J1939 Router User Manual A-J1939

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Revision History

Revision	Date	Comment
1.0	22 May 2017	Initial document
1.2	5 October 2017	Add UL Class 1 Division 2
1.4	6 April 2022	Add note that node 255 is a broadcast address
1.5	4 August 2022	Added information required for UL regarding open type device enclosures.
1.6	10 August 2022	Updated Tag Mapping to have Ack Request and Node naming change.

1. PREFACE

1.1. INTRODUCTION TO THE J1939 ROUTER

This manual describes the installation, operation, and diagnostics of the Aparian J1939 Router module. The J1939 Router, (hereafter referred to as the **module**,) provides intelligent data routing between either EtherNet/IP and the SAE J1939 CAN bus network. This allows the user to integrate J1939 devices into a Rockwell Logix platform (e.g. ControlLogix or CompactLogix) with minimal effort.

The SAE J1939 protocol is primarily used in the heavy/industrial vehicle industry. It is used for communication and diagnostics between various components and/or sensors used in the vehicle system (e.g. Engine Controller). Due to is widespread popularity it is also used in diesel-power applications, marine propulsion, power generation, and industrial pumping. J1939 provides the user with Parameter Group Numbers (PGNs) which consists of various Suspect Parameter Numbers (SPNs). Numerous PGNs and SPNs are defined by the SAE group and are used to define the data received, scaling, ranges, etc. [Source: www.sae.org]

The J1939 Router provides auto extraction and scaling of SPNs for standard SAE defined PGNs. These SPNs can then be mapped to Logix UDTs Tags which can also be automatically generated by the Slate software. This allows the user to create a J1939 Router project with all the required PGNs and then export a Logix L5X file which contains all the required Tags and UDTs for that specific J1939 Router project. This L5X file can be imported into Logix removing the hassle of creating UDTs for the numerous PGNs.

The J1939 Router is configured using the Aparian Slate application. This program can be downloaded from <u>www.aparian.com</u> free of charge.

The J1939 Router allows the user to select standard specification defined PGNs (e.g. PGN 61444 – Electronic Engine Controller 1) from a list in the Slate software. This will automatically build the mapping and scaling for each SPN which can be downloaded to the module. The user can then export a Logix UDT from the Slate software which maps the PGN selected. This can be imported into a Logix application and used as a destination tag for the configured PGN (greatly simplifying the application setup).



Figure 1.1. – Typical architecture using the J1939 Router

Slate also allows the user to map custom and/or propriety PGNs to a SINT array allowing the user to format the response data in the Logix environment. The module can be configured to either consume data from J1939 devices or produce data for other J1939 devices.

The module also provides a range of statistics to simplify the diagnostic process.

A built-in webserver provides detailed diagnostics of system configuration and operation, including the display of J1939 operation and communication statistics, without the need for any additional software.

1.2. ARCHITECTURE

The figure below provides an example of the typical network setup for connecting various J1939 devices to a Logix controller via the J1939 Router.



Figure 1.2. - Example of a typical network setup for connecting J1939 device to Logix

The next example illustrates how various sensors connected to Logix can produce J1939 data for the consumption of an Engine Control Unit (ECU).



Figure 1.3. – Logix producing J1939 data

1.3. ADDITIONAL INFORMATION

The following documents contain additional information that can assist the user with the module installation and operation.

Resource	Link
Slate Installation	http://www.aparian.com/software/slate
J1939 Router User Manual J1939 Router Datasheet Example Code & UDTs	http://www.aparian.com/products/j1939Router
Ethernet wiring standard	www.cisco.com/c/en/us/td/docs/video/cds/cde/cde205_220_420/installa tion/guide/cde205_220_420_hig/Connectors.html
SAE J1939 Standards	http://www.sae.org/standardsdev/groundvehicle/j1939a.htm

Table 1.1. - Additional Information

1.4. SUPPORT

Technical support is provided via the Web (in the form of user manuals, FAQ, datasheets etc.) to assist with installation, operation, and diagnostics.

For additional support the user can use either of the following:

Resource	Link
Contact Us web link	www.aparian.com/contact-us
Support email	support@aparian.com

Table 1.2. – Support Details

2. INSTALLATION

2.1. MODULE LAYOUT

The module has two ports at the bottom of the enclosure as shown in the figure below. The ports are used for Ethernet and SAE J1939. The 5-way connector also provides power to the module. The Ethernet cable must be wired according to industry standards which can be found in the additional information section of this document.



Figure 2.1. – J1939 Router side and bottom view

The module provides three diagnostic LEDs as shown in the front view figure below. These LEDs are used to provide information regarding the module system operation, the Ethernet interface, and the J1939 interface.



Figure 2.2. – J1939 Router front and top view

The module provides four DIP switches at the top of the enclosure as shown in the top view figure above.

DIP Switch	Description
DIP Switch 1	Used to force the module into "Safe Mode". When in "Safe Mode" the module will not load the application firmware and will wait for new firmware to be downloaded. This should only be used in the rare occasion when a firmware update was interrupted at a critical stage.
DIP Switch 2	This will force the module into DHCP mode which is useful when the user has forgotten the IP address of the module.
DIP Switch 3	Reserved
DIP Switch 4	Applies the 120Ω terminating resistor across the CAN network (switched between Can-H and Can-L).
	NOTE: When the module is at the start or the end of the J1939 network the terminator must be switched on.

Table 2.1. - DIP Switch Settings

2.2. MODULE MOUNTING

NOTE: This module is an open-type device and is meant to be installed in an enclosure suitable for the environment such that the equipment is only accessible with the use of a tool.

The module provides a DIN rail clip to mount onto a 35mm DIN rail.



Figure 2.3 - DIN rail specification

The DIN rail clip is mounted on the bottom of the module at the back as shown in the figure below. Use a flat screw driver to pull the clip downward. This will enable the user to mount the module onto the DIN rail. Once the module is mounted onto the DIN rail the clip must be pushed upwards to lock the module onto the DIN rail.



Figure 2.4 - DIN rail mouting

2.3. J1939 AND POWER

A five-way J1939 connector is used to connect the J1939 CAN bus network as well as the Power+, Power– (GND), and earth. The module requires an input voltage of 10 - 28Vdc. **Refer** to the technical specifications section in this document.



Figure 2.5 – J1939 and Power connector

2.4. ETHERNET PORT

The Ethernet connector should be wired according to industry standards. **Refer** to the additional information section in this document for further details.

3. SETUP

3.1. INSTALL CONFIGURATION SOFTWARE

All the network setup and configuration of the module is achieved by means of the Aparian Slate device configuration environment. This software can be downloaded from http://www.aparian.com/software/slate.



Figure 3.1. - Aparian Slate Environment

3.2. NETWORK PARAMETERS

The module will have DHCP (Dynamic Host Configuration Protocol) enabled as factory default. Thus, a DHCP server must be used to provide the module with the required network parameters (IP address, subnet mask, etc.). There are a number of DHCP utilities available, however it is recommended that the DHCP server in Slate be used.

Within the Slate environment, the DHCP server can be found under the Tools menu.



Figure 3.2. - Selecting DHCP Server

Once opened, the DHCP server will listen on all available network adapters for DHCP requests and display their corresponding MAC addresses.

S DHCP Server								>
MAC Address	Vendor	Requests	Elapsed	Assigned IP	Assign	Status	Identity	
00:60:35:21:AB:2C	Aparian	2	1		Assign	Discover		

Figure 3.3. - DHCP Server

i

NOTE: If the DHCP requests are not displayed in the DHCP Server it may be due to the local PC's firewall. During installation, the necessary firewall rules are automatically created for the Windows firewall. Another possibility is that another DHCP Server is operational on the network and it has assigned the IP address.

To assign an IP address, click on the corresponding "Assign" button. The IP Address Assignment window will open.

5	DHCP Server								<u>_ 🗆 ×</u>
	MAC Address	Vendor	Requests	Elapsed	Assigned IP	Assign	Status	Iden	tity
	00:60:35:21:AB:2C	Aparian	16	2		Assign	Discover		
			S Assign I	P Address	for MAC : 00:60:	35:21:AB:2C	_	<u> </u>	
			19 Address	168 .	1 . 41	192.168.1.2	223		
			🔽 Ena	ble Static (Disable DHCP)				
					Ok	Cancel]		

Figure 3.4. - Assigning IP Address

The required IP address can then be either entered, or a recently used IP address can be selected by clicking on an item in the Recent List.

If the "Enable Static" checkbox is checked, then the IP address will be set to static after the IP assignment, thereby disabling future DHCP requests.

Once the IP address window has been accepted, the DHCP server will automatically assign the IP address to the module and then read the Identity object Product name from the device.

The successful assignment of the IP address by the device is indicated by the green background of the associated row.

IAC Address	Vendor	Requests	Elapsed	Assigned IP	Assign	Status	Identity
0:60:35:21:AB:2C	Aparian	262	6	192.168.1.41	Assign	Set Static	J1939 Router

Figure 3.5. - Successful IP address assignment

It is possible to force the module back into DHCP mode by powering up the device with DIP switch 2 set to the On position.

A new IP address can then be assigned by repeating the previous steps.



NOTE: It is important to return DIP switch 2 back to Off position, to avoid the module returning to a DHCP mode after the power is cycled again.

If the module's DIP switch 2 is in the On position during the address assignment, the user will be warned by the following message.



Figure 3.6. - Force DHCP warning

In addition to the setting the IP address, a number of other network parameters can be set during the DHCP process. These settings can be viewed and edited in Slate's Application Settings, in the DHCP Server tab.

Once the DHCP process has been completed, the network settings can be set using the Ethernet Port Configuration via the Target Browser.

The Target Browser can be accessed under the Tools menu.



Figure 3.7. - Selecting the Target Browser

The Target Browser automatically scans the Ethernet network for EtherNet/IP devices.

S Target B	rowser	
°†≓⊘		Done
1	192.168.1.244 : Cell Connect	^
	192.168.1.121 : 1788-EN2FFR/B	
	192.168.1.243 : Cell Connect	
	192.168.1.245 : Cell Connect	
	192.168.1.181 : J1939 Router	
1	192.168.1.186 : XPosition	
	100 100 1 100 - 17EC ENIOTE/D	

Figure 3.8. - Target Browser

Right-clicking on a device, reveals the context menu, including the Port Configuration option.



Figure 3.9. - Selecting Port Configuration

All the relevant Ethernet port configuration parameters can be modified using the Port Configuration window.

Port Configuration Interfac	ce Statistics Media Statistics	
Network Configuration	Туре	Speed / Duplex Configuration
O Dynamic	Method DHCP V	Auto-negotiate
Static		O Manual
Static Configuration	n	Manual Configuration
IP Address	192 . 168 . 1 . 204	Port Speed 100 V
Subnet Mask	255 _ 255 _ 255 _ 0	Duplex Full Duplex V
Default Gateway	0.0.0.0	
Primary NS	0.0.0.0	General
Secondary NS	0.0.0.0	00-60-25-21-4.0-24
Domain Name		MAC Address 00.00.35.21.AD.2A
Host Name		Refresh

Figure 3.10. - Port Configuration

Alternatively, these parameters can be modified using Rockwell Automation's RSLinx software.

3.3. CREATING A NEW PROJECT

Before the user can configure the module, a new Slate project must be created. Under the File menu, select New.



Figure 3.11. - Creating a new project

A Slate project will be created, showing the Project Explorer tree view. To save the project use the Save option under the File menu.

A new device can now be added by selecting Add under the Device menu.



Figure 3.12. - Adding a new device

lmage	Device Name 🔺	Description	
I	HDLC Router	HDLC to EtherNet/IP Communication Module	
Ð	IP Point Hart In	HART Single Channel Input Communication Module	
Ð	IP Point Hart Out	HART Single Channel Output Communication Module	
	J1939 Router	SAE J1939 to Logix Communication Module	
I	Modbus Router	Modbus to Logix Communication Module	
I	Modbus Router 485	Modbus 485 to Logix Communication Module	
	Process Cache	Process Cache Module	

In the Add New Device window select the J1939 Router, and click the Ok button.

Figure 3.13 – Selecting a new J1939 Router

The device will appear in the Project Explorer tree as shown below, and its configuration window opened. The device configuration window can be reopened by either double clicking the module in the Project Explorer tree or right-clicking the module and selecting *Configuration*.

J1939Router - Configuration	- • ×
General J1939 Communication J1939 Identity Tag Mapping	
Instance Name J1939Router	
Description	
IP Address 0 . 0 . 0 . 0 . Major Revision 1 ~	
Logix Configuration	
Logix Path	
ENIP Retry Limit 3 [0-5]	
ENIP TimeOut 600 ms	
Ok Apply Cancel	

Figure 3.14. – J1939 Router configuration

3.4. J1939 ROUTER PARAMETERS

The J1939 Router parameters are configured using Slate. **Refer** to the additional information section for documentation and installation links for Aparian Slate. The J1939 Router parameter configuration consists of a general configuration, J1939 Communication configuration, J1939 Identity, and Tag Mapping. When downloading this configuration into the module it will be saved in non-volatile memory that persists when the module is powered down.



NOTE: When a firmware upgrade is performed, the module will clear all J1939 Router configuration and routing maps.

Parameter	Description
Instance Name	This parameter is a user defined name to identify between various J1939 Router modules.
Description	This parameter is used to provide a more detail description of the application for the module.
IP Address	The IP address of the target module. The user can use the target browse button to launch the target browser to the select the J1939 Router on the network.
Major Revision	The major revision of the module
Logix Configuration	Logix Path:
	The Logix path is the CIP path to the Logix controller which will be used to exchange data with the various J1939 devices. The user can use the target browse button to launch the target browser to the select the Logix controller on the network.
	ENIP Retry Limit
	The number of EtherNet/IP retries the module will make once no response was received from the Logix Controller.
	ENIP TimeOut
	The time in milliseconds after which a retry is sent. Once the first retry is sent the next retry will be sent after the same amount of time. This will repeat until the ENIP Retry Limit is reached.

The general configuration consists of the following parameters:

Table 3.1 - General configuration parameters

The general configuration is shown in the figure below. The J1939 Router general configuration window is opened by either double clicking on the module in the tree or right-clicking the module and selecting *Configuration*.

J1939Router - Configuration	
General J1939 Communication J1939 Identity Tag Mapping	
Instance Name J1939Router	
Description	
IP Address 192 . 168 . 1 . 180 Major Revision 1	
Logix Configuration	
Logix Path 192.168.1.129,1,0	
ENIP Retry Limit 3 [0-5]	
ENIP TimeOut 600 ms	
Ot Auch Court	
OK Appiy Cancel	

Figure 3.15. - General Configuration

Parameter	Description							
BAUD Rate	The J1939 CAN bus BAUD rate. The following options are available:							
	• 250k							
	• 500k							
Node Address	The module's node address on the J1939 CAN bus network.							
CAN Retry Limit	The number of retries that will be attempted before indicating the device is offline.							
CAN Message Timeout	The response wait period in milliseconds before flagging a no response.							
Arbitrary Address Capable	When this is set the J1939 Router module will start with the configured node address, but if there is a conflict and the J1939 Router has a lower priority it will change its Node address to an open slot and continue operation.							
	NOTE: When this is not set the J1939 Router module will start with the configured node address, but if there is a conflict and the J1939 Router has a lower priority it will stop communicating until a new address has been configured and downloaded.							

The J1939 Communication configuration consists of the following parameters:

Table 3.2 – J1939 Communication parameters

The J1939 Communication configuration is shown in the figure below. The J1939 Communication configuration window is opened by either double clicking on the module in the tree or right-clicking the module and selecting *Configuration*.

S J1939R	outer - Configuration				_ 🗆 🗙
General	J1939 Communication	J1939 Identity	Tag Mapping		
В	AUD Rate	250k	~		
N	ode Address	128	~	Arbitrary Address Capable	
с	AN Retry Limit	3	[0-10]		
c	AN Message Timeout	500	(ms)		
			Ok	Apply Cancel	

Figure 3.16 – J1939 Communication Configuration

The J1939 Identity configuration consists of the following parameters:

Parameter	Description
Industry Group	
Vehicle System	The J1939 Name consists of the following elements. These can
Vehicle System Instance	be configured to provide the J1939 Router with a specific name.
Function	Refer to the 11939 specification (see section 1.3 for additional
Function Instance	information).
ECU Instance	
Manufacturer Code	

Table 3.3 – J1939 Identity parameters

The J1939 Identity configuration is shown in the figure below. The J1939 Identity configuration window is opened by either double clicking on the module in the tree or right-clicking the module and selecting *Configuration*.

J1939Router - Configuration		- 0
General J1939 Communication J193	9 Identity Tag Mapping	
Industry Group	0 - Global (All) v	
Vehicle System	0 ~	
Vehicle System Instance	0 ~	
Function	0 ~	
Function Instance	0 ~	
ECU Instance	0 ~	
Manufacturer Code	5000	
	Ok Apply Cancel	

Figure 3.17 – J1939 Identity Configuration

3.5. MESSAGE ROUTING

The module can be configured to exchange data between a Logix controller and various J1939 devices. This will allow the user to read data from a J1939 device into a Logix controller and/or write data to a J1939 device from a Logix controller.

J1939F	Router - Config	juration									
ieneral J1939 Communication J1939 Identity Tag Mapping											
Logi	Logix Tag Mapping (max. of 40 items.)										
	Function	Remote Node	Custom	PGN	Browse	Size	Ack Req.	Priority	Interval (ms)	Target Tag	Browse
	~	~									
				Ok		Apply		Cancel	He	In	
				OK		Арріу		Cancel	Пе	μh	

Figure 3.18 – Tag Mapping Configuration

Below is a description for each parameter in the Tag Mapping.

Parameter	Description
Function	The operation of the mapped item.
	Consume
	The J1939 Router will receive J1939 PGNs and write the data into Logix tags.
	Produce
	The J1939 Router will read data from Logix tags and transmit PGNs on the J1939 network.
	Refer to the Consume Function and Produce Function sections for more detail.
Remote Node	The destination node that the PGN is mapped to.
	NOTE: Node 255 is a broadcast address.
Custom	The user can select this option to either use a standard SAE defined PGN or a custom manufacturer defined PGN.
	When selecting the Custom PGN option the target Logix tag must be a SINT array and the user will need to decode the data in Logix.
	Refer to the Custom vs Standard PGN section for more detail.
PGN	The PGN number for the specific mapped item.
Size	The size (in bytes) of the PGN data that will be transmitted.
Ack Req.	Each Peer to Peer PGN mapping item to be selected to either send a J1939 ACK (Consume) or wait for a ACK (Produce).
Priority	The priority of the PGN that will be transmitted.
Interval	This is update interval for the specific PGN in milliseconds.
Target Tag	The Logix Tag that will be used to exchange data with the specific J1939 device. The target tag can either be entered manually or if online with the controller the target tag can be updated using the target browser. (See figure below).

Table 3.4 – J1939 Identity parameters







NOTE: If there are duplicate mapping items in the mapping list then only the first mapped item (of all the duplicates) will be executed. The other mapped items will keep requesting the PGN as they are not executing successfully.

3.5.1. CONSUME FUNCTION

When the user has selected the Consume function for a mapped item the J1939 Router will receive the specific PGN and write the data into a Logix tag as shown below.



Figure 3.20 - Consume Function data flow

If no PGN is receive from the specified node within **three** update intervals the J1939 Router will request the mapped PGN from the configured node address.



NOTE: PGNs are made up of various SPNs, but many devices only support certain SPNs which means only certain parts of the PGN returned is valid. The industry norm is to make the SPNs not supported all 1s (e.g. a byte SPN that is not supported will be returned as 0xFF).



NOTE: Some PGNs are of variable length (e.g. PGN 65226 – Active Diagnostics). The user must ensure that the selected Logix tag (of type SINT array) is sufficiently large to accommodate the largest packet size for that specific PGN.

3.5.2. PRODUCE FUNCTION

When the user has selected the Produced function for a mapped item the J1939 Router will read data from a Logix tag and transmit the specific PGN (with the Logix Data reformatted) on the J1939 network as shown below.



Figure 3.21 – Produce Function data flow

The mapped PGN will be transmitted on the J1939 network at the configured update interval.

3.5.3. CUSTOM VS STANDARD PGN

For each mapped item the user can select to either use a standard SAE defined PGN or a custom manufacturer defined PGN. When using a standard PGN the user can use the PGN browse button to select from the list of SAE defined PGNs as shown below.

							E	PGN Select	or				-	•	x		
5	J1939Router - Configuration					Г											
Γ	General J1939 Communication J1939 Identity Tag Mapping					Шſ	PGN	Short Name	B/C	Full Name	SP	N List		^			
Ē										0							Ξ
	Lo	gix Tag Mapp	ing (I	max. of 40) items	i.)				256	TC1		Transmission Control 1	681,682,683,4	4242,684	1,525,68	
		Function		Node		Custom	PGN	Browse Si		1024	XBR		External Brake Request	2920,2914,29	15,2916	,4099,3	
	-									1792	GPV4		General Purpose Valve Pressure	4086,4087,40	88,4089		
	-	Consume	×	0	×		65263		ŧ.	2048	AUXIO5		Auxiliary Input/Output Status 5	4155,4156,41	57,4158		
		Consume	×	0	~		61444		11	2304	SRASI		Static Roll Angle Sensor Information	5582,5583			
	•		ΎΙ		~				-	2560	CCVS2		Cruise Control / Vehicle Speed 2	5603,5604,56	05,8438	,8439,8	
										2816	AEBS2		Advanced Emergency Braking System 2 5681		5681,5682,5683		
										3072	EEC16		Electronic Engine Controller 16 28,7		ł		
										3328	TC2		Transmission Control 2	6569,6570			
										6912	HVES1C1		High Voltage Energy Storage 1 Control 1	8123,8124,81	25,8126	,8127,8	-
										7168	TC3		Transmission Control 3	7037,7038,70	41,7039	,7040,7	
										7424	EIC		Engine Ignition Controller	7355			
										7680	ALTC		Alternator Control	7589,7590,75	591,7592		
										27904	WSPT1		Well Stimulation Pump System Configuration	8860,8861,88	862,8863	,8864,8	
										29184	ODMCC		Oil Debris Monitor Configuration Command	8191,8192,81	93,8194	,8195,8	
										00.110	E 1 51 10500			000000000000			<u> </u>
													Ok Cancel				

Figure 3.22 - PGN selection list

When selecting a standard SAE defined PGN a Logix UDT will be used to map the data from the PGN into Logix. Slate can automatically create the Logix UDTs and Tags (via a Logix L5X file) needed to accurately map the specific variable data (or SPNs). See the *Generating Logix L5X* section for more information regarding this feature.

The J1939 Router module will also automatically scale the J1939 data sent/received as per the SAE PGN standards and definitions.



NOTE: When using Standard SAE defined PGNs it is strongly recommended that the automatic UDT and Tag generation function is used to ensure the correct data structure mapping.



NOTE: Using an incorrectly formed UDT for J1939 data exchange can cause unexpected and dangerous results.

When selecting a custom PGN the Logix Data Type used is a SINT array. The user will need to extract, scale, and reformat the required data in the Logix environment.



NOTE: The L5X generation will also create the Tag (of data type SINT array) for custom PGNs.

3.5.4. GENERATING LOGIX L5X

The standard SAE specified PGN data received from, or being sent to, each J1939 device must be formatted and scaled as per the SAE Standards and Definitions. Each PGN consists of one or more SPNs each with its own data type and scaling. For this reason, a UDT must be used to map the received data in Logix. Slate allows the user to create all the needed Logix UDTs and Tags for each J1939 Router by creating a Logix L5X export file which can simply be imported into Logix. Below are the required steps for generating and importing of the Logix UDTs and Tags required for a J1939 Router.

Once the user has created a J1939 Router project with the required PGN mappings the *Generate Logix L5X* option must be selected as shown below:



Figure 3.23 – Generate Logix L5X Option

Select the destination folder of the L5X export file and press the save button.

5 Select a Logix XMI	nport/Export File		x
← → • ↑ 📕	 This PC > Local Disk (C:) > Aparian > J939 	Search J939	م
Organize 👻 Nev	older		• •
🔚 Desktop	Name Date modified	Туре	Size
📔 Documents	No itoms match your soars	-b	
🔈 Downloads	No tems match your searc	.11.	
🜗 Music			
🔚 Pictures			
🖪 Videos			
💺 Local Disk (0			
🐂 Libraries			
🔮 Network			
• 《 Homegroup			
			>
File name:	1939Router.L5X		~
Save as type:	ogix XML File (*.L5X)		~
∧ Hide Folders		Save	Cancel

Figure 3.24 – Save L5X file

In the Logix environment right click on the User-Defined element under Data Types and select *Import Data Type*.

Controller J1939									
🖨 🔤 Tasks									
🖨 🚭 MainTask									
🗄 🛱 MainProgr	ram	1							
🛄 Unscheduled	Pro	ograms / Phases							
🖶 🚔 Motion Groups	🖨 😂 Motion Groups								
Ungrouped A	xes	5							
Add-On Instruct	ion	S							
🖻 🖾 Data Types									
User-Define		New Data Type							
Strings	010								
Add-On-De		Import Data Type							
Predefined	X	Cut	Ctrl+X						
Trends		Сору	Ctrl+C						
Logical Model	- It. Logical Model 🖻 Paste Ctrl+V								
□ 🕾 I/O Configurati Paste With Configuration Ctrl+Shift+V									
🖨 🛲 1756 Backpla	ne,	1/ 00-A4							
📠 🗓 [0] 1756-L	71.	J1939RouterExample							

Figure 3.25 – Import L5X file into Logix

Select the previous generated L5X file and select open. The required UDTs and configured Tags have now been added to the Logix Controller which directly map to the J1939 Router Slate project configuration.

Controller Organizer - 🗣 🗙	📝 Controller Tags -	J1939Routerl	xample(controller)							
Controller J1939RouterExample	Scope: 10 J1939F	outerExamp ~	Show:	All Tags							✓ Y. Enter
Controller lags	Nome		Eoroo 6	Shil Data T	/D.O.	Descript	tion	Constant			
Power-Up Handler	T-PGN61444	Value ·	I II	Anariar	PGN61444	Descrip	uon				
	+ PGN65263	[]	{}	Apariar	PGN65263						
a la			1	(panai	0.100200						
🖶 🗣 MainProgram	Data Type: A	arianPGN614	44								
Unscheduled Programs / Phases										Droportion	
Motion Groups	Name:	AparianPGN6	1444				Dat	a Type Siz	e: 24 bytes	Extended Pr	oportion
Add-On Instructions	Description									E General	operties
🖃 🖾 Data Types	Description.									Data Tv	ne Sizi
🖨 🖼 User-Defined										Description	tion
- MarianPGN61444	Members:									Descrip	tion
AparianPGN65263	🔺 Name				Data Type	[Descript	tion		Name	Aparian
Strings	EngineTe	orqueMode			SINT				^		
Add-On-Defined	ActualEr	ginePercentTo	orqueFrac	tion	REAL						
Module-Defined	Drivers	emandEngine	PercentT	orque	INT						
- Trends	Dirverse	ernandengine	rereentri	orque							
-Th. Logical Model	ActualEr	ginePercentTo	orque		INT						
□ □ I/O Configuration	EngineS	beed			REAL						
□ 1756 Backplane, 1756-A4	SourceA	ddressofConti	ollingDe	vicefor	INT						
	EngineS	arterMode			SINT						
	EngineD	emandPercen	Torque		INT				~		
Description Size 24 bytes				OK	Can	icel	App	bly	Help		

Figure 3.26 – Imported UDTs and Tags

3.6. MODULE DOWNLOAD

Once the J1939 Router configuration has been completed, it must be downloaded to the module.

Before downloading the Connection Path of the module should be set. This path will automatically default to the IP address of the module, as set in the module configuration. It can however be modified, if the J1939 Router is not on a local network.

The Connection path can be set by right-clicking on the module and selecting the Connection Path option.

5 Aparian-Slate - MyJ1939Route	er*
File Device Tools Windo	ow Help
Project Explorer A MyJ1939Router J1939Router (J1939 Ro	÷ ₽ ×
Configuration	Configuration
	Go Online
	➡ Download
	1 Upload
	Verify Configuration
	🗗 Сору
	C Export
	X Delete

Figure 3.27 - Selecting Connection Path

The new connection path can then be either entered manually or selected by means of the Target Browser.

🛃 J1939Router - Co	onnection Path		- • ×
Connection Path 192.168.1.180			Browse
	Ok	Cancel	

Figure 3.28 - Connection Path

To initiate the download, right-click on the module and select the Download option.

S Aparian-Slate - MyJ1939Router*							
File Device Tools W	lindow Help						
Project Explorer	- # X						
1939Router (J1939	9 Router)						
Configuration	Configuration						
	Connection Path						
	I Go Online						
	Download						
	↑ Upload						
	☑ Verify Configuration						
	🗗 Сору						
	C Export						
	X Delete						

Figure 3.29 - Selecting Download

Once complete, the user will be notified that the download was successful.



Figure 3.30 - Successful download

Within the Slate environment the module will be in the Online state, indicated by the green circle around the module.

The module is now configured and will start operating immediately.

S Aparian-Slate - MyJ1939Router*						
File Device Tools Window Help						
🗄 🖆 🔛 🗶 🗗 👌 🕂 📳 🖾 🗶 🗇						
Project Explorer 👻 🤻 🗘						
MyJ1939Router J1939Router (J1939 Router) Configuration Ethernet Port Config Status Event Viewer J1939 Packet Capture						

Figure 3.31 - Module online

3.7. LOGIX 5000 CONFIGURATION

3.7.1. ADD MODULE TO I/O CONFIGURATION

When the module operates in a Logix "owned" mode the J1939 Router will need to be added to the Logix 5000 I/O tree. The module will need to be added as a generic Ethernet module. This is done by right clicking on the Ethernet Bridge in the Logix 5000 and selecting *New Module* after which the *ETHERNET-MODULE* is selected to be added as shown in the figure below.



NOTE: See the next section for importing the configuration (L5X).

Select Module	×
Module Description - 2097-V34PR3 Kinetix 300, 2A, 480V, No Filter - 2097-V34PR5 Kinetix 300, 6A, 480V, No Filter - 2097-V34PR6 Kinetix 300, 6A, 480V, No Filter - 2364F RGU-EN1 Regen Bus Supply via 1203-EN1 - Drivelogix5730 Ethernet Port. 0/100 Mbps Ethernet Port on DriveLogix5 - ETHERNET-BRIDGE Generic Ethernet/IP CIP Bridge - ETHERNET-PANELVIEVV EtherNet/IP Panelview - EtherNet/IP SoftLogix5800 Ethernet/IP - PowerFilex 4 Class Multi-E Multi Drive via 22-COMM-E - PowerFilex 44-E AC Drive via 22-COMM-E - PowerFilex 40-E AC Drive via 22-COMM-E - PowerFilex 40-E AC Drive via 22-COMM-E	730
By Category By Vendor Favorites	Add Favorite
OK Ce	incel Help

Figure 3.32 - Add a Generic Ethernet Module in Logix 5000

The user must enter the IP address of the J1939 Router that will be used. The assembly instance and size must also be added for the input, output, and configuration in the connection parameters section. Below are the required connection parameters.

Connection Parameter	Assembly Instance	Size	
Input	123	31 (32-bit)	
Output	101	1 (32-bit)	
Configuration	102	0 (8-bit)	

Table 3.5 - Logix class 1 connection parameters for the J1939 Router

Module Prop	erties Report: Eth (ETHERNET-MODU	JLE 1.1)		×
General* Conn	ection Module Info			
Type: Vendor:	ETHERNET-MODULE Generic Etherne Allen-Bradley	t Module		
Parent: Name:	Eth J1939R01	Connection Parar	neters Assembly Instance:	Size:
Description.	~	Input:	123 101	31 ▲ (32-bit) 1 ▲ (32-bit)
Comm Format	Data - DINT v	Configuration:	102	0 ▲ (8-bit)
IP Addres	s: 192 . 168 . 1 . 180	Status Input:		
Host Nam		Status Output:		
Status: Offline	ОК	Cancel	Apply	Help

Figure 3.33 - Logix General module properties in Logix 5000



NOTE: The user will need to enter the exact connection parameters before the module will establish a class 1 connection with the Logix controller.

Next the user needs to add the connection requested packet interval (RPI). This is the rate at which the input and output assemblies are exchanged. The recommended value is 200ms. Refer to the technical specification section in this document for further details on the limits of the RPI.



NOTE: Although the module is capable of running with an RPI of 10ms, it is recommended to set the RPI to 200ms, to avoid unnecessary loading of the module processor.

General Connection* Module Info
Requested Packet Interval (RPI): 200.0 🚔 ms (1.0 - 3200.0 ms)
Inhibit Module
Major Fault On Controller If Connection Fails While in Run Mode
✓ Use Unicast Connection over EtherNet/IP

Figure 3.34 - Connection module properties in Logix 5000

Once the module has been added to the Logix 5000 I/O tree the user must assign the User Defined Types (UDTs) to the input and output assemblies. The user can import the required UDTs by right-clicking on *User-Defined* sub-folder in the *Data Types* folder of the IO tree and selecting *Import Data Type*. The assemblies are then assigned to the UDTs with a ladder copy instruction (COP) as shown in the figure below.



Figure 3.35 – Logix 5000 I/O module tree

3.7.2. IMPORTING UDTS AND MAPPING ROUTINES

To simplify the mapping of the input image, a Logix 5000 Routine Partial Import (L5X) file is provided.

This file can be imported by right-clicking on the required Program and selecting the Import Routine option.



🗸 Import Routine X						
Look in:	📙 J1939 Router					
=1_	Name	^	Date modified	Туре		
	📔 J1939RouterRe	outineAndUDTs.L5X	5/24/2017 5:15 PM	Logix Designer		
Quick access						
Desktop						
-						
Libraries						
This PC						
						
Network	<			>		
	File name:	J1939RouterRoutineAndUDTs.L5X	~	Import		
	Files of type:	RSLogix 5000 XML Files (*.L5X)	\sim	Cancel		
	Files containing:	Routine	~	Help		
	Into:	🛱 MainProgram	~			

Figure 3.37 - Selecting partial import file

The import will create the following:

- The required UDTs (user defined data types)
- Two controller tags representing the Input and Output assemblies.
- A routine mapping the J1939 Router module to the aforementioned tags.

The user may need to change the routine to map to the correct J1939 Router module instance name, and make sure that the mapping routine is called by the Program's Main Routine.



Figure 3.38 - Imported Logix 5000 objects

Refer to the additional information section of this document for an example Logix 5000 project as well as the required UDTs.

4. OPERATION

4.1. MESSAGE ROUTING

Once the module has been configured correctly, the J1939 Router will produce and consume configured PGNs on the J1939 network and route the data to and from the selected Logix tags. Once a transaction has been successfully completed the *Transaction Ok* bit in the mapped items status will be set. Refer to the diagnostics section of this document for a more detailed explanation of the various indicators that can be used to diagnose the module.

With each successful consume transaction the Tag Data will be updated as shown below:

_					
	⊟ PGN65263	{}	$\{\ldots\}$		PGN65263
	-PGN65263.FuelPressue	1020.0		Float	REAL
	PGN65263.BlowbyPressure	12.75		Float	REAL
	-PGN65263.0ilLevel	102.0		Float	REAL
	-PGN65263.0ilPressure	1016.0		Float	REAL
	-PGN65263.CrankCasePressure	510.03906		Float	REAL
	PGN65263.CoolantPressure	510.0		Float	REAL
	PGN65263.CoolantLevel	102.0		Float	REAL

Figure 4.1 – J1939 Router Input and Output Assembly

4.2. LOGIX 5000 ASSEMBLIES

When the module operates in a Logix "owned" mode the Logix controller will establish a class 1 cyclic communication connection with the J1939 Router. An input and output assembly is exchanged at a fix interval (RPI). The UDTs provided will convert the input and output arrays into tag based assemblies. Refer to the additional information section in this document for the input and output UDTs.

4.2.1. INPUT ASSEMBLY

The following parameters are used in the input assembly of the module.

Parameter	Datatype	Description
InstanceNameLen	DINT	This parameter is the instance name length of the module that was configured under the general J1939 Router configuration in Slate.
InstanceName	SINT[16]	This parameter is the instance name of the module that was configured under the general J1939 Router configuration in Slate.

Status.ConfigValid	BOOL	Set if a valid configuration is executing in the module.
Status. Duplicate Node	BOOL	Set if a duplicate node is detected on the network.
TransactionRate	DINT	The transaction rate is the number of J1939 messages per second that the module is currently routing.
DeviceTemperature	REAL	The internal temperature of the J1939 Router module.
RxCANCount	DINT	Received CAN message count.
TxCANCount	DINT	Transmitted CAN message count.
CANCrcCount	DINT	CAN CRC failed message count.
CANBitError	DINT	CAN Bit error count.
CANStuffError	DINT	CAN Stuff error count.
J1939ReqTxCount	DINT	J1939 PGN Request Transmitted count.
J1939ReqRxCount	DINT	J1939 PGN Request Received count.
J1939ResTxCount	DINT	J1939 PGN Response Transmitted count.
J1939ResRxCount	DINT	J1939 PGN Response Received count.
TagReads	DINT	The total number of Logix tag reads executed by the module.
TagWrites	DINT	The total number of Logix tag writes executed by the module.
ConnectionFailures	DINT	The number of failed class 3 connection attempts.
		Note: Logix tag reading and writing requires the module to first establish a class 3 connection with the Logix Controller.
TagErrors	DINT	The number of failed tag access (read/write) requests.
		These may include privileged violations, non-existing tags, etc.
MappedItems	SINT[40]	Each mapped item has status bits to provide feedback of its operation.
		Bit 0 – Transaction Ok
		If this bit is set it means that the specific mapped item is successfully communicating between the J1939 device and the Logix controller.
		Bit 1-7 – Reserved
		These bits are reserved for future use.

Table 4.1 - Logix 5000 input assembly parameters

4.2.2. OUTPUT ASSEMBLY

The following parameters are used in the output assembly of the module.

Parameter	Datatype	Description
Reserved	DINT	This DINT is reserved for future use.

Table 4.2 - Logix 5000 output assembly parameters

An excerpt of the Input Image is shown in the following figure.

Name	-8 4	Value 🔸	Force Mask 🔹 🔦	Style	Data Type
⊟-J1939R01Input		{}	{}		AparianJ1939RInputData
		0		Decimal	DINT
∃ J1939R01Input.InstanceName		{}	{}	Decimal	SINT[16]
- J1939R01Input.Status		{}	{}		AparianJ1939RInputStatus
J1939R01Input.Status.ConfigValid		0		Decimal	BOOL
J1939R01Input.Status.DuplicateNode		0		Decimal	BOOL
J1939R01Input.TransactionRate		0		Decimal	DINT
-J1939R01Input.Temperature		0.0		Float	REAL
J1939R01Input.RxCANCount		0		Decimal	DINT
J1939R01Input.TxCANCount		0		Decimal	DINT
J1939R01Input.CANCrcCount		0		Decimal	DINT
J1939R01Input.CANBitError		0		Decimal	DINT
J1939R01Input.CANStuffError		0		Decimal	DINT
J1939R01Input.J1939ReqTxCount		0		Decimal	DINT
J1939R01Input.J1939ReqRxCount		0		Decimal	DINT
		0		Decimal	DINT
J1939R01Input.J1939ResRxCount		0		Decimal	DINT
J1939R01Input.TagReadCount		0		Decimal	DINT
■ J1939R01Input.TagWriteCount		0		Decimal	DINT
J1939R01Input.TagConnFailCount		0		Decimal	DINT
J1939R01Input.TagErrorCount		0		Decimal	DINT
🗄 J1939R01Input.MappedItems		{}	{}	Decimal	SINT[40]

Figure 4.2 – J1939 Router Input and Output Assembly

5. DIAGNOSTICS

5.1. LEDS

The module provides three LEDs for diagnostics purposes as shown in the front view figure below. A description of each LED is given in the table below.



Figure 5.1 - J1939 Router front view

LED	Description
Ok	The module Ok LED will provide information regarding the system-level operation of the module. If the LED is red then the module is not operating correctly. For example, if the module application firmware has been corrupted or there is a hardware fault the module will have a red Module LED.
Eth	The Ethernet LED will light up when an Ethernet link has been detected (by plugging in a connected Ethernet cable). The LED will flash every time traffic was detected.
Act	The activity LED is used for indicating successful (green) or failed (red) routing transactions.

Table 5.1 - Module LED operation

5.2. MODULE STATUS MONITORING IN SLATE

The J1939 Router can provide a range of statistics which can assist with module operation, maintenance, and fault finding. The statistics can be accessed in full by Slate or using the web server in the module.

To view the module's status in the Aparian-Slate environment, the module must be online. If the module is not already Online (following a recent configuration download), then right-click on the module and select the *Go Online* option.



Figure 5.2. - Selecting to Go Online

The Online mode is indicated by the green circle behind the module in the Project Explorer tree.



Figure 5.3. - Selecting online Status

The Status monitoring window can be opened by either double-clicking on the *Status* item in the Project Explorer tree, or by right-clicking on the module and selecting *Status*.

The status window contains multiple tabs to display the status of the module. Most of these parameters in the status windows are self-explanatory or have been discussed in previous sections.

J1939Router - Status		
General J1939 Statistics	CAN Statistics Logix Statistics	Map Items Node List PGN Live List CIP Statistics Ethernet Clients TCP / ARP
Owned	Owned	MAC Address 00:60:35:1F:FA:F5
Transaction Rate	90	Temperature 43.6 °C
Up Time	0d - 22:27:41	Processor Scan 9.8 us
Configured Node	128	Ethernet Cable Length ≈ 5 m
Actual Node	128	DIP Switches SW1 - Safe Mode Off
Node Status	Ok	SW2 - Force DHCP Off
		SW3 - Reserved Off
		SW4 - Reserved Off
		(Updated only on boot up.)

Figure 5.4. - Status monitoring - General

The General tab displays the following general parameters and can also be used to set the module time to the PC time:

Parameter	Description
Owned	Indicates whether the module is currently owned (Class 1) by a Logix controller.
Transaction Rate	The transaction rate is the number of J1939 messages per second that the module is currently routing.
Up Time	Indicates the elapsed time since the module was powered-up.
Configured Node	The user required node address as specified in the module configuration.
Actual Node	The actual node address currently being used by the module. Note: The actual node address may be different from the configured node address if a node conflict was detected and the module's Arbitrary Address Capable option has been enabled.
Node Status	Indicates if a node conflict has been detected.

MAC Address	Displays the module's unique Ethernet MAC address.
Temperature	The internal temperature of the module.
Processor Scan	The amount of time (microseconds) taken by the module's processor in the last scan.
Ethernet Cable Length	Approximate length of the Ethernet cable (accurate to 5m).
DIP Switch Position	The status of the DIP switches when the module booted. Note that this status will not change if the DIP switches are altered when the module is running.

Table 5.2 - Parameters displayed in the Status Monitoring – General Tab

J1939 Statistics			Clear Counters	
Counter	Value	Counter	Value	
Request Tx Count	280	Ack Tx Count	0	
Request Rx Count	280	Ack Rx Count	0	
Response Tx Count	0	Nack Tx Count	0	
Response Rx Count	270761	Nack Rx Count	0	
Addr Claim Tx Count	0	Incorrect CIP Data Type	0	
Addr Claim Rx Count	280	Incorrect Function Assigned	0	
Multipacket Tx Count	0	Mapped Item Not Found	14700	
Multipacket Rx Count	12594	Incorrect CIP Tag Id	0	

Figure 5.5. - Status monitoring – J1939 Statistics

The J1939 Statistics tab displays the following general parameters:

Parameter	Description
Request Tx Count	J1939 PGN Request Transmitted count.
Request Rx Count	J1939 PGN Request Received count.
Response Tx Count	J1939 PGN Response Transmitted count.
Response Rx Count	J1939 PGN Response Received count.
Addr Claim Tx Count	J1939 Address Claim messages sent.
Addr Claim Rx Count	J1939 Address Claim messages received.

Multipacket Tx Count	J1939 Connection Management packets sent.
Multipacket Rx Count	J1939 Connection Management packets received.
Ack Tx Count	J1939 Acknowledge messages sent.
Ack Rx Count	J1939 Acknowledge messages received.
Nack Tx Count	J1939 Negative Acknowledge messages sent.
Nack Rx Count	J1939 Negative Acknowledge messages received.
Incorrect CIP Data Type	Configured Data Type was not received from the specific tag.
Incorrect Function Assigned	A request was received for a consume function mapped item or a response was received for a produce function mapped item.
Mapped Item Not Found	A PGN and/or node was received that is not part of the mapped item list.
Incorrect CIP Tag Id	The expected CIP Tag Id was not received.

Table 5.3 - Parameters displayed in the Status Monitoring – J1939 Statistics Tab

J1939Router - Status						- • ×
General J1939 Statistics CAN Statis	tics Logix Statistics	Map Items	PGN Live List	CIP Statistics	Ethernet Clients	TCP / ARP
CAN Statistics	Clear Counters					
Counter	Value					
RxCanPacketCount	285905					
TxCanPacketCount	42865					
CAN CRC Errors	0					
CAN Bit Errors	0					
Can Stuff Errors	0					

Figure 5.6. - Status monitoring – CAN Statistics

The CAN Statistics tab displays the following general parameters:

Parameter	Description
RxCANPacketCount	Received CAN message count.
TxCANPacketCount	Transmitted CAN message count.

CAN CRC Errors	CAN CRC failed message count.
CAN Bit Errors	CAN Bit error count.
CAN Stuff Errors	CAN Stuff error count.

Table 5.4 - Parameters displayed in the Status Monitoring – CAN Statistics Tab

neral J1939 Statistics CAN Stati	stics Logix Statistics	Map Items	PGN Live List	CIP Statistics	Ethernet Clients	TCP / ARP
Logix Statistics	Clear Counters					
Counter	Value					
Current Connections	0					
Connection Failures	0					
Tag Not Exist Errors	0					
Privilege Violations	0					
Tag Reads	0					
Tag Writes	0					
ENIP Retries	0					
ENIP Failures	0					
General Access Errors	0					

Figure 5.7. - Status monitoring – Logix Statistics

The Logix Statistics tab displays the following general parameters:

Parameter	Description
Current Connections	The number of current open class 3 connections.
Connection Failures	The number of failed attempts at establishing a class 3 connection with a Logix controller.
Tag Not Exist Errors	The number of tag read and tag write transactions that failed due to the destination tag not existing.
Privilege Violations	The number of tag read and tag write transactions that failed due to a privilege violation error.
	This may be caused by the External Access property of the Logix tag being set to either None or Read Only.
Tag Reads	The number of tag read transactions executed by the DF1 Router module.
Tag Writes	The number of tag write transactions executed by the DF1 Router module.

ENIP Retries	This count increases when no response was received from the Logix Controller by the time the ENIP timeout is reached.
ENIP Failures	This count increases when the ENIP Retry Limit is reached and no response has been received from the Logix Controller.
Tag Access General Error	This count increases when a tag cannot be accessed for any other reason not reported above.

Table 5.5 - Parameters displayed in the Status Monitoring – Logix Statistics Tab

eral J1939	Statistics	CAN Sta	tistics Log	ix Statistics Map Items Node List PGN Live Li	st CIP Statistics	Ethernet Clients	TCP / ARP	
							·	
Function	Interval	Node	PGN	Tagname	Tx Count	Rx Count	Timeouts	^
Consume	1000	0	61444	PGN61444	0	4074808	0	
Produce	1000	128	126720	PGN126720	81615	81616	0	
Produce	1000	255	65280	PGN65280	81614	0	0	
Produce	1000	255	65281	PGN65281	81614	0	0	
Produce	1000	255	65226	PGN65226Tx	81614	0	0	
Produce	1000	255	65282	PGN65282	81614	0	0	
Produce	1000	255	65283	PGN65283	81614	0	0	
Produce	1000	255	65284	PGN65284	81614	0	0	
Produce	1000	255	65285	PGN65285	81614	0	0	
Produce	1000	255	65286	PGN65286	81614	0	0	
Produce	1000	255	65287	PGN65287	81614	0	0	
Produce	1000	255	65288	PGN65288	81614	0	0	
Produce	1000	255	65289	PGN65289	81614	0	0	
Produce	1000	255	65290	PGN65290	81614	0	0	
Produce	1000	255	65291	PGN65291	81614	0	0	
Produce	1000	255	65292	PGN65292	81614	0	0	

Figure 5.8. - Status monitoring – Mapped Item Status

The Mapped Item tab displays the following general parameters:

Parameter	Description
Function	The operation of the mapped item.
	Consume
	The J1939 Router will receive PGNs and write the data into Logix tags.
	Produce
	The J1939 Router will read data from Logix tags and transmit PGNs onto the J1939 network.
	Refer to the <i>Consume Function</i> and <i>Produce Function</i> sections for more detail.
Interval	This is update interval for the specific PGN in milliseconds.

Node	The destination node that the PGN is mapped to.
PGN	The PGN number for the specific mapped item.
Controller	The Logix Controller used.
Tagname	The Logix Tag that will be used to exchange data with the specific J1939 device.
Tx Count	Request Data Count.
Rx Count	Receive Data Count.
Timeouts	The amount of times a PGN response was not received within the interval time.

Table 5.6 - Parameters displayed in the Status Monitoring – Mapped Item Tab

The Node List displays all the active nodes on the CAN bus network, and their current status and name information.

- Status											- C
Statistics CAN Statistics	Logix Statistics	Map Items	Node List	PGN Live Li	st CIP Statistics	s Ethernet Clients	TCP / ARP				
Manufacturer	Identity	Protect	Amber Lamp	Red Stop Lamp	Malfunction Lamp	Industry Group	Vehicle System	Vehicle System Instance	Function	Function Instance	ECU Instance
[0]	0x0	-	Amber	-	-	0 - Global (All)	0	0	0	0	0
[904]	0x1D5F5F71	Protect	Amber	Stop	Malfunction	0 - Global (All)	0	0	28	0	0
[001]		Totoot		otop	Mananotain	o clobal (ray	Ū	Ū	20	Ū	
	Statistics CAN Statistics Manufacturer [0] [904]	Statistics CAN Statistics Logix Statistics Manufacturer Identity [0] 0x0 [904] 0x1D5F5F71	Statistics CAN Statistics Logix Statistics Map Items Manufacturer Identity Protect [0] 0x0 - [904] 0x1D5F5F71 Protect	Statistics CAN Statistics Logix Statistics Map Items Node List Manufacturer Identity Protect Amber Lamp [0] 0x0 - Amber [904] 0x1D5F5F71 Protect Amber	Statistics CAN Statistics Logix Statistics Map Items Node List PGN Live Live Manufacturer Identity Protect Amber Red Stop Lamp [0] 0x0 - Amber - [904] 0x1D5F5F71 Protect Amber Stop	Statistics CAN Statistics Logix Statistics Map Items Node List PGN Live List CIP Statistic Manufacturer Identity Protect Amber Lamp Red Stop Lamp Malfunction [0] 0x0 - Amber - [904] 0x1D5F5F71 Protect Amber Stop	Statistics CAN Statistics Logix Statistics Map Items Node List PGN Live List CIP Statistics Ethernet Clients Manufacturer Identity Protect Amber Lamp Red Stop Lamp Malfunction Lamp Industry Group [0] 0x0 - Amber - 0 - Global (All) [904] 0x1D5F5F71 Protect Amber Stop Malfunction 0 - Global (All)	Statistics CAN Statistics Logix Statistics Map Items Node List PGN Live List CIP Statistics Ethernet Clients TCP / ARP Manufacturer Identity Protect Amber Lamp Red Stop Lamp Malfunction Lamp Industry Group Vehicle System [0] 0x0 - Amber - 0 - Global (All) 0 [904] 0x1D5F5F71 Protect Amber Stop Malfunction 0 - Global (All) 0	Statistics CAN Statistics Logix Statistics Map Items Node List PGN Live List CIP Statistics Ethernet Clients TCP / ARP Manufacturer Identity Protect Amber Lamp Red Stop Lamp Malfunction Lamp Industry Group Vehicle System Vehicle System [0] 0x0 - Amber - 0 - 0 - [904] 0x1D5F5F71 Protect Amber Stop Malfunction 0 0 0	Statistics CAN Statistics Logix Statistics Map Items Node List PGN Live List CIP Statistics Ethermet Clients TCP / ARP Manufacturer Identity Protect Amber Lamp Red Stop Lamp Mafunction Lamp Industry Group Vehicle System Vehicle System Vehicle System Function [0] 0x0 - Amber - 0 0 0 0 [904] 0x1D5F5F71 Protect Amber Stop Malfunction 0 0 0 28	Statistics Capix Statistics Map Items Node List PGN Live List CIP Statistics Ethermet Clients TCP / ARP Manufacturer Identity Protect Amber Lamp Red Stop Lamp Malfunction Lamp Industry Group Vehicle System Vehicle System Function Instance [0] 0x0 - Amber - 0 0 clobal (All) 0 0 0 [904] 0x1D5F5F71 Protect Amber Stop Malfunction 0 0 28 0

Figure 5.9. - Status monitoring – Node List

The PGN Live List provides the user with the PGNs being sent from each node on the network. Note that only the first 100 PGNs are displayed.

PGN and Node combinations that are included in the mapped configuration are displayed with a blue background.

Node	PGN	Description	
0	61444	Electronic Engine Controller 1	
0	65262	Engine Temperature 1	
0	65263	Engine Fluid Level/Pressure 1	
0	65271	Vehicle Electrical Power 1	
0	65226	-	
0	65253	Engine Hours, Revolutions	

Figure 5.10. - Status monitoring – PGN Live List

5.3. J1939 PACKET CAPTURE

The module provides the capability to capture the J1939 traffic for analysis. The will allow the user and a remote support team to resolve any possible issues on site. To invoke the capture of the module, double-click on the J1939 Packet Capture item in the Project Explorer tree.



Figure 5.10 - Selecting J1939 Packet Capture

The J1939 Packet Capture window will open and automatically start capturing all J1939 packets.

5 J1939Rou	uter - J1939 Pac	ket Capture								
E 🔛 🗙 🕚	0									
Index	 Time 	Status	Dirn	Src	Dest	Description	Address	Detail	TNS	Data
	Press STOP to	o view result	s.							
Capturing	Packets : 13	36								

Figure 5.11 – J1939 packet capture

To display the captured J1939 packets, the capture process must first be stopped, by pressing the Stop button.

Index 4	Time	Status	Dirn	Mode	Src	Dest	PGN	Description	Data	
3792979	0d - 22:53:45.110	Ok	Rx	Peer-to-Peer	129	128	CM.DT	Data Transfer - Seq: 003	81 80 EB 18 03 0F FF FF FF FF FF FF	
3792980	0d - 22:53:45.130	Ok	Rx	Broadcast	0	-	61444	-	00 04 F0 0C FF FF FF 00 00 FF FF FF	
3792981	0d - 22:53:45.150	Ok	Rx	Broadcast	0	-	61444	-	00 04 F0 0C FF FF FF 00 00 FF FF FF	
3792982	0d - 22:53:45.170	Ok	Rx	Broadcast	0	-	61444	-	00 04 F0 0C FF FF FF 00 00 FF FF FF	
3792983	0d - 22:53:45.190	Ok	Rx	Broadcast	0	-	61444	-	00 04 F0 0C FF FF FF 00 00 FF FF FF	
3792984	0d - 22:53:45.210	Ok	Tx	Peer-to-Peer	128	129	EMAck	CM:End of Message Ack PG	80 81 EC 18 13 0F 00 03 FF 00 EF 00	j –
3792985	0d - 22:53:45.210	Ok	Rx	Broadcast	0	-	61444	-	00 04 F0 0C FF FF FF 00 00 FF FF FF	
3792986	0d - 22:53:45.230	Ok	Rx	Broadcast	0	-	61444	-	00 04 F0 0C FF FF FF 00 00 FF FF FF	
3792987	0d - 22:53:45.250	Ok	Rx	Broadcast	0	-	61444	-	00 04 F0 0C FF FF FF 00 00 FF FF FF	
3792988	0d - 22:53:45.270	Ok	Rx	Broadcast	0	-	61444	-	00 04 F0 0C FF FF FF 00 00 FF FF FF	
3792989	0d - 22:53:45.290	Ok	Rx	Broadcast	0	-	61444	-	00 04 F0 0C FF FF FF 00 00 FF FF FF	
3792990	0d - 22:53:45.310	Ok	Rx	Broadcast	0	-	61444	-	00 04 F0 0C FF FF FF 00 00 FF FF FF	
3792991	0d - 22:53:45.320	Ok	Rx	Peer-to-Peer	129	255	CM.MP	CM:Multipacket PGN: 65280	81 FF EC 18 20 19 00 04 FF 00 FF 00	
3792992	0d - 22:53:45.320	Ok	Rx	Broadcast	129	-	PB	Proprietary B	81 01 FF 18 05 00 00 06 00 00 00 63	
3792993	0d - 22:53:45.330	Ok	Rx	Broadcast	0	-	61444	-	00 04 F0 0C FF FF FF 00 00 FF FF FF	
3792994	0d - 22:53:45.340	Ok	Rx	Broadcast	129	-	65226	-	81 CA FE 18 55 00 00 00 00 00 00 00)
3792995	0d - 22:53:45.340	Ok	Rx	Broadcast	129	-	PB	Proprietary B	81 02 FF 18 01 02 00 00 00 00 2D 38	
3792996	0d - 22:53:45.350	Ok	Rx	Broadcast	0	-	61444	-	00 04 F0 0C FF FF FF 00 00 FF FF FF	_
3792997	0d - 22:53:45.350	Ok	Rx	Broadcast	0	-	65262	-	00 EE FE 18 FE FF FF FF FF FF FF FF	:
3792998	0d - 22:53:45.350	Ok	Rx	Broadcast	0	-	65263	-	00 EF FE 18 FF FF FF FE FF FF FF	
3792999	0d - 22:53:45 350	Ok	Bx	Peer-to-Peer	0	255	CM MP	CM:Multipacket PGN: 65226	00 FE EC 18 20 0A 00 02 FE CA FE 00	5

Figure 5.12 – J1939 Packet Capture complete

The captured J1939 packets are tabulated as follows:

Statistic	Description
Index	The packet index, incremented for each packet sent or received.
Time	The elapsed time since the module powered up.
Status	The status of the packet. Received packets are checked for valid J1939 constructs and valid checksums.

Dirn	The direction of the packet, either transmitted (Tx) or received (Rx).
Mode	The message can be either a Peer to Peer or Broadcast message.
Src	J1939 Source Address
Dest	J1939 Destination Address
PGN	The PGN Number used in the Message ID
Description	Description of the packet that was received.
Data	The raw packet data.

Table 5.7 – J1939 Packet Capture fields

The packet capture can be saved to a file for further analysis, by selecting the *Save* button on the toolbar. Previously saved J1939 Packet Capture files can be viewed by selecting the *J1939 Packet Capture Viewer* option in the tools menu.



Figure 5.13 - Selecting the J1939 Packet Capture Viewer

5.4. MODULE EVENT LOG

The J1939 Router module logs various diagnostic records to an internal event log. These logs are stored in non-volatile memory and can be displayed using Slate or via the web interface. To view them in Slate, select the Event Viewer option in the Project Explorer tree.



Figure 5.14. - Selecting the module Event Log

The Event Log window will open and automatically read all the events from the module. The log entries are sorted so as to have the latest record at the top. Custom sorting is achieved by double-clicking on the column headings.

5 J1	939Route	er - Event Viewer			- X
	2 X				
	Uploade	d 23 records.		Filter (All)	~
	Index 💌	Time	Up Time	Event	^
	22	2010/01/01 21:42:32	0d - 00:00:38	Config valid	
	21	2010/01/01 21:41:55	0d - 00:00:01	Ethernet link up	
	20	2010/01/01 21:41:55	0d - 00:00:01	Application code running	
	19	2010/01/01 21:41:53	0d - 00:00:00	Config CRC fail	
	18	2010/01/01 21:41:52	0d - 00:03:27	Module reset	
	17	2010/01/01 21:41:48	0d - 00:03:27	Firmware update started	

Figure 5.15. – Module Event Log

The log can also be stored to a file for future analysis, by selecting the Save button in the tool menu. To view previously saved files, use the Event Log Viewer option under the tools menu.

5.5. WEB SERVER

The J1939 Router provides a web server allowing a user without Slate or Logix 5000 to view various diagnostics of the module. This includes Ethernet parameters, system event log, advanced diagnostics, and application diagnostics (J1939 statistics).



NOTE: The web server is view **only** and thus no parameters or configuration can be altered from the web interface.

Aparian ×		≛ – ⊡ ×		
\leftarrow \rightarrow C (i) 192.168.1.180		☆ :		
Module: J1939 Router Serial: 351FFAF5 Firmware Rev: 1.1				
Overview	Device Name	J1939 Router		
Ethernet	Serial number	351FFAF5		
Event Logs	Firmware Revision	1.1		
Diagnostics Application	Module Status	Configured and Owned		
	Vendor Id	1370		
	Product Type	12		
	Product Code	126		
	Uptime	4h 59m 16s		
	Switches	0:0:0:0		
	Temperature	40.8298°C		
Copyright 2015 Aparian Inc. All rights reserved				

Figure 5.16. - Web interface

6. TECHNICAL SPECIFICATIONS

6.1. DIMENSIONS

Below are the enclosure dimensions as well as the required DIN rail dimensions. All dimensions are in millimetres.



Figure 6.1 – J1939 Router enclosure dimensions



Figure 6.2 - Required DIN dimensions

6.2. ELECTRICAL

Specification	Rating
Power requirements	Input: 10 – 28V DC, (70 mA @ 24 VDC)
Power consumption	1.7 W
Connector	5-way terminal, 5.08mm pitch.
Conductors	24 – 18 AWG
Enclosure rating	IP20, NEMA/UL Open Type
Temperature	-20 – 70 °C
Earth connection	Yes, terminal based
Emissions	IEC61000-6-4
ESD Immunity	EN 61000-4-2
Radiated RF Immunity	IEC 61000-4-3
EFT/B Immunity	EFT: IEC 61000-4-4
Surge Immunity	Surge: IEC 61000-4-5
Conducted RF Immunity	IEC 61000-4-6

Table 6.1 - Electrical specification

6.3. ETHERNET

Specification	Rating
Connector	RJ45
Conductors	CAT5 STP/UTP
ARP connections	Max 20
TCP connections	Max 20
CIP connections	Max 10
Communication rate	10/100Mbps
Duplex mode	Full/Half
Auto-MDIX support	Yes

Table 6.2 - Ethernet specification

6.4. J1939 NETWORK

Specification	Rating
Connector	5-way terminal, 5.08mm pitch.
Max PGN Mapping	40
Max PGN size supported	480 bytes
Supported Baud Rates	250k
	500k
Arbitrary Address Capable	Yes
Support for multi-packets	Yes
Configurable J1939 Name	Yes

Table 6.3 – J1939 specification

6.5. CERTIFICATIONS

Certification	Mark
CE Mark	CE
RoHS2 Compliant	RoHS ₂
UL Mark	
File: E494895	cUlus
	LISTED
	CLASS 1, DIV 2, GROUPS A, B, C, D

Table 6.4 – Certifications

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