

USER MANUAL UMAX200000 Version V3A

4-CHANNEL STRAIN GAUGE CONTROLLER

With SAEJ1939®

USER MANUAL

P/N: AX200000 (250kbps) P/N: AX200000-01 (500kbps) P/N: AX200000-02 (1Mbps)

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ACCRONYMS

ACK	Positive Acknowledgement	(from SAE J1939 standard)
SGIN	Strain Gauge Input	
EA	Electronic Assistant [®] , p/n AX0	070502 (A Service Tool for Axiomatic ECUs)
ECU	Electronic Control Unit	(from SAE J1939 standard)
NAK	Negative Acknowledgement	(from SAE J1939 standard)
PDU1	9	e to be sent to a destination address, either specific (from SAE J1939 standard)
PDU2		tion that has been labeled using the Group s not contain a destination address.
PGN	Parameter Group Number	(from SAE J1939 standard)
PropA	Message that uses the Proprie	etary A PGN for peer-to-peer communication
PropB	Message that uses a Proprieta	ary B PGN for broadcast communication
SPN	Suspect Parameter Number	(from SAE J1939 standard)

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1. OVERVIEW OF CONTROLLER

1.1. Description of 4-Channel Strain Gauge Input Controller

This User Manual describes the architecture and functionality of the 4-Channel Strain Gauge input controller.

The 4-Channel Strain Gauge Input Controller (4CH-SG) is designed for versatile control of up to 4 input channels to measure strain gauge load cells independently, Digital input for Tare/Calibration operations, 1 Digital output and 1 Interlock/relay output. The sophisticated control algorithms allow the user to program the controller for a wide range of applications without the need for custom software.

There are 4 strain gauge input channels which can be configured to read any type of Load Cell with output ranges from +/-19mV to +/-2.5V to suit a wide variety of applications.

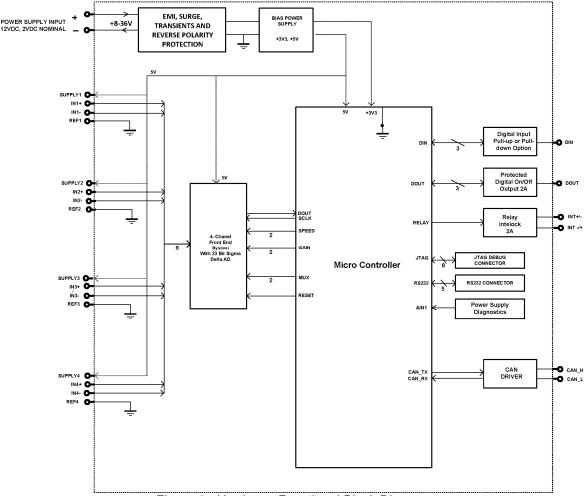


Figure 1 - Hardware Functional Block Diagram

The 4CH-SG is a highly configurable controller - allowing for custom configuration without the need of custom firmware. Its inputs, outputs, logical and mathematical function blocks allow the controller to support a wide variety of load cells to fit customer's various applications.

The 4CH-SG controller consists of a Digital Input which is used for Tare/Calibration operations that are highly configurable in order to accommodate various users' applications. In cases where the UMAX200000. 4-Channel Strain Gauge Controller. Version: 3A 5-69

digital input is not desired to be used as a Tare, the controller also allows to Tare the inputs via CAN messages.

The controller also consists of an Interlock output and Digital output. These can be used for signaling through an LED/lamp, driving an On/Off valve and/or as an interlock mechanism.

All inputs and logical function blocks on the unit are inherently independent from one another, but can be programmed to interact in a large number of ways. Figure 2 shows the hardware features of the 4CH-SG while Figure 1 shows the firmware features of the 4CH-SG.

The various function blocks supported by the 4CH-SG are outlined in the following sections. All setpoints are configurable using Axiomatic service tool, Electronic Assistant (EA).

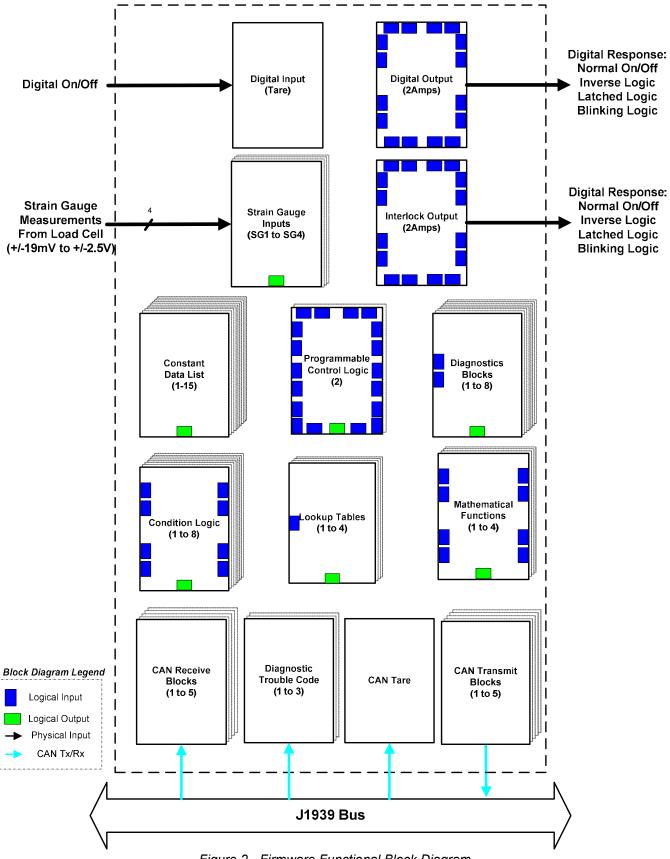


Figure 2 - Firmware Functional Block Diagram

1.2. Tare/Calibration Input Function Block

The Tare/Calibration input function block can be used to zero the platform and measure and store minimum and maximum weights of the 4-strain gauge system. Figure 2 shows the parameters in the Tare Input Function Block:

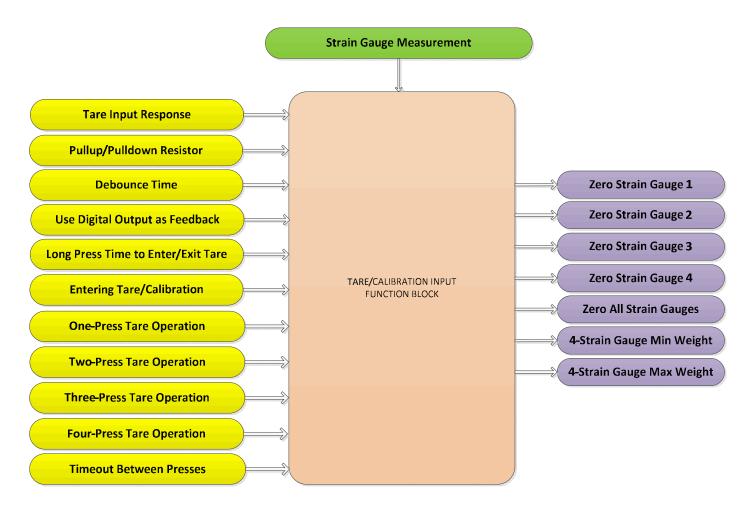


Figure 3 - Tare/Calibration Input Function Block Diagram

1.2.1. Digital Input Setpoints

Tare Input Response allows the user to select how the controller responds to the behaviour of the digital input. The signals going into the controller are interpreted as 0 or 1. The turn ON value (1) is reached at ~1V signal. Table 1 shows the different Tare Input Responses with the default response being highlighted.

Value	Meaning
0	Normal On/Off
1	Inverse Logic
2	Latched Logic

Table 1 - Tare Input Response

22kOhm pull-up and 22kOhm pull-down resistors can be enabled or both can be disabled using the setpoint **Pullup/Pulldown Resistor.** Table 2 lists the available pull-up/pull-down resistor options with the default option highlighter.

	Value	e Meaning	
	0	Pullup/Pulldown Off	
	1	22kOhm pullup	
	2	22kOhm pulldown	
T	able 2 - Pi	ull-up/Pull-down Resistor Option	

The Debounce Time parameter is a useful parameter in cases where the digital input signal coming in to the controller is noisy. Figure 4 how the Debounce Time helps detect a correct input signal

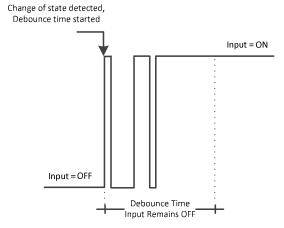


Figure 4 - Digital Input Debounce Time

1.2.2. Tare/Calibrate Functionality

When calibrating or zeroing the strain gauge inputs, the 4CH-SG offers a variety of options that can be performed with the use of a single Tare button. The **'Use Digital Output as Feedback'** setpoint gives the user the option of using one of the digital outputs as feedback to calibration steps. **Table 3** lists the different feedback types that can be selected when Tare/Calibrating.

Value	Meaning
0	No Feedback Used
1	Digital Output
2	Interlock Output

Table 3 - Use Digital Output as Feedback Options

When using the Digital Output or the Interlock Output as feedback when calibrating, the following scenarios will occur:

- Outputs will not be commanded by their respective control sources
- The selected output will engage for 750ms when Entering Calibration
- The selected output will engage for 250ms corresponding to the Tare Operation number
- The selected output will engage for 750ms when Exiting Calibration
- Outputs will be commanded by their respective control sources after exiting calibration

1.2.2.1. Entering/Exiting Calibration

In order to prevent 'false calibration' by pressing the Tare button by mistake, it is therefore necessary to enter calibration mode and exit calibration mode. 'Long Press Time to Enter/Exit Calibration' setpoint is used to accomplish this function. Figure 5 explains the operation of entering and exiting calibration mode.

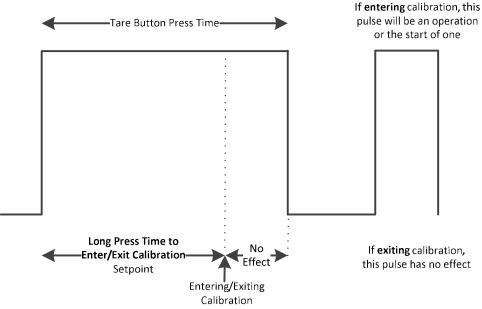


Figure 5 - Long Press to Enter/Exit Calibration Mode

As shown in **Figure 5**, the user can press the Tare button for much longer than the 'Long Press Time to Enter/Exit Calibration' setpoint as it will have no effect on the calibration. When entering calibration, any Tare button press which has been pressed for shorter period of time than 'Long **Press Time to Enter/Exit Calibration**' setpoint will be considered a Tare/Calibration operation. Refer to section 1.2.2.2 for more details. On the other hand, when exiting calibration, any Tare button press which has been pressed for shorter period of time than 'Long **Press Which** has been pressed for shorter period of time than 'Long **Press Time to Enter/Exit Calibration**' setpoint will be considered a Tare/Calibration, any Tare button press which has been pressed for shorter period of time than 'Long **Press Time to Enter/Exit Calibration**' setpoint as the other hand, when exiting calibration, any Tare button press which has been pressed for shorter period of time than 'Long **Press Time to Enter/Exit Calibration**' setpoint as the other hand, when exiting calibration, any Tare button press which has been pressed for shorter period of time than 'Long **Press Time to Enter/Exit Calibration**' will be ignored.



It is very important to exit calibration after the needed operations have been completed. Otherwise, the tare/calibration operations will not be saved.

1.2.2.2. Tare/Calibration Operations

After entering calibration mode the amount of consecutive presses will reflect the operation number. Consecutive presses are determined by parameter '**Timeout Between Presses**'. As long as the next Tare button press occurs before this parameter, the number of consecutive presses increases. Once the timeout occurs, the operation that will be executed will be determined by the count of consecutive presses before the timeout happened. **Figure 6** provides a graphical explanation.

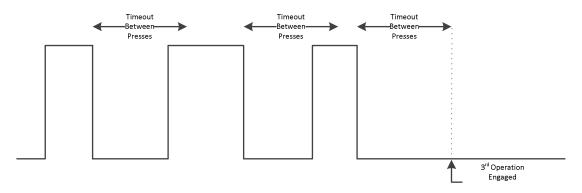


Figure 6 - Timeout Between Presses (Example)

The 4CH-SG allows up to 4 Tare/calibration operations that the user can perform. **Table 4** lists all the available operations.

Value	Tare Operation
0	Operation Not Used
1	Zero Strain Gauge 1
2	Zero Strain Gauge 2
3	Zero Strain Gauge 3
4	Zero Strain Gauge 4
5	Zero All Strain Gauges
6	Set Overall Minimum Weight
7	Set Overall Maximum Weight
	Table 4 - Tare Operations

When Tare Options 6 and 7 are used ('Set Overall Minimum Weight' and 'Set Overall Maximum Weight') as Tare/Calibration steps, their results - after exiting calibration mode - will be stored to Constant Data List 3 and Constant Data List 4, respectively. This allows the user to use those variables as inputs to other function blocks.

1.3. Strain Gauge Input Function Block

The Strain Gauge Input (SGIn) function block is the logic associated with measuring and managing strain gauge inputs. The SGIn function block provides configurable parameters

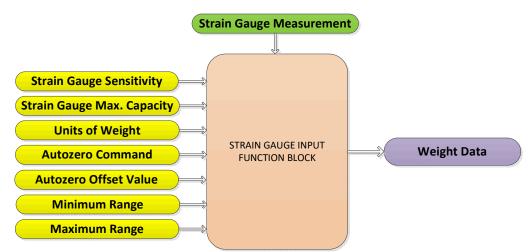


Figure 7 - Strain Gauge Input Function Block Diagram

The **Strain Gauge Sensitivity** parameter is the Strain Gauge Load Cell's output voltage (in mV/V). **The Strain Gauge Maximum Capacity** parameter is the maximum weight (in kilograms) the strain gauge can sense. With these two parameters, the 4CH-SG controller will modify its input measurements to determine the appropriate calculations based on the load cell's entire output range.

When the required or desired measurements of weight need to be other than kg, **Units of Weight** parameter can be used to convert the measured weight in kg (by default) into pounds (lbs). This conversion of weight can be used in other functional blocks to compare to different weights.

Value	Meaning
0	Kilograms (kg)
1	Pounds (lbs)
Toble 5	Waight Conversion Options

Table 5 - Weight Conversion Options

Strain gauge load cells typically have an offset when installing. There may be weight added to the load cells, i.e. a platform which exerts weight onto the strain gauges. These offsets or extra added weight may be desired to become to 'zero-weight' position of the system. The 4CH-SG controller is continuously reading input data from strain gauge load cells. Another alternative to using the Tare button as explained in section 1.2, when the **Autozero Command** parameter is set to TRUE, the current measured weight (in kg or lbs) by the 4CH-SG will be considered the 'zero-weight' position. By doing this, **Autozero Offset Value** parameter will be automatically updated to the current weight position. Alternatively, the **Autozero Offset Value** parameter can be changed at any time.

1.4. Internal Function Block Control Sources

The 4-Channel Strain Gauge controller allows for internal function block sources to be selected from the list of the logical function blocks supported by the controller. As a result, any output from one function block can be selected as the control source for another. Keep in mind that not all options make sense in all cases, but the complete list of control sources is shown in Table 6.

Value	Meaning
0	Control Source Not Used (Ignored)
1	Strain Gauge Input Function Block
2	Digital Output Stage
3	CAN Receive Message
4	Conditional Logic Block
5	Lookup Table Function Block
6	Mathematical Function Block
7	Programmable Logic Function Block
8	Constant Data List Block
9	Diagnostic Trouble Code
10	Measured Power Supply
11	Measured Processor Temperature
12	Receive Message Timeout

Table 6 - Control Source Options

In addition to a source, each control also has a number which corresponds to the sub-index of the function block in question. Table 7 outlines the ranges supported for the number objects, depending on the source that had been selected.

Control Source	Control Source Number
Control Source Not Used (Ignored)	[0]
Strain Gauge Input Function Block	[14]
Digital Output Stage Function Block	[14]
CAN Receive Message	[15]
Conditional Logic Block	[18]
Lookup Table Function Block	[14]
Mathematical Function Block	[14]
Programmable Logic Function Block	[12]
Constant Data List Block	[115]
Diagnostic Trouble Code	[13]
Measured Power Supply	[1]
Measured Processor Temperature	[1]
Receive Message Timeout	[1]

Table 7 - Control Source Number Options

1.5. Digital / Interlock Function Blocks

The 4CH-SG supports a Digital Output as well as an Interlock Output. These outputs can be used for signaling, driving on/off valves, and interlocking – whichever the application may be.

The structure of the output blocks for Digital and Interlock outputs are based on stages. The 4CH-SG provides the user with up to four different stages in order to provide more flexibility to the digital and digital output functionality.

Each of the four stages consists of its independent control source and digital response. However, only one stage can be used to control the output. For this reason, the 4-stage structure is based on priority in which the 4th stage has the highest priority and the 1st stage has the lowest priority. In other words: if all 4 stages are true, the digital response set for stage 4 will be used to drive the particular output.

The control sources that can be used to command each of the four stages are listed in section 1.4 **Table 7**.

The Digital Responses that are available for each stage in the 4CH-SG are listed in **Table 8** below

Value	Meaning
0	Normal On/Off
1	Inverse Logic
2	Latched Logic
3	Blinking Logic
T-11-0 D'	

 Table 8 - Digital Response Options

 Table 8 - Digital Response Options

In '*Normal On/Off*' response type, the output command state will follow the control input command: when the control input command is ON, the output will be turned ON and vice-versa.

In '*Inverse Logic*' response type, the output command state will be opposite of the control input command: when the control input command is ON, the output will be turned OFF and vice-versa.

In *'Latched Logic'* response type, the output command state will change every time the input command goes from OFF to ON.

In *'Blinking Logic'* response type, the output will toggle at a period of '**Digital Blink Rate**' for as long as the input command is ON.

The "**Control Source**" setpoint together with "**Control Number**" setpoint determine which signal is used to drive the output. For example setting "**Control Source**" to '*Strain Gauge Input Measured*' and "**Control Number**" to '*1*', connects signal measured from Strain Gauge Input 1 to the output in question. The input signal is scaled per input type range between 0 and 1 to form control signal. Outputs respond in a linear fashion to changes in control signal. If a non-digital signal is selected to drive digital output the command state will be 0 (OFF) at or below the "**Output At Minimum Command**", 1 (ON) at or above "**Output At Maximum Command**" and will not change in between those points.

In addition to the Control input, Proportional Outputs also support Enable and Override inputs.

The "Enable Source" setpoint together with "Enable Number" setpoint determine the enable signal for the output in question. The "Enable Response" setpoint is used to select how output will respond to the selected Enable signal. "Enable Response" setpoint options are listed in Table 9 - Enable Response Options

9. If a non-digital signal is selected as Enable signal the signal is interpreted as shown in Figure 8.

Enable When On
Enable When Off

Table 9 - Enable Response Options

Override input allows the output drive to be configured to go to a default value in the case of the override input being engaged/disengaged, depending on the logic selected in "Override Response", presented on 0. When active, the output will be driven to the value in "Output at **Override Command**" regardless of the value of the Control input. The "**Override Source**" and "Override Number" together determine the Override input signal.

	Value	Meaning
	0	Override When On
	1	Override When Off
Table 10 - Override Response Options		

If a fault is detected in any of the active inputs (Control/Enable/Override) the output will respond per "Control Fault Response" setpoint as outlined in Table 11. Fault Value is defined by "Output in Fault Mode" setpoint value, which is interpreted in selected output units.

Value	Meaning
0	Shutoff Output
1	Apply Fault Value
2	Hold Last Value
Table 11 - Fault Response Options	

Table 11 - Fault Response Options

Fault detection is available for current output types. A current feedback signal is measured and compared to desired output current value. Fault detection and associated setpoints are presented in section 1.66.

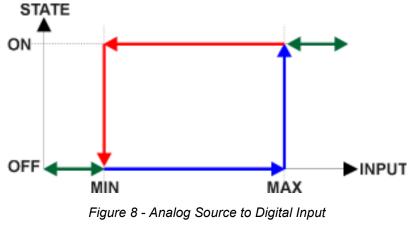


Figure 1 - Analog source to Digital input

1.6. Diagnostic Function Blocks

DM11

The 4CH-SG supports diagnostic messaging. DM1 message is a message, containing Active Diagnostic Trouble Codes (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.

DM2	Previously Active Diagnostic Trouble Codes		Sent only on request
SPN	Suspect Parameter Number	(user defined)	
FMI	Failure Mode Identifier	(see 0 and Table 151)	
СМ	Conversion Method	(always set to 0)	
OC	Occurrence Count	(number of times the fau	It has happened)
DM3	Diagnostic Data Clear/Reset c	f Previously Active DTCs	Done only on request

In addition to supporting the DM1 message, the following are supported:

Diagnostic Data Clear/Reset for Active DTCs

Fault detection and reaction is a standalone functionality that can be configured to monitor and report diagnostics of various controller parameters. The 4CH-SG supports 8 Diagnostics Definitions, each freely configurable by the user.

By default, the monitoring of operating voltage, CPU temperature and receive message 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.

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.

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Done only on request

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.

Double minimum and maximum error lets user to specify four thresholds, each with independent diagnostic parameters. The diagnostic status and threshold values is determined and expected as show in **Error! Reference source not found.**5 below.

By default, Diagnostic Block 8 gets automatically updated if it monitoring a Math Block Function Block after going through Calibration with the Tare Button. The updated parameters are the MIN Shutdown Set, MAX Shutdown Set with a 10% Hysteresis. The

fault type by default in Diagnostic Block 8 is with **Minimum and maximum error**.

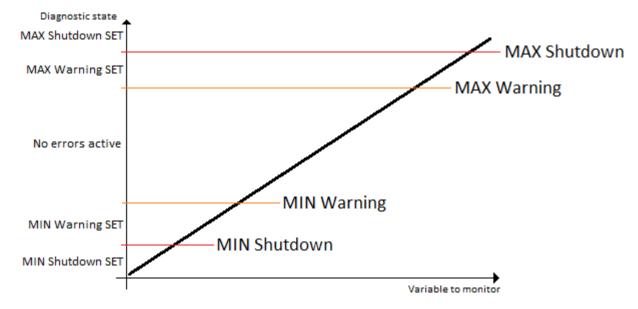


Table 12 - Double Minimum and Maximum Error Thresholds

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 particular 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".

While there are no active DTCs, the 4CH-SG 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).

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 UMAX200000. 4-Channel Strain Gauge Controller. Version: 3A 17-69

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 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 13. By default, the '*Amber, Warning*' lamp is typically the one set be any active fault.

Value	Meaning
0	Protect
1	Amber Warning
2	Red Stop
3	Malfunction

Table 13 - Lamp Set by Even in DM1 Options

"SPN for Event" 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" in is configured to be different from zero. It is 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.

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

17	Data Valid But Below Normal Operating Range – Least Severe Level
18	Data Valid But Below Normal Operating Range – Moderately Severe Level
19	Network Error
20	Data Drifted High
21	Data Drifted Low
31	Condition Exists

Table 14 – FMI for Event Options

Every fault has associated a default FMI with them. The used FMI can be configured with "**FMI for Event**" setpoint, presented in Table 14. When an FMI is selected from Low Fault FMIs in Table 15 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 15. There is no automatic setting of High and Low FMIs in the firmware, the user can configure these freely.

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

Table 15 – Low Fault FMIs and corresponding High Fault FMIs

1.7. Simple Conditional Logic Function Blocks

The Simple Conditional Logic Blocks provide a way of connecting different blocks and comparing them to one another. The output of the Conditional Logic Blocks is either 0 (FALSE) or 1 (TRUE).

There are three operations that take place in the Conditional Logic Blocks which allows the user to make more elaborate comparisons. The first two operations, '**Operator 1 (Input 1, Input 2)**' and '**Operator 2 (Input 3, Input4)**' compare two separate values from different selectable control sources. The operations for these two operators are listen in **Table 16**.

Value	Operation	Meaning
0	Not Used	Result = False
1	=	True when InA Equals InB
2	!=	True when InA Not Equal InB
3	>	True when InA Greater Than InB
4	>=	True when InA Greater Than or Equal InB
5	<	True when InA Less Than InB
6	<=	True when InA Less Than or Equal InB
7	OR	True when InA or InB is True
8	AND	True when InA and InB are True
9	XOR	True when InA/InB is True, but not both

Table 16 - Available Operation for Operator 1 and Operator 2

The last operation is used between the results of both Operator 1 and Operator 2 using logic gates operations. The list of available operations for '**Operator 3 (Operator 1, Operator 2)**' are listed in **Table 17**.

Value	Operation	Meaning
0	Not Used	Result = False
1	OR	True when Op1 or Op2 is True
2	AND	True when Op1 and Op2 are True
3	XOR	True when Op1/Op2 is True, but not both

Table 17 - Available Operations for Operator 3



When configuring a Conditional Block and only one comparison is needed, it is necessary that operation selected for **'Operator 3 (Operator 1, Operator 2)**' is set to *1* (*'OR, True When Op1 or Op2 is True*')

1.8. Lookup Table Function Block

Lookup Tables are used to give an output response of up to 10 slopes per input. The array size of the Response [], Point X [] and Point Y [] setpoints shown in the block diagram above is therefore 6.

Note: 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 is described in Section 1.5.

There are two key setpoints that will affect this function block. The first is the "**X-Axis Source**" and "**X-Axis Number**" which together define the Control Source for the function block. When it is changed, the table is automatically updated with new defaults based on the X-Axis source selected if "**Auto update when control changes**" in the Miscellaneous block is *TRUE*.

As stated earlier if **"Auto update when control changes"** is *TRUE,* should the selected Control Source change (i.e. the Min or Max values of the function block are updated), the associated table will also be automatically updated with default settings, based on the new X-Axis limits.



Initialize the Control Source of a Lookup Table BEFORE changing the table values, as the new settings WILL get erased when the control is updated if the "**Auto update when control changes**" in the Miscellaneous function block is set to *TRUE*.

The second setpoint that will affect the function block (i.e. reset to defaults), is the "**X-Axis Type**". By default, the tables have a *'Data Response'* output. Alternatively, it can be selected as a *'Time Response'*.

1.8.1. X-Axis, Input Data Response

In the case where the **X-Axis Type**" = *Data Response*, the points on the X-Axis represents the data of the control source. These values must be selected within the range of the control source.

When selecting X-Axis data values, there are no constraints on the value that can be entered into any of the X-Axis points. The user should enter values in increasing order to be able to utilize the entire table. Therefore, when adjusting the X-Axis data, it is recommended that X₁₀ is changed first, then lower indexes in descending order as to maintain the below:

MinInputRange <= X₀ <= X₁ <= X₂<= X₃<= X₄<= X₅<= X₆<= X₇<= X₈<= X₉<= X₁₀ MaxInputRange

As stated earlier, MinInputRange and MaxInputRange will be determined by the X-Axis Source that has been selected.

If some of the data points are *'Ignored'* as described in Section 1.8.4, they will not be used in the X-Axis calculation shown above. For example, if points X_4 and higher are ignored, the formula becomes MinInputRange <= $X_0 <= X_1 <= X_2 <= X_3 <=$ MaxInputRange instead.

1.8.2. Y-Axis, Lookup Table Output

The Y-Axis has no constraints on the data that it represents. This means that inverse, or increasing/decreasing or other responses can be easily established.

In all cases, the controller looks at the **entire range** of the data in the Y-Axis setpoints, and selects the lowest value as the MinOutRange and the highest value as the MaxOutRange. They are passed directly to other function blocks as the limits on the Lookup Table output. (i.e used as Xmin and Xmax values in linear calculations.)

However, if some of the data points are *'Ignored'* as described in Section 1.8.4, they will not be used in the Y-Axis range determination. Only the Y-Axis values shown on EA will be considered when establishing the limits of the table when it is used to drive another function block, such as a Math Function Block.

1.8.3. Default Configuration, Data Response

By default, all Lookup Tables in the ECU are disabled ("**X-Axis Source**" equals *Control Source Not Used*"). Lookup Tables can be used to create the desired response profiles. If a Strain Gauge input is used as the X-Axis, the output of the Lookup Table will be what the user enters in Y-Axis[] setpoints.

Recall, any controlled function block which uses the Lookup Table as an input source will also apply a linearization to the data. Therefore, for a 1:1 control response, ensure that the minimum and maximum values of the output correspond to the minimum and maximum values of the table's Y-Axis.

All tables (1 to 4) are disabled by default (no control source selected). However, should an "**X-Axis Source**" be selected, the Y-Axis defaults will be in the range of 0 to 100% as described in the "<u>Y-Axis, Lookup Table Output</u>" section above. X-Axis minimum and maximum defaults will be set as described in the "<u>X-Axis, Data Response</u>" section above.

By default, the X and Y axes data is setup for an equal value between each point from the minimum to maximum in each case.

1.8.4. Point To Point Response

By default, the X and Y axes are setup for a linear response from point (0,0) to (10,10), where the output will use linearization between each point, as shown in Figure 6. To get the linearization, each "**Point N – Response**", where N = 1 to 10, is setup for a *'Ramp To'* output response.

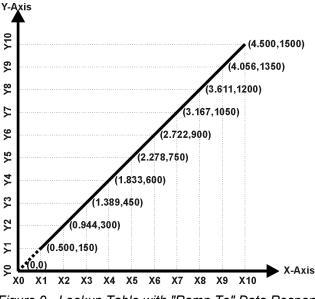
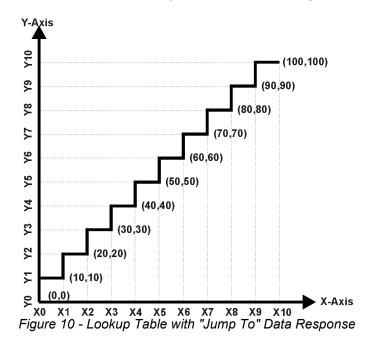


Figure 9 - Lookup Table with "Ramp To" Data Response

Alternatively, the user could select a 'Jump To' response for "**Point N – Response**", where N = 1 to 10. In this case, any input value between X_{N-1} to X_N will result in an output from the Lookup Table function block of Y_N .

An example of a Math function block (0 to 100) used to control a default table (0 to 100) but with a *Jump To*' response instead of the default *Ramp To*' is shown in Figure 10.



Lastly, any point except (0,0) can be selected for an *'Ignore'* response. If "**Point N – Response**" is set to ignore, then all points from (X_N , Y_N) to (X_5 , Y_5) will also be ignored. For all data greater than X_{N-1} , the output from the Lookup Table function block will be Y_{N-1} .

A combination of *'Ramp To'*, *'Jump To'* and *'Ignore'* responses can be used to create an application specific output profile.

1.8.5. X-Axis, Time Response

As mentioned in Section 1.8, a Lookup Table can also be used to get a custom output response where the "**X-Axis Type**" is a *'Time Response.'* When this is selected, the X-Axis now represents time, in units of milliseconds, while the Y-Axis still represents the output of the function block.

In this case, the "**X-Axis Source**" is treated as a digital input. If the signal is actually an analog input, it is interpreted like a digital input per Figure 8. When the control input is ON, the output will be changed over a period of time based on the profile in the Lookup Table. Once the profile has finished (i.e. index 10, or *'Ignored'* response), the output will remain at the last output at the end of the profile until the control input turns OFF.

When the control input is OFF, the output is always at zero. When the input comes ON, the profile ALWAYS starts at position (X_0 , Y_0) which is 0 output for 0ms.

In a time response, the interval time between each point on the X-axis can be set anywhere from 1ms to 24 hours. [86,400,000 ms]

1.9. Programmable Logic Function Block

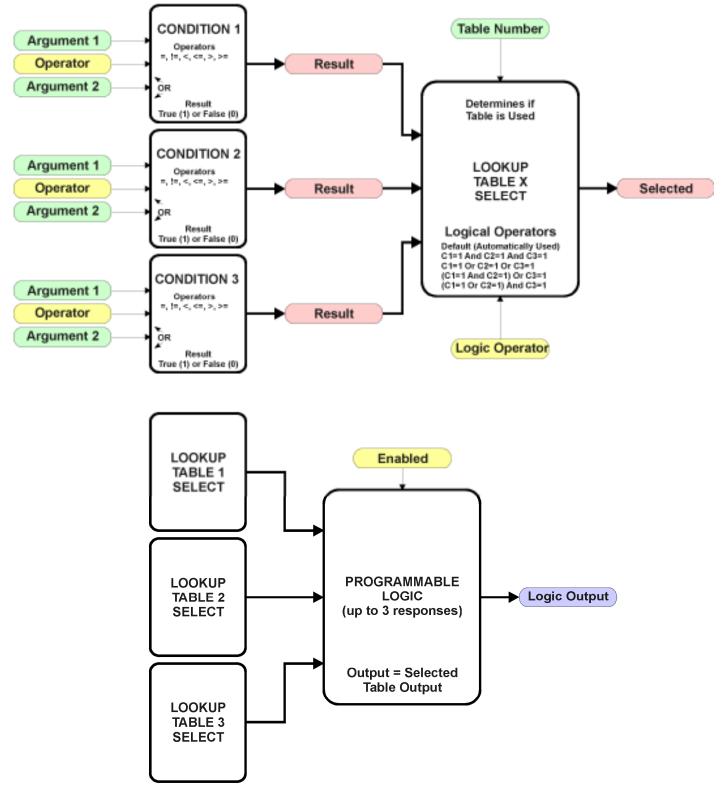


Figure 11 - Programmable Logic Function Block

This function block is obviously the most complicated of them all, but very powerful. The Programmable Logic can be linked to up to three tables, any one of which would be selected only under given conditions. Any three tables (of the available 8) can be associated with the logic, and which ones are used is fully configurable.

Should the conditions be such that a particular table (1, 2 or 3) has been selected as described in Section 1.9.2, then the output from the selected table, at any given time, will be passed directly to the Logic Output.

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, such as an Output X Drive. To do this, the "**Control Source**" for the reactive block would be selected to be the *'Programmable Logic Function Block.'*

In order to enable any one of Programmable Logic blocks, the "**Programmable Logic Block Enabled**" setpoint must be set to True. They are all disabled by default.

Logic is evaluated in the order shown in Figure 12. Only if a lower number table has not been selected will the conditions for the next table be looked at. The default table is always selected as soon as it is evaluated. It is therefore required that the default table always be the highest number in any configuration.

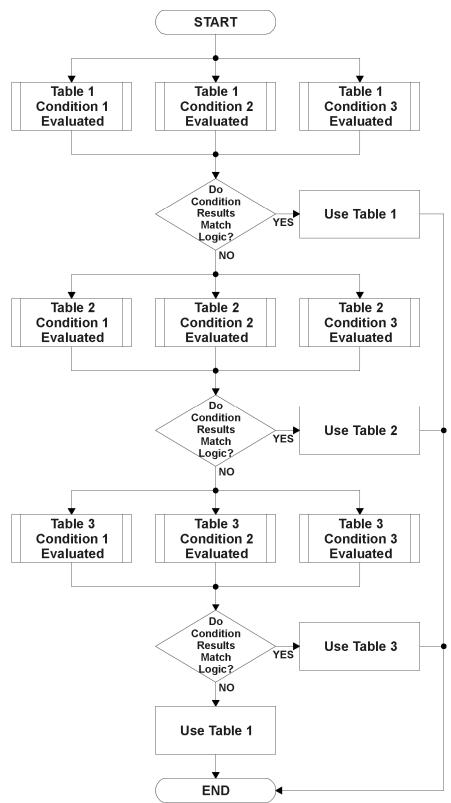


Figure 12 - Programmable Logic Flowchart

1.9.1. Conditions Evaluation

The first step in determining which table will be selected as the active table is to first evaluate the conditions associated with a given table. Each table has associated with it up to three conditions that can be evaluated.

Argument 1 is always a logical output from another function block, as listed in Section 1.3. As always, the source is a combination of the functional block type and number, setpoints "Table X, Condition Y, Argument 1 Source" and "Table X, Condition Y, Argument 1 Number", where both X = 1 to 3 and Y = 1 to 3.

Argument 2 on the other hand, could either be another logical output such as with Argument 1, OR a constant value set by the user. To use a constant as the second argument in the operation, set "Table X, Condition Y, Argument 2 Source" to 'Control Constant Data.' Note that the constant value has no unit associated with it in EA, so the user must set it as needed for the application.

The condition is evaluated based on the "Table X, Condition Y Operator" selected by the user. It is always '=, Equal' by default. The only way to change this is to have two valid arguments selected for any given condition. Options for the operator are listed in Table 18.

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

Table 18 - Condition Operator Options

For example, a condition for a weight going over a certain range could be that the Strain Gauge Input Measured 1 be greater than a certain value to flag a different output. In this case, "...Argument 1 Source" would be set to 'Strain Gauge Input Measured 1, "...Argument 2 Source" to 'Control Constant Data', and the "...Operator" to '>, Greater Than.' The "Constant **Value X**" in the Constant Data List would be set to whatever warning weight the application reauired.

By default, both arguments are set to 'Control Source Not Used' which disables the condition, and automatically results in a value of N/A as the result. Although Figure 12 shows only True or False as a result of a condition evaluation, the reality is that there could be four possible results, as described in Table 19.

Value	Meaning	Reason
0	False	(Argument 1) Operator (Argument 2) = False
1	True	(Argument 1) Operator (Argument 2) = True
2	Error	Argument 1 or 2 output was reported as being in an error state
3	Not Applicable	Argument 1 or 2 is not available (i.e. set to 'Control Source Not Used')
Table 19 - Condition Evaluation Results		

1.9.2. Table Selection

In order to determine if a particular table will be selected, logical operations are performed on the results of the conditions as determined by the logic in Section 1.9.1. There are several logical combinations that can be selected, as listed in Table 20.

0	Default Table	
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	Table 20 Conditions Logical Operator Options	

Table 20 - Conditions Logical Operator Options

Not every evaluation is going to need all three conditions. The case given in the earlier section, for example, only has one condition listed, i.e. that the Engine RPM be below a certain value. Therefore, it is important to understand how the logical operators would evaluate an Error or N/A result for a condition.

Logical Operator	Select Conditions Criteria		
Default Table	Associated table is automatically selected as soon as it is evaluated.		
Cnd1 And Cnd2 And Cnd3	3 Should be used when two or three conditions are relevant, and all must be true to select the table.		
	If any condition equals False or Error, the table is not selected. An N/A is treated like a True.		
	If all three conditions are True (or N/A), the table is selected.		
	lf((Cnd1==True) &&(Cnd2==True)&&(Cnd3==True)) Then Use Table		
Cnd1 Or Cnd2 Or Cnd3	Should be used when only one condition is relevant. Can also be used with two or three relevant conditions.		
	If any condition is evaluated as True, the table is selected. Error or N/A results are treated as False		
	lf((Cnd1==True) (Cnd2==True) (Cnd3==True)) Then Use Table		
(Cnd1 And Cnd2) Or Cnd3	To be used only when all three conditions are relevant.		
	If both Condition 1 and Condition 2 are True, OR Condition 3 is True, the table is selected. Error or N/A results are treated as False		
	If(((Cnd1==True)&&(Cnd2==True)) (Cnd3==True)) Then Use Table		
(Cnd1 Or Cnd2) And Cnd3	To be used only when all three conditions are relevant.		
	If Condition 1 And Condition 3 are True, OR Condition 2 And Condition 3 are True, the table is selected. Error or N/A results are treated as False		
	If(((Cnd1==True) (Cnd2==True)) && (Cnd3==True)) Then Use Table Conditions Evaluation Based on Selected Logical Operator		

Table 21 - Conditions Evaluation Based on Selected Logical Operator

The default "Table X, Conditions Logical Operator" for Table 1 and Table 2 is 'Cnd1 And Cnd2 And Cnd3,' while Table 3 is set to be the 'Default Table.'

1.9.3. Logic Block Output

Recall that Table X, where X = 1 to 3 in the Programmable Logic function block does NOT mean Lookup Table 1 to 3. Each table has a setpoint "Table X – Lookup Table Block Number" which allows the user to select which Lookup Tables they want associated with a particular Programmable Logic Block. The default tables associated with each logic block are listed in Table 22

Programmable	Table 1 – Lookup	Table 2 – Lookup	Table 3 – Lookup
Logic Block Number	Table Block Number	Table Block Number	Table Block Number
1	1	2	3
Table 22 - Programmable Logic Block Default Lookup Table			

Fable 22 - Programmable Log	gic Block Default Lookup Table	

If the associated Lookup Table does not have an "X-Axis Source" selected, then the output of the Programmable Logic block will always be "Not Available" so long as that table is selected. However, should the Lookup Table be configured for a valid response to an input, be it Data or Time, the output of the Lookup Table function block (i.e. the Y-Axis data that has been selected based on the X-Axis value) will become the output of the Programmable Logic function block so long as that table is selected.

Unlike all other function blocks, the Programmable Logic does NOT perform any linearization calculations between the input and the output data. Instead, it mirrors exactly the input (Lookup Table) data. Therefore, when using the Programmable Logic as a control source for another function block, it is HIGHLY recommended that all the associated Lookup Table Y-Axes either be (a) Set between the 0 to 100% output range or (b) all set to the same scale.

1.10. Math Function Block

There are four mathematical 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 percentage value based on the "Function X Input Y Minimum" and "Function X Input Y Maximum" values selected. For additional control the user can also adjust the "Function X Input Y Scaler". By default, each input has a scaling 'weight' of 1.0 However, each input can be scaled from -1.0 to 1.0 as necessary before it is applied in the function.

A mathematical function block includes three selectable functions, which each implements equation A operator B, where A and B are function inputs and operator is function selected with setpoint "Math function X Operator". Setpoint options are presented in Table 23. The functions are connected together, 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 'Control not used' signal goes through function unchanged.

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		
15	MAX-MIN, Result = Absolute value of (InA – InB)		
	Table 23 - Math Function Operators		

Math Block Output = (((A1 op1 B1)op2 B2)op3 B3)op4 B4

Table 23 - Math Function Operators

User should make sure the inputs are compatible with each other when using some of the Mathematical Operations. For instance, if Strain Gauge Input 1 is to be measured in [kg], while Strain Gauge Input 2 is to be measured in [lbs] and Math Function Operator 9 (+), the result will not be the true weight of the system.

For a valid result, the control source for an input must be a non-zero value, i.e. something other than 'Control Source Not Used.'

When dividing, a zero InB value will always result is a zero output value for the associated function. When subtracting, a negative result will always be treated as a zero, unless the function is multiplied by a negative one, or the inputs are scaled with a negative coefficient first.

1.11. CAN Transmit Function Block

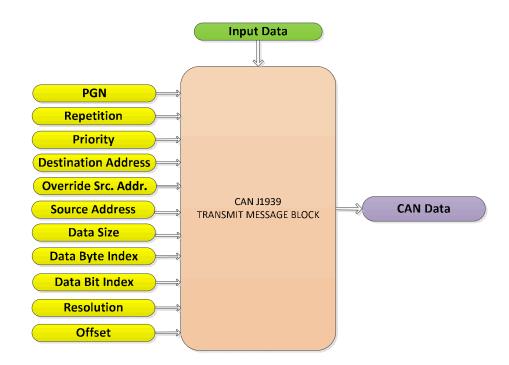


Figure 13 - CAN Transmit Function Block

The CAN Transmit function block is used to send any output from another function block (i.e. input, status or feedback signals) to the J1939 network.

Normally, to disable a transmit message, the "**Transmit Repetition Rate**" is set to zero. However, should message share its Parameter Group Number (PGN) with another message, this is not necessarily true. In the case where multiple messages share the same "**Transmit PGN**", the repetition rate selected in the message with the LOWEST number will be used for ALL the messages that use that PGN.

By default, all messages are sent on Proprietary B PGNs as broadcast messages. If all of the data is not necessary, disable the entire message by setting the lowest channel using that PGN to zero. If some of the data is not necessary, simply change the PGN of the superfluous channel(s) to an unused value in the Proprietary B range.



At power up, transmitted message will not be broadcasted until after a 5 second delay. This is done to prevent any power up or initialization conditions from creating problems on the network.

Since the defaults are PropB messages, the **"Transmit Message Priority"** is always initialized to 6 (low priority) and the **"Destination Address (for PDU1)"** setpoint is not used. This setpoint is only valid when a PDU1 PGN has been select, and it can be set either to the Global Address (0xFF) for broadcasts, or sent to a specific address as setup by the user.

The 4CH-SG allows to transmit CAN messages with a masked source address. The associated setpoints for this configuration are "**Override Source Address**" and "**Source Address**". When

"Override Source Address" setpoint is set to *FALSE* the CAN Transmit will transmit with the address the 4CH-SG has claimed. However, when this is set to *TRUE*, the user can configure a source address to be used for that CAN Transmit, from 0...255. Each CAN Transmit setpoint group has the ability to have its own source address configured.

The **"Transmit Data Size"**, **"Transmit Data Index in Array (LSB)"**, **"Transmit Bit Index in Byte (LSB)"**, **"Transmit Resolution"** and **"Transmit Offset"** can all be use to map the data to any SPN supported by the J1939 standard. The defaults used by the 4CH-SG are all for proprietary SPNs, and are defined in detail in Section 3.3.

Note: CAN Data = (Input Data – Offset)/Resolution

The 4CH-SG supports up to 5 unique CAN Transmit Messages, all of which can be programmed to send any available data to the CAN network. By default, the first CAN Transmit block is preconfigured to send all Strain Gauge Input measurements. The details are outlined in Section 3.3, and the default list is shown in Table 24 below.

Block#, Signal #	Default Transmit Data	(PGN)
1, 1	Strain Gauge Input 1	(0xFF00)
1, 2	Strain Gauge Input 2	(0xFF00)
1, 3	Strain Gauge Input 3	(0xFF00)
1, 4	Strain Gauge Input 4	(0xFF00)
2, 1	Control Source Not Used	(0xFF01)
2, 2	Control Source Not Used	(0xFF01)
2, 3	Control Source Not Used	(0xFF01)
2, 4	Control Source Not Used	(0xFF01)
3, 1	Control Source Not Used	(0xFF01)
3, 2	Control Source Not Used	(0xFF01)
3, 3	Control Source Not Used	(0xFF01)
3, 4	Control Source Not Used	(0xFF01)
4, 1	Control Source Not Used	(0xFF01)
4, 2	Control Source Not Used	(0xFF01)
4, 3	Control Source Not Used	(0xFF01)
4, 4	Control Source Not Used	(0xFF01)
5, 1	Control Source Not Used	(0xFF01)
5, 2	Control Source Not Used	(0xFF01)
5, 3	Control Source Not Used	(0xFF01)
5, 4	Control Source Not Used	(0xFF01)

Table 24 - Default CAN Transmit Messages

1.12. Diagnostic Trouble Code (DTC) React

The DTC React function block will allow a received DTC sent from another ECU on a DM1 message to be used as an input to any other function block in order to disable an output, for example. Up to three SPN/FMI combinations can be selected.

Should a DM1 message be received with the SPN/FMI combination defined, the corresponding DTC State will be set to ON. Once ON, if the same SPN/FMI combination has not been received again after 3 seconds, the DTC State will be reset to OFF.

The DTC could be used as a digital input for any function block as appropriate.

1.13. 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.

The **Receive Message Enabled** 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/disabled as appropriate. By default ALL receive messages are disabled.

Once a message has been enabled, a Lost Communication fault will be flagged if that message is not received within the **Receive Message Timeout** period. This could trigger a Lost Communication event as described in section 1.66. In order to avoid timeouts 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, simply set this value to zero, in which case the received message will never timeout and will never trigger a Lost Communication fault.

By default, all control messages are expected to be sent to the 4CH-SG Controller on Proprietary B PGNs. However, should a PDU1 message be selected, the 4CH-SG Controller can be setup to receive it from any ECU by setting the **Specific Address that sends the PGN** to the Global Address (0xFF). If a specific address is selected instead, then any other ECU data on the PGN will be ignored.

The **Receive Data Size**, **Receive Data Index in Array (LSB)**, **Receive Bit Index in Byte (LSB)**, **Receive Resolution** and **Receive Offset** can all be used to map any SPN supported by the J1939 standard to the output data of the Received function block.

As mentioned earlier, a CAN receive function block can be selected as the source of the control input for the output function blocks. When this is the case, the **Received Data Min** (Off Threshold) and **Received Data Max** (On Threshold) setpoints determine the minimum and maximum values of the control signal. As the names imply, they are also used as the 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 4CH-SG Controller supports up to five unique CAN Receive Messages.

1.14. CAN Tare Function Block

The CAN Tare function block is a means to zero/tare the input via CAN messages. If desired to tare the inputs via this function block, the user must send the specific CAN message frames the 4CH-SG expects. By default, the **"Receive PGN"** is set to 0xFFA5 but can be configured to a different PGN.

The message to be sent is a 2-byte message with the first byte being the command while the second byte determines the operation. See the below tables for the list of commands and operations.

Command	First Byte Data
Enter Calibration	0xAB
Exit Calibration and Save	0xBA

Options	Bits on Second Byte Data
Tare Strain Gauge Input 1	1 st bit location
Tare Strain Gauge Input 2	2 nd bit location
Tare Strain Gauge Input 3	3 rd bit location
Tare Strain Gauge Input 4	4 th bit location
Minimum Sum of all Strain Gauge Inputs is saved as a Constant in Constant Data List	5 th bit location
Maximum Sum of all Strain Gauge Inputs is saved as a Constant in Constant Data List	6 th bit location

Table 25 - CAN Tare Command Byte

Table 26 - CAN Tare Option Byte

For example, if Strain Gauge Inputs 1 & 3 need to be Tared, the following command would be sent to the 4CH-SG unit (with the default settings)

PGN	Length	D0	D1
0xFFA5	2	0xAB	0x05 (00000101b)

Then to save the calibration settings to the flash, the following command needs to be sent:

PGN	Length	D0	D1
0xFFA5	2	0xBA	0xnn

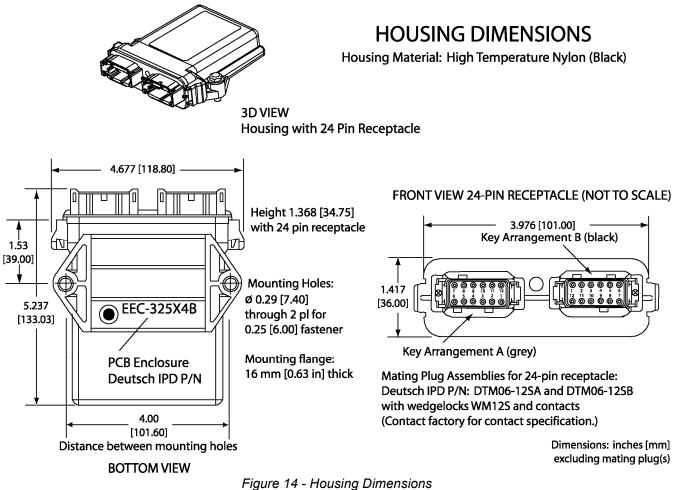
D1: 0xnn (this byte is ignored when 0xBA is sent)

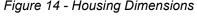
UMAX200000. 4-Channel Strain Gauge Controller. Version: 3A

2. Installation Instructions

2.1. **Dimensions and Pinout**

The 4-Channel Strain Gauge Input Controller is packaged in a plastic housing from Deutsch IPD. The assembly carries an IP67 rating.





G	rey Connector	Bla	ck Connector
Pin #	Pin # Function		Function
1	+5V Excitation 1	1	GND 3
2	IN 1+	2	IN 3-
3	+5V Excitation 2	3	GND 4
4	IN 2+	4	IN 4-
5	Tare Button	5	Interlock +/-
6	BATT-	6	CAN_H
7	BATT+	7	CAN_L
8	Digital Out	8	Interlock +/-
9	IN 2-	9	IN 4+
10	GND 2	10	+5V Excitation 4
11	IN 1-	11	IN 3+
12	GND 1	12	+5V Excitation 3

Table 27 - Connector Pinout

2.2. Mounting Instructions

NOTES & WARNINGS

- Do not install near high-voltage or high-current devices.
- Note the operating temperature range. All field wiring must be suitable for that temperature range.
- Install the unit with appropriate space available for servicing and for adequate wire harness access (15 cm) and strain relief (30 cm).
- Do not connect or disconnect the unit while the circuit is live, unless the area is known to be non-hazardous.

MOUNTING

The module is designed for mounting on the valve block. If it is mounted without an enclosure, the controller should be mounted horizontally with connectors facing left or right, or with the connectors facing down, to reduce likelihood of moisture entry.

Mask all labels if the unit is to be repainted, so label information remains visible.

Mounting legs include holes sized for $\frac{1}{4}$ " bolts. The bolt length will be determined by the end-user's mounting plate thickness. Typically 20 mm ($\frac{3}{4}$ inch) is adequate.

If the module is mounted away from the valve block, no wire or cable in the harness should exceed 30 meters in length. The power input wiring should be limited to 10 meters.

CONNECTIONS

Use the following Deutsch IPD mating plugs to connect to the integral receptacles. Wiring to these mating plugs must be in accordance with all applicable local codes. Suitable field wiring for the rated voltage and current must be used. The rating of the connecting cables must be at least 85°C. For ambient temperatures below -10°C and above +70°C, use field wiring suitable for both minimum and maximum ambient temperature.

Refer to the respective Deutsch IPD datasheets for usable insulation diameter ranges and other instructions.

Receptacle Contacts	Mating Sockets as appropriate (Refer to <u>www.laddinc.com</u> for more information on the contacts available for this mating plug.)
Mating Connector	DTM06-12SA, DTM06-12SB, 2 wedges WM12S, 24 contacts (0462-201-20141)

3. OVERVIEW OF J1939 FEATURES

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

- Configurable ECU Instance in the NAME (to allow multiple ECUs on the same network)
- Configurable Transmit PGN and SPN Parameters
- Configurable Receive PGN and SPN Parameters
- Sending DM1 Diagnostic Message Parameters
- Reading and reacting to DM1 messages sent by other ECUs
- Diagnostic Log, maintained in non-volatile memory, for sending DM2 messages

3.1. Introduction To Supported Messages

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

From J1939-21 - Data Link Layer

Request 59904 (\$00EA00) • 59392 (\$00E800) Acknowledgment • Transport Protocol – Connection Management 60416 (\$00EC00) • Transport Protocol – Data Transfer Message 60160 (\$00EB00) • PropB Transmit, Default Measured Inputs Feedback Message 65280 (\$00FF00) • PropB Transmit, Default Proportional Outputs Target Message 65296 (\$00FF10) • PropB Transmit, Default Proportional Outputs Feedback Message 65312 (\$00FF20) • PropB Transmit, Default Digital I/O State Feedback Message 65328 (\$00FF30) • PropB Receive, Default Output Control Data Message 65408 (\$00FF80) • PropB Receive, Default Output Enable Data Message 65424 (\$00FF90) • PropB Receive, Default Output Override Data Message 65440 (\$00FFA0) PropB Receive, Default PID Feedback Data Message 65456 (\$00FFB0) •

Note: Any Proprietary B PGN in the range 65280 to 65535 (\$00FF00 to \$00FFFF) can be selected Note: The Proprietary A PGN 61184 (\$00EF00) can also be selected for any of the messages

From J1939-73 - Diagnostics

DM1 – Active Diagnostic Trouble Codes	65226 (\$00FECA)
DM2 – Previously Active Diagnostic Trouble Codes	65227 (\$00FECB)
• DM3 – Diagnostic Data Clear/Reset for Previously Active DTCs	65228 (\$00FECC)
DM11 - Diagnostic Data Clear/Reset for Active DTCs	65235 (\$00FED3)
DM14 – Memory Access Request	55552 (\$00D900)
DM15 – Memory Access Response	55296 (\$00D800)
DM16 – Binary Data Transfer	55040 (\$00D700)
From J1939-81 - Network Management	
Address Claimed/Cannot Claim	60928 (\$00EE00)
Commanded Address	65240 (\$00FED8)
From J1939-71 – Vehicle Application Layer	
Software Identification	65242 (\$00FEDA)

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

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

3.2. NAME, Address and Software ID

J1939 NAME

The 4CH-SG ECU has the following defaults 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	230, Body-to-Vehicle Interface Control
Function Instance	00, Axiomatic AX200000, 4 Channel Strain Gauge
ECU Instance	0, First Instance
Manufacture Code	162, Axiomatic Technologies Corporation
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 by other ECUs (including the Electronic Assistant [®]) when they are all connected on the same network.

ECU Address

The default value of this setpoint is 128 (0x80), which is the preferred starting address for selfconfigurable ECUs as set by the SAE in J1939 tables B3 to B7. The EA will allow the selection of any address between 0 to 253, and *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 4CH-SG will continue select the next highest address until it find one that it can claim. See J1939/81 for more details about address claiming.

Software Identifier

PGN 65242	Software lo	dentification		- SOFT
Transmission Rep	petition Rate:	On request		
Data Length:	-	Variable		
Extended Data Pa	age:	0		
Data Page:	-	0		
PDU Format:		254		
PDU Specific:		218 PGN Supporting Information:		
Default Priority:		6		
Parameter Group	Number:	65242 (0xFEDA)		
Start Position I	Length Para	ameter Name	SPN	
1	1 Byte Nu	mber of software identification fields	965	
2-n	Variable Soft	tware identification(s), Delimiter (ASCII "*")	234	

For the 4CH-SG ECU, Byte 1 is set to 5, and the identification fields are as follows

(Part Number)*(Version)*(Date)*(Owner)*(Description)

Electronic Advistant			
le View Optione Help			
5 2 0 F			
0939 CAN Network	Parameter	Value	Description
E AV200000, 4 Channel Strain Gauge #1	ECU Part Number	AX200000	
i Select ECU Mermit of	· ECU Serial Number	0000115001	
HI I Setpoint File			
B Bootloader Information	FECU R939 NAME		PGN 00928-04-bit ECU Identifier sent in Address Claimed Messages
	+ Arbitrary Address Capable	0301	
	+Industry Group		Golal
	+ Vehicle System Instance	0000	
	Vehicle System	0000	Non-specific system
	+ Renarved	0000	Contraction of the second s
	+ Function	0.056	
	+Function Instance	0000	
	+ ECU Ivistarice	0000	#L - First historice
	+Manufacturer Code	03042	Axiomatic Technologies
	Le Identity Number	0,0018797	Unique ECU network ID number
	ECU Address	0382	Reserved for future assignment by SAE, but available for use by self configurable ECU
	FECUID		PGN 64963 -ECUID
	+ECU Part Number	A32200000	
	+ECU Serial Number	0000115001	
	+ECU Type	4-Channel Strain Gauge	
	ECU Manufacturer Name	Asionatic	
	Software ID		PGN45242 -SOFT
	+Field #1	4-Channel Strain Gauge module	
	* Field #2	A3(200000	
	+Field #3	Simulink Edition	
	Field #4	Firmware V2.00, May 2015	

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

3.3. CAN Transmit Message Defaults

This section outlines the **default** settings of the 4CH-SG CAN transmissions. Recall, however, that this is a fully programmable unit, such that all these SPNs can be sent on different PGNs if so desired.

In all the messages shown below, not all the transmitted values have an SPN assigned to them, as this ECU only uses the SPNs for diagnostic trouble codes. If the SPN is shown as N/A, this means that the associated value cannot be used to generate DTCs.

The "Strain Gauge Inputs Message" has the following default configuration.

PGN 65280	Strair	n Gauge Input Measured	
Transmission F Data Length: Data Page: PDU Format: PDU Specific: Default Priority Parameter Gro	:	1000ms (1 second transmit rate) 8 0 254 GE PGN Supporting Information: 6 r: 65280 (0xFF00)	
Start Position 1-2 3-4 5-6 7-8	Length 2 byte 2 byte 2 byte 2 byte	Parameter Name Strain Gauge Input Measured 1 Strain Gauge Input Measured 2 Strain Gauge Input Measured 3 Strain Gauge Input Measured 4	SPN 520448 520449 520450 520451

Strain Gauge Input Measured X, where X = 1 to 4

This value reflects the measured strain gauge load cell. By default, this value will be in terms of g/bit (grams per bit).

Data Length:	2 byte	
Resolution:	1kg/bit, 0 offset	
Data Range:	0 to 64255 g	
Туре:	Measured	
Suspect Parameter Number:	520448 to 520451	(0x7F100 to 0x7F103, proprietary SPNs)
Parameter Group Number:	65280	

4. ECU SETPOINTS ACCESSED WITH ELECTRONIC ASSISTANT

Many setpoints have been reference throughout this manual. This section describes in detail each setpoint, and their defaults and ranges. For more information on how each setpoint is used by the 4CH-SG, refer to the relevant section of the User Manual.

4.1. Miscellaneous Setpoints

The Miscellaneous setpoints primarily deal with the CAN Network. Refer to the notes for more information about each setpoint.

te lien	w Optione Help				
Ð	Setpoint File	*	Setpoint Name	Yebue	Comment
	Strain Gauge Input 2 Strain Gauge Input 2 Strain Gauge Input 3 Strain Gauge Input 3 Strain Gauge Input 3		SPECU Address SPECU Instance Number SPADC Gain SPADC Speed	0000 3	Reserved for future amignment by SAE, but available for use by self configurable ECU #1 - First Instance +/-19mV Range, Gain = 128 80 Samples/Second
	Will straw goalds what e				

Screen Capture of Default Miscellaneous Setpoints

Name	Range	Default	Notes
ECU Instance Number	Drop List	0, #1 – First Instance	Per J1939-81
ECU Address	0 to 253	130 (0x82)	Preferred address for a self- configurable ECU
ADC Gain	0 to 3	3	+/-19mV (Gain 128)
ADC Speed	0 to 1	1	80 Samples per Second

If non-default values for the "ECU Instance Number" or "ECU Address" are used, they will not be updated during a setpoint file flash. These parameters need to be changed manually in order to prevent other units on the network to be affected. When they are changed, the controller will claim its new address on the network. It is recommended to close and re-open the CAN connection on EA after the file is loaded so that only the new NAME and address are showing in the J1939 CAN Network ECU list.

ADC Gain allows for determining the input differential range into the 4CH-SG controller. This parameter should be changed to optimize the highest resolution.

4.2. Tare Button Setpoints

The Tare/Calibration Input function block is defined in Section 1.2. Please refer to that section for detailed information on how these setpoints are used.

le <u>V</u> iew Options <u>H</u> elp																
i General ECU Information	*	Setpoint Name	Value	Comment												
E Setpoint File		SP Tare Input Response	0	Normal On/Off												
	E	SP Pullup/Pulldown Resistor	0	Pullup/down Off												
		SP Debounce Time	10	ms												
SP Strain Gauge Input 1		SP Use Digital Outputs as Feedback	1	Digital Output												
SP Strain Gauge Input 2						SP Long Press Time to Enter/Exit Calibration	2500	ms								
- SP Strain Gauge Input 3		SP One-Press Operation	5	Zero All Strain Gauge Inputs												
SP Strain Gauge Input 4		SP Two-Press Operation	6	Set Overall Minimum Weight												
SP Digital Output														SP Three-Press Operation	7	Set Overall Maximum Weigh
SP Interlock Output		SP Four-Press Operation	0	Operation Not Used												
SP Constant Data List	-	SP Timeout Between Presses	1000	ms												

Screen Capture of Default Tare Button Setpoints

Name	Range	Default	Notes
Tare Input Response	Drop List	0 – Normal On/Off	Refer to Table 1
Pullup/Pulldown Resistor	Drop List	0 – Pullup/down Off	Refer to Table 2
Debounce Time	0 to 60000	10ms	Refer to Figure 3
Use Digital Outputs as Feedback	Drop List	1 – Digital Output	Refer to Table 3
Long Press Time to Enter/Exit Calibration	0 to 0xFFFFFFFF	2500ms	Time required to have the Tare button engaged to Enter and Exit Calibration. Refer to Figure 4
One-Press Operation	Drop List	5 – Zero All Strain Gauge Input	Refer to Table 4
Two-Press Operation	Drop List	6 – Set Overall Minimum Weight	Sets the overall minimum weight of all 4 strain gauge inputs for the application. Refer to Table 4
Three-Press Operation	Drop List	7 – Set Overall Maximum Weight	Sets the overall maximum weight of all 4 strain gauge inputs for the application. Refer to Table 4
Four-Press Operation	Drop List	0 – Operation Not Used	Refer to Table 4
Timeout Between Presses	0 to 0xFFFFFFFF	1000ms	Refer to Figure 5

4.3. Strain Gauge Input Setpoints

The Strain Gauge Input function block is defined in Section 1.3. Please refer there for detailed information about how all these setpoints are used.

<u>Eile View Options H</u> elp				
🏪 😰 📰 F				
- i General ECU Information	*	Setpoint Name	Value	Comment
🖻 🗐 Setpoint File		SP Units of Weight Conversion	0	Kilograms (kg
		SP Strain Gauge Maximum Capacity (in kg)	500.00000	kg
		SP Strain Gauge Sensitivity	2.00000	mV/V
- SP Strain Gauge Input 1		SP Minimum Range	-500.00000	kg
SP Strain Gauge Input 2		SP Maximum Range	500.00000	kg
SP Strain Gauge Input 3		SP AutoZero	0	False
SP Strain Gauge Input 4	-	SP AutoZero Offset	0.00000	kg
(m	P			

Screen Capture of Default Strain Gauge Input 1 Setpoints

Name	Range	Default	Notes
Units of Weight Conversion	Drop List	0 – Kilograms (kgs)	Units of conversion that will be used internally to measure weight
Strain Gauge Maximum Capacity	0 to 50000	500 kg	Capacity of Strain Gauge Load Cell is in kgs
Strain Gauge Sensitivity	0 to 50	2.00 mV/V	
Minimum Range	-Maximum Capacity to Maximum Range	-500 kg	This setpoint is automatically updated when Strain Gauge Maximum Capacity is changed. This range along with Maximum Range should be adjusted if intended to use a Strain Gauge Input as a Control Source to an Output Function Block
Maximum Range	Minimum Range to Maximum Capacity	500 kg	This setpoint is automatically updated when Strain Gauge Maximum Capacity is changed. This range along with Minimum Range should be adjusted if intended to use a Strain Gauge Input as a Control Source to an Output Function Block
AutoZero	Drop List	0 – False	When set to TRUE, the AutoZero command will auto null the current weight measured by the controller
AutoZero Offset	0 to 60000	0 (kg/lbs)	Updated when AutoZero command is used. However, it can be updated at anytime.

4.4. Digital Output Setpoints

The digital output by default is configured to respond to Conditional Function Block #1 and Conditional Function Block #2. Refer to section 1.5 for a more detailed description on this function block

ile <u>V</u> iew	Options <u>H</u> elp				
" <u></u>	spi F				
	SP Miscellaneous	*	Setpoint Name	Value	Comment
	SP Tare Button		SP Output Type	1	Digital ON/OFF
	SP Strain Gauge Input 1		SP Stage 1 Control Source	4	Conditional Function Block
	SP Strain Gauge Input 2		SP Stage 1 Control Number	1	Conditional Function Block #1
	SP Strain Gauge Input 3		SP Stage 1 Digital Response	3	Blinking Logic
	SP Strain Gauge Input 4		SP Stage 1 Digital Blink Rate	1000	ms
	SP Digital Output		SP Stage 1 Digital Edge to Delay	0	Rising Edge
	SP Interlock Output		SP Stage 1 Digital Edge Delay Time	0	ms
	SP Constant Data List		SP Stage 2 Control Source	4	Conditional Function Block
	SP Conditional Block 1		SP Stage 2 Control Number	2	Conditional Function Block #2
	SP Conditional Block 2		SP Stage 2 Digital Response	3	Blinking Logic
	SP Conditional Block 3	Ξ	SP Stage 2 Digital Blink Rate	250	ms
	SP Conditional Block 4		SP Stage 2 Digital Edge to Delay	0	Rising Edge
	SP Conditional Block 5		SP Stage 2 Digital Edge Delay Time	0	ms
			SP Stage 3 Control Source	0	Control Source Not Used
	SP Conditional Block 6		SP Stage 3 Control Number		Parameter not used with current Control Source selecte
	SP Conditional Block 7		SP Stage 3 Digital Response		Parameter not used with current Control Source selecte
	SP Conditional Block 8		SP Stage 3 Digital Blink Rate		Parameter not used with current Control Source selecte
			SP Stage 3 Digital Edge to Delay		Parameter not used with current Control Source selecte
	SP Lookup Table 2		SP Stage 3 Digital Edge Delay Time		Parameter not used with current Control Source selecte
	SP Lookup Table 3		SP Stage 4 Control Source	0	Control Source Not Used
	SP Lookup Table 4		SP Stage 4 Control Number		Parameter not used with current Control Source selecte
	SP Math Block 1		SP Stage 4 Digital Response		Parameter not used with current Control Source selecte
			SP Stage 4 Digital Blink Rate		Parameter not used with current Control Source selecte
	SP Math Block 3		SP Stage 4 Digital Edge to Delay		Parameter not used with current Control Source selecte
	SP Math Block 4		SP Stage 4 Digital Edge Delay Time		Parameter not used with current Control Source selecte
	SP Programmable Logic Bloc	k	SP Enable Source	0	Control Source Not Used
	SP Programmable Logic Bloc		SP Enable Number		Parameter not used with current Enable Source selected
	SP CAN Receive 1		SP Enable Response		Parameter not used with current Enable Source selected
	SP CAN Receive 2		SP Override Source	0	Control Source Not Used
	SP CAN Receive 3	+	SP Override Number		Parameter not used with current Override Source select
	III N		SP Override Response		Parameter not used with current Override Source select

Screen Capture of Default Digital Output Setpoints

Name	Range	Default	Notes
Output Type	Drop List	1 – Digital ON/OFF	If value is set to 0, Output is disabled
Stage 1 Control Source	Drop List	4 – Conditional Function Block	Refer to Table 6
Stage 1 Control Number	Depends on Source	1 – Conditional Function Block #1	Refer to Table 7
Stage 1 Digital Response	Drop List	3 – Blinking Logic	Refer to Table 8
Stage 1 Digital Blink Rate	0 to 60000	1000ms	
Stage 1 Digital Edge to Delay	Drop List	0 – Rising Edge	
Stage 1 Digital Edge Delay Time	0 to 60000	Oms	
Stage 2 Control Source	Drop List	4 – Conditional Function Block	Refer to Table 6
Stage 2 Control Number	Depends on Source	2 – Conditional Function Block #2	Refer to Table 7

Stage 2 Digital Response	Drop List	3 – Blinking Logic	Refer to Table 8
Stage 2 Digital Blink Rate	0 to 60000	250ms	
Stage 2 Digital Edge to Delay	Drop List	0 – Rising Edge	
Stage 2 Digital Edge Delay Time	0 to 60000	0ms	
Stage 3 Control Source	Drop List	0 – Control Source Not Used	Refer to Table 6
Stage 3 Control Number	Depends on Source	1	Refer to Table 7
Stage 3 Digital Response	Drop List	0 – Normal On/Off	Refer to Table 8
Stage 3 Digital Blink Rate	0 to 60000	0	
Stage 3 Digital Edge to Delay	Drop List	0 – Rising Edge	
Stage 3 Digital Edge Delay Time	0 to 60000	Oms	
Stage 4 Control Source	Drop List	0 – Control Source Not Used	Refer to Table 6
Stage 4 Control Number	Depends on Source	1	Refer to Table 7
Stage 4 Digital Response	Drop List	0 – Normal On/Off	Refer to Table 8
Stage 4 Digital Blink Rate	0 to 60000	0	
Stage 4 Digital Edge to Delay	Drop List	0 – Rising Edge	
Stage 4 Digital Edge Delay Time	0 to 60000	Oms	
Enable Source	Drop List	0 – Control Source Not Used	Refer to Table 6
Enable Number	Depends on Source	1	Refer to Table 7
Enable Response	Drop List	0 – Enable When On	Refer to Table 9
Override Source	Drop List	0 – Control Source Not Used	Refer to Table 6
Override Number	Depends on Source	1	Refer to Table 7
Override Response	Drop List	0 – Override When On	Refer to Table 10

4.5. Interlock Output Setpoints

The interlock output by default is configured to respond to Conditional Function Block #2. Refer to section 1.5 for a more detailed description on this function block

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	Setpoint Name	Value	Comment
	SP Output Type	1	Digital ON/OFF
SP Strain Gauge Input 3	SP Stage 1 Control Source	4	Conditional Function Block
	SP Stage 1 Control Number	2	Conditional Function Block #2
	SP Stage 1 Digital Response	0	Normal On/Off
-SP Interlock Output	SP Stage 1 Digital Blink Rate	0	ms
SP Constant Data List	SP Stage 1 Digital Edge to Delay	0	Rising Edge
SP Conditional Block 1	SP Stage 1 Digital Edge Delay Time	0	ms
SP Conditional Block 2	SP Stage 2 Control Source	0	Control Source Not Used
SP Conditional Block 3	SP Stage 2 Control Number		Parameter not used with current Control Source selected
SP Conditional Block 4	SP Stage 2 Digital Response		Parameter not used with current Control Source selected
SP Conditional Block 5	SP Stage 2 Digital Blink Rate		Parameter not used with current Control Source selected
SP Conditional Block 6	SP Stage 2 Digital Edge to Delay		Parameter not used with current Control Source selected
SP Conditional Block 7	SP Stage 2 Digital Edge Delay Time		Parameter not used with current Control Source selected
	SP Stage 3 Control Source	0	Control Source Not Used
	SP Stage 3 Control Number		Parameter not used with current Control Source selected
SP Lookup Table 1	SP Stage 3 Digital Response		Parameter not used with current Control Source selected
SP Lookup Table 2	SP Stage 3 Digital Blink Rate		Parameter not used with current Control Source selected
	SP Stage 3 Digital Edge to Delay		Parameter not used with current Control Source selected
SP Lookup Table 4	SP Stage 3 Digital Edge Delay Time		Parameter not used with current Control Source selected
- SP Math Block 1	SP Stage 4 Control Source	0	Control Source Not Used
- SP Math Block 2	SP Stage 4 Control Number		Parameter not used with current Control Source selected
	SP Stage 4 Digital Response		Parameter not used with current Control Source selected
	SP Stage 4 Digital Blink Rate		Parameter not used with current Control Source selected
	SP Stage 4 Digital Edge to Delay		Parameter not used with current Control Source selected
	SP Stage 4 Digital Edge Delay Time		Parameter not used with current Control Source selected
SP CAN Receive 1	SP Enable Source	0	Control Source Not Used
SP CAN Receive 2	SP Enable Number		Parameter not used with current Enable Source selected
SP CAN Receive 3	SP Enable Response		Parameter not used with current Enable Source selected
SP CAN Receive 4	SP Override Source	0	Control Source Not Used
SP CAN Receive 5	SP Override Number		Parameter not used with current Override Source selecte
III F	SP Override Response		Parameter not used with current Override Source selected

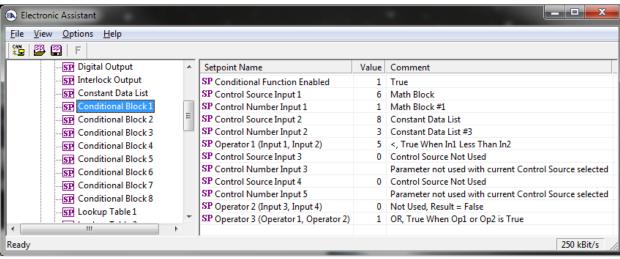
Screen Capture of Default Interlock Output Setpoints

Name	Range	Default	Notes
Output Type	Drop List	1 – Digital ON/OFF	If value is set to 0, Output is disabled
Stage 1 Control Source	Drop List	4 – Conditional Function Block	Refer to Table 6
Stage 1 Control Number	Depends on Source	2 – Conditional Function Block #2	Refer to Table 7
Stage 1 Digital Response	Drop List	0 – Normal On/Off	Refer to Table 8
Stage 1 Digital Blink Rate	0 to 60000	0ms	
Stage 1 Digital Edge to Delay	Drop List	0 – Rising Edge	
Stage 1 Digital Edge Delay Time	0 to 60000	0ms	
Stage 2 Control Source	Drop List	0 – Control Source Not Used	Refer to Table 6
Stage 2 Control Number Depends on Source		1	Refer to Table 7
Stage 2 Digital Response	Drop List	0 – Normal On/Off	Refer to Table 8
Stage 2 Digital Blink Rate	0 to 60000	Oms	

Stage 2 Digital Edge to Delay	Drop List	0 – Rising Edge	
Stage 2 Digital Edge Delay Time	0 to 60000	Oms	
Stage 3 Control Source	Drop List	0 – Control Source Not Used	Refer to Table 6
Stage 3 Control Number	Depends on Source	1	Refer to Table 7
Stage 3 Digital Response	Drop List	0 – Normal On/Off	Refer to Table 8
Stage 3 Digital Blink Rate	0 to 60000	0	
Stage 3 Digital Edge to Delay	Drop List	0 – Rising Edge	
Stage 3 Digital Edge Delay Time	0 to 60000	Oms	
Stage 4 Control Source	Drop List	0 – Control Source Not Used	Refer to Table 6
Stage 4 Control Number	Depends on Source	1	Refer to Table 7
Stage 4 Digital Response	Drop List	0 – Normal On/Off	Refer to Table 8
Stage 4 Digital Blink Rate	0 to 60000	0	
Stage 4 Digital Edge to Delay	Drop List	0 – Rising Edge	
Stage 4 Digital Edge Delay Time	0 to 60000	Oms	
Enable Source	Drop List	0 – Control Source Not Used	Refer to Table 6
Enable Number	Depends on Source	1	Refer to Table 7
Enable Response	Drop List	0 – Enable When On	Refer to Table 9
Override Source	Drop List	0 – Control Source Not Used	Refer to Table 6
Override Number	Depends on Source	1	Refer to Table 7
Override Response	Drop List	0 – Override When On	Refer to Table 10

4.6. Conditional Function Block Setpoints

The Conditional Logic function blocks are defined in section 1.7. Please refer to that section for more details on the functionality of these blocks. The user can make up to two comparisons per block. The output of this function block is only 1 (TRUE) or 0 (FALSE).



Screen Capture of Default Conditional Block Setpoints

4.7. 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. Throughout this manual, various references have been made to constants, as summarized in the examples listed below.

- a) Programmable Logic: Constant "Table X = Condition Y, Argument 2", where X and Y = 1 to 3
- b) Math Function: Constant "Math Input X", where X = 1 to 4

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 configurable to any value between +/- 1,000,000. The default values (shown below) are arbitrary and should be configured by the user as appropriate for their application. Constant Value 3 will be updated if Tare Option 6 *'Set Overall Minimum Weight'* is selected during zeroing/calibration. Similarly, Constant Value 4 will be updated if Tare Option 7 *'Set Overall Maximum Weight'* is selected during zeroing/calibration.

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🗐 🗊 Setpoint File	*	Setpoint Name	Value	Comment
	-	SP Constant FALSE (fixed)	False	(Read Only)
		SP Constant TRUE (fixed)	True	(Read Only)
	E	SP Constant Value 3	-1000.0000000	1
	-	SP Constant Value 4	1000.0000000	
SP Strain Gauge Input 3		SP Constant Value 5	25.0000000	
SP Strain Gauge Input 4		SP Constant Value 6	37.5000000	
SP Digital Output		SP Constant Value 7	50.0000000	
SP Interlock Output		SP Constant Value 8	62.5000000	
SP Constant Data List		SP Constant Value 9	75.0000000	
SP Conditional Block 1		SP Constant Value 10	87.5000000	
SP Conditional Block 2		SP Constant Value 11	0.0000000	
SP Conditional Block 3		SP Constant Value 12	0.0000000	
SP Conditional Block 4		SP Constant Value 13	0.0000000	
SP Conditional Block 5		SP Constant Value 14	0.0000000	
SP Conditional Block 6	-	SP Constant Value 15	0.0000000	
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Screen Capture of Default Constant Data List Setpoints

4.8. Lookup Table Setpoints

The Lookup Table function block is defined in Section 1.8. Please refer there for detailed information about how all these setpoints are used. As this function block's X-Axis defaults are defined by the **"X-Axis Source"** selected from Table 6, there is nothing further to define in terms of defaults and ranges beyond that which is described in Section 1.8. Recall, the X-Axis values will be automatically updated if the min/max range of the selected source is changed.

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SP Constant Data List	*	Setpoint Name	Value	Comment
		SP X-Axis Source	1	Strain Gauge Input
		SP X-Axis Number	1	Strain Gauge Input #1
		SP X-Axis Type	0	1983 - 1983 - 1985 - 1985 - 1985 - 1985 - 1985 - 1985 - 1985 - 1985 - 1985 - 1985 - 1985 - 1985 - 1985 - 1985 -
- SP Conditional Block 4		SP Point 1 - Response	1	Ramp To
SP Conditional Block 5		SP Point 2 - Response	1	Ramp To
SP Conditional Block 6		SP Point 3 - Response	1	Ramp To
SP Conditional Block 7		SP Point 4 - Response	1	Ramp To
SP Conditional Block 8	_	SP Point 5 - Response	1	Ramp To
SP Lookup Table 1		SP Point 6 - Response	1	Ramp To
SP Lookup Table 2		SP Point 7 - Response	1	Ramp To
SP Lookup Table 3		SP Point 8 - Response	1	Ramp To
SP Lookup Table 4		SP Point 9 - Response	1	
SP Math Block 1		SP Point 10 - Response	1	Ramp To
		SP Point 0 - X Value	0.000	
SP Math Block 3		SP Point 1 - X Value	0.500	
SP Math Block 4		SP Point 2 - X Value	1.000	
SP Programmable Logic Block		SP Point 3 - X Value	1.500	
SP Programmable Logic Block		SP Point 4 - X Value	2.000	
SP CAN Receive 1	Ξ	SP Point 5 - X Value	2.500	
SP CAN Receive 2		SP Point 6 - X Value	3.000	
		SP Point 7 - X Value SP Point 8 - X Value	3.500	
		SP Point 9 - X Value	4.000	
CAN Receive 4		SP Point 10 - X Value	5.000	
CAN Receive 5		SP Point 0 - Y Value	0.000	
CAN Transmit 1		SP Point 1 - Y Value	10.000	
SP CAN Transmit 2		SP Point 2 - Y Value	20.000	
CAN Transmit 3		SP Point 3 - Y Value	30.000	
EAN Transmit 4		SP Point 4 - Y Value	40.000	
		SP Point 5 - Y Value	50.000	
SP DTC React	_	SP Point 6 - Y Value	60.000	
		SP Point 7 - Y Value	70.000	
		SP Point 8 - Y Value	80.000	
		SP Point 9 - Y Value	90.000	
	-	SP Point 10 - Y Value	100.000	
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Screen Capture of Example Lookup Table 1 Setpoints

Note: In the screen capture shown above, the "X-Axis Source" has been changed from its default value in order to enable the function block.

4.9. Programmable Logic Setpoints

The Programmable Logic function block is defined in Section 1.9. Please refer there for detailed information about how all these setpoints are used.

As this function block is disabled by default, there is nothing further to define in terms of defaults and ranges beyond that which is described in Section 1.9. The screen capture below shows how the setpoints referenced in that section appear on EA.

-FF Conditional Block 6 SP Table 2 - Lookup Table Block Number 2 Lookup Table 2 -FF Conditional Block 7 SP Table 2 - Condition 1, Argument 1 Source 0 Control Source Not Used -FF Lookup Table 1 SP Table 2 - Condition 1, Argument 1 Number Parameter not used with current Control Source sele -FF Lookup Table 3 SP Table 2 - Condition 1, Argument 2 Source 0 Control Source Not Used -FF Lookup Table 3 SP Table 2 - Condition 1, Argument 2 Source 0 Control Source Not Used -FF Lookup Table 4 SP Table 2 - Condition 2, Argument 1 Number Parameter not used with current Control Source sele -FF Math Block 1 SP Table 2 - Condition 2, Argument 1 Number Parameter not used with current Control Source sele -FF Math Block 3 SP Table 2 - Condition 2, Argument 1 Source 0 Control Source Not Used -FF Math Block 4 SP Table 2 - Condition 2, Argument 1 Source 0 Control Source Not Used -FF Parameter not used with current Control Source Sele SP Table 2 - Condition 3, Argument 1 Source 0 Control Source Not Used -FF CAN Receive 3 SP Table 2 - Condition 3, Argument 1 Number Parameter not used	: 🕮 🔛 F			
Image: Service		Setpoint Name	Value	Comment
Image: Sepoint File SP Table 1 Conditions Logical Operator 1 Cnd1 And Cnd3 Image: Strain Gauge Input 1 SP Table 1 Condition 1, Argument 1. Number Parameter not used with current Control Source sele Image: Strain Gauge Input 2 SP Table 1 Condition 1, Argument 2. Number Parameter not used with current Control Source sele Image: Strain Gauge Input 2 SP Table 1 Condition 1, Argument 2. Number Parameter not used with current Control Source sele Image: Strain Gauge Input 3 SP Table 1 Condition 2, Argument 1. Number Parameter not used with current Control Source sele Image: Strain Gauge Input 4 SP Table 1 Condition 2, Argument 1. Number Parameter not used with current Control Source sele Image: Strain Gauge Input 4 SP Table 1 Condition 2, Argument 2. Number Parameter not used with current Control Source sele Image: Conditional Block 1 SP Table 1 Condition 3, Argument 2. Number Parameter not used with current Control Source sele Image: Conditional Block 2 SP Table 1 Condition 3, Argument 2. Number Parameter not used with current Control Source Sele Image: Conditional Block 3 SP Table 2 Condition 3, Argument 2. Number Parameter not used with current Control Sourc		SP Programmable Logic Enabled	1	True
Fig Macellaneous SP Table 1 - Condition 1, Argument 1 Number Parameter not used with current Control Source sele Fig Strain Gauge Input 2 SP Table 1 - Condition 1, Argument 1 Number Parameter not used with current Control Source sele Fig Strain Gauge Input 3 SP Table 1 - Condition 1, Argument 1 Number Parameter not used with current Control Source sele Fig Strain Gauge Input 4 SP Table 1 - Condition 2, Argument 1 Number Parameter not used with current Control Source sele Fig Strain Gauge Input 4 SP Table 1 - Condition 2, Argument 1 Number Parameter not used with current Control Source sele Fig Conditional Block 1 SP Table 1 - Condition 2, Argument 2 Number O Control Source Not Used Fig Conditional Block 2 SP Table 1 - Condition 3, Argument 1 Number Parameter not used with current Control Source sele Fig Conditional Block 3 SP Table 1 - Condition 3, Argument 1 Number Parameter not used with current Control Source sele Fig Conditional Block 4 SP Table 1 - Condition 3, Argument 2 Number Parameter not used with current Control Source sele Fig Conditional Block 5 SP Table 1 - Condition 3, Argument 2 Number Parameter not used with current Control Source sele Fig Conditional Block 5 SP Table 2 - Condition A, Argument 1 Number Parameter not used with current Control Source sel				
SP Tare Burton SP Table 1 - Condition 1, Argument 1 Number Parameter not used with current Control Source sele SP Table 1 - Condition 1, Argument 2 Source 0 Control Source Net Used SP Table 1 - Condition 1, Argument 2 Source 0 Control Source Net Used SP Table 1 - Condition 2, Argument 1 Source 0 Control Source Net Used SP Table 1 - Condition 2, Argument 1 Source 0 Control Source Net Used SP Table 1 - Condition 2, Argument 1 Source 0 Control Source Net Used SP Table 1 - Condition 2, Argument 2 Source 0 Control Source Net Used SP Table 1 - Condition 2, Argument 2 Source 0 Control Source Net Used SP Table 1 - Condition 3, Argument 1 Source 0 Control Source Net Used SP Table 1 - Condition 3, Argument 1 Source 0 Control Source Net Used SP Table 1 - Condition 3, Argument 2 Source 0 Control Source Net Used SP Table 1 - Condition 3, Argument 2 Source 0 Control Source Net Used SP Table 1 - Condition 3, Argument 2 Source 0 Control Source Net Used SP Table 1 - Condition 3, Argument 2 Source 0 Control Source Net Used SP Table 2 - Condition 3, Argument 2 Source 0 Control Source Net Used SP Table 2 - Cond	·			
Strain Gauge Input 1 SP Table 1 - Condition 1, Argument 2 Source Parameter not used with current Control Source sele GF Strain Gauge Input 3 SP Table 1 - Condition 2, Argument 1 Source O Control Source Not Used GF Strain Gauge Input 3 SP Table 1 - Condition 2, Argument 1 Source O Control Source Not Used GF Strain Gauge Input 4 SP Table 1 - Condition 2, Argument 1 Number Parameter not used with current Control Source sele GF Orstant Data Lit SP Table 1 - Condition 2, Argument 2 Source O Control Source Not Used GF Conditional Block 1 SP Table 1 - Condition 3, Argument 1 Number Parameter not used with current Control Source sele GF Conditional Block 3 SP Table 1 - Condition 3, Argument 1 Number Parameter not used with current Control Source sele GF Conditional Block 4 SP Table 1 - Condition 3, Argument 2 Source O Control Source Not Used GF Conditional Block 5 SP Table 1 - Condition 3, Argument 2 Source O Control Source Not Used GF Conditional Block 5 SP Table 2 - Condition 3, Argument 2 Source O Control Source Not Used GF Conditional Block 6 SP Table 2 - Condition 1, Argument 2 Source O Control Source Not Used GF Condit			0	
Strain Gauge Input 2 SP Table 1 - Condition 1, Argument 2 Source 0 Control Source Not Used GP Strain Gauge Input 3 SP Table 1 - Condition 2, Argument 1 Number Parameter not used with current Control Source sele GP Strain Gauge Input 3 SP Table 1 - Condition 2, Argument 1 Number Parameter not used with current Control Source sele GP Interlock Cutput SP Table 1 - Condition 2, Argument 2 Number Parameter not used with current Control Source sele GP Containt Data Litt SP Table 1 - Condition 2, Argument 2 Number Parameter not used with current Control Source sele GP Conditional Block 1 SP Table 1 - Condition 3, Argument 1 Number Parameter not used with current Control Source sele GP Conditional Block 4 SP Table 1 - Condition 3, Argument 2 Number Parameter not used with current Control Source sele GP Conditional Block 4 SP Table 1 - Condition 3, Argument 2 Number Parameter not used with current Control Source sele GP Conditional Block 5 SP Table 2 - Condition 1, Argument 2 Number Parameter not used with current Control Source sele GP Conditional Block 6 SP Table 2 - Condition 1, Argument 2 Number Parameter not used with current Control Source sele GP Conditional Block 7 SP Table 2 - Condition 1, Argument 2 Number Parameter not used with current Control Source sele GP Lockup Table 4				
Bits SP Table 1 Condition 1, Argument 2 Number Parameter not used with current Control Source sele SB Strain Gauge Input 4 SP Table 1 Condition 2, Argument 1 Number Parameter not used with current Control Source sele SB Interlock Output SP Table 1 Condition 2, Argument 2 Source O Control Source Not Used SB Contant Data List SP Table 1 Condition 3, Argument 2 Source O Control Source Not Used SB Conditional Block 1 SP Table 1 Condition 3, Argument 2 Number Parameter not used with current Control Source sele SB Conditional Block 3 SP Table 1 Condition 3, Argument 2 Number Parameter not used with current Control Source sele SB Conditional Block 3 SP Table 1 Condition 3, Argument 2 Number Parameter not used with current Control Source sele SB Conditional Block 5 SP Table 2 Control Numeer Not Used Control Source Not Used SB Conditional Block 6 SP Table 2 Control Numeer Not Used Control Source Not Used SB Conditional Block 7 SP Table 2 Condition 1, Argument 1 Number Parameter not used with current Control Source sele SB Condutional Block 8 SP Table 2 Condition 1, Argument 1 N				
Basel Brain Gauge Input 4 SP Table 1 - Condition 2, Argument 1 Source O Control Source Not Used GBD Digital Output SP Table 1 - Condition 2, Argument 1 Number Parameter not used with current Control Source sele GBD Interlock Output SP Table 1 - Condition 2, Argument 2 Source O Control Source Not Used GBD Constant Data List SP Table 1 - Condition 3, Argument 1 Source O Control Source Not Used GBD Conditional Block 1 SP Table 1 - Condition 3, Argument 1 Source O Control Source Not Used GBD Conditional Block 2 SP Table 1 - Condition 3, Argument 1 Number Parameter not used with current Control Source sele GBD Conditional Block 3 SP Table 1 - Condition 3, Argument 2 Source O Control Source Not Used GBD Conditional Block 5 SP Table 1 - Condition 3, Argument 2 Number Parameter not used with current Control Source sele GBD Conditional Block 7 SP Table 2 - Lockup Table 1 Source Not Used SP Table 2 - Condition 1, Argument 2 Source O GBD Conditional Block 8 SP Table 2 - Condition 1, Argument 1 Source O Control Source Not Used GBD Lockup Table 2 SP Table 2 - Condition 1, Argument 2 Source O Control Source Not Used <			0	
Bit Digital Output SP Table 1 - Condition 2, Argument 1 Number Parameter not used with current Control Source sele GBI Interlock Output SP Table 1 - Condition 2, Argument 2 Number Parameter not used with current Control Source sele GBI Conditional Block 1 SP Table 1 - Condition 3, Argument 2 Number Parameter not used with current Control Source sele GBI Conditional Block 3 SP Table 1 - Condition 3, Argument 1 Number Parameter not used with current Control Source sele GBI Conditional Block 3 SP Table 1 - Condition 3, Argument 2 Number Parameter not used with current Control Source sele GBI Conditional Block 4 SP Table 1 - Condition 3, Argument 2 Number Parameter not used with current Control Source sele GBI Conditional Block 5 SP Table 1 - Condition 1, Argument 2 Number Parameter not used with current Control Source sele GBI Conditional Block 6 SP Table 2 - Conditional 1 Source 0 Control Source Not Used GBI Conditional Block 7 SP Table 2 - Conditional 1, Argument 1 Number Parameter not used with current Control Source sele GBI Conduitonal Block 8 SP Table 2 - Condition 1, Argument 1 Number Parameter not used with current Control Source sele GBI Lookup Table 4 SP Table 2 - Condition 1, Argument 2 Number Parameter not used with current Control Source sele			0	
Bigling Unput SP Table 1 - Condition 2, Operator Parameter not used with current Control Source sele GB Constant Data List SP Table 1 - Condition 2, Argument 2 Source 0 Control Source Not Used GB Conditional Block 1 SP Table 1 - Condition 3, Argument 1 Source 0 Control Source Not Used GB Conditional Block 2 SP Table 1 - Condition 3, Argument 1 Source 0 Control Source Not Used GB Conditional Block 4 SP Table 1 - Condition 3, Argument 2 Source 0 Control Source Not Used GB Conditional Block 4 SP Table 1 - Condition 3, Argument 2 Source 0 Control Source Not Used GB Conditional Block 5 SP Table 2 - Condition 1, Argument 1 Source 0 Control Source Not Used GB Conditional Block 7 SP Table 2 - Condition 1, Argument 1 Source 0 Control Source Not Used GB Condup Table 3 SP Table 2 - Condition 1, Argument 2 Source 0 Control Source Not Used GB Conkup Table 3 SP Table 2 - Condition 1, Argument 2 Source 0 Control Source Not Used GB Conkup Table 4 SP Table 2 - Condition 1, Argument 2 S			0	
Str Table 1 - Condition 2, Argument 2 Source 0 Control Source Not Used Str Conditional Block 1 Str Table 1 - Condition 3, Argument 1 Source 0 Control Source Not Used Str Conditional Block 2 Str Table 1 - Condition 3, Argument 1 Source 0 Control Source Not Used Str Conditional Block 3 Str Table 1 - Condition 3, Argument 1 Number Parameter not used with current Control Source sele Str Conditional Block 4 Str Table 1 - Condition 3, Argument 2 Number Parameter not used with current Control Source sele Str Conditional Block 5 Str Table 1 - Condition 3, Argument 2 Number Parameter not used with current Control Source sele Str Conditional Block 5 Str Table 2 - Condition 1, Argument 1 Number Parameter not used with current Control Source sele Str Conditional Block 8 Str Table 2 - Condition 1, Argument 1 Source 0 Control Source Not Used Str Table 1 Str Table 2 - Condition 1, Argument 2 Source 0 Control Source Not Used Str Table 2 Str Table 2 - Condition 1, Argument 2 Source 0 Control Source Not Used Str Table 2 Str Table 2 - Condition 2, Argument 2 Source 0 Control Source Not Used Str Table 2 Str Table 2 - Condition 2, Argument 2 Source 0 Control Source Not Used				
Str Constant Data List SP Table 1 - Condition 2, Argument 2 Number Parameter not used with current Control Source sele Str Conditional Block 1 SP Table 1 - Condition 3, Argument 1 Number Parameter not used with current Control Source sele Str Conditional Block 4 SP Table 1 - Condition 3, Argument 2 Source O Control Source Not Used Str Conditional Block 5 SP Table 1 - Condition 3, Argument 2 Number Parameter not used with current Control Source sele Str Conditional Block 5 SP Table 2 - Condition 1, Argument 2 Number Parameter not used with current Control Source sele Str Conditional Block 7 SP Table 2 - Condition 1, Argument 1 Source O Control Source Not Used Str Table 2 - Condition 1, Argument 1 Number Parameter not used with current Control Source sele Str Lookup Table 3 SP Table 2 - Condition 1, Argument 1 Number Parameter not used with current Control Source sele Str Lookup Table 4 SP Table 2 - Condition 1, Argument 2 Number Parameter not used with current Control Source sele Str Table 2 - Condition 2, Argument 2 Number Parameter not used with current Control Source sele Str Table 2 - Condition 2, Argument 1 Number Parameter not use			0	
BP Conditional Block 1 SP Table 1 - Condition 3, Argument 1 Source 0 Control Source Not Used BP Conditional Block 2 SP Table 1 - Condition 3, Argument 1 Number Parameter not used with current Control Source sele BP Conditional Block 3 SP Table 1 - Condition 3, Argument 2 Number 0 Control Source Not Used BP Conditional Block 5 SP Table 1 - Condition 3, Argument 2 Number 0 Control Source Not Used BP Conditional Block 5 SP Table 2 - Condition 1, Argument 1 Source 0 Control Source Not Used BP Conditional Block 6 SP Table 2 - Condition 1, Argument 1 Source 0 Control Source Not Used BP Lookup Table 1 SP Table 2 - Condition 1, Argument 1 Source 0 Control Source Not Used BP Lookup Table 3 SP Table 2 - Condition 1, Argument 1 Source 0 Control Source Not Used BP Lookup Table 3 SP Table 2 - Condition 1, Argument 2 Number Parameter not used with current Control Source sele BP Math Block 1 SP Table 2 - Condition 2, Argument 1 Source 0 Control Source Not Used BP Table 2 - Condition 2, Argument 1 Source 0 Control Source Not Used SP Table 2 - Co	- SP Constant Data List			
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Screen Capture of Default Programmable Logic 1 Setpoints

Note: In the screen capture shown above, the "Programmable Logic Block Enabled" has been changed from its default value in order to enable the function block.

Note: The default values for the Argument1, Argument 2 and Operator are all the same across all the Programmable Logic function blocks, and must therefore be changed by the user as appropriate before this can be used.

4.10. Math Function Setpoints

The Math Function block is defined in Section 1.10. Please refer there for detailed information about how all these setpoints are used.

Electronic Assistant				
ile <u>V</u> iew <u>O</u> ptions <u>H</u> elp				
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	*	Setpoint Name	Value	Comment
		SP Math Function Enabled	1	True
		SP Function 1 Input A Source	1	Strain Gauge Input
		SP Function 1 Input A Number	1	Strain Gauge Input #1
		SP Function 1 Input A Minimum	0.00	_
		SP Function 1 Input A Maximum	100.00	
SP Math Block 2		SP Function 1 Input A Scaler	1.00	
Math Block 3		SP Function 1 Input B Source	1	Strain Gauge Input
Math Block 4		SP Function 1 Input B Number	2	Strain Gauge Input #2
SP Programmable Logic Block		SP Function 1 Input B Minimum	0.00	
SP Programmable Logic Block		SP Function 1 Input B Maximum	100.00	
SP CAN Receive 1		SP Function 1 Input B Scaler	1.00	
SP CAN Receive 2		SP Math Function 1 Operation	9	+, Result = InA plus InB
SP CAN Receive 3		SP Function 2 Input B Source	1	Strain Gauge Input
SP CAN Receive 4		SP Function 2 Input B Number	3	Strain Gauge Input #3
		SP Function 2 Input B Minimum	0.00	
SP CAN Receive 5	Ξ	SP Function 2 Input B Maximum	100.00	
SP CAN Transmit 1		SP Function 2 Input B Scaler	1.00	
CAN Transmit 2		SP Math Function 2 Operation (Input A = Result of Function 1)	9	+, Result = InA plus InB
		SP Function 3 Input B Source	1	Strain Gauge Input
		SP Function 3 Input B Number	4	Strain Gauge Input #4
		SP Function 3 Input B Minimum	0.00	
		SP Function 3 Input B Maximum	100.00	
		SP Function 3 Input B Scaler	1.00	
		SP Math Function 3 Operation (Input A = Result of Function 2)	9	+, Result = InA plus InB
BP Diagnostic Block 3	-	SP Math Output Minimum Range	0.00	
		SP Math Output Maximum Range	1000.00	
ady		,		250 kBit/s

Screen Capture of Example Math Function 1 Setpoints

Note: In the screen capture shown above, the "Math Function Enabled" has been changed from its default value in order to enable the function block. Other setpoints have also been changed from default values in order to illustrate how the block might look when functional, as per the example outlined in Section 1.10.

Name	Range	Default	Notes
Math Function Enabled	Drop List	False	
Function 1 Input A Source	Drop List	Control not used	See Error! Reference source not found.6
Function 1 Input A Number	Depends on control source	1	See Error! Reference source not found.7
Function 1 Input A Minimum	-10 ⁶ to 10 ⁶	0.0	
Function 1 Input A Maximum	-10 ⁶ to 10 ⁶	100.0	
Function 1 Input A Scaler	-1.00 to 1.00	1.00	
Function 1 Input B Source	Drop List	Control not used	See Error! Reference source not found.6
Function 1 Input B Number	Depends on control source	1	See Error! Reference source not found.7

Function 1 Input B Minimum	-10 ⁶ to 10 ⁶	0.0	
Function 1 Input B Maximum	-10 ⁶ to 10 ⁶	100.0	
Function 1 Input B Scaler	-1.00 to 1.00	1.00	
Math Function 1 Operation	Drop List	=, True when InA Equals InB	See Error!
			Reference source
			not found.18
Function 2 Input B Source	Drop List	Control not used	See Error!
			Reference source
			not found.6
Function 2 Input B Number	Depends on control	1	See Table Error!
	source		Reference source not found.7
Function 2 Input B Minimum	-10 ⁶ to 10 ⁶	0.0	
Function 2 Input B Maximum	-10 ⁶ to 10 ⁶	100.0	
Function 2 Input B Scaler	-1.00 to 1.00	1.00	
Math Function 3 Operation	Drop List	=, True when InA Equals InB	See Error!
			Reference source
			not found.18
Function 3 Input B Source	Drop List	Control not used	See Error!
			Reference source
			not found.6
Function 3 Input B Number	Depends on control	1	See Table 7
	source		
Function 3 Input B Minimum	-10 ⁶ to 10 ⁶	0.0	
Function 3 Input B Maximum	-10 ⁶ to 10 ⁶	100.0	
Function 3 Input B Scaler	-1.00 to 1.00	1.00	
Math Function 3 Operation	Drop List	=, True when InA Equals InB	See Error!
			Reference source
			not found.18
Math Output Minimum Range	-10 ⁶ to 10 ⁶	0.0	
Math Outptu Maximum Range	-10 ⁶ to 10 ⁶	100.0	

4.11. CAN Receive Setpoints

The CAN Receive function block is defined in Section 1.13. Please refer there for detailed information about how all these setpoints are used.

	F Lookup Table 1			
	SP Lookup Table 1			
100		Setpoint Name		Comment
	SP Lookup Table 2	SP Receive Message Enabled		True
	SP Lookup Table 3	SP Receive PGN	0xFF80	Received PGN: 65408
10.00	SP Lookup Table 4	SP Receive Message Timeout	0	ms
	SP Math Block 1	SP Specific Address That Sends	0	False
	SP Math Block 2	SP Address That Sends		Parameter not used - Receive from Source Address is Disable
	SP Math Block 3	SP Receive Data Size		Continuous 2-Bytes
	SP Math Block 4	SP Receive Data Index in Array (LSB)	0	1st Byte Position
	SP Programmable Logic I	SP Receive Bit Index in Byte (LSB)		Parameter not used with current Data Size selected
	SP Programmable Logic I	SP Receive Data Resolution	0.0010000	
100	SP CAN Receive 1	SP Receive Data Offset	0.0000000	
	SP CAN Receive 2	SP Receive Data Min (OFF Threshold)		
	SP CAN Receive 3	SP Receive Data Max (ON Threshold)	2.5000000	
20 B S R	SP CAN Receive 4			
	SP CAN Receive 5			
	SP CAN Transmit 1			
1.1	SP CAN Transmit 2			
20 D D D D D D D D D D D D D D D D D D D	SP CAN Transmit 3			
10 B B B B B B B B B B B B B B B B B B B				
	SP CAN Transmit 4			
B 10.	SP CAN Transmit 5			
10 10 10 M	SP DTC React			
	SP Diagnostic Block 1			
	SP Diagnostic Block 2			
-	SP Diagnostic Block 3			
	SP Diagnostic Block 4 +			

Screen Capture of Default CAN Receive 1 Setpoints

Note: In the screen capture shown above, the "Receive Message Enabled" has been changed from its default value in order to enable the function block

4.12. DTC React

The DTC React Function Block is defined in Section 1.1212. Please refer there for detailed information about how these setpoints are used.

<u>File V</u> iew <u>O</u> ptions <u>H</u> elp					
📲 😰 📰 F					
-SP CAN Transmit 5	•	Setpoint Name	Value	Comment	
		SP SPN to Trigger Reaction #1	0x0000000	SPN: 0	
	+	SP FMI to Trigger Reaction #1	31	Condition Exists	
(<u> </u>		SP SPN to Trigger Reaction #2	0x0000000	SPN: 0	

Screen Capture of DTC Setpoints

Name	Range	Default	Notes
SPN to Trigger Reaction #1	0 to 524287	0	0 is an illegal value, and disables the DTC
FMI to Trigger Reaction #X	Drop List	31, Condition Exists	Supports all FMIs in the J1939 standard

4.13. Diagnostics Blocks

There are 8 Diagnostics blocks that can be configured to monitor various parameters of the Controller. The Diagnostic Function Block is defined in section 1.66. Please refer there for detailed information how these setpoints are used.

is Yew	Optione Help			
1 8 8	3 F			
	Se Constant Data List	Setpoint Name	Vietue	Comment
	Set Conditional Block 1	SP Fault Detection is Enabled	t	Town
	ST Conditional Block 2	SP Function Type to Monitor		Measured Power Supply
	Se Conditional Block 3	SP Function Parameter to Monitor		Meaning Power Supply
	Set Conditional Block 4	SP Enable Source		Control Source Not Used
	Se Conditional Block 5	SP Enable Number		Parameter not used with current Enable Source selected
	Se Conditional Black 6	SP Enable Response		Parameter not used with current Enable Source selected
1.1		SP Fault Detection Type		Min and Max Error
	Conditional Block 7	SP Maximum Value for Diagnostic Data	45.00	NUT and that the
	E Conditional Block B	SP Minimum Value for Diagnostic Data	0.00	
	2 Lookup Table1	SP Use Hysteresis When Defining Thresholds		True
	E Lookup Table 2	SP Hysteresis	2.00	inge .
	az Lookup Table 3	SP Event Cleared Only by DMLL		Fake
	and Lookup Table 4	SP Set Limit for MAXIMUM SHUTDOWN	30.00	race
	an Math Block 1	SP Clear Limit for MAXIMUM SHUTDOWN	-30.00	Parameter not used - Hysteresis used when defining threshold
	and Math Block 2	SP Set Limit for MAXIMUM WARNING		Paremeter not used with current Fault Detection Type
	57 Math Block 3	SP Clear Limit for MAXIMUM WARMING		Parameter not used with current Fault Detection Type
	52 Math Block 4	SP Clear Limit for MINIMUM WARRING		Parameter not used with current Fault Detection Type
	57 Programmable Logic 1	SP Set Limit for MINIMUM WARNING		Parameter not used with current Fault Detection Type
	Programmable Logic I	SP Clear Land for MD/MUM SHUTDOWN		Parameter not used with current rook objection type Parameter not used - Hysteresis used when defining threshold
	AN Receive 1	SP Set Limit for MINIMUM SHUTDOWN	9.00	Parameter and - Hydriger and whith denning offended
	57 CAN Receive 2	SP MAXIMUM SHUTDOWN, Event Generates a DTC in DMD		True
	Ser CAN Receive 3	SP MAXIMUM SHUTDOWN, Lamp Set by Event	1	Amber Warning
	CAN Receive 4	SP MAXIMUM SHUTDOWN, SPN for Event	The second se	SPN: 520960
	SR CAN Receive5	SP MAXMUM SHUTDOWN, FMI for Event		Valtage Above Normal. Or Sharted To High Source
		SP MAXMUM SHUTDOWN, Delay Before Event in Flegged	1000	
	E CAN Transmit 1	SP MAXIMUM WARNING, Event Generates a DTC in DML		Parameter not used with current Fault Detection Type
	G CAN Transmit 2	SP MAXIMUM WARNING, Lamp Set by Event		Parameter not used with current Fault Detection Type
	CAN Transmit 3	SP MAXIMUM WARMING, SPN for Event		Parameter not used with current Fault Detection Type
	52 CAN Transm≹-4	SP MAXIMUM WARMING, FMI for Event		Parameter not used with current Fault Detection Type
	GAN Transmit 5	SP MAXIMUM WARNING, Delay Before Event is Flagged		Parameter not used with current Fault Detection Type
	an DTC React	SP MINIMUM WARNING Event Generates a DTC in DML		Parameter not used with current Fault Detection Type
	Signatic Block 1	SP MENMUM WARNING, Lamp Set by Event		Parameter not used with current Fault Detection Type
	Diagnostic Block 2	SP MENIMUM WARNING, SPN for Event		Parameter not used with current Fault Detection Type
	Bignostic Block 3	SP MENMUM WARNING, FME for Event		Parameter not used with current Fault Detection Type
	57 Diagnostic Block 4	SP MINIMUM WARPING, Delay Before Event is Flagged		Parameter not used with current Fault Detection Type
	Diagnostic Block 5	SP MINIMUM SHUTDOWN, Event Generates a DTC in DML		True
	52 Diagnostic Block 6	SP MENUMUM SHUTDOWN, Livery Generates a Dirc in Child		Amber Werning
	Bar Diagnostic Block 7	SP MINIMUM SHUTDOWN, SPN for Event		SPN: 520900
	SP Diagnostic Block 8	SP MENEMUM SHUTDOWN, FME for Event		Voltage Below Normel, Dr Shorted To Low Source
	Rontinadec Information	SP MENAMUM SHUTDOWN, Prestor Event is Flagged	1000	
- P	A P	an intransient sho throwing being being event is Hagged	1000	ing .

Screen Capture of Default Diagnostic Block 1 Setpoints

Name	Range	Default	Notes
Fault Detection is Enabled	Drop List	False	
Function Type to Monitor	Drop List	0 – Control not used	
Function parameter to	Drop List	0 – No selection	
Monitor			
Fault Detection Type	Drop List	1 – Min and Max Error	See section 1.6
Maximum Value for	Minimum Value for	5.0	
Diagnostic Data	Diagnostic Data 4.28e ⁹		
Minimum Value for	0.0 Maximum Value for	0.0	
Diagnostic Data	Diagnostic Data		

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Lloo Hyptoropia Where	Drop List	Foloo	1
Use Hysteresis When	Drop List	False	
Defining Thresholds	0.0 Maximum Value for	0.0	
Hysteresis	Diagnostic Data	0.0	
Event Cleared only by	Diagnostic Data	False	
DM11			
Set Limit for MAXIMUM	Minimum Value for	4.8	
SHUTDOWN	Diagnostic Data		
	Maximum Value for		
	Diagnostics Data		
Clear Limit for MAXIMUM	Minimum Value for	4.6	
SHUTDOWN	Diagnostic Data		
	Maximum Value for		
	Diagnostics Data		
Set Limit for MAXIMUM	Minimum Value for	0.0	
WARNING	Diagnostic Data		
	Maximum Value for		
	Diagnostics Data		
Clear Limit for MAXIMUM	Minimum Value for	0.0	
WARNING	Diagnostic Data		
	Maximum Value for		
	Diagnostics Data	0.0	
Clear Limit for MINIMUM	Minimum Value for	0.0	
WARNING	Diagnostic Data		
	Maximum Value for		
Set Limit for MINIMUM	Diagnostics Data Minimum Value for	0.0	
WARNING	Diagnostic Data	0.0	
	Maximum Value for		
	Diagnostics Data		
Clear Limit for MINIMUM	Minimum Value for	0.4	
SHUTDOWN	Diagnostic Data		
	Maximum Value for		
	Diagnostics Data		
Set Limit for MINIMUM	Minimum Value for	0.2	
SHUTDOWN	Diagnostic Data		
	Maximum Value for		
	Diagnostics Data		
MAXIMUM SHUTDOWN,	Drop List	True	
Event Generates a DTC in			
DM1			
MAXIMUM SHUTDOWN,	Drop List	0 – Protect	1.1. See Table 13 -
Lamp Set by Event			Lamp Set by Even in
			DM1 Options
MAXIMUM SHUTDOWN,	0524287	520448 (\$7F100)	It is the user's
SPN for Event			responsibility to select an
			SPN that will not violate
			the J1939 standard.
MAXIMUM SHUTDOWN,	Drop List	3, Voltage Above Normal	See Table 14
FMI for Event			
MAXIMUM SHUTDOWN,	060000 ms	1000	
Delay Before Event is			
Flagged			

MAXIMUM WARNING,	Drop List	True	
Event Generates a DTC in DM1		Thue	
MAXIMUM WARNING,	Drop List	0 – Protect	1.2. See Table 13 -
Lamp Set by Event			Lamp Set by Even in DM1 Options
MAXIMUM WARNING, SPN for Event	0524287	520704 (\$7F200)	It is the user's responsibility to select an SPN that will not violate the J1939 standard.
MAXIMUM WARNING, FMI for Event	Drop List	3, Voltage Above Normal	See Table 14
MAXIMUM WARNING, Delay Before Event is Flagged	060000 ms	1000	
MINIMUM WARNING, Event Generates a DTC in DM1	Drop List	True	
MINIMUM WARNING, Lamp Set by Event	Drop List	0 – Protect	1.3. See Table 13 - Lamp Set by Even in DM1 Options
MAXIMUM WARNING, SPN for Event	0524287	520960 (\$7F300)	It is the user's responsibility to select an SPN that will not violate the J1939 standard.
MINIMUM WARNING, FMI for Event	Drop List	4, Voltage Below Normal	See Table 14
MINIMUM WARNING, Delay Before Event is Flagged	060000 ms	1000	
MINIMUM SHUTDOWN, Event Generates a DTC in DM1	Drop List	True	
MINIMUM SHUTDOWN, Lamp Set by Event	Drop List	Amber Warning	1.4. See Table 13 - Lamp Set by Even in DM1 Options
MINIMUM SHUTDOWN, SPN for Event	0524287	521216 (\$7F400)	It is the user's responsibility to select an SPN that will not violate the J1939 standard.
MINIMUM SHUTDOWN, FMI for Event	Drop List	4, Voltage Below Normal	See Table 14
MINIMUM SHUTDOWN, Delay Before Event is Flagged	060000 ms	1000	

4.14. CAN Transmit Setpoints

The CAN Transmit function block is defined in Section 1.11, with addition information in Section 3.3. Please refer there for detailed information about how all these setpoints are used.

<u>V</u> iew <u>O</u> ptions <u>H</u> elp				
E Conditional Block 5	 Setpoint Name 		Value	Comment
	SP Transmit PGN			
E Conditional Block 7		William Data		Transmit PGN: 65280 ms
E Conditional Block 8	SP Transmit Repe		6	ms
E Lookup Table 1	SP Transmit Mess	5 · ·		
E Lookup Table 2	SP Destination A			Destination ECU Address: 0xFF
E Lookup Table 3	SP Override Sour		0	False
Eleokup Table 4	SP Source Addres			Parameter not used - Disguise Source Address
B Math Block 1	^{sp} Signal 1 Data			Strain Gauge Input
B Math Block 2	^{SP} Signal 1 Data			Strain Gauge Input #1
B Math Block 3	^{SP} Signal 1 Trans			Continuous 2-Bytes
B Math Block 4	_	mit Data Index in Array (LSB)	0	1st Byte Position
Programmable Logic Block 1	SP Signal 1 Trans	mit Bit Index in Byte (LSB)		Parameter not used with current Data Size sele
Programmable Logic Block 2	SP Signal 1 Trans	mit Data Resolution	0.0010000	
E CAN Receive 1	^{sp} Signal 1 Trans		0.0000000	
E CAN Receive 2	^{sp} Signal 2 Data	Source	1	Strain Gauge Input
E CAN Receive 3	SP Signal 2 Data	Number	2	Strain Gauge Input #2
E CAN Receive 4	SP Signal 2 Trans	mit Data Size	5	Continuous 2-Bytes
E CAN Receive 5	SP Signal 2 Trans	mit Data Index in Array (LSB)	2	3rd Byte Position
E CAN TARE	SP Signal 2 Trans	mit Bit Index in Byte (LSB)		Parameter not used with current Data Size sele
EP CAN Transmit 1	SP Signal 2 Trans	mit Data Resolution	0.0010000	
E CAN Transmit 2	SP Signal 2 Trans	mit Data Offset	0.0000000	
🖅 CAN Transmit 3	SP Signal 3 Data	Source	1	Strain Gauge Input
🖅 CAN Transmit 4	SP Signal 3 Data	Number	3	Strain Gauge Input #3
🖅 CAN Transmit 5	SP Signal 3 Trans	mit Data Size	5	Continuous 2-Bytes
🖅 DTC React	SP Signal 3 Trans	mit Data Index in Array (LSB)	4	5th Byte Position
🖅 Diagnostic Block 1	SP Signal 3 Trans	mit Bit Index in Byte (LSB)		Parameter not used with current Data Size sele
🖅 Diagnostic Block 2		mit Data Resolution	0.0010000	
🖅 Diagnostic Block 3	SP Signal 3 Trans		0.0000000	
B Diagnostic Block 4	sP Signal 4 Data		1	Strain Gauge Input
B Diagnostic Block 5	^{sp} Signal 4 Data			Strain Gauge Input #4
B Diagnostic Block 6	^{SP} Signal 4 Trans			Continuous 2-Bytes
Diagnostic Block 7		mit Data Index in Array (LSB)		7th Byte Position
E Diagnostic Block 8	_	mit Bit Index in Byte (LSB)	Ū	Parameter not used with current Data Size sele
B Bootloader Information		mit Data Resolution	0.0010000	a and the about the current bata bize set
	SP Signal 4 Trans		0.0010000	

Screen Capture of Default CAN Transmit 1 Setpoints

Name	Range	Default	Notes
Transmit PGN	0 to 65535	65280 (\$FF00) Txd1 to 2	See Section 3.3 for defaults
Transmit Repetition Rate	0 to 60,000 ms	0	0ms disables transmit
Transmit Message Priority	0 to 7	6	Proprietary B Priority
Destination Address (for PDU1)	0 to 255	254 (0xFE, Null Address)	Not used by default
Override Source Address	Drop List	No	
Source Address	0 to 255	130 (0x82)	Source Address to Mask
Transmit Data Source	Drop List	Different for each	See Table 18 for defaults
Transmit Data Number	Per Source	Different for each	See Table 18 for defaults
			0 = Not Used (disabled)
Transmit Data Size	Drop List	Continuous 2-Bytes	1 = 1-Bit
			2 = 2-Bits

			3 = 4-Bits 4 = 1-Byte 5 = 2-Bytes 6 = 4-Bytes See Section 3.3 for defaults
Transmit Data Index in Array (LSB)	1 to 9-DataSize	Different for each	See Section 3.3 for defaults
Transmit Bit Index in Byte (LSB)	1 to 9-BitSize	Different for each	Only used with Bit Data Types
Transmit Data Resolution	-10 ⁶ to 10 ⁶	Different for each	See Section 3.3 for defaults
Transmit Data Offset	-10 ⁴ to 10 ⁴	Different for each	See Section 3.3 for defaults

4.15. CAN Tare Setpoints

The CAN Tare function block is defined in Section 1.14. It is used to calibrate/tare the strain gauge input of the 4CH-SG controller. Please refer to that section for detailed information about how all these setpoints are used.

Electronic Assistant Ele View Options Help				– 🗆 X
E CAN Receive 5	^	Setpoint Name	Value	Comment
E CAN TARE		SP Receive Message Enabled	1	True
CAN Transmit 1		SP Receive PGN	0xFFA5	Received PGN: 65445
SE CAN Transmit 2		SP Specific Address That Sends	0	False
CAN Transmit 3 RECAN Transmit 4	~	SP Address That Sends		Parameter not used - Receive from Source Address is Disabled
eady				.50 kbit/

Screen Capture of Default CAN Tare Setpoints

Name	Range	Default	Notes
Received Message Enabled	Drop List	True	Enables or disables CAN Tare Function
Receive PGN	0 to 65535	0xFFA5	Any PGN
Specific Address That Sends	Drop List	False	If set to True, 4CH-SG communicates with ECU address selected
Address That Sends	0 to 254	0x00	ECU Address of sender

5. REFLASHING OVER CAN WITH EA ® 🔊 BOOTLOADER

The AX200000 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.

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

Electronic Assistant		
<u>F</u> ile <u>V</u> iew <u>O</u> ptions <u>H</u> elp		
11 F		
SP Lookup Table 2	Parameter	Value
	Hardware ID	13022
	+ Hardware Revision Number	2.00
	+ Hardware Compatibility Level	1.00
SP Math Block 2	+ Hardware Description	PCB-13022-01-R2
SP Math Block 3		
Math Block 4	Bootloader ID	13022
SP Programmable Logic Block	Bootloader Version Number	2.01
SP Programmable Logic Block		1.00
SP CAN Receive 1	Bootloader Description	Bootloader for 13022
SP CAN Receive 2	Bootloader ECU Address	253
SP CAN Receive 3	Force Bootloader To Load on Reset	No
SP CAN Receive 4		
SP CAN Receive 5	Application Firmware ID	13003
SP CAN Transmit 1	Application Firmware Version Number	2.00
SP CAN Transmit 2	Application Firmware Compatibility Level	1.00
SP CAN transmit 2	Application Firmware Description	4-Channel Strain Gauge with CAN J193
SP CAN transmit 5	Application Firmware Flash File	AX200000_Model.bin
	Application Firmware Flashing Date	June 26, 2015, 02:40 PM
SP CAN Transmit 5	Application Firmware Flashing Tool	Electronic Assistant V*, June 2015
<u>SP</u> DTC React	Application Firmware Flashing Comments	
	E	
BP Diagnostic Block 4		
• SP Diagnostic Block 6		
SP Diagnostic Block 7		
SP Diagnostic Block 8		
B Bootloader Information	•	
4		
eady		250 kBit/s

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

X
•
Set Default
OK Cancel

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

Electron	nic Assistant 🛛 🔀
2	Do you want to reset the ECU after changing this parameter ?
	<u>Y</u> es <u>N</u> o

4. Upon reset, the ECU will no longer show up on the J1939 network as an AX200000 but rather as **J1939 Bootloader #1**.

Electronic Assistant			•		×
File View Options Help Image:					
□— J1939 CAN Network □ECU J1939 Bootloader #1 □i General ECU Information B Bootloader Information	ECU ECU J1939 Bootloader #1	J1939 NAME 0X00FEFF0014418797		J1939 Preferred Reserved for OEM	
Ready				250 kBit/s	1

🔁 😰 F					
H1939 CAN Network J1939 Bootloader #1 General ECU Information B Bootloader Information	Parameter	Value	Description		
	ECU Part Number	AX200000			
	ECU Serial Number	0000115001			
	- ECU J1939 NAME		PGN 60928. 64-bit ECU Identifier sent in Address Claimed Messages		
	Arbitrary Address Capable	0X00			
	➡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		
	Lentity Number	0X018797	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		

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

5. When the **Bootloader Information** section is selected, the same information is shown as when it was running the AX200000 firmware, but in this case the <u>F</u>lashing feature has been enabled.

<u>File View Options H</u> elp			
🛍 🖭 🖪 F			
□··· J1939 CAN Network	Parameter	Value	
⊑ECU J1939 Bootloader #1	Hardware ID	13022	
i General ECU Information B Bootloader Information	+ Hardware Revision Number	2.00	
	Hardware Compatibility Level	1.00	
	Hardware Description	PCB-13022-01-R2	
	Bootloader ID	13022	
	Bootloader ID Bootloader Version Number	2.01	
	Bootloader Version Number Bootloader Compatibility Level	1.00	
	Bootloader Compatibility Eeven Bootloader Description	Bootloader for 13022	
	Bootloader ECU Address	253	
	 Force Bootloader To Load on Reset 	Yes	
	Application Firmware ID	13003	
	Application Firmware Version Number	2.00	
	Application Firmware Compatibility Level	1.00	
	Application Firmware Description	4-Channel Strain Gauge with CAN J1939	
	+ Application Firmware Flash File	AX200000_Model.bin	
	+ Application Firmware Flashing Date	June 26, 2015, 02:40 PM	
	+ Application Firmware Flashing Tool	Electronic Assistant V*, June 2015	
	Application Firmware Flashing Comments		

 Select the <u>F</u>lashing button and navigate to where you had saved the AF-13022-x.yy.bin file sent from Axiomatic. (Note: only binary (.bin) files can be flashed using the EA tool)

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

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

Flash File Name:	AF-13022-2.00.bin
Flashing Comments:	Firmware Flashed by G.D.V.
	Erase All ECU Flash Memory
Flashing Status	Erase All ECU Flash Memory Flash ECU

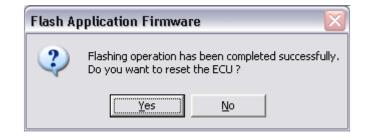
WARNING: Do not check the "Erase All ECU Flash Memory" box unless instructed to do so by your Axiomatic contact. Selecting this will erased ALL data stored in nonvolatile flash. It will also erase any configuration of the setpoints that might have been done to the ECU and reset all setpoints to their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

8. 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.

Flash File Name:	AF-13022-2.00.bin
Flashing Comments:	Firmware Flashed by G.D.V.
	1
-Flashing Status	Erase All ECU Flash Memory
Flashing Status Flashing Memory	Flash ECU
	Flash ECU

UMAX200000. 4-Channel Strain Gauge Controller. Version: 3A

9. Once the firmware has finished uploading, a message will popup indicating the successful operation. If you select to reset the ECU, the new version of the AX200000 application will start running, and the ECU will be identified as such by EA. Otherwise, The next time the ECU is power-cycled, the AX200000 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.

6.1. Power Supply

Power Supply Input - Nominal	12 or 24Vdc nominal operating voltage 836 Vdc power supply range for voltage transients
Surge Protection	Provided
Reverse Polarity Protection	Provided

6.2. Inputs

Strain Gauge Inputs	4 Channels Accepts 4-wire Strain Gauge inputs Input range selectable from +/- 19.5 mV to +/- 2.5 Vdc.
	All input channels have excitation and ground connections provided. All inputs send a message to the CAN bus.
Measurement rate	The measurement rate is 2.5 scans per second for all 4 channels. The update rate is 400 mSec. for all 4 channels.
Common-mode	Common-mode rejection is > 100 db@ 1V p-p, simultaneous 50/60 Hz. Common mode input range is +/- 3.5V maximum.
Resolution	18.2-Bit noise-free minimum
Drift	Overall drift with temperature is 50 ppm/°C of span (maximum).
Input Accuracy	+/- 0.5% throughout the entire range of the input
Excitation	4 +5V excitation connections
Other Input	1 Digital Input Active High to 5V or Active Low to GND Configurable Pull Up or Pull Down Resistor Amplitude: up to +Vps
Grounds	4 GND connections

6.3. Output

Digital On/Off Out	put	1 Digital On/Off Output Fully protected high side digital switch with low current readings
		2A Overcurrent, overvoltage and undervoltage protection is provided.
Relay Output		An interlock relay with 2 contact pins is provided. 2A (nominal)

6.4. Communication

CAN	1 CAN 2.0B port, protocol SAE J1939
Network Termination	According to the CAN standard, it is necessary to terminate the network with external termination resistors. The resistors are 120 Ohm, 0.25W minimum, metal film or similar type. They should be placed between CAN_H and CAN_L terminals at both ends of the network.

6.5. General Specifications

Microprocessor	STM32F205VGT7				
Communications	1 CAN port (SAE J1939)				
User Interface	Electronic Assistant®, P/N: AX070502				
Control Logic	Standard embedded control logic is provided. Application-specific control logic is available on request.				
Simulink®	Model AX200000 was developed using Simulink®. Simulink® is a model-based design tool from Mathworks®.				
SAE J1939 Compliance	 The ECU is compliant with the following SAE J1939 standards. J1939 Recommended Practice for a Serial Control and Communications Vehicle Network, SAE, April 2011 J1939/21 Data Link Layer, SAE, December 2010 J1939/71 Vehicle Application Layer, SAE, March 2011 J1939/81 Network Management, SAE, May 2003 				

Electrical Connections Deutsch DTM series 24 pin receptacle: DTM13-12PA-12PB-R008 Mating plug: Deutsch DTM06-12SA and DTM06-12SB with 2 wedgelocks (WM12S) and 24 contacts (0462-201-20141). 20 AWG wire is recommended for use with contacts 0462-201-20141.						
		Grey Connector		Blac	k Connector	
		Pin #	Function	Pin #	Function	
		1	+5V Excitation 1	1	GND 3	
		2	IN 1+	2	IN 3-	
		3	+5V Excitation 2	3	GND 4	
		4	IN 2+	4	IN 4-	
		5	Tare Input	5	Interlock +/-	
		6	BATT-	6	CAN_H	
		7	BATT+	7	CAN_L	
		8	Digital Output	8	Interlock -/+	
		9	IN 2 -	9	IN 4+	
		10	GND 2	10	+5V Excitation 4	
		11	IN 1 -	11	IN 3+	
		12	GND 1	12	+5V Excitation 3	
Packaging and Dimensions	4.62 x 5.24 x 1.4	High Temperature Nylon housing - Deutsch IPD PCB Enclosure (EEC-325X4B) 4.62 x 5.24 x 1.43 inches 117.42 x 133.09 x 36.36 mm (W x L x H excluding mating plugs)				
Operating Conditions	-40 to 85°C (-40	-40 to 85°C (-40 to 185°F)				
Weight	0.55 lb. (0.25 kg	0.55 lb. (0.25 kg)				
Protection	IP67, PCB asser	IP67, PCB assembly is conformal coated.				
Vibration	10 g peak (Sine)	MIL-STD-202G, Test 204D and 214A (Sine and Random) 10 g peak (Sine) 7.86 Grms peak (Random)				
Shock MIL-STD-202G, Test 213B						
	50g					
Mounting	Mounting Mounting holes sized for ¼ inch or M6 bolts. The bolt length will be determined by the mounting plate thickness. The mounting flange of the controller is 0.63 inches (16 mm) the mounting flange of the contro					
	All field wiring should be suitable for the operating temperature range.					
	Install the unit with appropriate space available for servicing and for adequate wire harness access (6 inches or 15 cm) and strain relief (12 inches or 30 cm).					

7. VERSION HISTORY

Version	Date	Author	Modifications
1	December 29th, 2014	Gustavo Del Valle	Initial Draft
1A	December 30 th , 2014	Gustavo Del Valle	Corrected typo on page 7
2A	June 29 th , 2015	Gustavo Del Valle	Initial Draft Revision 2 Hardware
-	August 21, 2015	Amanda Wilkins	Added vibration compliance information
2B	March 2, 2017	Gustavo Del Valle	Added Part Numbers on title page for the higher baud
			rates available
3	October 2, 2018	Gustavo Del Valle	Corrected Figure and Table numbers
			Added CAN Tare Functionality
			Added Source Address masking to CAN Transmits
3A	October 4, 2018	Gustavo Del Valle	Updated CAN Transmit section to correct the number of
			CAN Transmit blocks supported by controller



OUR PRODUCTS

Actuator Controls

Battery Chargers

CAN bus Controls, Gateways

CAN/Wifi, CAN/Bluetooth

Current Converters

DC/DC Power Converters

DC Voltage/Current Signal Converters

Engine Temperature Scanners

Ethernet/CAN Converters

Fan Drive Controllers

Hydraulic Valve Controllers

I/O Controls

LVDT Simulators

Machine Controls

Motor Controls

PID Controls

Position Sensors, Angle Measurement Inclinometers

Power Supplies

PWM Signal Converters/Isolators

Resolver Signal Conditioners

Service Tools

Signal Conditioners

Strain Gauge CAN Controls

Surge Suppressors

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- Hours of operation, description of problem
- Wiring set up diagram, application
- Other comments as needed

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