 2
2	>, True when Argument 1 is greater than Argument 2
3	>=, True when Argument 1 is greater than Argument 2
4	<, True when Argument 1 is less than Argument 2
5	<=, True when Argument 1 is less than or equal Argument 2
6	OR, True when Argument 1 or Argument 2 is True
7	AND, True when Argument 1 and Argument 2 are True

Table 10 – Input Operator Options

0	OR, True when Argument 1 or Argument 2 is True
1	AND, True when Argument 1 and Argument 2 are True
2	XOR, True when Argument 1 is not equal to Argument 2

Table 11 – Condition Operator Options

If only one condition is used, it is to make sure that Operator 3 is set to OR so that the result is based solely on the condition which has been chosen.

1.7. Lookup Table Function Block

Lookup Tables are used to give output response up to 10 slopes per input. If more than 10 slopes are required, A Programmable Logic Block can be used to combine up to three tables to get 30 slopes as described in Section 1.8.

Lookup tables have two differing modes defined by “**X-Axis Type**” setpoint, given in Table 12. The ‘*Data Response*’ option is the normal mode where block input signal is selected with the “**X-Axis Source**” and “**X-Axis Number**” setpoints and X values present directly input signal values. With the ‘*Time Response*’ option, the input signal is time and X values present time in milliseconds. And selected input signal is used as digital enable.

0	Data Response
1	Time Response

Table 12 – X-Axis Type Options

The slopes are defined with (x, y) points and associated point response. X value presents input signal value and Y value corresponding Lookup Table output value. “**PointN – Response**” setpoint defines the type of slope from preceding point to the point in question. Response options are given in Table 13. ‘*Ramp To*’ gives a linearized slope between points, whereas ‘*Jump To*’ gives a point-to-point response, where any input value between X_{N-1} and X_N will result Lookup Table output being Y_N . “**Point0 – Response**” is always ‘Jump To’ and cannot be edited. Choosing ‘Ignored’ response causes associated points and all the following points to be ignored.

0	Ignore
1	Ramp To
2	Jump To

Table 13 – PointN - Response Options

The X values are limited by the minimum and maximum range of the selected input source if the source is a Math Function Block. For the afore-mentioned sources X-Axis data will be redefined when ranges are changed, therefore inputs should be adjusted before changing X-Axis values. For other sources X_{min} and X_{max} are -100000 and 1000000. The X-Axis is constraint to be in rising order; thus, the value of the next index is greater than or equal to the preceding one. Therefore, when adjusting the X-Axis data, it is recommended that X_{10} is changed first, then lower indexes in descending order.

$$X_{min} \leq X_0 \leq X_1 \leq X_2 \leq X_3 \leq X_4 \leq X_5 \leq X_6 \leq X_7 \leq X_8 \leq X_9 \leq X_{10} \leq X_{max}$$

The Y-Axis has no constraints on the data it presents, thus inverse, decreasing, increasing or other response can be easily established. The Smallest of the Y-Axis values is used as Lookup Table output minimum and the largest of the Y-Axis values is used as Lookup Table output maximum (i.e. used as X_{min} and X_{max} values in linear calculation.). Ignored points are not considered for minimum and maximum values.

1.8. Programmable Logic Function Block

Programmable Logic Function Blocks can be linked to up to three Lookup Tables, any of which would be selected only under given conditions. Thus, the output of a Programmable Logic Block at any given time will be the output of the Lookup Table selected by the defined logic. Therefore, up to three different responses to the same input, or three different responses to different inputs, can become the input to another function block.

To enable any of the Programmable Logic Blocks, the “**Logic Enabled**” setpoint must be set to ‘True’. By default, all Logic blocks are disabled.

The three associated tables are selected by setting “**Table Number X**” setpoint to desired Lookup Table number, for example selecting 1 would set Lookup Table 1 as TableX.

For each TableX there are three conditions that define the logic to select the associated Lookup Table as Logic output. Each condition implements the function *Argument1 Operator Argument2*. Where ‘Operator’ is logical operator defined by setpoint “**Table X – Condition Y Operator**”. Setpoint options are listed in Table 14. Condition arguments are selected with “**Table X – Condition Y Argument Z Source**” and “**Table X - Condition Y Argument Z Number**” setpoints. If the ‘No Source’ option is selected as “**Table X - Condition Y Argument Z Source**” the argument is interpreted as 0.

0	=, Equal
1	!=, Not Equal
2	>, Greater Than
3	>=, Greater Than or Equal
4	<, Less Than
5	<=, Less Than or Equal

Table 14 – Table X - Condition Y Operator Options

The three conditions are evaluated and if the result satisfies logical operation defined with “**Logical Operator X**” setpoint, given in Table 15, the associated Lookup Table is selected as output of the Logical block. Option ‘0 – Default Table’ selects associated Lookup Table in all conditions.

0	Default Table (Table1)
1	Cnd1 And Cnd2 And Cnd3
2	Cnd1 Or Cnd2 Or Cnd3
3	(Cnd1 And Cnd2) Or Cnd3
4	(Cnd1 Or Cnd2) And Cnd3

Table 15 – Table X - Conditions Logical Operator Options

The three logical operations are evaluated in order and the first to satisfy gets selected, thus if Table1 logical operation is satisfied, the Lookup Table associated with Table1 gets selected regardless of two other logical operations. If none of the logical operations are satisfied, the output will appear as a NULL or 0xFF value.

1.9. Set / Reset Latch Function Block

Set-Reset Latch Blocks use two control sources to drive a logical output. The purpose of these blocks is to simulate a modified latching function in which the 'Reset Signal' has more precedence. The latching function operates using the logic described in Table 16 below.

Set Signal	Reset Signal	Set-Reset Block Output (Initial State: OFF)
OFF	OFF	Latched State
OFF	ON	OFF
ON	OFF	ON
ON	ON	OFF

Table 16 – Set-Reset Function block operation

The Reset and Set sources each have minimum and maximum threshold values associated with them that determine the ON and OFF state. The “**Reset Source**” uses the “**Reset Minimum Threshold**” and “**Reset Maximum Threshold**” setpoints. Similarly, for the “**Set Source**”, the “**Set Minimum Threshold**” and “**Set Maximum Threshold**” setpoints are used. These setpoints are interpreted in terms of percentage of the selected input. A signal is determined to be ON after reaching or going above the maximum threshold and determined to be OFF after reaching or going below the minimum threshold.

As seen in Table 16 above, the Reset Signal has more precedence over the Set Signal - if the state of the Reset Signal is ON, then the state of the Set-Reset Block Output will be OFF. To create an ON state in the Set-Reset Block Output, then the state of the Reset Signal must be OFF while the state of the Set Signal is ON. In this case, the state of the Set-Reset Block Output will remain ON even if the Set Signal turns OFF if the Reset Signal remains OFF. As soon as the Reset Signal turns ON the Set-Reset Block Output will turn OFF regardless of the state of Set Signal.

1.10. Diagnostic Function Block

The converter supports diagnostic messaging. A DM1 message contains an Active Diagnostic Trouble Code (DTC) that is sent to the J1939 network in case a fault has been detected. A Diagnostic Trouble Code is defined by the J1939 standard as a four-byte value which is a combination of:

SPN	Suspect Parameter Number	(user defined)
FMI	Failure Mode Identifier	(see Table 19)
CM	Conversion Method	(always set to 0)
OC	Occurrence Count	(number of times the fault has happened)

In addition to supporting the DM1 message, the converter also supports:

DM2	Previously Active Diagnostic Trouble Codes	Sent only on request
DM3	Diagnostic Data Clear/Reset of Previously Active DTCs	Done only on request
DM11	Diagnostic Data Clear/Reset for Active DTCs	Done only on request

Fault detection and reaction is a standalone functionality that can be configured to monitor and report diagnostics of various controller parameters. The converter supports 16 Diagnostics Definitions, each freely configurable by the user.

By default, the monitoring of operating voltage, CPU temperature and CAN receive timeouts is configured to diagnostics blocks 1, 2 and 3., In case any of these three diagnostics blocks are needed for some other use, the default settings can be adjusted by the user to suit the application.

There are 4 fault types that can be used, “**Minimum and maximum error**”, “**Absolute value error**”, “**State error**” and “**Double minimum and maximum error**”.

Minimum and maximum error has two thresholds, “MIN Shutdown” and “MAX Shutdown” that have configurable, independent diagnostics parameters (SPN, FMI, Generate DTCs, delay before flagging status). In case the parameter to monitor stays between these two thresholds, the diagnostic is not flagged.

An **Absolute value error** has one configurable threshold with configurable parameters. In case the parameter to monitor stays below this threshold, the diagnostic is not flagged.

A **State error** is similar to the Absolute value error; the only difference is that State error does not allow the user to specify specific threshold values; thresholds ‘1’ and ‘0’ are used instead. This is ideal for monitoring state information, such as received message timeouts.

The **double minimum and maximum error thresholds** allow the user to specify four thresholds, each with independent diagnostic parameters. The diagnostic status and threshold values is determined and expected as show in Figure 4 below.

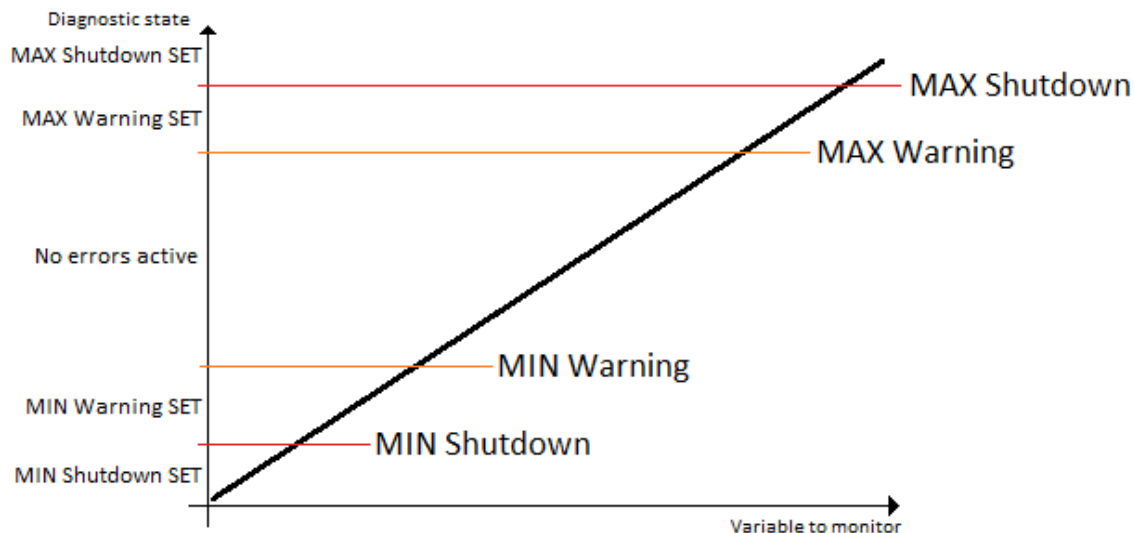


Figure 4 – Double Minimum and Maximum Error Thresholds

In case any of the Diagnostics blocks is configured to monitor Output Current Feedback, there is an internal error status flag maintained automatically for that particular output. This internal flag can be used for driving the output to a specified state in case of diagnostic event using Proportional Current Output setpoints “**Control Fault Response**”, “**Output in Fault Mode**” and “**Fault Detection Enabled**”.

There are also built in error status flags for power supply and CPU temperature monitoring. The setpoints “**VPS Fault Disables Outputs**” and “**Shutdown Temperature Disables Outputs**”, described in Section 1.12, disable the outputs when the measured supply voltage or controller temperature crosses its configured threshold.

While there are no active DTCs, the converter will send ‘No Active Faults’ message. If a previously inactive DTC becomes active, a DM1 will be sent immediately to reflect this. As soon as the last active DTC goes inactive, a DM1 indicating that there are no more active DTCs will be sent.

If there is more than one active DTC at any given time, the regular DM1 message will be sent using a multipacket message to the Requester Address using the Transport Protocol (TP).



At power up, the DM1 message will not be broadcasted until after 5 second delay. This is done to prevent any power up or initialization conditions from being flagged as an active error on the network.

When the fault is linked to a DTC, a non-volatile log of the occurrence count (OC) is kept. As soon as the controller detects a new (previously inactive) fault, it will start decrementing the “**Delay before Event is flagged**” timer for that Diagnostic function block. If the fault has remained present during the delay time, then the controller will set the DTC to active, and will increment the OC in the log. A DM1 will immediately be generated that includes the new DTC. The timer is provided so that intermittent faults do not overwhelm the network as the fault comes and goes, since a DM1 message would be sent every time the fault shows up or goes away.

By default, the fault flag is cleared when the error condition that has caused it goes away. The DTC is made Previously Active and is it is no longer included in the DM1 message. To identify a fault having happened, even if the condition that has caused is one away, the “**Event Cleared only by DM11**” setpoint can be set to ‘True’. This configuration enables DTC to stay Active, even after the fault flag has been cleared, and be included in DM1 message until a Diagnostic Data Clear/Reset for Active DTCs (DM11) has been requested.

As defined by J1939 Standard the first byte of the DM1 message reflects the Lamp status. “**Lamp Set by Event**” setpoint determines the lamp type set in this byte of DTC. “**Lamp Set by Event**” setpoint options are listed in Table 17. By default, the ‘Amber, Warning’ lamp is typically the one set be any active fault.

0	Protect
1	Amber Warning
2	Red Stop
3	Malfunction

Table 17 – Lamp Set by Event in DM1 Options

The “**SPN for Event**” setpoint defines suspect parameter number used as part of DTC. The default value zero is not allowed by the standard, thus no DM will be sent unless “**SPN for Event**” is configured to be different from zero. It is the user’s responsibility to select SPN that will not violate J1939 standard. When the “**SPN for Event**” is changed, the OC of the associated error log is automatically reset to zero.

Every fault has a default FMI associated with them. The used FMI can be configured with “**FMI for Event**” setpoint, presented in Table 18. When an FMI is selected from Low Fault FMIs in Table 19 for a fault that can be flagged either high or low occurrence, it is recommended that the user would select the high occurrence FMI from the right column of Table 19. There is no automatic setting of High and Low FMIs in the firmware, the user can configure these freely.

0	<i>Data Valid But Above Normal Operational Range - Most Severe Level</i>
1	<i>Data Valid But Below Normal Operational Range - Most Severe Level</i>
2	<i>Data Intermittent</i>
3	<i>Voltage Above Normal, Or Shorted To High Source</i>
4	<i>Voltage Below Normal, Or Shorted To Low Source</i>
5	<i>Current Below Normal Or Open Circuit</i>
6	<i>Current Above Normal Or Grounded Circuit</i>
7	<i>Mechanical Error</i>
8	<i>Abnormal Frequency Or Pulse Width Or Period</i>
9	<i>Abnormal Update Rate</i>
10	<i>Abnormal Rate Of Change</i>
11	<i>Root Cause Not Known</i>
12	<i>Bad Component</i>
13	<i>Out Of Calibration</i>
14	<i>Special Instructions</i>
15	<i>Data Valid But Above Normal Operating Range – Least Severe Level</i>
16	<i>Data Valid But Above Normal Operating Range – Moderately Severe Level</i>
17	<i>Data Valid But Below Normal Operating Range – Least Severe Level</i>
18	<i>Data Valid But Below Normal Operating Range – Moderately Severe Level</i>
19	<i>Network Error</i>
20	<i>Data Drifted High</i>
21	<i>Data Drifted Low</i>
31	<i>Condition Exists</i>

Table 18 – FMI for Event Options

Low Fault FMIs	High Fault FMIs
FMI=1, Data Valid But Below Normal Operation Range – Most Severe Level	FMI=0, Data Valid But Above Normal Operational Range – Most Severe Level
FMI=4, Voltage Below Normal, Or Shorted to Low Source	FMI=3, Voltage Above Normal, Or Shorted To High Source
FMI=5, Current Below Normal Or Open Circuit	FMI=6, Current Above Normal Or Grounded Circuit
FMI=17, Data Valid But Below Normal Operating Range – Least Severe Level	FMI=15, Data Valid But Above Normal Operating Range – Least Severe Level
FMI=18, Data Valid But Below Normal Operating Level – Moderately Severe Level	FMI=16, Data Valid But Above Normal Operating Range – Moderately Severe Level
FMI=21, Data Drifted Low	FMI=20, Data Drifted High

Table 19 – Low Fault FMIs and corresponding High Fault FMIs

1.11. DTC React Function Block

DTC React is a function block that allows the ECU to receive and process the DM1 messages. There are 16 separated function blocks that can capture up to 16 different DM1 messages. Each DTC React has two mandatory and two optional parameters. The mandatory parameters are the SPN and FMI. If only these parameters are used, the output will be set to high if the DM1 message with the combination of selected SPN and FMI. The state will remain high for five seconds and will be set if the DM1 message is received again.

Among optional parameters there are lamp setting and the source address. To enable them, the **“Lamp Used to Trigger Reaction”** and **“Source Address Used to Trigger Reaction”** should be set to 1, *True*. In this case, beside SPN and FMI the ECU will compare the Lamp Setting and/or Source Address of the received message. Messages with the source address matching the ECU address set by the unit (0x80 by default) are designed to be ignored. Therefore, selecting the same source address as the ECU address of the unit itself will result in no reaction.

The exceptions are the following SPN:

- SPN1213 and Lamp Status 0x40
- SPN623 and Lamp Status 0x10
- SPN624 and Lamp Status 0x04
- SPN987 and Lamp Status 0x01

In case the SPNs above are chosen, the DTC React function block will set the output to HIGH if SPN and Lamp Status match even if FMI doesn't match. However, if the **“Source Address Used to Trigger Reaction”** is set to 1, *True* and selected address doesn't match, the DTC React output will be set to FALSE.

1.12. Miscellaneous Settings

The Miscellaneous Settings group contains the setpoints that control supply-voltage shutdown, temperature shutdown, and diagnostic messages on each CAN port.

“VPS Fault Disables Outputs” selects whether a supply-voltage fault disables the outputs. When this setpoint is ‘True’, the measured supply voltage is compared with **“Undervoltage Threshold”** and **“Overvoltage Threshold”**. A voltage at or below the undervoltage threshold, or at or above the overvoltage threshold, will disable the outputs.

“Undervoltage Threshold” is the supply voltage at or below which an undervoltage fault is detected. It can be set from 6.0 V up to 0.1 V below **“Overvoltage Threshold”**, with a default value of 10.0 V.

“Overvoltage Threshold” is the supply voltage at or above which an overvoltage fault is detected. It can be set from 0.1 V above **“Undervoltage Threshold”** up to 36.0 V. The default is 30.0 V.

“Shutdown Temperature Disables Outputs” selects whether a high controller temperature disables the outputs. When this setpoint is ‘True’, a measured temperature at or above **“Shutdown Temperature Threshold”** disables the outputs. When it is ‘False’, a temperature fault does not disable the outputs, and the threshold setpoint is hidden. The default is ‘False’.

“Shutdown Temperature Threshold” is the controller temperature at or above which a temperature fault is detected. The allowable range is -40 °C to 85 °C. 85 °C is the hardware limit. The default is 75 °C.

“CAN1 Diagnostic Message Setting” and **“CAN2 Diagnostic Message Setting”** select how diagnostic messages are transmitted on CAN 1 and CAN 2. The options are listed in Table 20. ‘Diagnostic Messages Off’ disables diagnostic messages on that port. ‘Empty Diagnostic Messages Blocked’ enables the port for diagnostic messages, but the DM1 message is not sent when there are no active faults. ‘Diagnostic Messages On’ enables diagnostic messages on that port, including the DM1 message sent when no faults are active. The default for both ports is ‘Diagnostic Messages Off’.

0	Diagnostic Messages Off
1	Empty Diagnostic Messages Blocked
2	Diagnostic Messages On

Table 20 – Diagnostic Message Settings

1.13. CAN Transmit Message Function Block

The CAN Transmit function block is used to send any output from another function block (i.e., input, CAN receive) to the J1939 network. The ECU has 10 CAN Transmit Messages which can be configured, and each message has four completely user defined signals.

1.13.1. CAN Transmit Message Parameters

Each CAN Transmit Message setpoint group includes setpoints that affect the whole message and are thus mutual for all signals of the message. These setpoints are presented in this section. The setpoints that configure an individual signal are presented in the next section.

Each Transmit block can be either enabled or disabled using the “**Transmit Enabled**” setting.

The “**PGN**” setpoint sets PGN used with the message. **Users should be familiar with the SAE J1939 standard and select values for PGN/SPN combinations as appropriate from section J1939/71.**

“**Repetition Rate**” defines the interval used to send the message to the J1939 network. If the rate is set to zero, the message is disabled unless it shares its PGN with another message. In the case of a shared PGN repetition rate of the LOWEST numbered message are used to send the message ‘bundle’.

By default, all messages are sent on Proprietary B PGNs as broadcast messages. Thus “**Transmit Message Priority**” is always initialized to 6 (low priority) and the “**Destination Address (PDU1)**” setpoint is not used. This setpoint is only valid when a PDU1 PGN has been selected, and it can be set either to the Global Address (0xFF) for broadcasts or sent to a specific address as set up by the user.

1.13.2. CAN Transmit Signal Parameters

Each CAN transmit message has four associated signals, which define data inside the Transmit message. Each signal can be configured with the “**Signal Data Type**” setpoint to either be disabled or configured as a ‘*Discrete*’ or ‘*Continuous*’ signal. The “**Control Source**” setpoint together with “**Control Number**” setpoint define the signal source of the message. The options for those setpoints are listed in Table 1. Setting “**Control Source**” to ‘*No Source*’ disables the signal.

The “**Signal Data Size**” setpoint determines how many bits within the message will be reserved for that signal. “**Signal Byte Index**” determines in which byte of the CAN message the LSB of the signal is located. Similarly, “**Signal Bit Index**” determines in which bit within the byte that the LSB of the signal is located. These setpoints are freely configurable, and it is up to user discretion to configure signals that are not overlapping or masking data from each other.

“**Signal Resolution**” determines the scaling done on the signal data before it is sent to the bus. While “**Signal Offset**” determines the value that is subtracted from the data before it is scaled. The Offset and Resolution are interpreted in units of the selected source signal.

1.14. CAN Receive Function Block

The CAN Receive function block is designed to take any SPN from the J1939 network and use it as an input to another function block (i.e., Outputs).

The “**Signal Type**” parameter is the most important setpoint associated with this function block and it should be selected first. Changing it will result in other setpoints being enabled or disabled, and assigning the type of data to be received. By default, all receive messages are disabled.

Each CAN Receive message is configured to read only certain signals via the J1939 network, and setting the “**PGN**” parameter allows only signals with the matching PGN to be read. By default, all control messages are expected to be sent to the converter on Proprietary B PGNs. However, should a PDU1 message be selected, the converter can be configured to receive messages from any ECU by setting “**PGN From Selected Address**” to ‘FALSE’. Conversely, setting that parameter to ‘TRUE’ will instead allow only a specific address to be received. The “**Selected Address**” setting will configure which specific address that the data should be received from, ignoring signals with the same PGN but with other ECU addresses.

The “**Size**”, “**Data Position Byte**”, “**Data Position Bit**”, “**Resolution**” and “**Offset**” can all be used to map any SPN supported by the J1939 standard to the output data of the Received function block.

Once a data type has been selected, a CAN Receive Timeout fault will be flagged if that message is not received on the CAN bus within the “**Autoreset Time**” period. In order to avoid a timeout on a heavily saturated network, it is recommended to set the period at least three times longer than the expected update rate. To disable the timeout feature set this value to zero, in which case the received message will not trigger a timeout fault.

As mentioned earlier, a CAN receive function clock can be selected as the source of the control input for the output function blocks. When this is case, the “**Data Maximum**” and “**Data Minimum**” setpoints determine the maximum and minimum values of the control signal. They are also used to determine on/off thresholds for digital output types. These values are in whatever units the data is AFTER the resolution and offset is applied to CAN receive signal.

The converter supports up to fifteen unique CAN Receive Messages.

2. INSTALLATION INSTRUCTIONS

2.1. Dimensions and Pinout

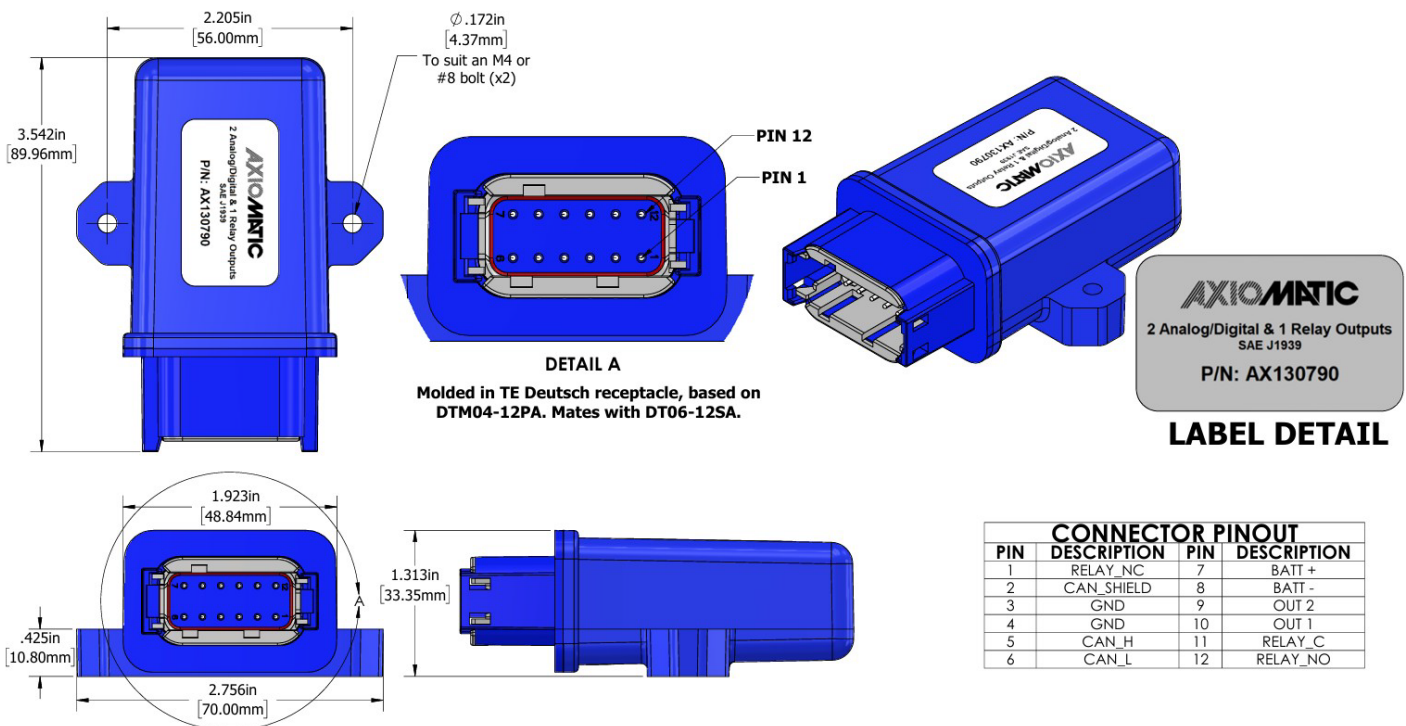


Figure 5 – AX130790 Dimensional Drawing

Integral 12-pin receptacle (equivalent to TE Deutsch P/N: **DTM04-12PA**)

Connector			
Pin	Description	Pin	Description
1	RELAY NC	1	BAT+
2	CAN SHIELD	2	BAT-
3	GND	3	OUT 2
4	GND	4	OUT 1
5	CAN HIGH	5	RELAY C
6	CAN LOW	6	RELAY NO

Table 21 – AX130790 Connector Pinout

3. OVERVIEW OF J1939 FEATURES

The software was designed to provide flexibility to the user with respect to messages sent from the ECU by providing:

- Configurable ECU Instance in the NAME (to allow multiple ECUs on the same network).
- Configurable Input Parameters.
- Configurable PGN and Data Parameters.
- Configurable Diagnostic Messaging Parameters, as required.
- Diagnostic Log, maintained in non-volatile memory.

3.1. Introduction to Supported Messages

The ECU is compliant with the standard SAE J1939 and supports following PGNs from the standard.

From J1939-21 – Data Link Layer

- | | | |
|--|------------|----------|
| • Request | 59904 | 0x00EA00 |
| • Acknowledgement | 59392 | 0x00E800 |
| • Transport Protocol – Connection Management | 60416 | 0x00EC00 |
| • Transport Protocol – Data Transfer Message | 60160 | 0x00EB00 |
| • Proprietary B | from 65280 | 0x00FF00 |
| | to 65535 | 0x00FFFF |

From J1939-73 – Diagnostics

- | | | |
|--|-------|----------|
| • DM1 – Active Diagnostic Trouble Codes | 65226 | 0x00FECA |
| • DM2 – Previously Active Diagnostic Trouble Codes | 65227 | 0x00FECB |
| • DM3 – Diagnostic Data Clear/Reset for Previously Active DTCs | 65228 | 0x00FECC |
| • DM11 – Diagnostic Data Clear/Reset for Active DTCs | 65235 | 0x00FED3 |

From J1939-81 – Network Management

- | | | |
|--------------------------------|-------|----------|
| • Address Claimed/Cannot Claim | 60928 | 0x00EE00 |
| • Commanded Address | 65240 | 0x00FED8 |

From J1939-71 – Vehicle Application Layer

- | | | |
|----------------------------|-------|----------|
| • Software Identification | 65242 | 0x00FEDA |
| • Software Identification | 65242 | 0x00FEDA |
| • Component Identification | 65259 | 0x00FEEB |

None of the application layer PGNs are supported as part of the default configurations, but they can be selected as desired for transmit function blocks.

Setpoints are accessed using standard Memory Access Protocol (MAP) with proprietary addresses. The Axiomatic Electronic Assistant (EA) allows for quick and easy configuration of the unit over CAN network.

3.2. NAME, Address and Software ID

The converter has the following default for the J1939 NAME. The user should refer to the SAE J1939/81 standard for more information on these parameters and their ranges.

Arbitrary Address Capable	Yes
Industry Group	0, Global
Vehicle System Instance	0
Vehicle System	0, Non-specific system
Function	124, I/O Controller
Function Instance	12, Axiomatic AX130790
ECU Instance	0, First Instance
Manufacture Code	162, Axiomatic Technologies
Identity Number	Variable, uniquely assigned during factory programming for each ECU

The ECU Instance is a configurable setpoint associated with the NAME. Changing this value will allow multiple ECUs of this type to be distinguishable from one another when they are connected on the same network.

The default value of the “ECU Address” setpoint is 128 (0x80), which is the preferred starting address for self-configurable ECUs as set by the SAE in J1939 tables B3 and B7. The Axiomatic EA supports the selection of any address between 0 and 253. ***It is the user’s responsibility to select an address that complies with the standard.*** The user must also be aware that since the unit is arbitrary address capable, if another ECU with a higher priority NAME contends for the selected address, the converter will continue select the next highest address until it finds one that it can claim. See J1939/81 for more details about address claiming.

ECU Identification Information

PGN 64965		ECU Identification Information		-ECUID
Transmission Repetition Rate:		On request		
Data Length:		Variable		
Extended Data Page:		0		
Data Page:		0		
PDU Format:		253		
PDU Specific:		197 PGN Supporting Information:		
Default Priority:		6		
Parameter Group Number:		64965 (0x00FDC5)		
Start Position	Length	Parameter Name	SPN	
a	Variable	ECU Part Number, Delimiter (ASCII “*”)	2901	
b	Variable	ECU Serial Number, Delimiter (ASCII “*”)	2902	
c	Variable	ECU Location, Delimiter (ASCII “*”)	2903	
d	Variable	ECU Type, Delimiter (ASCII “*”)	2904	
e	Variable	ECU Manufacturer Name, Delimiter (ASCII “*”)	4304	
(a)*(b)*(c)*(d)*(e)*				

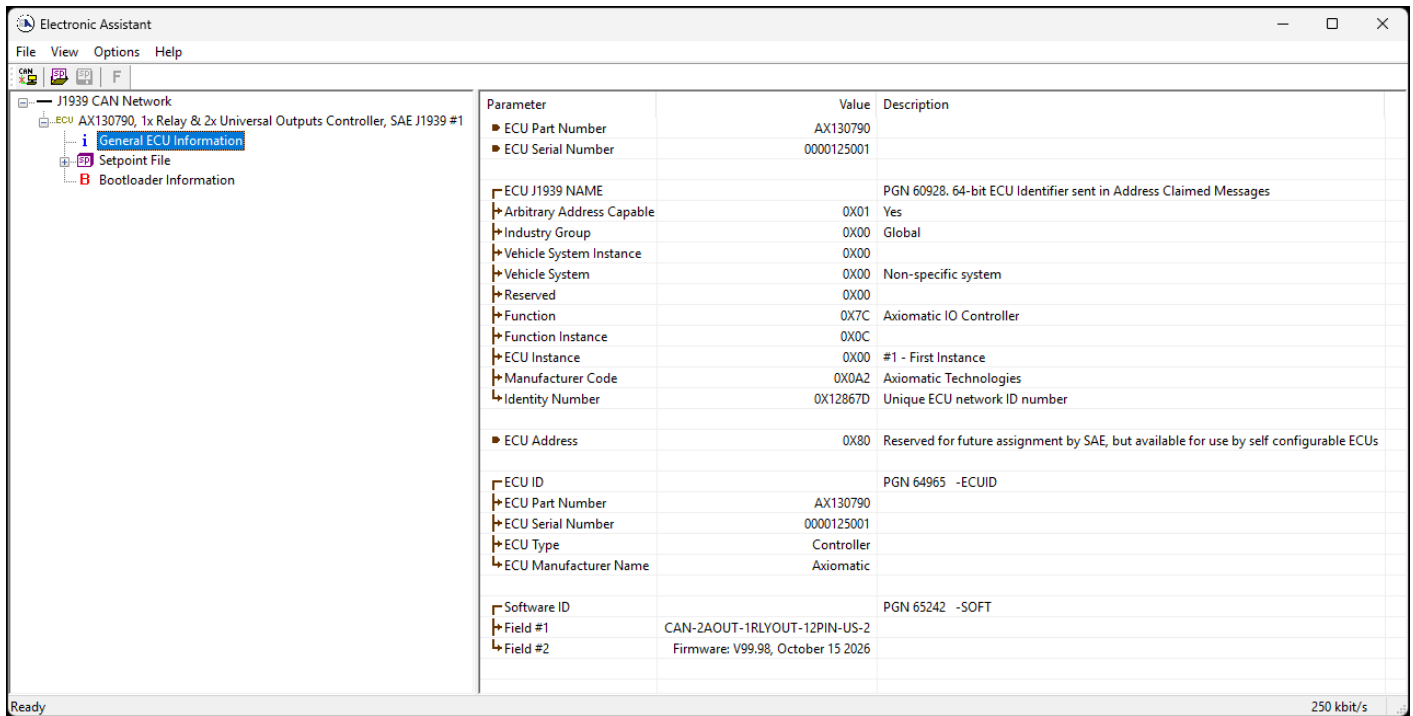


Figure 6 – General ECU Information

Software Identifier

PGN 65242		Software Identification		- SOFT
Transmission Repetition Rate:		On request		
Data Length:		Variable		
Extended Data Page:		0		
Data Page:		0		
PDU Format:		254		
PDU Specific:		218 PGN Supporting Information:		
Default Priority:		6		
Parameter Group Number:		65242 (0xFEDA)		
Start Position	Length	Parameter Name	SPN	
1	1 Byte	Number of software identification fields	965	
2-n	Variable	Software identification(s), Delimiter (ASCII “*”)	234	

For the ECU, Byte 1 is set to 2, and the identification fields are as follows.

(Firmware Description)*(Version, Date)

The Axiomatic EA shows all this information in “General ECU Information”, as shown below.

Note: The information provided in the Software ID is available for any J1939 service tool which supports the PGN -SOFT.

Component Identification

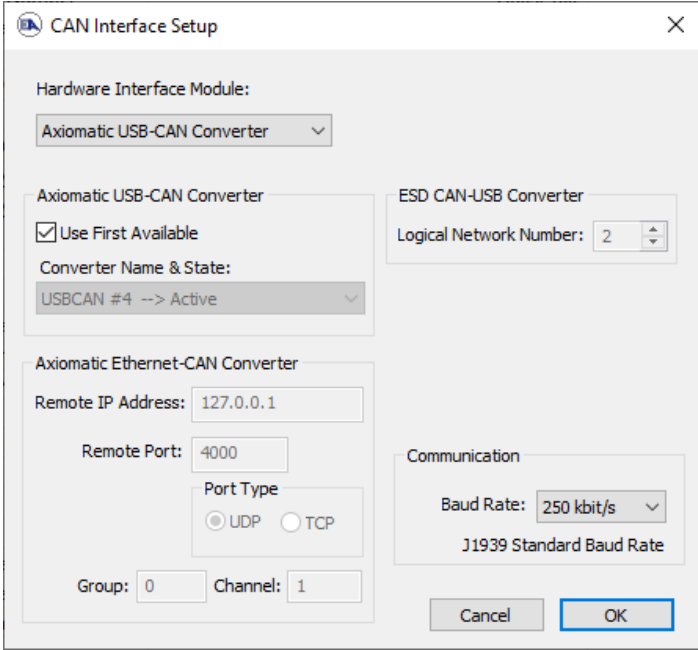
PGN 65259		Component Identification		-CI
Transmission Repetition Rate:		On request		
Data Length:		Variable		
Extended Data Page:		0		
Data Page:		0		
PDU Format:		254		
PDU Specific:		235 PGN Supporting Information:		
Default Priority:		6		
Parameter Group Number:		65259 (0x00FEEB)		
Start Position	Length	Parameter Name	SPN	
a	1-5 Byte	Make, Delimiter (ASCII “*”)	586	
b	Variable	Model, Delimiter (ASCII “*”)	587	
c	Variable	Serial Number, Delimiter (ASCII “*”)	588	
d	Variable	Unit Number (Power Unit), Delimiter (ASCII “*”)	233	
(a)*(b)*(c)*(d)*(e)*				

4. ECU SETPOINTS ACCESSED WITH AXIOMATIC ELECTRONIC ASSISTANT

This section describes in detail each setpoint, and their defaults and ranges. The setpoints are divided into setpoint groups as they are shown in the Axiomatic EA. For more information on how each setpoint is used by the converter, refer to the relevant section in this user manual.

4.1. Accessing the ECU Using Axiomatic Electronic Assistant

ECU with P/N AX130790 does not need any specific setup for the Axiomatic EA. To access the high-speed versions, the CAN bus Baud Rate needs to be set accordingly. The CAN Interface Setup can be found from the 'Options' menu in EA. Please refer to UMAX07050x **Connecting to the J1939 Bus** section for Axiomatic Electronic Assistant CAN Interface Setup instructions.



The image shows the 'CAN Interface Setup' dialog box. It contains several sections for configuring the hardware and communication settings. The 'Hardware Interface Module' is set to 'Axiomatic USB-CAN Converter'. Under 'Axiomatic USB-CAN Converter', 'Use First Available' is checked, and the 'Converter Name & State' is 'USBCAN #4 --> Active'. The 'Axiomatic Ethernet-CAN Converter' section shows 'Remote IP Address' as '127.0.0.1', 'Remote Port' as '4000', and 'Port Type' as 'UDP'. The 'Communication' section shows 'Baud Rate' as '250 kbit/s' and 'J1939 Standard Baud Rate'. At the bottom, 'Group' is '0' and 'Channel' is '1'. There are 'Cancel' and 'OK' buttons at the bottom right.

Section	Parameter	Value
Hardware Interface Module	Hardware Interface Module	Axiomatic USB-CAN Converter
	Logical Network Number	2
Axiomatic USB-CAN Converter	Use First Available	☒
	Converter Name & State	USBCAN #4 --> Active
Axiomatic Ethernet-CAN Converter	Remote IP Address	127.0.0.1
	Remote Port	4000
	Port Type	UDP
	Group	0
Communication	Baud Rate	250 kbit/s
	J1939 Standard Baud Rate	
General	Channel	1
	Buttons	Cancel, OK

4.2. J1939 Network Setpoints

The “**ECU Instance Number**” and “**ECU Address**” setpoints and their effect are defined in Section 3.2.

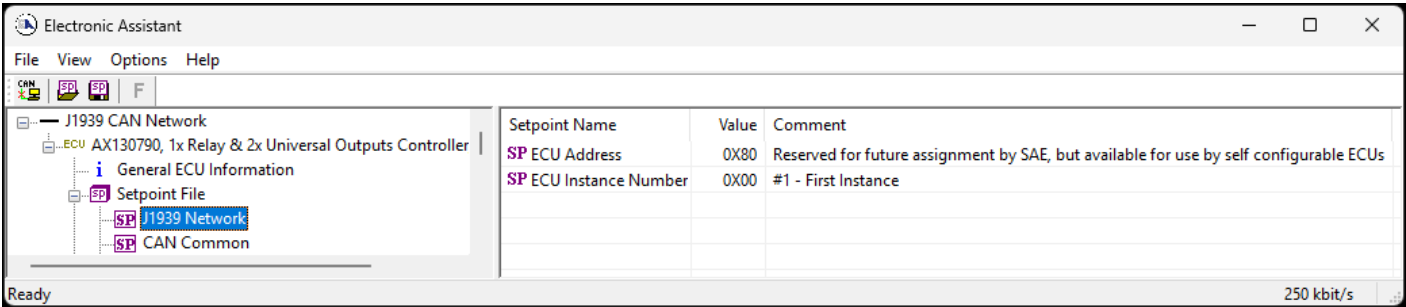


Figure 7 – Screen Capture of J1939 Setpoints

Name	Range	Default	Notes
ECU Address	0-253	0x80	Preferred address for a self-configurable ECU
ECU Instance	0-7	0x00	Per J1939-81

Table 22 – J1939 Network Setpoints

If non-default values for the “**ECU Instance Number**” or “**ECU Address**” are used, they will be mirrored during a setpoint file flashing and will only take effect once the entire file has been downloaded to the unit. After the setpoint flashing is complete, the unit will claim the new address and/or re-claim the address with the new NAME. If these setpoints are changing, it is recommended to close and re-open the CAN connection on the Axiomatic EA after the file is loaded, such that only the new NAME and address appear in the J1939 CAN Network ECU list.

4.3. CAN Common Setpoints

The CAN Common setpoints are defined in Section 1.2. Please refer to that section for further details on how to configure each setpoint and their effect on the ECU.

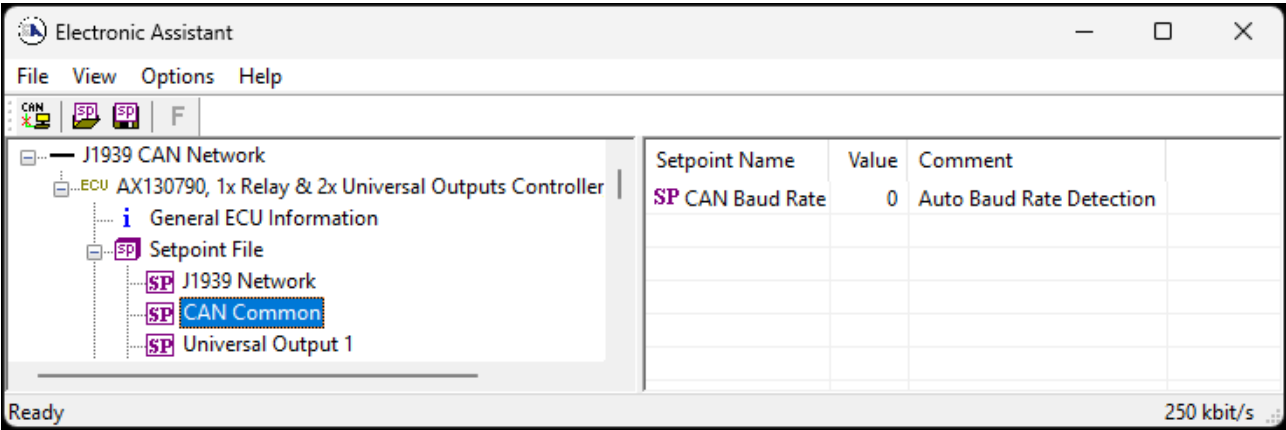


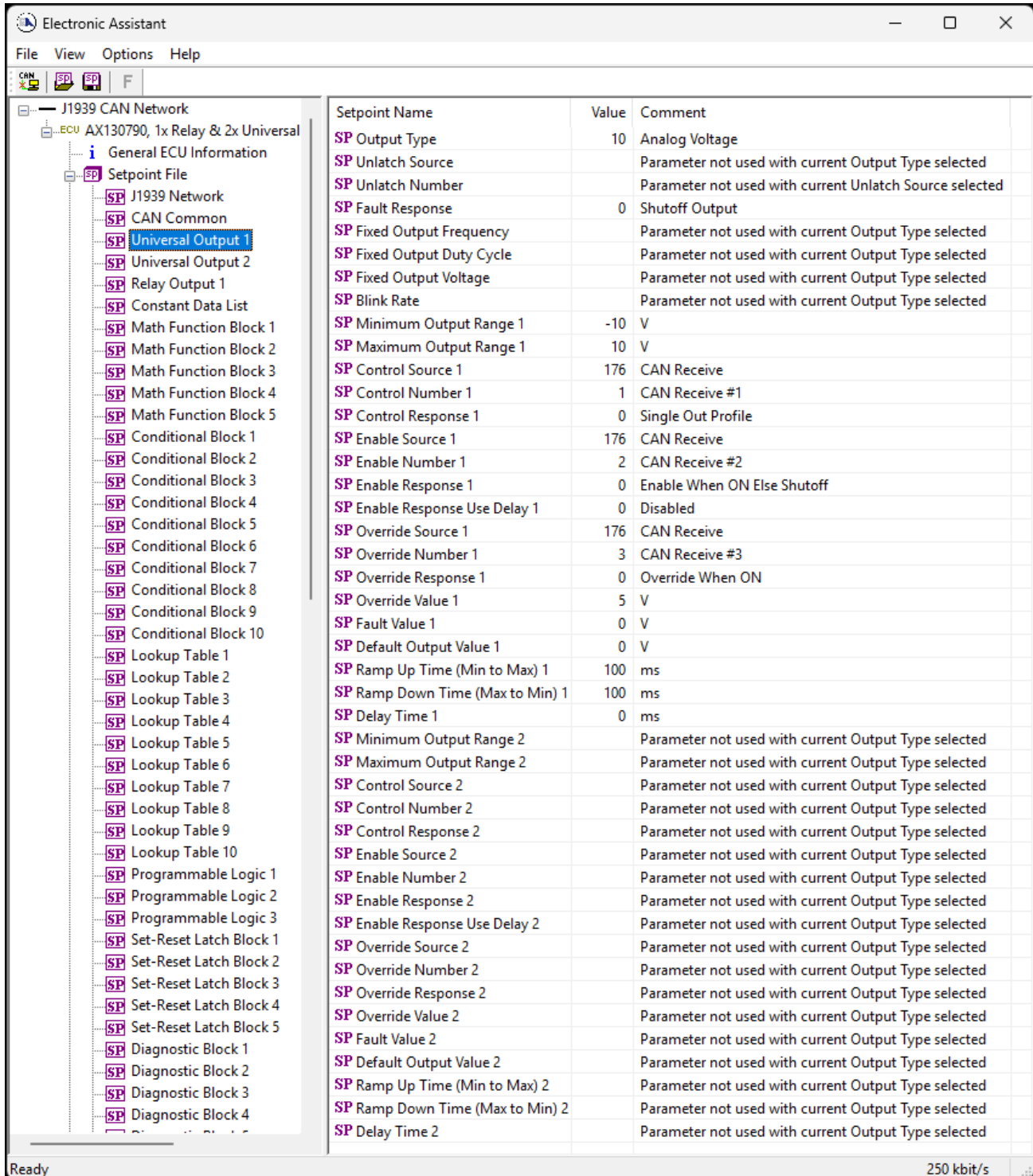
Figure 8 – Screen Capture of CAN Common Setpoints

Name	Range	Default	Notes
CAN 1 Baud Rate	Drop List	0, Auto-Baud Rate Detection	Refer Table 2

Table 23 – CAN Common Setpoints

4.4. Universal Output Setpoints

The Proportional Output Setpoint block allows the user to select values to configure the output. Please refer to Section 1.3 for more information on the configuration of these parameters. Table 24 shown below lists the available setpoints, with multiple sets of the same setpoint listed with 'x' to denote the set number ('1' or '2').



Setpoint Name	Value	Comment
SP Output Type	10	Analog Voltage
SP Unlatch Source		Parameter not used with current Output Type selected
SP Unlatch Number		Parameter not used with current Unlatch Source selected
SP Fault Response	0	Shutoff Output
SP Fixed Output Frequency		Parameter not used with current Output Type selected
SP Fixed Output Duty Cycle		Parameter not used with current Output Type selected
SP Fixed Output Voltage		Parameter not used with current Output Type selected
SP Blink Rate		Parameter not used with current Output Type selected
SP Minimum Output Range 1	-10	V
SP Maximum Output Range 1	10	V
SP Control Source 1	176	CAN Receive
SP Control Number 1	1	CAN Receive #1
SP Control Response 1	0	Single Out Profile
SP Enable Source 1	176	CAN Receive
SP Enable Number 1	2	CAN Receive #2
SP Enable Response 1	0	Enable When ON Else Shutoff
SP Enable Response Use Delay 1	0	Disabled
SP Override Source 1	176	CAN Receive
SP Override Number 1	3	CAN Receive #3
SP Override Response 1	0	Override When ON
SP Override Value 1	5	V
SP Fault Value 1	0	V
SP Default Output Value 1	0	V
SP Ramp Up Time (Min to Max) 1	100	ms
SP Ramp Down Time (Max to Min) 1	100	ms
SP Delay Time 1	0	ms
SP Minimum Output Range 2		Parameter not used with current Output Type selected
SP Maximum Output Range 2		Parameter not used with current Output Type selected
SP Control Source 2		Parameter not used with current Output Type selected
SP Control Number 2		Parameter not used with current Output Type selected
SP Control Response 2		Parameter not used with current Output Type selected
SP Enable Source 2		Parameter not used with current Output Type selected
SP Enable Number 2		Parameter not used with current Output Type selected
SP Enable Response 2		Parameter not used with current Output Type selected
SP Enable Response Use Delay 2		Parameter not used with current Output Type selected
SP Override Source 2		Parameter not used with current Output Type selected
SP Override Number 2		Parameter not used with current Output Type selected
SP Override Response 2		Parameter not used with current Output Type selected
SP Override Value 2		Parameter not used with current Output Type selected
SP Fault Value 2		Parameter not used with current Output Type selected
SP Default Output Value 2		Parameter not used with current Output Type selected
SP Ramp Up Time (Min to Max) 2		Parameter not used with current Output Type selected
SP Ramp Down Time (Max to Min) 2		Parameter not used with current Output Type selected
SP Delay Time 2		Parameter not used with current Output Type selected

Figure 9 – Screen Capture of Universal Output Setpoints

Name	Range	Default	Notes
Output Type	Drop List	0, Output Not Implemented	Refer to Table 3
Unlatch Source	Drop List	0, No Source	Refer to Table 1
Unlatch Number	Depends on Unlatch Source	1	Refer to Table 1
Fault Response	Drop List	0, Shutoff Output	See 1.3.4
Fixed Output Frequency	1 to 10,000 Hz	1000 Hz	See 1.3.4.2
Fixed Output Duty Cycle	0 to 100%	50%	See 1.3.4.2
Fixed Output Voltage	5 to 12V	5V	See 1.3.4.2
Blink Rate	500 to 65,000 ms	1000 ms	See 1.3.5
Minimum Output Range x	From Minimum Error to Maximum Range	Depends on Output Type	Refer to Table 3
Maximum Output Range x	From Minimum Range to Maximum Error	Depends on Output Type	Refer to Table 3
Control Source x	Drop List	0, No Source	Refer to Table 1
Control Number x	Depends on Control Source	1	Refer to Table 1
Control Response x	Drop List	0, Single Out Profile	See Section 1.3.3
Enable Source x	Drop List	0, No Source	Refer to Table 1
Enable Number x	Depends on Enable Source	1	Refer to Table 1
Enable Response x	Drop List	0, Enable When ON Else Shut Off	See 1.3.3
Enable Response Use Delay x	Drop List	0, False	See 1.3.3
Override Source x	Drop List	0, No Source	Refer to Table 1
Override Number x	Depends on Override Source	1	Refer to Table 1
Override Response x	Drop List	0, Override When OFF	See 1.3.3
Override Value x	Depends on Output Type	0	See 1.3.3
Fault Value x	Depends on Output Type	0	See 1.3.4
Default Output Value x	Depends on Output Type	0	See 1.3.4
Ramp Up Time (Min to Max) x	0 to 60000 ms	1000 ms	See 1.3.4
Ramp Down Time (Max to Min) x	0 to 60000 ms	1000 ms	See 1.3.4
Delay Time x	0 to 60000 ms	1000 ms	See 1.3.4

Table 24 – Proportional Output Setpoints

4.5. Relay Output Setpoints

The Digital Output Setpoint block allows the user to select values to configure the output. Please refer to Section 1.3.5 for more information on the configuration of these parameters.

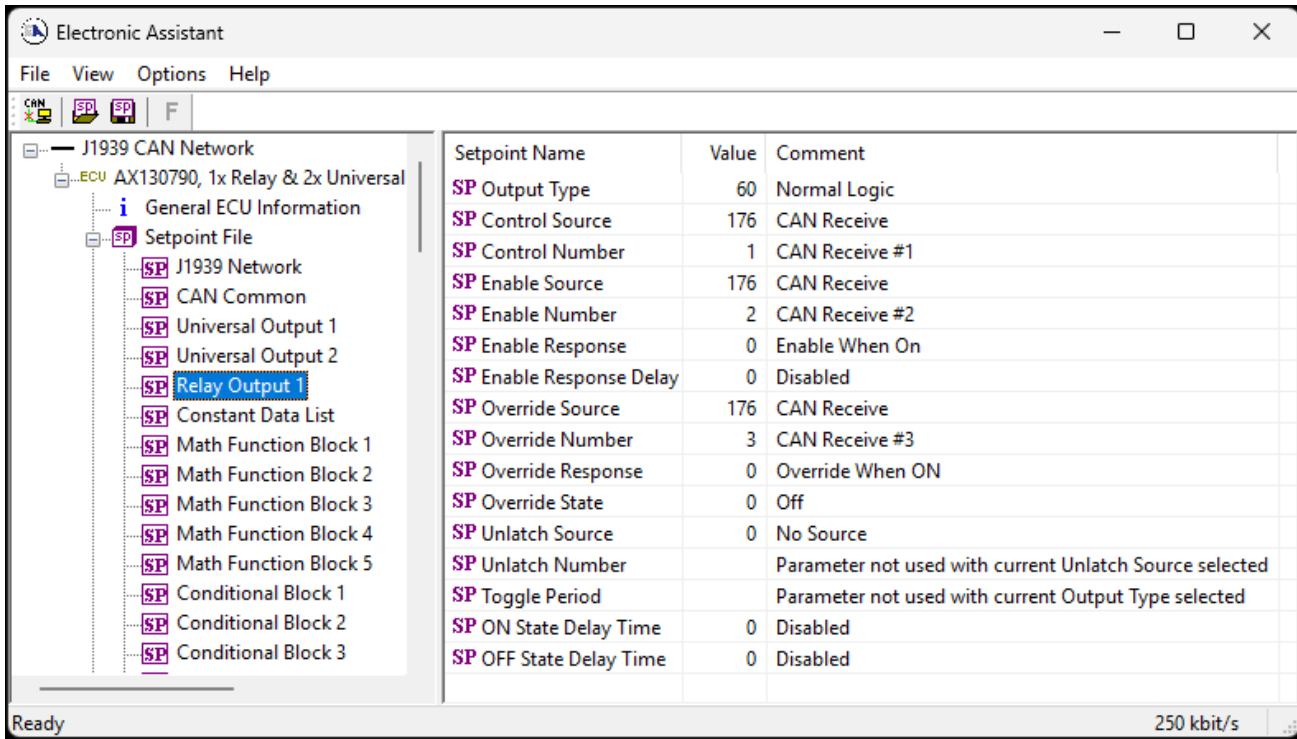


Figure 10 – Screen Capture of Relay Output Setpoints

Name	Range	Default	Notes
Output Type	Drop List	0, Output Not Implemented	
Control Source	Drop List	0, No Source	Refer to Table 1
Control Number	Depends on Control Source	1	Refer to Table 1
Enable Source	Drop List	0, No Source	Refer to Table 1
Enable Number	Depends on Enable Source	1	Refer to Table 1
Enable Response	Drop List	0, Enable When ON Else Shut Off	See 1.3.3
Enable Response Use Delay	Drop List	0, Disabled	See 1.3.3
Override Source	Drop List	0, No Source	Refer to Table 1
Override Number	Depends on Override Source	1	Refer to Table 1
Override State	0 to 1	0	See 1.3.3
Override Value	Depends on Output Type	0	See 1.3.3
Unlatch Source	Depends on Unlatch Source	0, No Source	Refer to Table 1
Unlatch Number	Depends on Enable Source	1	Refer to Table 1
Toggle Period	500 to 65,000 ms	1000 ms	See 1.3.5
ON State Delay Time	0 to 65,000 ms	0 ms	See 1.3.5
OFF State Delay Time	0 to 65,000 ms	0 ms	See 1.3.5

Table 25 – Relay Output Setpoints

4.6. Constant Data List Setpoints

The Constant Data List Function Block is provided to allow the user to select values as desired for various logic block functions.

The first two constants are fixed values of 0 (False) and 1 (True) for use in binary logic. The remaining 13 constants are fully user programmable to any value between +/- 1 000 000. The default values (shown in Figure 11) are arbitrary and should be configured by the user as appropriate for their application.

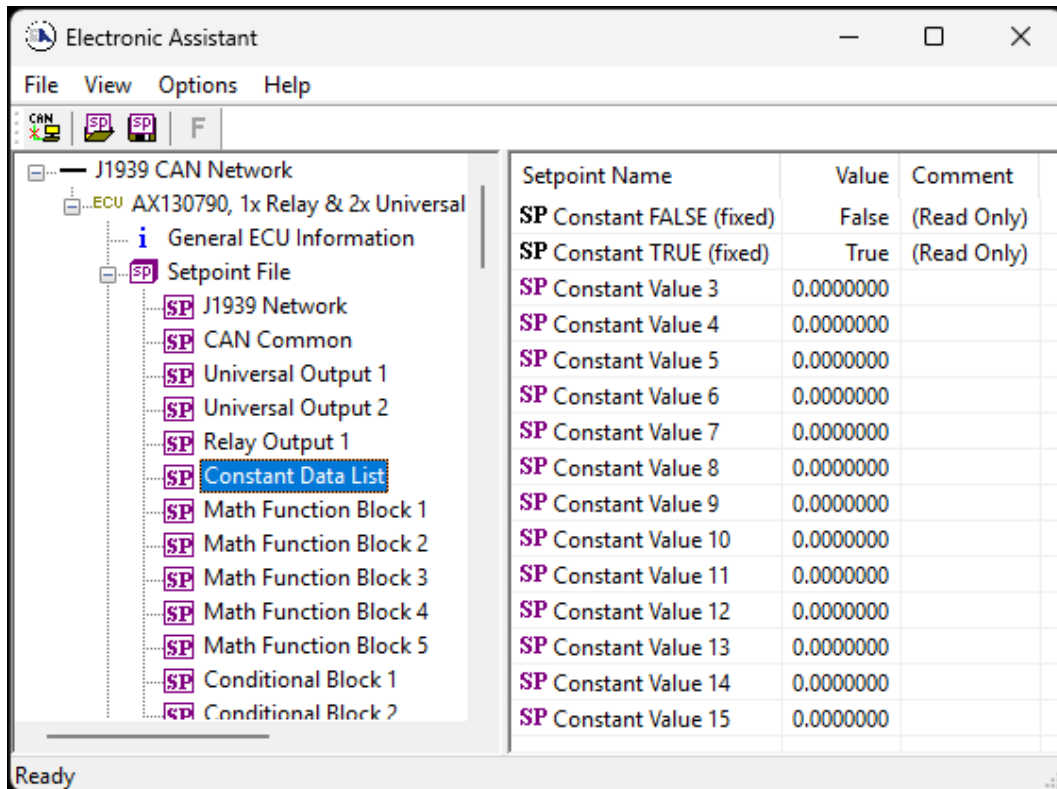


Figure 11 – Screen Capture of Constant Data List Setpoints

4.7. Math Function Block Setpoints

The Math Function Block is defined in Section 1.5. Please refer there for detailed information about how all these setpoints are used. “**Math Enabled**” is ‘False’ by default. To enable a Math function Block, set “**Math Enabled**” to ‘True’ and select appropriate “**Input Source**”.

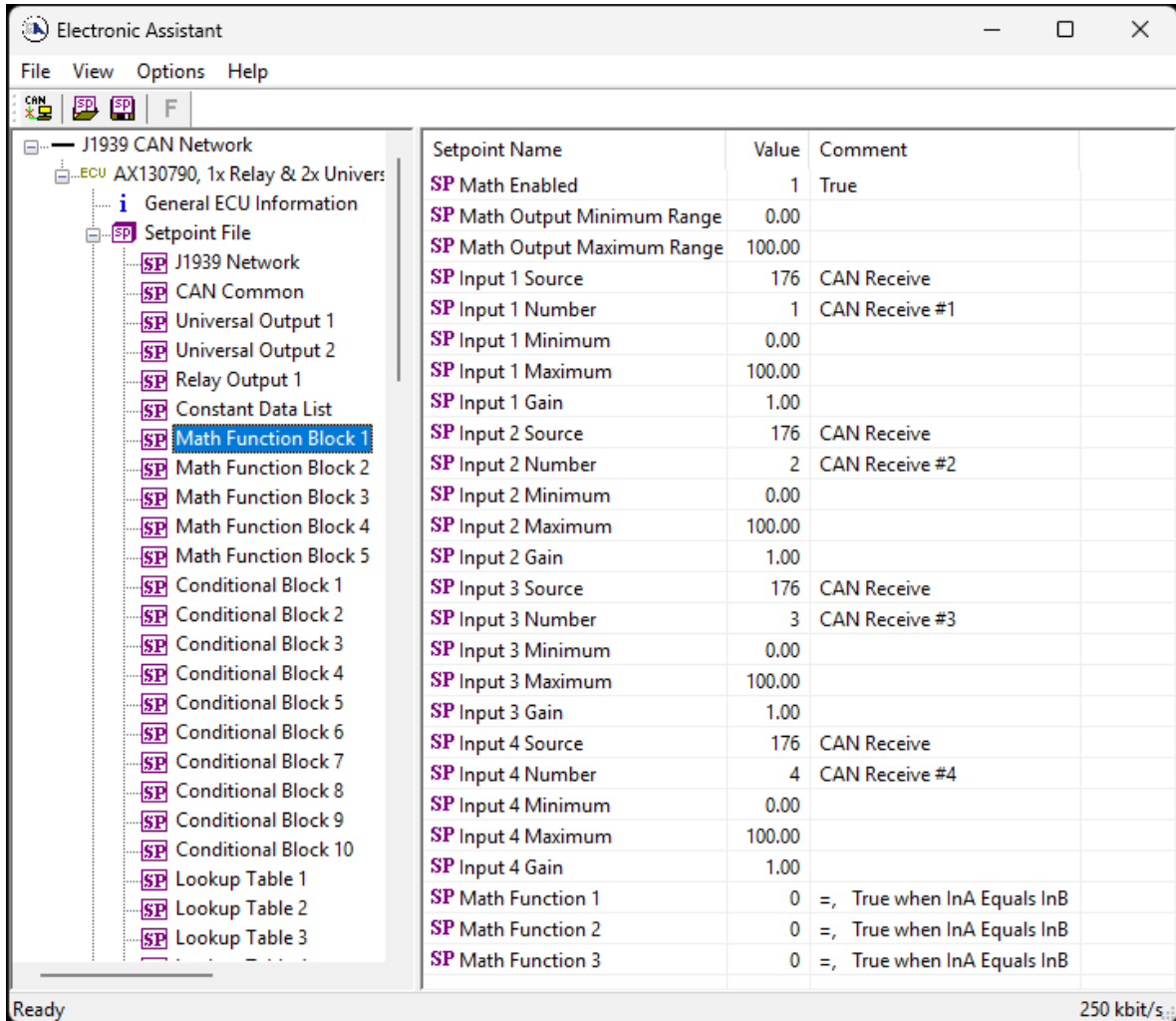


Figure 12 – Screen Capture of Math Function Block Setpoints

Name	Range	Default	Notes
Math Enabled	Drop List	0, False	See 1.5
Math Output Minimum Range	-10 ⁶ to 10 ⁶	0.0	See 1.5
Math Output Maximum Range	-10 ⁶ to 10 ⁶	100.0	See 1.5
Input x Source	Drop List	No Source	Refer to Table 1
Input x Number	Depends on Control Source	1	Refer to Table 1
Input x Minimum	-10 ⁶ to 10 ⁶	0.0	See 1.5
Input x Maximum	-10 ⁶ to 10 ⁶	100.0	See 1.5
Input x Gain	-1.00 to 1.00	1.00	See 1.5
Math Function 1	Drop List	=, True when InA Equals InB	See Table 9
Math Function 2	Drop List	=, True when InA Equals InB	See Table 9
Math Function 3	Drop List	=, True when InA Equals InB	See Table 9

Table 26 – Math Function Setpoints

4.8. Conditional Logic Block Setpoints

The Conditional Block setpoints are defined in Section 1.6. Refer to that section for detailed information on how these setpoints are used. The screen capture in Figure 13 displays the available setpoints for each of the Conditional Blocks. The table below the screen capture highlights the allowable ranges for each setpoint.

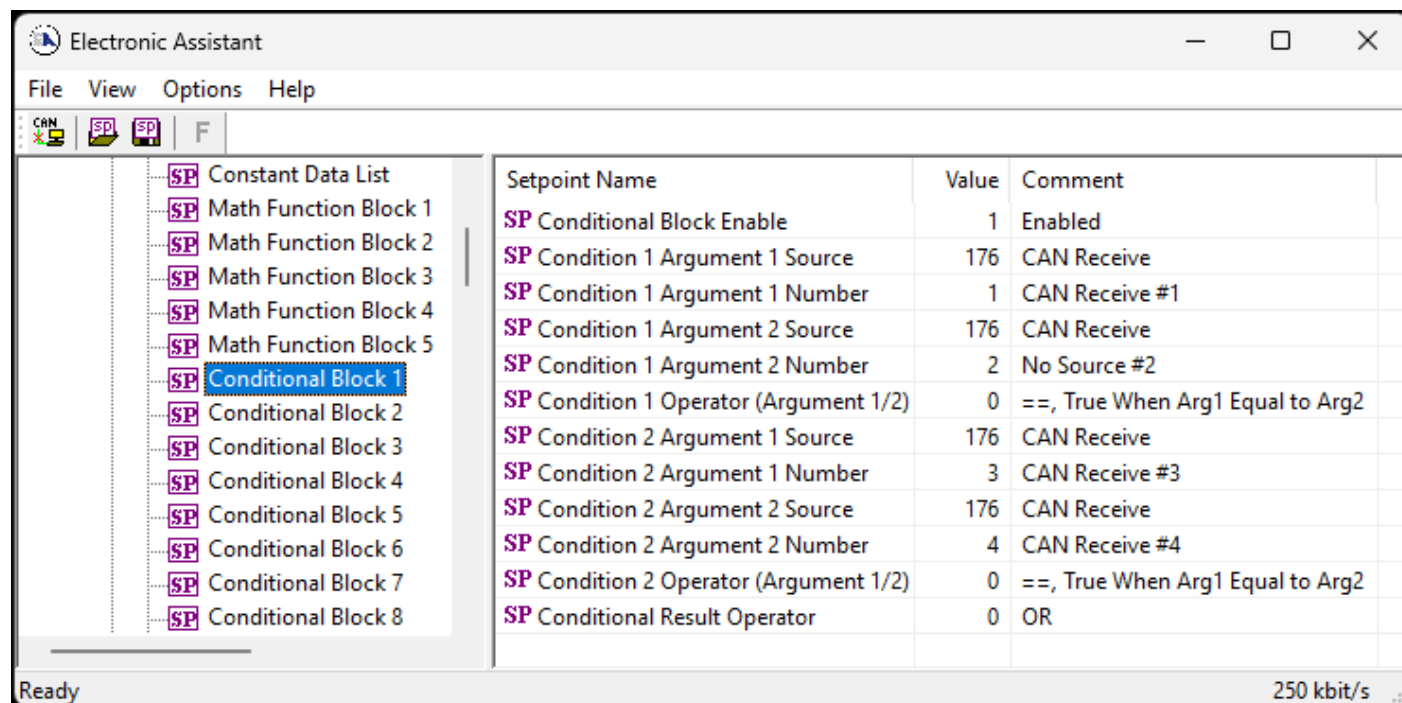


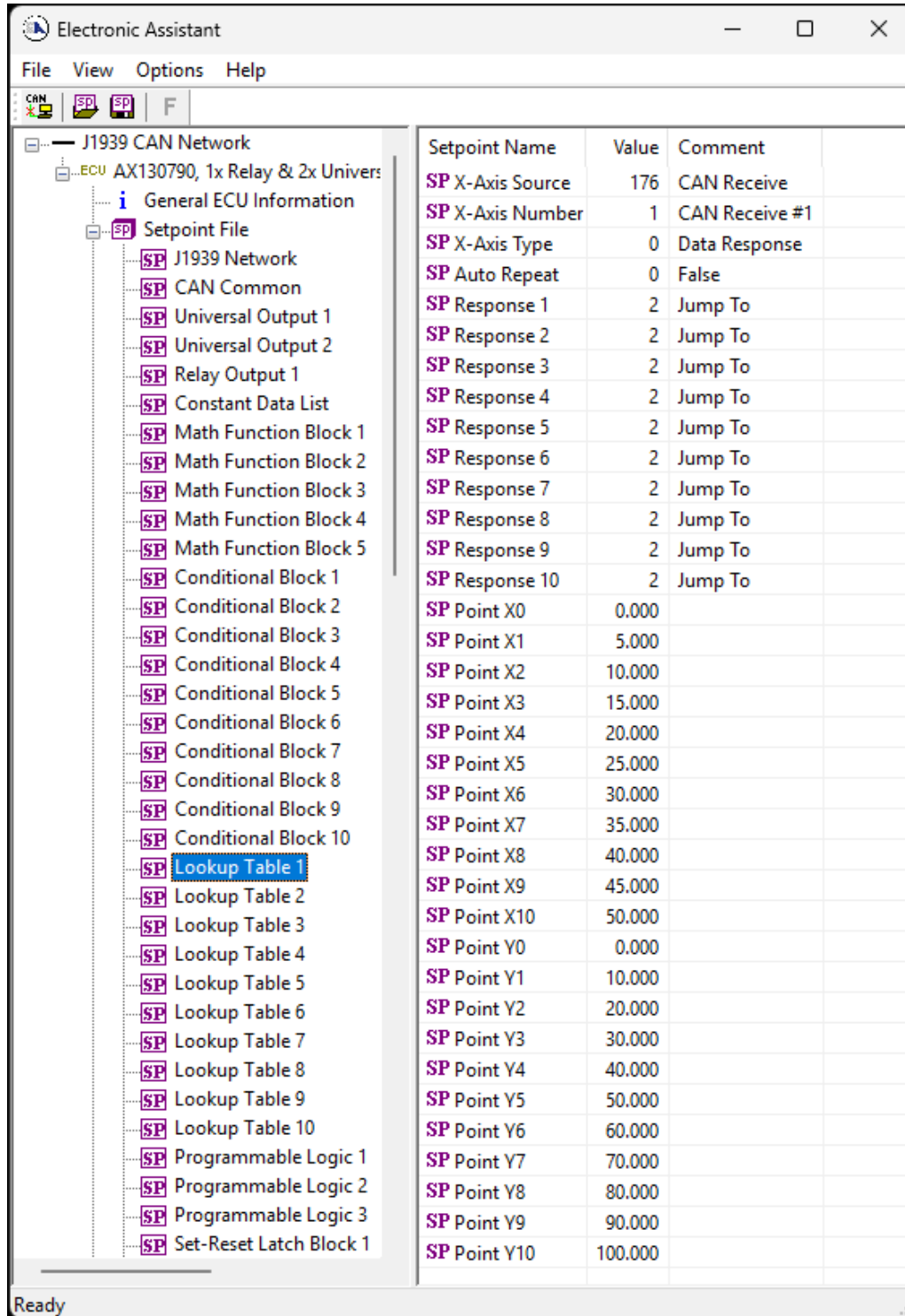
Figure 13 – Screen Capture of Conditional Block Setpoints

Name	Range	Default	Notes
Conditional Block Enable	Drop List	0, False	See 1.6
Condition 1 Argument 1 Source		0, No Source	Refer to Table 1
Condition 1 Argument 1 Number	Depends on Source Selected	1	Refer to Table 1
Condition 1 Argument 2 Source		0, No Source	Refer to Table 1
Condition 1 Argument 2 Number	Depends on Source Selected	1	Refer to Table 1
Condition 1 Operator (Argument 1/2)	Drop List	0, Equals	Refer to Table 10
Condition 2 Argument 1 Source		0, No Source	Refer to Table 1
Condition 2 Argument 1 Number	Depends on Source Selected	1	Refer to Table 1
Condition 2 Argument 2 Source		0, No Source	Refer to Table 1
Condition 2 Argument 2 Number	Depends on Source Selected	1	Refer to Table 1
Condition 2 Operator (Argument 1/2)	Drop List	0, Equals	Refer to Table 10
Conditional Result Operator	Drop List	OR	Refer to Table 11

Table 27 – Default Conditional Block Setpoints

4.9. Lookup Table Setpoints

The Lookup Table Function Block is defined in Section 1.7. Please refer there for detailed information about how all these setpoints are used. “**X-Axis Source**” is set to ‘No Source’ by default. To enable a Lookup Table select appropriate “**X-Axis Source**”.



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File View Options Help

CAN SP SP F

J1939 CAN Network

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 - Universal Output 2
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 - Math Function Block 4
 - Math Function Block 5
 - Conditional Block 1
 - Conditional Block 2
 - Conditional Block 3
 - Conditional Block 4
 - Conditional Block 5
 - Conditional Block 6
 - Conditional Block 7
 - Conditional Block 8
 - Conditional Block 9
 - Conditional Block 10
 - Lookup Table 1**
 - Lookup Table 2
 - Lookup Table 3
 - Lookup Table 4
 - Lookup Table 5
 - Lookup Table 6
 - Lookup Table 7
 - Lookup Table 8
 - Lookup Table 9
 - Lookup Table 10
 - Programmable Logic 1
 - Programmable Logic 2
 - Programmable Logic 3
 - Set-Reset Latch Block 1

Setpoint Name	Value	Comment
SP X-Axis Source	176	CAN Receive
SP X-Axis Number	1	CAN Receive #1
SP X-Axis Type	0	Data Response
SP Auto Repeat	0	False
SP Response 1	2	Jump To
SP Response 2	2	Jump To
SP Response 3	2	Jump To
SP Response 4	2	Jump To
SP Response 5	2	Jump To
SP Response 6	2	Jump To
SP Response 7	2	Jump To
SP Response 8	2	Jump To
SP Response 9	2	Jump To
SP Response 10	2	Jump To
SP Point X0	0.000	
SP Point X1	5.000	
SP Point X2	10.000	
SP Point X3	15.000	
SP Point X4	20.000	
SP Point X5	25.000	
SP Point X6	30.000	
SP Point X7	35.000	
SP Point X8	40.000	
SP Point X9	45.000	
SP Point X10	50.000	
SP Point Y0	0.000	
SP Point Y1	10.000	
SP Point Y2	20.000	
SP Point Y3	30.000	
SP Point Y4	40.000	
SP Point Y5	50.000	
SP Point Y6	60.000	
SP Point Y7	70.000	
SP Point Y8	80.000	
SP Point Y9	90.000	
SP Point Y10	100.000	

Ready

Figure 14 – Screen Capture of Lookup table Setpoints

Name	Range	Default	Notes
X-Axis Source	Drop List	No Source	Refer to Table 1
X-Axis Number	Depends on Control Source	1	Refer to Table 1
X-Axis Type	Drop List	Data Response	See Table 12
Auto Repeat	Drop List	0, False	See 1.7
Response 1	Drop List	Ramp To	See Table 13
Response 2	Drop List	Ramp To	See Table 13
Response 3	Drop List	Ramp To	See Table 13
Response 4	Drop List	Ramp To	See Table 13
Response 5	Drop List	Ramp To	See Table 13
Response 6	Drop List	Ramp To	See Table 13
Response 7	Drop List	Ramp To	See Table 13
Response 8	Drop List	Ramp To	See Table 13
Response 9	Drop List	Ramp To	See Table 13
Response 10	Drop List	Ramp To	See Table 13
Point X0	From -32768 to Point X1 Value	0.00	See 1.7
Point X1	From Point X0 Value to Point X2 Value	5.00	See 1.7
Point X2	From Point X1 Value to Point X3 Value	10.00	See 1.7
Point X3	From Point X2 Value to Point X4 Value	15.00	See 1.7
Point X4	From Point X3 Value to Point X5 Value	20.00	See 1.7
Point X5	From Point X4 Value to Point X6 Value	25.00	See 1.7
Point X6	From Point X5 Value to Point X7 Value	30.00	See 1.7
Point X7	From Point X6 Value to Point X8 Value	35.00	See 1.7
Point X8	From Point X7 Value to Point X9 Value	40.00	See 1.7
Point X9	From Point X8 Value to Point X10 Value	45.00	See 1.7
Point X10	From Point X9 Value to 32768	50.00	See 1.7
Point Y0	-10^6 to 10^6	0.000	See 1.7
Point Y1	-10^6 to 10^6	10.000	See 1.7
Point Y2	-10^6 to 10^6	20.000	See 1.7
Point Y3	-10^6 to 10^6	30.000	See 1.7
Point Y4	-10^6 to 10^6	40.000	See 1.7
Point Y5	-10^6 to 10^6	50.000	See 1.7
Point Y6	-10^6 to 10^6	60.000	See 1.7
Point Y7	-10^6 to 10^6	70.000	See 1.7
Point Y8	-10^6 to 10^6	80.000	See 1.7
Point Y9	-10^6 to 10^6	90.000	See 1.7
Point Y10	-10^6 to 10^6	10.000	See 1.7

Table 28 – Lookup Table Setpoints

4.10. Programmable Logic Setpoints

The Programmable Logic function block is defined in Section 1.8. Please refer there for detailed information about how all these setpoints are used. “**Logic Enabled**” is ‘*False*’ by default. To enable Logic set “**Logic Enabled**” to ‘*True*’ and select appropriate “**Argument Source**”.

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CAN SP SP F

J1939 CAN Network

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 - Conditional Block 3
 - Conditional Block 4
 - Conditional Block 5
 - Conditional Block 6
 - Conditional Block 7
 - Conditional Block 8
 - Conditional Block 9
 - Conditional Block 10
 - Lookup Table 1
 - Lookup Table 2
 - Lookup Table 3
 - Lookup Table 4
 - Lookup Table 5
 - Lookup Table 6
 - Lookup Table 7
 - Lookup Table 8
 - Lookup Table 9
 - Lookup Table 10
 - Programmable Logic 1**
 - Programmable Logic 2
 - Programmable Logic 3
 - Set-Reset Latch Block 1
 - Set-Reset Latch Block 2
 - Set-Reset Latch Block 3
 - Set-Reset Latch Block 4
 - Set-Reset Latch Block 5
 - Diagnostic Block 1
 - Diagnostic Block 2
 - Diagnostic Block 3
 - Diagnostic Block 4
 - Diagnostic Block 5
 - Diagnostic Block 6
 - Diagnostic Block 7
 - Diagnostic Block 8
 - Diagnostic Block 9
 - Diagnostic Block 10
 - Diagnostic Block 11
 - Diagnostic Block 12
 - Diagnostic Block 13

Setpoint Name	Value	Comment
SP Logic Enabled	1	True
SP Table Number 1	1	Lookup Table 1
SP Logical Operator 1	2	Cnd1 Or Cnd2 Or Cnd3
SP Table 1 - Condition 1 Argument 1 Source	176	CAN Receive
SP Table 1 - Condition 1 Argument 1 Number	1	CAN Receive #1
SP Table 1 - Condition 1 Argument 2 Source	176	CAN Receive
SP Table 1 - Condition 1 Argument 2 Number	2	CAN Receive #2
SP Table 1 - Condition 1 Operator	0	=, Equal
SP Table 1 - Condition 2 Argument 1 Source	176	CAN Receive
SP Table 1 - Condition 2 Argument 1 Number	3	CAN Receive #3
SP Table 1 - Condition 2 Argument 2 Source	176	CAN Receive
SP Table 1 - Condition 2 Argument 2 Number	4	CAN Receive #4
SP Table 1 - Condition 2 Operator	0	=, Equal
SP Table 1 - Condition 3 Argument 1 Source	176	CAN Receive
SP Table 1 - Condition 3 Argument 1 Number	5	CAN Receive #5
SP Table 1 - Condition 3 Argument 2 Source	176	CAN Receive
SP Table 1 - Condition 3 Argument 2 Number	6	CAN Receive #6
SP Table 1 - Condition 3 Operator	0	=, Equal
SP Table Number 2	1	Lookup Table 1
SP Logical Operator 2	0	Default Table
SP Table 2 - Condition 1 Argument 1 Source		Parameter not used with current Logical Operator selected
SP Table 2 - Condition 1 Argument 1 Number		Parameter not used with current Logical Operator selected
SP Table 2 - Condition 1 Argument 2 Source		Parameter not used with current Logical Operator selected
SP Table 2 - Condition 1 Argument 2 Number		Parameter not used with current Logical Operator selected
SP Table 2 - Condition 1 Operator		Parameter not used with current Logical Operator selected
SP Table 2 - Condition 2 Argument 1 Source		Parameter not used with current Logical Operator selected
SP Table 2 - Condition 2 Argument 1 Number		Parameter not used with current Logical Operator selected
SP Table 2 - Condition 2 Argument 2 Source		Parameter not used with current Logical Operator selected
SP Table 2 - Condition 2 Argument 2 Number		Parameter not used with current Logical Operator selected
SP Table 2 - Condition 2 Operator		Parameter not used with current Logical Operator selected
SP Table 2 - Condition 3 Argument 1 Source		Parameter not used with current Logical Operator selected
SP Table 2 - Condition 3 Argument 1 Number		Parameter not used with current Logical Operator selected
SP Table 2 - Condition 3 Argument 2 Source		Parameter not used with current Logical Operator selected
SP Table 2 - Condition 3 Argument 2 Number		Parameter not used with current Logical Operator selected
SP Table 2 - Condition 3 Operator		Parameter not used with current Logical Operator selected
SP Table Number 3	1	Lookup Table 1
SP Logical Operator 3	0	Default Table
SP Table 3 - Condition 1 Argument 1 Source		Parameter not used with current Logical Operator selected
SP Table 3 - Condition 1 Argument 1 Number		Parameter not used with current Logical Operator selected
SP Table 3 - Condition 1 Argument 2 Source		Parameter not used with current Logical Operator selected
SP Table 3 - Condition 1 Argument 2 Number		Parameter not used with current Logical Operator selected
SP Table 3 - Condition 1 Operator		Parameter not used with current Logical Operator selected
SP Table 3 - Condition 2 Argument 1 Source		Parameter not used with current Logical Operator selected
SP Table 3 - Condition 2 Argument 1 Number		Parameter not used with current Logical Operator selected
SP Table 3 - Condition 2 Argument 2 Source		Parameter not used with current Logical Operator selected
SP Table 3 - Condition 2 Argument 2 Number		Parameter not used with current Logical Operator selected
SP Table 3 - Condition 2 Operator		Parameter not used with current Logical Operator selected
SP Table 3 - Condition 3 Argument 1 Source		Parameter not used with current Logical Operator selected
SP Table 3 - Condition 3 Argument 1 Number		Parameter not used with current Logical Operator selected
SP Table 3 - Condition 3 Argument 2 Source		Parameter not used with current Logical Operator selected
SP Table 3 - Condition 3 Argument 2 Number		Parameter not used with current Logical Operator selected
SP Table 3 - Condition 3 Operator		Parameter not used with current Logical Operator selected

Ready 250 kbit/s

Figure 15 – Screen Capture of Programmable Logic Setpoints

Setpoint ranges and default values for Programmable Logic Blocks are listed in Table 29. Only “**Table1**” setpoint are listed, because other “**TableX**” setpoints are similar, except for the default value of the “**Lookup Table Block Number**” setpoint, which is X for “**TableX**”.

Name	Range	Default	Notes
Logic Enabled	Drop List	False	See 1.8
Table Number 1	1 to 10	1	See 1.8
Logical Operator 1	Drop List	Default Table	Refer to Table 15
Table 1 - Condition 1 Argument 1 Source	Drop List	Control Not Used	Refer to Table 1
Table 1 - Condition 1 Argument 1 Number	Depends on Control Source	1	Refer to Table 1
Table 1 - Condition 1 Operator	Drop List	=, Equal	Refer to Table 14
Table 1 - Condition 1 Argument 2 Source	Drop List	Control Not Used	Refer to Table 1
Table 1 - Condition 1 Argument 2 Number	Depends on Control Source	1	Refer to Table 1
Table 1 - Condition 2 Argument 1 Source	Drop List	Control Not Used	Refer to Table 1
Table 1 - Condition 2 Argument 1 Number	Depends on Control Source	1	Refer to Table 1
Table 1 - Condition 2 Operator	Drop List	=, Equal	Refer to Table 14
Table 1 - Condition 2 Argument 2 Source	Drop List	Control Not Used	Refer to Table 1
Table 1 - Condition 2 Argument 2 Number	Depends on Control Source	1	Refer to Table 1
Table 1 - Condition 3 Argument 1 Source	Drop List	Control Not Used	Refer to Table 1
Table 1 - Condition 3 Argument 1 Number	Depends on Control Source	1	Refer to Table 1
Table 1 - Condition 3 Operator	Drop List	=, Equal	Refer to Table 14
Table 1 - Condition 3 Argument 2 Source	Drop List	Control Not Used	Refer to Table 1
Table 1 - Condition 3 Argument 2 Number	Depends on Control Source	1	Refer to Table 1

Table 29 – Programmable Logic Setpoints

4.11. Set-Reset Latch Block Setpoints

The Set-Reset Latch Block setpoints are defined in Section 1.9. Refer to that section for detailed information on how these setpoints are used. The screen capture in Figure 16 displays the available setpoints for each of the Set-Reset Latch Blocks. The table below the screen capture highlights the allowable ranges for each setpoint.

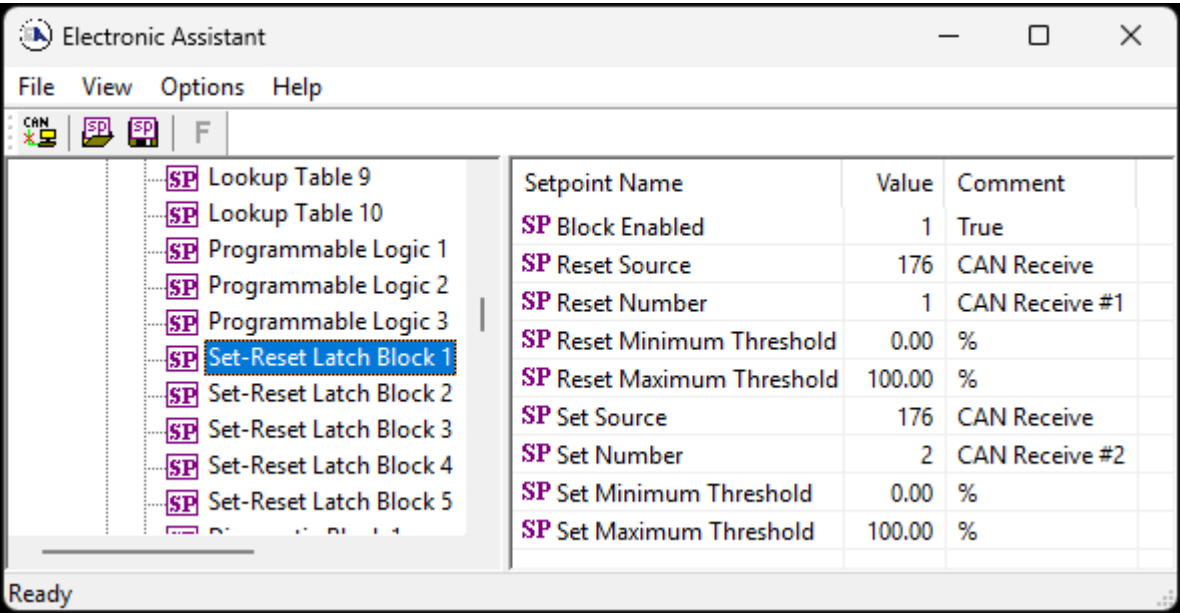


Figure 16 – Screen Capture of Set-Reset Latch Block Setpoints

Name	Range	Default	Notes
Block Enabled	Drop List	False	See 1.9
Reset Source	Drop List	No Source	Refer to Table 1
Reset Number	Depends on Source Selected	1	Refer to Table 1
Reset Minimum Threshold	0% to 100%	0%	See 1.9
Reset Maximum Threshold	0% to 100%	100%	See 1.9
Set Source	Drop List	No Source	Refer to Table 1
Set Number	Depends on Source Selected	1	Refer to Table 1
Set Minimum Threshold	0% to 100%	0%	See 1.9
Set Maximum Threshold	0% to 100%	100%	See 1.9

Table 30 – Default Set-Reset Latch Block Setpoints

4.12. Diagnostics Block Setpoints

There are 16 Diagnostics blocks that can be configured to monitor various parameters of the Controller. The Diagnostic Function Block is defined in Section 1.10. Please refer there for detailed information on how these setpoints are used.

Setpoint Name	Value	Comment
SP Fault Detection is Enabled	1	True
SP Function Type to Monitor	75	Universal Output
SP Function Parameter to Monitor	1	Universal Output #1
SP Enable Source	0	No Source
SP Enable Number		Parameter not used with current Enable Source selected
SP Enable Response		Parameter not used with current Enable Source selected
SP Fault Detection Type	3	Double Threshold Min and Max Error
SP Maximum Value for Diagnostic Data	10.00	
SP Minimum Value for Diagnostic Data	-10.00	
SP Use Hysteresis When Defining Thresholds	0	False
SP Hysteresis		Parameter not used - Hysteresis not used when defining thresholds
SP Event Cleared Only by DM11	0	False
SP Set Limit for MAXIMUM SHUTDOWN	9.50	
SP Clear Limit for MAXIMUM SHUTDOWN	9.50	
SP Set Limit for MAXIMUM WARNING	8.00	
SP Clear Limit for MAXIMUM WARNING	8.00	
SP Set Limit for MINIMUM WARNING	-8.00	
SP Clear Limit for MINIMUM WARNING	-8.00	
SP Set Limit for MINIMUM SHUTDOWN	-9.50	
SP Clear Limit for MINIMUM SHUTDOWN	-9.50	
SP MAXIMUM SHUTDOWN, Event Generates a DTC in DM1	1	True
SP MAXIMUM SHUTDOWN, Lamp Set by Event	0	Protect
SP MAXIMUM SHUTDOWN, SPN for Event	0x0007FF00	SPN: 524032
SP MAXIMUM SHUTDOWN, FMI for Event	0	Data Valid But Above Normal Operational Range - Most Severe Level
SP MAXIMUM SHUTDOWN, Delay Before Event is Flagged	1000	ms
SP MAXIMUM WARNING, Event Generates a DTC in DM1	1	True
SP MAXIMUM WARNING, Lamp Set by Event	0	Protect
SP MAXIMUM WARNING, SPN for Event	0x0007FF00	SPN: 524032
SP MAXIMUM WARNING, FMI for Event	16	Data Valid But Above Normal Operating Range - Moderately Severe Level
SP MAXIMUM WARNING, Delay Before Event is Flagged	1000	ms
SP MINIMUM WARNING, Event Generates a DTC in DM1	1	True
SP MINIMUM WARNING, Lamp Set by Event	0	Protect
SP MINIMUM WARNING, SPN for Event	0x0007FF00	SPN: 524032
SP MINIMUM WARNING, FMI for Event	18	Data Valid But Below Normal Operating Range - Moderately Severe Level
SP MINIMUM WARNING, Delay Before Event is Flagged	1000	ms
SP MINIMUM SHUTDOWN, Event Generates a DTC in DM1	1	True
SP MINIMUM SHUTDOWN, Lamp Set by Event	0	Protect
SP MINIMUM SHUTDOWN, SPN for Event	0x0007FF00	SPN: 524032
SP MINIMUM SHUTDOWN, FMI for Event	1	Data Valid But Below Normal Operational Range - Most Severe Level
SP MINIMUM SHUTDOWN, Delay Before Event is Flagged	1000	ms

Figure 17 – Screen Capture of Diagnostic Block Setpoints

Name	Range	Default	Notes
Fault Detection is Enabled	Drop List	False	
Function Type to Monitor	Drop List	0 – No Source	Refer to Table 1
Function Parameter to Monitor	Depends on Function Type	1	Refer to Table 1
Enable Source	Drop List	0, No Source	Refer to Table 1
Enable Number	Depends on Enable Source	1	Refer to Table 1
Enable Response	Drop List	0	0 = Enable When On, 1 = Enable When Off
Fault Detection Type	Drop List	0 – Min and Max Error	See Section 1.10
Maximum Value for Diagnostic Data	Minimum Value for Diagnostic Data ... 4.28e ⁹	1.0	
Minimum Value for Diagnostic Data	0.0 ... Maximum Value for Diagnostic Data	0.0	
Use Hysteresis When Defining Thresholds	Drop List	False	
Hysteresis	0.0 ... Maximum Value for Diagnostic Data	0.0	
Event Cleared Only by DM11	Drop List	0, False	
Set Limit for MAXIMUM SHUTDOWN	Minimum Value for Diagnostic Data ... Maximum Value for Diagnostics Data	1.0	
Clear Limit for MAXIMUM SHUTDOWN	Minimum Value for Diagnostic Data ... Maximum Value for Diagnostics Data	1.0	
Set Limit for MAXIMUM WARNING	Minimum Value for Diagnostic Data ... Maximum Value for Diagnostics Data	1.0	
Clear Limit for MAXIMUM WARNING	Minimum Value for Diagnostic Data to Maximum Value for Diagnostic Data	1.0	
Clear Limit for MINIMUM WARNING	Minimum Value for Diagnostic Data to Maximum Value for Diagnostic Data	0.0	
Set Limit for MINIMUM WARNING	Minimum Value for Diagnostic Data to Maximum Value for Diagnostic Data	0.0	
Clear Limit for MINIMUM SHUTDOWN	Minimum Value for Diagnostic Data to Maximum Value for Diagnostic Data	0.0	
Set Limit for MINIMUM SHUTDOWN	Minimum Value for Diagnostic Data to Maximum Value for Diagnostic Data	0.0	
MAXIMUM SHUTDOWN, Event Generates a DTC in DM1	Drop List	False	
MAXIMUM SHUTDOWN, Lamp Set by Event	Drop List	0, Protect	See Table 17

MAXIMUM SHUTDOWN, SPN for Event	0 to 524287	524032 (0x7FF00) + block index	It is the user's responsibility to select an SPN that will not violate the J1939 standard.
MAXIMUM SHUTDOWN, FMI for Event	Drop List	0	See Table 18
MAXIMUM SHUTDOWN, Delay Before Event is Flagged	0...60000 ms	1000	
MAXIMUM WARNING, Event Generates a DTC in DM1	Drop List	False	
MAXIMUM WARNING, Lamp Set by Event	Drop List	0, Protect	See Table 17
MAXIMUM WARNING, SPN for Event	0 to 524287	524032 (0x7FF00) + block index	It is the user's responsibility to select an SPN that will not violate the J1939 standard.
MAXIMUM WARNING, FMI for Event	Drop List	0	See Table 18
MAXIMUM WARNING, Delay Before Event is Flagged	0...60000 ms	1000	
MINIMUM WARNING, Event Generates a DTC in DM1	Drop List	False	
MINIMUM WARNING, Lamp Set by Event	Drop List	0, Protect	See Table 17
MINIMUM WARNING, SPN for Event	0 to 524287	524032 (0x7FF00) + block index	It is the user's responsibility to select an SPN that will not violate the J1939 standard.
MINIMUM WARNING, FMI for Event	Drop List	0	See Table 18
MINIMUM WARNING, Delay Before Event is Flagged	0...60000 ms	1000	
MINIMUM SHUTDOWN, Event Generates a DTC in DM1	Drop List	False	
MINIMUM SHUTDOWN, Lamp Set by Event	Drop List	0, Protect	See Table 17
MINIMUM SHUTDOWN, SPN for Event	0 to 524287	524032 (0x7FF00) + block index	It is the user's responsibility to select an SPN that will not violate the J1939 standard.
MINIMUM SHUTDOWN, FMI for Event	Drop List	0	See Table 18
MINIMUM SHUTDOWN, Delay Before Event is Flagged	0...60000 ms	1000	

Table 31 – Diagnostic Block Setpoints

4.13. DTC React Function Block Setpoints

The DTC React function block is described in Section 1.11. The Figure below shows the DTC React function block setpoints. The table below shows the default values. Please note: *The setpoint “DTC React is Enabled” was changed to 1, True.*

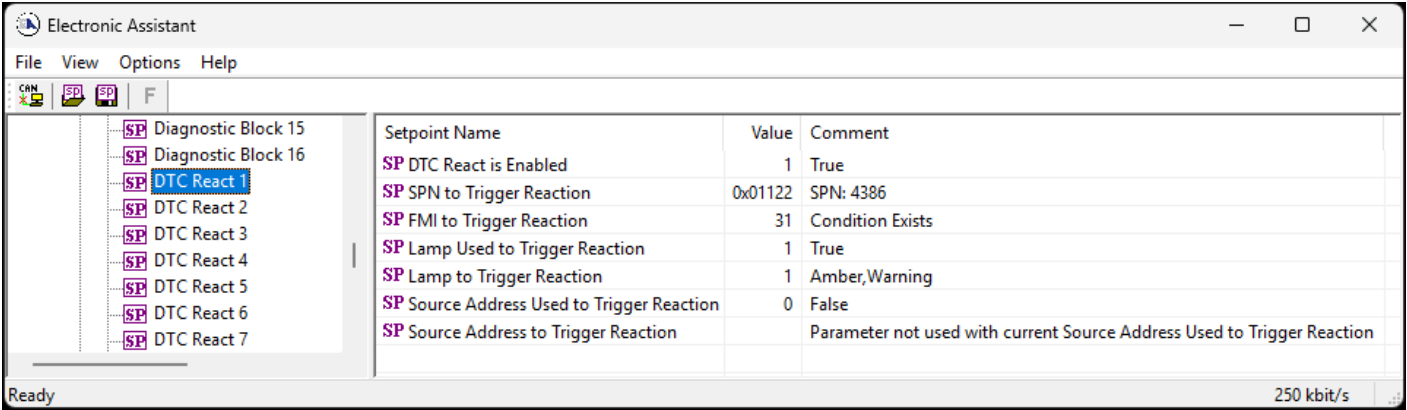


Figure 18 – Screen Capture of DTC React Setpoints

Name	Range	Default	Notes
DTC React is Enabled	Drop List	0, False	See 1.11
SPN to Trigger Reaction	0 to 524287 (0x7FFFF)	0	See 1.11
FMI to Trigger Reaction	Drop List	0	See 1.11
Lamp Used to Trigger Reaction	Drop list	0, False	See 1.11
Lamp to Trigger Reaction	Drop List	0, Protect	See 1.11
Source Address Used to Trigger Reaction	Drop list	0, False	See 1.11
Source Address to Trigger Reaction	0x00 to 0xFF	0	See 1.11

Table 32 – DTC React Setpoints

4.14. Miscellaneous Setpoints

The Miscellaneous setpoints control supply-voltage shutdown, temperature shutdown, and diagnostic messages on each CAN port. Refer to Section 1.12 for more info.

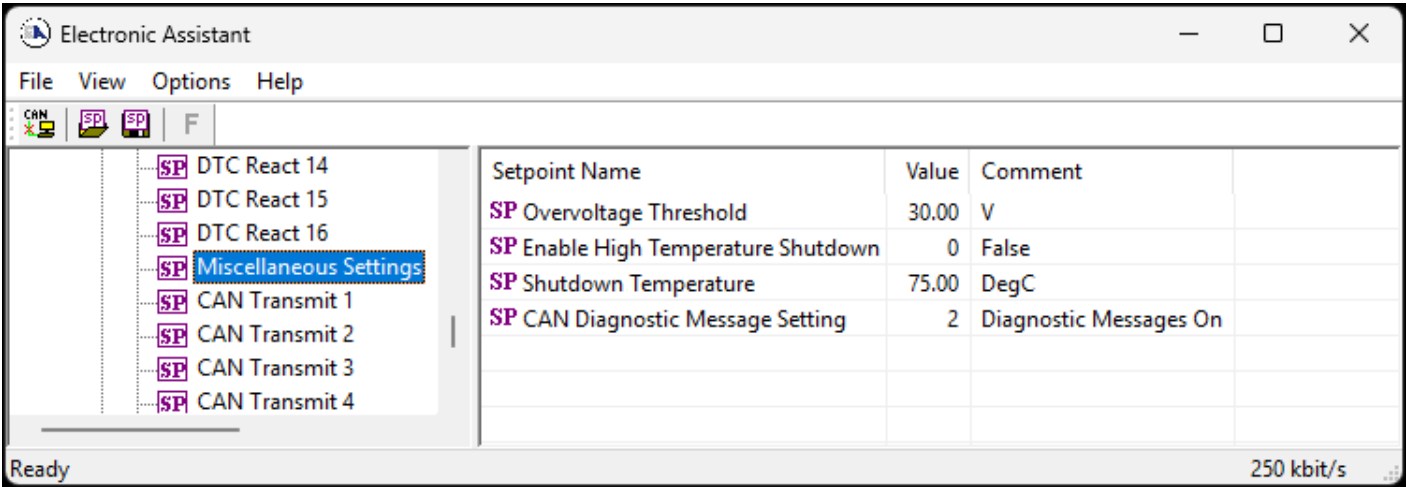


Figure 19 – Screen Capture of Miscellaneous Setpoints

Name	Range	Default	Notes
VPS Fault Disables Outputs	Drop List	0, False	See Section 1.12
Undervoltage Threshold	6.0 V to Overvoltage	10.0 V	See Section 1.12
Overvoltage Threshold	Undervoltage to 36.0 V	30.0 V	See Section 1.12
Shutdown Temperature Disables Outputs	Drop List	0, False	See Section 1.12
Shutdown Temperature Threshold	-40 to 85 °C	75 °C	See Section 1.12
CAN1 Diagnostic Message Setting	Drop List	0, Diagnostic Messages Off	See Table 20
CAN2 Diagnostic Message Setting	Drop List	0, Diagnostic Messages Off	See Table 20

Table 33 – Miscellaneous Setpoints

4.15. CAN Transmit Setpoints

CAN Transmit Message Function Block be presented in Section 1.13. Please refer there for detailed information on how these setpoints are used. “**Repetition Rate**” is 0ms by default, thus no message will be sent.

Electronic Assistant

File View Options Help

CAN SP SP F

Diagnostic Block 2

Diagnostic Block 3

Diagnostic Block 4

Diagnostic Block 5

Diagnostic Block 6

Diagnostic Block 7

Diagnostic Block 8

Diagnostic Block 9

Diagnostic Block 10

Diagnostic Block 11

Diagnostic Block 12

Diagnostic Block 13

Diagnostic Block 14

Diagnostic Block 15

Diagnostic Block 16

DTC React 1

DTC React 2

DTC React 3

DTC React 4

DTC React 5

DTC React 6

DTC React 7

DTC React 8

DTC React 9

DTC React 10

DTC React 11

DTC React 12

DTC React 13

DTC React 14

DTC React 15

DTC React 16

Miscellaneous Settings

CAN Transmit 1

CAN Transmit 2

CAN Transmit 3

CAN Transmit 4

CAN Transmit 5

CAN Transmit 6

CAN Transmit 7

CAN Transmit 8

CAN Transmit 9

CAN Transmit 10

CAN Receive 1

CAN Receive 2

CAN Receive 3

CAN Receive 4

CAN Receive 5

CAN Receive 6

CAN Receive 7

CAN Receive 8

CAN Receive 9

CAN Receive 10

Setpoint Name	Value	Comment
SP Transmit Enabled	1	True
SP PGN	0xFF00	Transmit PGN: 65280
SP Repetition Rate	1000	ms
SP Message Priority	6	
SP Destination Address (PDU1)	255	Destination ECU Address: 0xFF
SP Enable Mask Source Address	0	False
SP Mask Source Address		Parameter not used - Mask Source Address is Disabled
SP Message Length	8	Byte(s)
SP Signal 1 Data Type	2	Continuous
SP Signal 1 Data Source	75	Universal Output
SP Signal 1 Data Number	1	Universal Output #1
SP Signal 1 Data Size	16	bits
SP Signal 1 Byte Index	0	1st Byte Position
SP Signal 1 Bit Index	0	1st Bit Position
SP Signal 1 Resolution	1.0000	
SP Signal 1 Offset	0.0000	
SP Signal 1 Data Min	0.0000	
SP Signal 1 Data Max	100.0000	
SP Signal 2 Data Type	2	Continuous
SP Signal 2 Data Source	75	Universal Output
SP Signal 2 Data Number	1	Universal Output #1
SP Signal 2 Data Size	16	bits
SP Signal 2 Byte Index	2	3rd Byte Position
SP Signal 2 Bit Index	0	1st Bit Position
SP Signal 2 Resolution	1.0000	
SP Signal 2 Offset	0.0000	
SP Signal 2 Data Min	0.0000	
SP Signal 2 Data Max	100.0000	
SP Signal 3 Data Type	2	Continuous
SP Signal 3 Data Source	76	Relay Output
SP Signal 3 Data Number	1	Relay Output #1
SP Signal 3 Data Size	8	bits
SP Signal 3 Byte Index	4	5th Byte Position
SP Signal 3 Bit Index	0	1st Bit Position
SP Signal 3 Resolution	1.0000	
SP Signal 3 Offset	0.0000	
SP Signal 3 Data Min	0.0000	
SP Signal 3 Data Max	100.0000	
SP Signal 4 Data Type	0	Undefined
SP Signal 4 Data Source	0	No Source
SP Signal 4 Data Number		Parameter not used with current Data Source
SP Signal 4 Data Size		Parameter not used with current Data Source
SP Signal 4 Byte Index		Parameter not used with current Data Source
SP Signal 4 Bit Index		Parameter not used with current Data Source
SP Signal 4 Resolution		Parameter not used with current Data Source
SP Signal 4 Offset		Parameter not used with current Data Source
SP Signal 4 Data Min		Parameter not used with current Data Source
SP Signal 4 Data Max		Parameter not used with current Data Source

Ready 250 kbit/s

Figure 20 – Screen Capture of CAN Transmit Message Setpoints

Name	Range	Default	Notes
CAN Interface	Drop List	CAN1 Interface	See 1.13.1
Transmit Enabled	Drop List	0, False	See 1.13.1
PGN	0 to 262143	65280	See 1.13.1
Repetition Rate	0 to 262143 ms	0 ms	0ms disables transmit
Message Priority	0 to 7	6	See 1.13.1
Destination Address (PDU1)	0 to 255	255	See 1.13.1
Enable Mask Source Address	Drop List	0, False	See 1.13.1
Mask Source Address	0 to 255	255	See 1.13.1
Message Length	0 to 8	8	See 1.13.1
Signal X Data Type	Drop List	0, Undefined	Undefined, Discrete, or Continuous
Signal X Data Source	Drop List	0, No Source	Refer to Table 1
Signal X Data Number	Depends on Data Source		Refer to Table 1
Signal X Data Size	0 to 32 bits	8	See 1.13.2
Signal X Byte Index	0 to 7	0	See 1.13.2
Signal X Bit Index	0 to 7	0	See 1.13.2
Signal X Resolution	0 to 4294967295	1.0	See 1.13.2
Signal X Offset	-4294967295 to 4294967295	0.0	See 1.13.2
Signal X Data Min	-4294967295 to Data Max	0.0	See 1.13.2
Signal X Data Max	Data Min to 4294967295	100.0	See 1.13.2

Table 34 – CAN Transmit Message Setpoints

4.16. CAN Receive Setpoints

The CAN Receive Block is defined in Section 1.14. Please refer there for detailed information about how these setpoints are used. **“Signal Type”** is ‘Undefined’ by default, which disables the receive message. **“Autoreset Time”** defaults to 500 ms. Setting it to 0 disables the receive timeout.

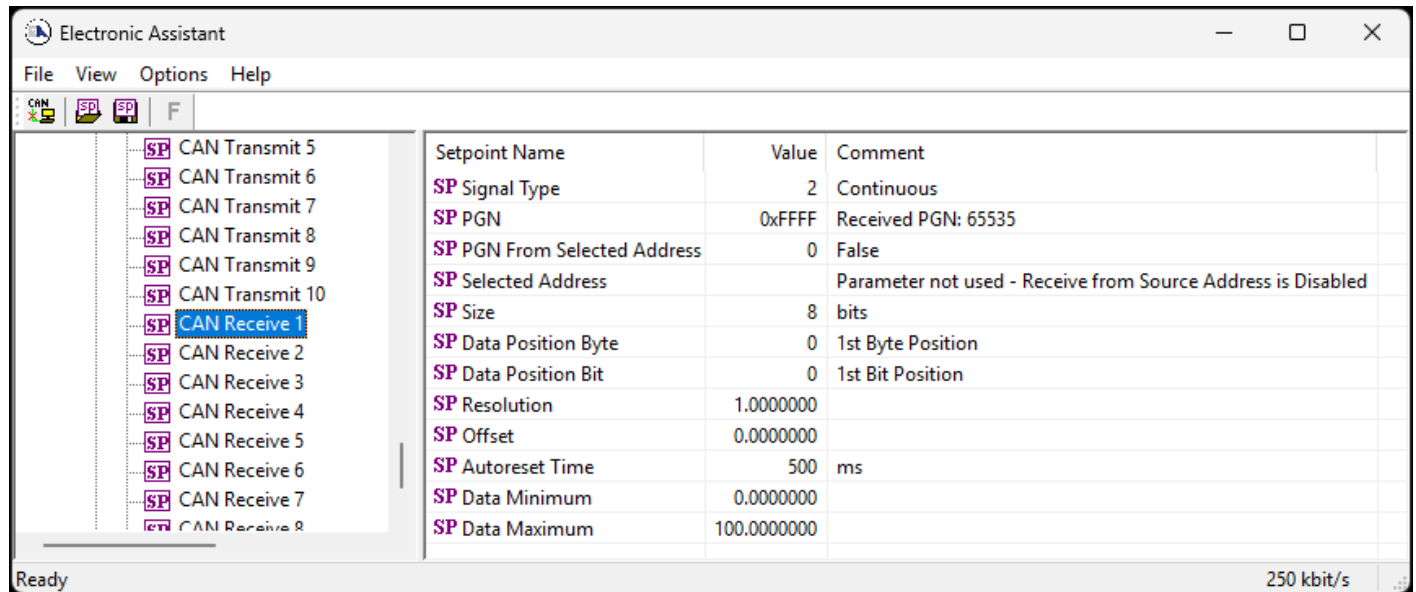


Figure 21 – Screen Capture of CAN Receive Message Setpoints

Name	Range	Default	Notes
CAN Interface	Drop List	CAN1 Interface	See 1.14
Signal Type	Drop List	0, Undefined	See 1.14
PGN	0 to 65535	65535	See 1.14
PGN From Selected Address	Drop List	0, False	False accepts the PGN from any address
Selected Address	0 to 255	0	See 1.14
Size	0 to 32 bits	8	See 1.14
Data Position Byte	0 to 7	0	See 1.14
Data Position Bit	0 to 7	0	See 1.14
Resolution	0 to 4294967295	1.0	See 1.14
Offset	-4294967295 to 4294967295	0.0	See 1.14
Autoreset Time	0 to 10000 ms	500 ms	See 1.14
Data Minimum	-4294967295 to Data Maximum	0.0	See 1.14
Data Maximum	Data Minimum to 4294967295	100.0	See 1.14

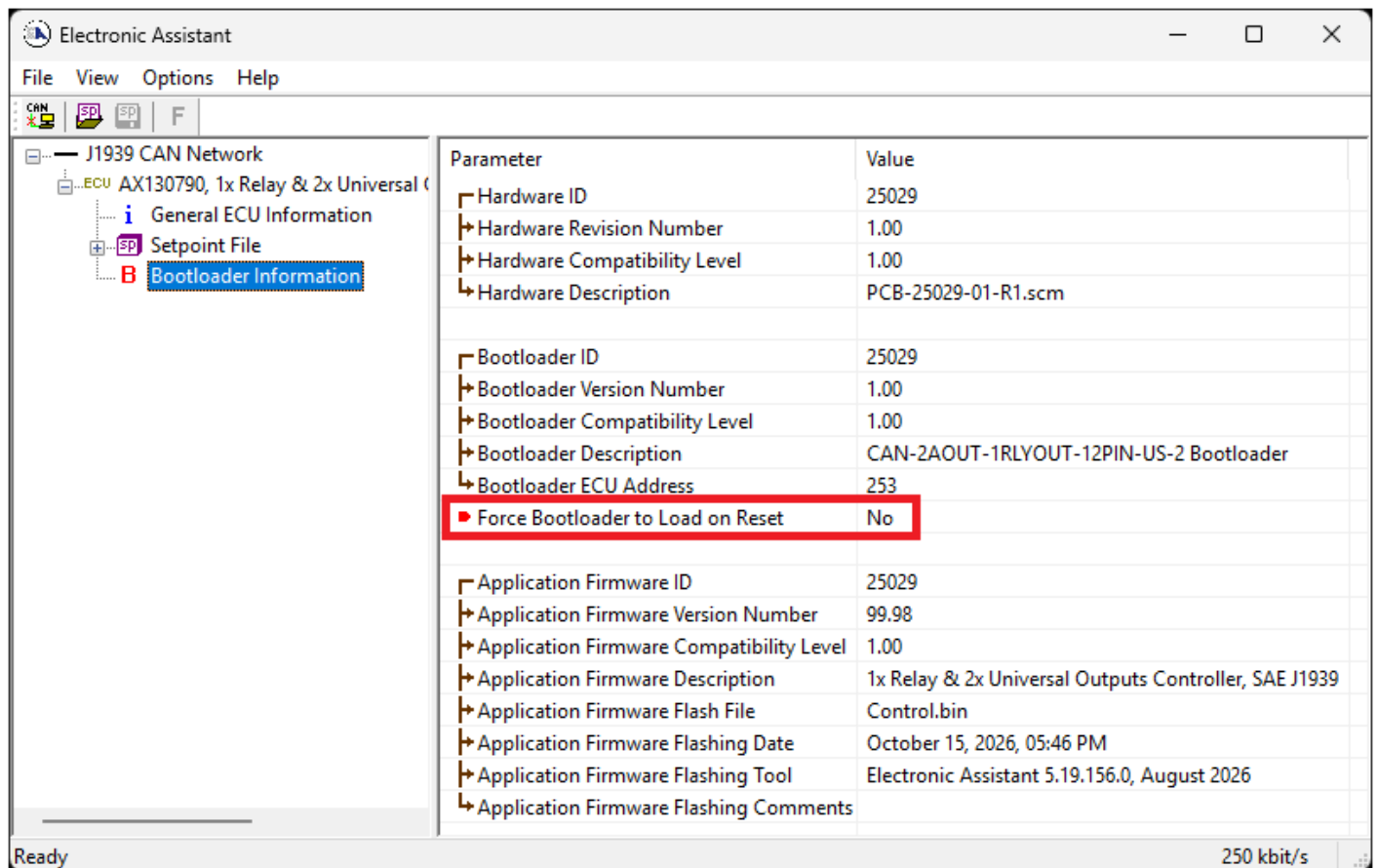
Table 35 – CAN Receive Setpoints

5. REFLASHING OVER CAN WITH THE AXIOMATIC EA BOOTLOADER

The AX130790 ECU 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 Axiomatic Electronic Assistant Vx.x.xx.x or higher.

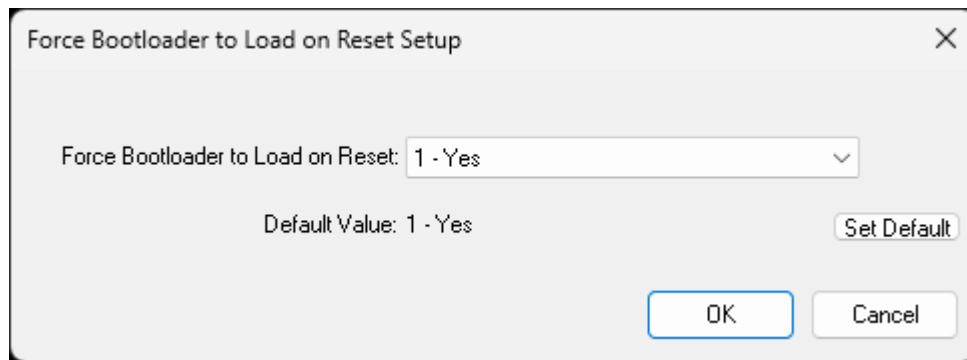
1. When the Axiomatic EA first connects to the ECU, the **Bootloader Information** section will display the following information.
2. To use the bootloader to upgrade the firmware running on the ECU, change the variable “**Force Bootloader to Load on Reset**” to Yes.



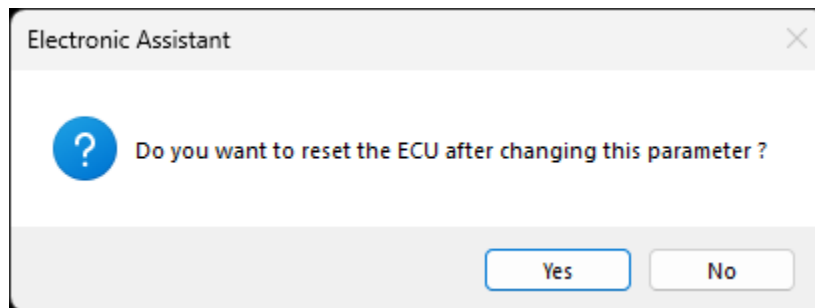
The screenshot shows the 'Electronic Assistant' window. On the left, a tree view under 'J1939 CAN Network' shows 'ECU AX130790, 1x Relay & 2x Universal Outputs Controller' expanded, with 'Bootloader Information' selected. The main pane displays a table of parameters and their values. The 'Force Bootloader to Load on Reset' parameter is highlighted with a red box and has a red arrow pointing to it.

Parameter	Value
Hardware ID	25029
Hardware Revision Number	1.00
Hardware Compatibility Level	1.00
Hardware Description	PCB-25029-01-R1.scm
Bootloader ID	25029
Bootloader Version Number	1.00
Bootloader Compatibility Level	1.00
Bootloader Description	CAN-2AOUT-1RLYOUT-12PIN-US-2 Bootloader
Bootloader ECU Address	253
Force Bootloader to Load on Reset	No
Application Firmware ID	25029
Application Firmware Version Number	99.98
Application Firmware Compatibility Level	1.00
Application Firmware Description	1x Relay & 2x Universal Outputs Controller, SAE J1939
Application Firmware Flash File	Control.bin
Application Firmware Flashing Date	October 15, 2026, 05:46 PM
Application Firmware Flashing Tool	Electronic Assistant 5.19.156.0, August 2026
Application Firmware Flashing Comments	

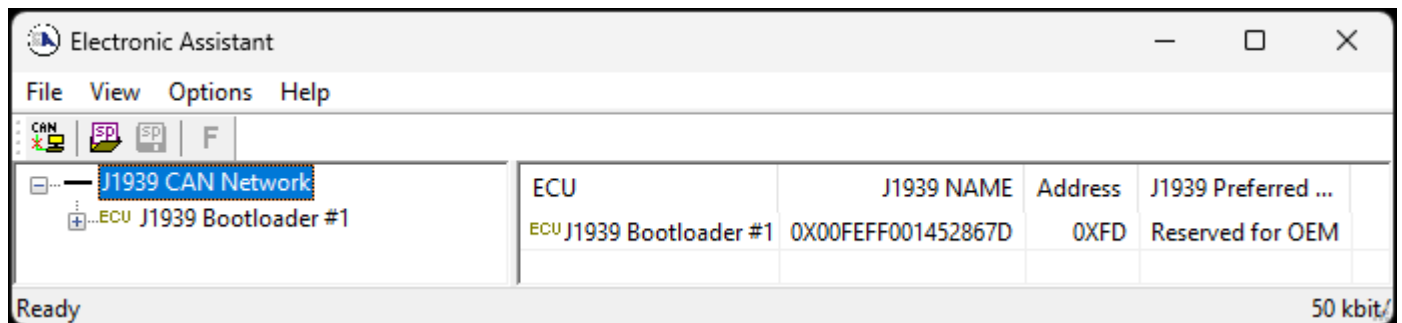
Ready 250 kbit/s



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 AX130790 but rather as **J1939 Bootloader #1**.



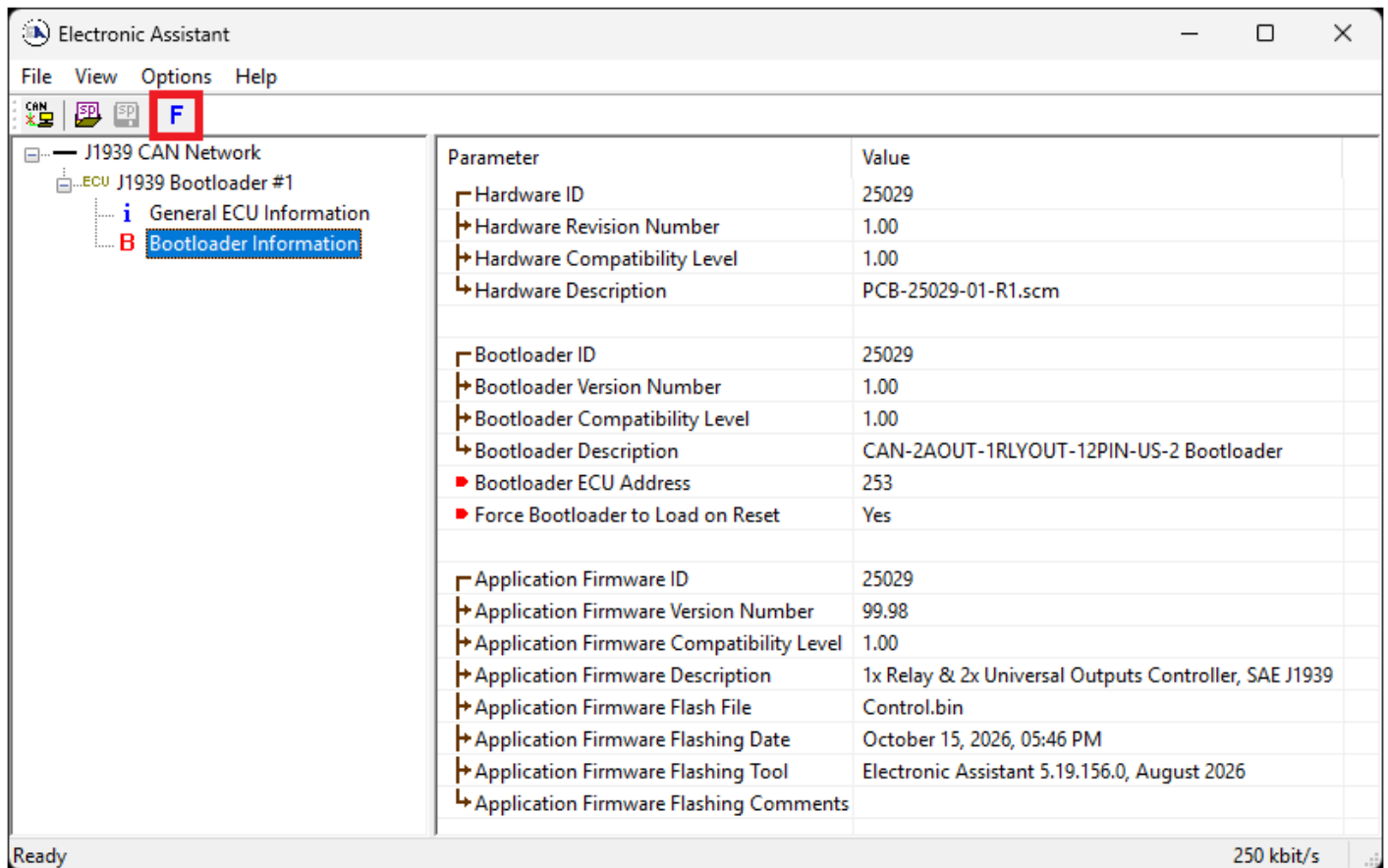
The screenshot shows the 'Electronic Assistant' window. On the left, a tree view under 'J1939 CAN Network' shows 'ECU J1939 Bootloader #1' expanded, with 'General ECU Information' selected. The main area displays a table of parameters:

Parameter	Value	Description
ECU Part Number	AX130790	
ECU Serial Number	0000125001	
ECU J1939 NAME PGN 60928, 64-bit ECU Identifier sent in Address Claimed Messages		
Arbitrary Address Capable	0X00	No
Industry Group	0X00	Global
Vehicle System Instance	0X00	
Vehicle System	0X7F	Not Available
Reserved	0X00	
Function	0XFF	Not Available
Function Instance	0X00	
ECU Instance	0X00	#1 - First Instance
Manufacturer Code	0X0A2	Axiomatic Technologies
Identity Number	0X12867D	Unique ECU network ID number
ECU Address 0XFD Reserved for OEM		
ECU ID	N/A	PGN 64965 -ECUID
Software ID	N/A	PGN 65242 -SOFT

The status bar at the bottom shows 'Ready' and '250 kbit/s'.

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.

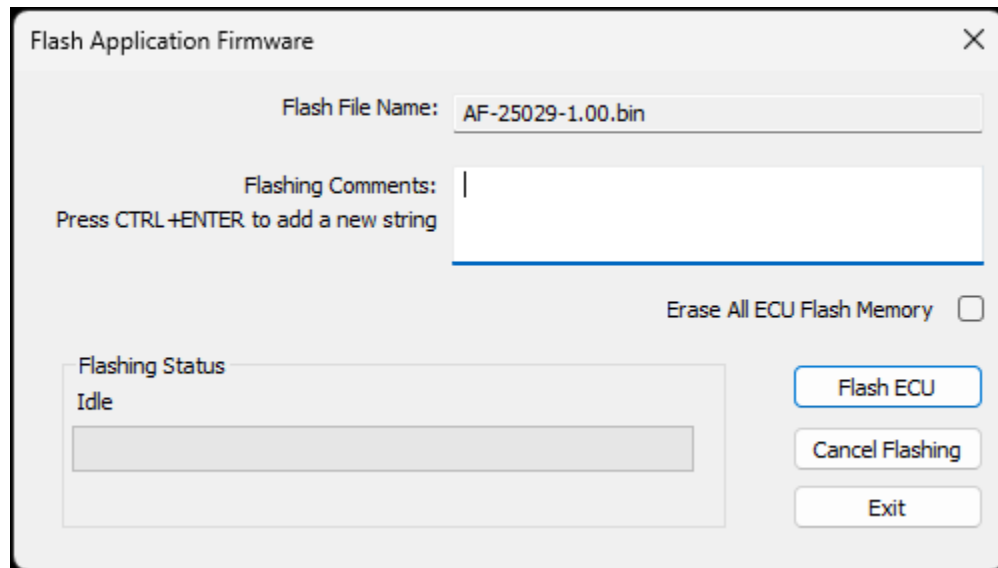
- When the **Bootloader Information** section is selected, the same information is shown as when it was running the AX130790 firmware, but in this case the **Flashing** feature has been enabled.



6. Select the **F**lashing button and navigate to where you had saved the **AF-24011-X.XX.bin** file sent from Axiomatic. (Note: only binary (.bin) files can be flashed using the Axiomatic 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-stamp or timestamp the file, as this is done automatically by the Axiomatic EA tool when you upload the new firmware.

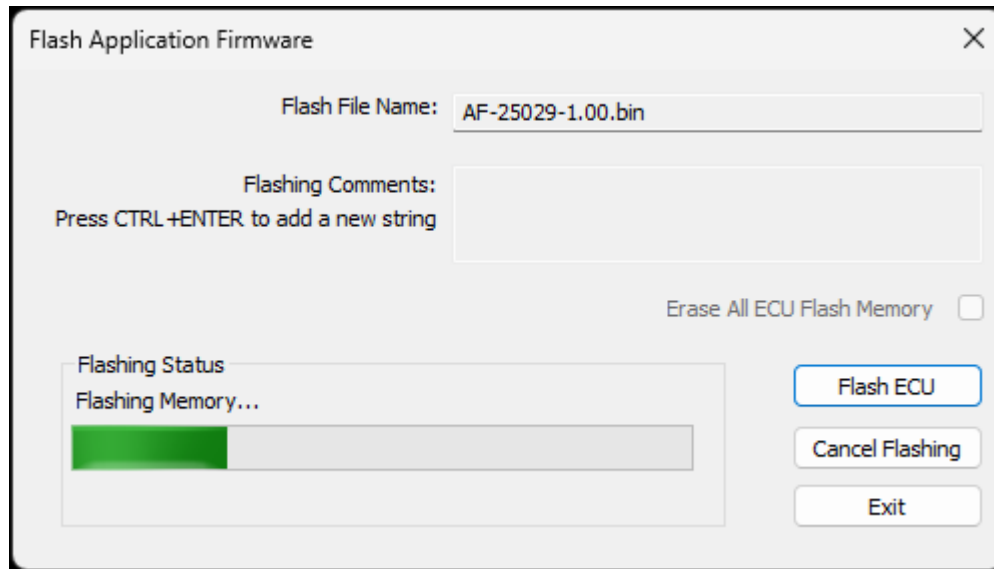


The image shows a software dialog box titled "Flash Application Firmware". It contains a "Flash File Name" field with the text "AF-25029-1.00.bin". Below it is a "Flashing Comments" text area with a placeholder text "Press CTRL+ENTER to add a new string". To the right of the comments area is a checkbox labeled "Erase All ECU Flash Memory" which is currently unchecked. In the bottom left, there is a "Flashing Status" section showing "Idle" above a progress bar. On the bottom right, there are three buttons: "Flash ECU", "Cancel Flashing", and "Exit".

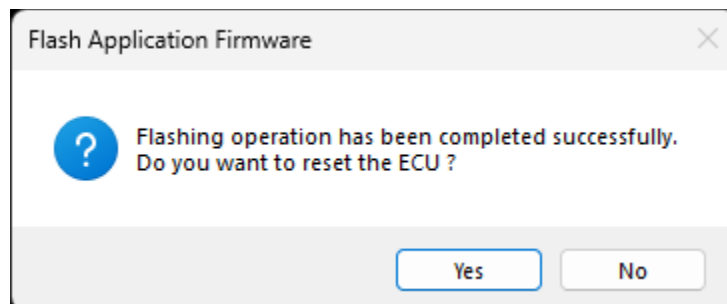


WARNING: Do not check the “Erase All ECU Flash Memory” box unless instructed to do so by your Axiomatic contact. Selecting this will erase ALL data stored in non-volatile flash, including the calibration done by Axiomatic during factory testing. It will also erase any configuration of the setpoints that might have been done to the ECU. and reset all setpoints to their factory defaults. By leaving this box unchecked, none of the setpoints will be changed when the new firmware is uploaded.

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 AX130790 application will start running, and the ECU will be identified as such by the Axiomatic EA. Otherwise, the next time the ECU is power cycled, the AX130790 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 or 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.

APPENDIX A - TECHNICAL SPECIFICATION

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 Limitations & Return Materials Process as described on <https://www.axiomatic.com/service/>.

Power Supply

Power Input	12 V _{DC} or 24 V _{DC} nominal (9 to 36 V _{DC})
Quiescent Current	160 mA @ 12 V, 80 mA @ 24 V
Reverse Polarity Protection	Provided
Surge and Transient Protection	Provided
Undervoltage Protection	Provided
Overvoltage Protection	Hardware shuts down at 45 V

Outputs

Universal Outputs	2x signal outputs configurable as: analog voltage, analogy current, PWM, frequency or digital types <u>Analog Voltage Output:</u> Range: 0-5 V, 0-10 V, ± 5 V or ± 10 V Minimum load: 1 kΩ Accuracy: ± 0.5 % (full scale) <u>Analog Current Output:</u> Range: 0-20 mA or 4-20 mA Maximum load resistance: 500 Ω Compliance voltage: 10 V Maximum Output Voltage (open circuit): 16 V Accuracy: ± 0.5 % (full scale) <u>PWM or Frequency Output:</u> Frequency Range: 0.1 Hz to 10 kHz Duty Cycle: 0 to 100 % Accuracy: ± 0.1 % Adjustable Amplitude: 5 to 12 V Push-Pull Output Max. Output Current: 20 mA <u>Digital Output:</u> Adjustable Amplitude: 5 to 12 V Push-Pull Output Max. Output Current: 20 mA 16-bit digital to analog (DAC) resolution
Protections	Protected against short circuits to ground Overcurrent protection: ± 32 mA Overvoltage protection: ± 33 V_{DC} (continuous)
Relay Output	1x isolated Form C relay Resistive Load: 5 A (Normally Open / NO) / 5 A (Normally Closed / NC) at 24 V_{DC} (Note: Please see IM03DGR datasheet for details) <u>Note:</u> • There is no special overcurrent/overvoltage protection on the relay outputs. The user is advised to provide a fast acting 6 A fuse or adequate external protection, if necessary. • If the relay is used, the operating temperature should not exceed 75 °C (167 °F).

General Specifications

Microcontroller	STM32H725RGV3, 32-bit, 1 MB flash program memory, 564 kB RAM																										
Isolation	Power supply and relay are isolated from the rest of the circuit.																										
Control Logic	Pre-programmed with standard logic. Refer to the user manual.																										
Communication	1x CAN port (SAE J1939) Supported baud rates: 125 kbit/s, 250 kbit/s, 500 kbit/s, 667 kbit/s, 1 Mbit/s, and auto-baud-rate detection																										
User Interface	Axiomatic Electronic Assistant P/N – AX070506K																										
Compliance	RoHS																										
Ingress Protection	IP67																										
Operating Temperature	-40 to 85 °C (-40 to 185 °F) If the relay is used, the operating temperature should not exceed 75 °C (167 °F).																										
Storage Temperature	-40 to 85 °C (-40 to 185 °F)																										
Weight	TBD lb. (TBD kg)																										
Enclosure and Dimensions	Molded enclosure, integral connector, Nylon 6/6, 30 % glass, ultrasonically welded Flammability rating: UL 94 V-0 3.5 in. x 2.8 in. x 1.3 in. (90.0 mm x 70.0 mm x 33.3 mm) L x W x H including integral connector Refer to dimensional drawing																										
Electrical Connections	Integral 12-pin receptacle (equivalent to TE Deutsch P/N: DTM04-12PA) <table border="1"> <thead> <tr> <th>Pin</th><th>Description</th></tr> </thead> <tbody> <tr><td>1</td><td>Relay (Normally Closed / NC)</td></tr> <tr><td>2</td><td>CAN shield</td></tr> <tr><td>3</td><td>Signal Ground</td></tr> <tr><td>4</td><td>Signal Ground</td></tr> <tr><td>5</td><td>CAN High</td></tr> <tr><td>6</td><td>CAN Low</td></tr> <tr><td>7</td><td>Battery +</td></tr> <tr><td>8</td><td>Battery -</td></tr> <tr><td>9</td><td>Signal Output 2</td></tr> <tr><td>10</td><td>Signal Output 1</td></tr> <tr><td>11</td><td>Relay (Common / C)</td></tr> <tr><td>12</td><td>Relay (Normally Open / NO)</td></tr> </tbody> </table>	Pin	Description	1	Relay (Normally Closed / NC)	2	CAN shield	3	Signal Ground	4	Signal Ground	5	CAN High	6	CAN Low	7	Battery +	8	Battery -	9	Signal Output 2	10	Signal Output 1	11	Relay (Common / C)	12	Relay (Normally Open / NO)
Pin	Description																										
1	Relay (Normally Closed / NC)																										
2	CAN shield																										
3	Signal Ground																										
4	Signal Ground																										
5	CAN High																										
6	CAN Low																										
7	Battery +																										
8	Battery -																										
9	Signal Output 2																										
10	Signal Output 1																										
11	Relay (Common / C)																										
12	Relay (Normally Open / NO)																										
Mating Plug KIT	A mating plug KIT is available from Axiomatic under P/N: PL-DTM06-12SA . It includes 1x DTM06-12SA plug, 1x WM-12S wedgelock, 12x 0462-201-20141 contacts, and 6x 0413-204-2005 sealing plugs.																										

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Engine Temperature Scanners
Ethernet/CAN Converters, Gateways
Ethernet Switches
Fan Drive Controllers
Gateways, CAN/Modbus, RS-232
Gyroscopes, Inclinometers
Hydraulic Valve Controllers
Inclinometers, Triaxial
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Machine Controls
Media Converters
Modbus, RS-422, RS-485 Controls
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Power Supplies, DC/DC, AC/DC
PWM Signal Converters/Isolators
Resolver Signal Conditioners
SAE J1939 I/O Modules
Service Tools
Signal Conditioners, Converters
Strain Gauge CAN Controls
Surge Suppressors

OUR COMPANY

Axiomatic provides electronic machine control components 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.***

QUALITY DESIGN AND MANUFACTURING

We have an ISO9001 registered R&D, electronics design and manufacturing facility in Canada.

Sales offices are in Canada, USA, Australia and Finland.

COMPLIANCE

Product compliance details can be found in the product literature and/or on axiomatic.com. Any inquiries should be sent to sales@axiomatic.com.

SAFE USE

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



This product can expose you to chemicals which are known in the State of California, USA to cause cancer and reproductive harm. For more information go to www.P65Warnings.ca.gov.

TECHNICAL SUPPORT

Contact technical support by emailing support@axiomatic.com.

WARRANTY, APPLICATION APPROVALS/LIMITATIONS

Axiomatic Technologies Corporation reserves the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. 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 at <https://www.axiomatic.com/service/>.

SERVICE

All products to be returned to Axiomatic require a Return Materials Authorization Number (RMA#) from rma@axiomatic.com. Please provide the following information when requesting an RMA number:

- Serial number, part number, Runtime hours, description of problem
- Wiring set up diagram, application and other comments as needed

DISPOSAL

Axiomatic products are electronic waste. Please follow your local environmental waste and recycling laws, regulations and policies for safe disposal or recycling of electronic waste.

CONTACTS

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