GarTech LUIS Gen2 User's Guide Version 2.0

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The Load Box User Interface System

Introduction

Introduction	The Load Box User Interface System, LUIS, is an engine simulator used to facilitate bench top engine control system hardware and software testing. The second generation LUIS system, LUIS Gen2, provides expanded capabilities from the original LUIS.
LUIS Physical Description	The LUIS is a bench top, PC controlled customizable load box. A standard LUIS Gen2 system configuration contains:
	 Main Module Wavemaker Module 2 Analog Modules Switch Module Resistive Loads Module Injector and Application Specific Loads Module

In addition, the user can request additional modules of each type depending on what is needed for their application. New modules are constantly being developed along with the ability to create custom modules for specific applications. Check with the GarTech engineering staff for additional information.

This is a picture of a standard LUIS Gen2 system configuration.



Introduction, Continued

 Open and closed loop engine speed simulation
• WaveMaker waveform generator, 8 channel arbitrary and 10 channel digital frequency outputs
• LUIS Gen2 PC application allowing user complete control over I/O setup
• Creation of configuration files to set up I/O for specific tests
• Up to 128 16 bit DAC outputs
• Up to 80 switch outputs
• (1) 30A relay output
• (4) 15A VBATT switched relay outputs
• Up to 72 resistive load inputs
• J1939 message simulation
• Upgradable firmware

Chapter 1 – Installation and Setup

Overview		
LUIS Hardware	The LUIS Gen2 has a main module that is connected to the PC v Additional modules can be added including Wavemaker, Switch Resistive Loads to customize the system to fit the user's specific	, Analog and
LUIS Gen2 Software	The LUIS Gen2 comes with a graphical user interface for control outputs as well as for setting up closed loop controls and J1939	0
In This Section	This table outlines the topics covered in this section.	
	Торіс	See Page
	Software	4
	Hardware	6

Section 1 – Software

Software			
Introduction	The LUIS Gen2 has a graphical user interface that runs in the Windows environment. The LUIS GUI is made up of a tab system with a toolbar specific to each tab.		
LUIS GUI Basic Environment	This diagram an	This diagram and table describe the basic LUIS Gen2 GUI environment.	
Environment		i Jajak mel Dan traktura System	
2	Hane Tools Vew Help	Tables Waveforms Channels Sensor Core Serie Clarkults Defaults Tables Waveforms Channels Datales Core Serie Clarkults Defaults	
3		erface System Former so where there such both watcherterprises.com There aloue us products maintening services download center circuit list products form products form products form Company Departure Product form Company Departure Product form Product form Product form 	
		Description	
	1	Main Menu and Quick Access Toolbar	
	2	Tabs – Options change based on the tab selected	
	3	Workspace – All windows display in this space.	

Software, Continued

Windows	Activities within the LUIS Gen2 environment occur in windows which display in the workspace. Like any Windows 7 application, windows can be closed by clicking the X in the right-hand corner. By default, the Startup window displays when LUIS is started. This includes a list of recently used configurations, new help topics, news and the Gartech website. The LUIS software can be configured to not show the Startup Window by clicking the Defaults menu option on the Home tab and changing the <i>No Startup Page</i> option.
Downloading and Installing Drivers	Before the LUIS Gen2 hardware and software can be installed, the driver must be downloaded and installed. Go to www.gartechenterprises.com and visit the download center to download and then follow the on-screen steps to install.
Downloading and Installing Software	To install the LUIS Gen2 graphical user interface, visit the www.gartechenterprises.com download center and download the software. Follow the on-screen instructions to install the software.

Section 2 – Hardware

Overview		
ntroduction	LUIS Gen2 provides the ability to run a standard h add additional modules as needed.	nardware configuration or
n This Section	This table outlines the topics covered in this section	on.
This Section	This table outlines the topics covered in this section	on. See Page
1 This Section	•	
n This Section	Торіс	See Page

Ordering Hardware

Gartech Contact	All hardware can be ordered from GarTech Enterprises, Inc.
Information	Gartech Enterprises, Inc.
	3037 W. State Road 256 Austin, IN 47102
	812-794-4796
	www.gartechenterprises.com
	info@gartechenterprises.com

GarTech Part

This table lists the part number and descriptions for the LUIS hardware.

Numbers

Part Number	Description
G01641-00	LUIS Gen2 Assembly:
	(1) Main Module
	(1) WavemakerIII Module
	(2) Analog Modules
	(1) Switch Module
	(1) Resistive Loads Module
	(1) Injector Loads Module
G01800-00	Main Module and Wavemaker III Module
G01801-00	Analog Module
G01802-00	Switch Module
G01803-00	Resistive Loads Module

GarTech Wiring Harnesses The user can specify how they would like to connect the I/O from the LUIS hardware to the target application and a custom harness can be designed.

Setting Up a Standard LUIS Gen2

Introduction	The setup for a standard LUIS Gen 2 box is simple, requiring no special tools. Any ECM can be mounted to the top of the unit by moving the screw-in mounting pegs. It is then connected through a simple color-coded system. The unit communicates with the PC through a standard USB connection.
Hardware Needed	To set up the LUIS Gen2, the following hardware is required.
	Standard LUIS
	• PC
	Electronic Control Module
	Wiring Harness
	• DC Power Cable
	• DC Power Supply
	• AC Power Cable
	• USB Cable
	Loads Module Cable
	Communications Cable
Setting Up the Hardware	This table outlines the physical connections required to set up the hardware to run a standard LUIS Gen2.

Step	Action
1	Unscrew and configure the ECM pegs on top of the box, shown in Figure 1, to accommodate the ECM and mount the ECM on the pegs.
2	Using the appropriate Wiring Harness, connect the Control Module to the LUIS Gen2 using the color coded ports on the back of the LUIS Gen2 box.
4	Connect the 8 pin <i>Unswitched Power Out</i> connector port on the back of the LUIS Main Module
5	Using the DC Power Cable, connect the LUIS Gen2 to the DC Power Supply using the <i>Vbatt In</i> port on the back of the LUIS Gen2, shown in Figure 2. <u>Note</u> : The DC Power Cable has a locking tab that must be
	depressed when disconnecting.

Setting Up a Standard LUIS Gen2, Continued

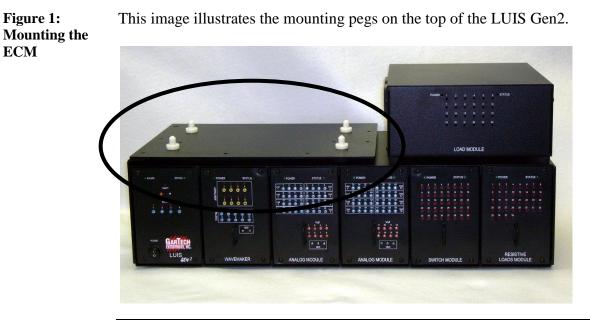


Figure 2: **DC** Power Connections

ECM

This picture illustrates the DC Power connection between the LUIS and the DC power supply.



Setting Up a Standard LUIS Gen2, Continued

Setting Up the Hardware, Continued	This table continues to outline the physical connections required to setup the hardware to run a standard LUIS Gen2.
--	--

Step	Action
6	Using the Loads Module Cable, connect the Main Module to the Injector Specific Loads Module.
	<u>Note</u> : The cable is labeled <i>Main Module End</i> and <i>Load Module End</i> because it can be plugged in backwards.
6	Using the AC Power Cable, show in Figure 3, plug the LUIS in.
7	To complete the connection to the PC, plug a standard USB cable into the <i>L-comm</i> port on the back of the LUIS Gen2 and into a USB port on the PC.

Setting Up a Standard LUIS Gen2, Continued

Figure 3: AC Power Supply This picture illustrates the AC power connection.



Updating Devices

Introduction Gartech may periodically issue firmware upgrades for the modules. When upgrades are made available via the Gartech website, the user must download the file to the PC before downloading to the hardware.

Updating Firmware This table outlines the steps for updating firmware.

Firmware	

Step	Action
1	Download the appropriate firmware file from the Gartech website to the local PC.
2	Ensure the LUIS Gen2 box is connected to the PC and running.
3	From the LUIS Gen2 software Home tab, click the Devices icon. <u>Result</u> : The Devices window, shown in Figure 4, displays and the servers display in the <i>Servers</i> field.
4	In the <i>Servers</i> field, select the correct server. <u>Result</u> : The devices available on that server display.
5	In the <i>Servers</i> field, select the correct device. <u>Result</u> : The information for the device fills in on the right-hand side.
6	Click the <select b="" file<="">> button. <u>Result</u>: The <i>Firmware File</i> dialog box opens where the user can browse and select the file downloaded in Step 1. Once the file is selected and the user clicks <ok< b="">>, the dialog box closes and the name displays in the <i>Firmware File</i> field.</ok<></select>
7	Once the file has been selected and displays in the <i>Firmware File</i> field, click the <download< b="">> button. <u>Result</u>: The status LED on the LUIS hardware will flash during the transfer then go out briefly while the hardware resets. A successful update results in the status LED turning back on.</download<>

Updating Devices, Continued

Figure 4: Devices	This graphic is an example of the Devices window.		
Window	Devices		_ 🗆 🗙
	Servers		
	UUISGen2_#1 Unit: MainModule Part#: 16 Serial#: 2223 Firmware: 0.3	Server Name: LUISGen2_#1	Refresh
	€ WaveMaker_#1	Unit: MainModule	
		Part Number: 16	Select File
		Serial Number: 2223	Download
		Firmware Version: 0.3	
		Firmware File:	Close
		To Download new Firmware: 1. Select a device from a Server in the left panel. 2. Press Select File and locate the BIN file to download 3. Press Download.	

Notes

Chapter 2 – Navigating the LUIS Gen2 GUI

Overview

Introduction	The LUIS Gen2 graphical user interface provides a Windows based interface for communicating with the LUIS Gen2 box. The GUI is broken into 4 main tabs. All interaction takes place within windows in the workspace below these tabs.
Main Menu	The Main menu is accessed by clicking the LUIS icon on the upper left-hand portion of the window. This menu provides the ability to create a new configuration file or open/save an existing file. It also provides a list of recently opened configuration files and an interface to print the details of a configuration file.
Quick Access Toolbar	The Quick Access Toolbar displays, by default, above the tabs. This feature provides quick shortcuts for saving a configuration as well as adding or modifying a window. This toolbar can be moved to display below the main toolbar by clicking the down-arrow and selecting <i>Show Below the Ribbon</i> .

Tabs

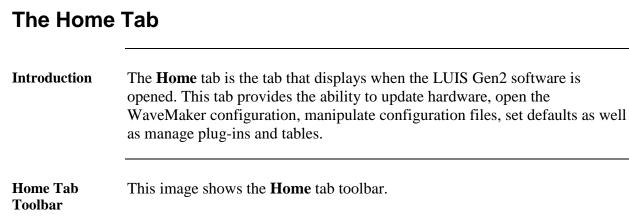
The tabs within the GUI are described below.

Tab	Description
Home	Provides the interface for working with configurations, interacting with hardware, managing tables and plug-ins, working with the WaveMaker application and setting defaults
Tools	Provides the interface for creating windows and building configurations
View	Provides an interface for navigating between open windows
Help	Provides on-line help

Updating Devices, Continued

Hiding the Tabs	At any time the tabs can be hidden to provide more space in the workspace. Right-click on any empty spot on a tab and select the <i>Minimize the Ribbon</i> option. The tab ribbon is hidden and the tab names display across a narrow bar. Clicking on these names opens the tab and clicking again closes it. To maximize the tabs, right-click on the narrow bar where the tab names appear and deselect the <i>Minimize the Ribbon</i> option. The ribbon can also be minimized/maximized from the drop-down arrow on the Quick Access Toolbar.	
In This Chapter	This table outlines the topics covered in this chapter.	
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	The Tools Tab	23
	The View and Help Tabs	60
	Printing a Configuration File Summary	61

Section 1 – The Home Tab





Hardware The **Hardware** section of the **Home** tab toolbar provides the ability to do some basic updating to the hardware.

Icon	Description
m	Opens the Server Management window where servers can be added and edited.
Server List	For more information about servers, see Page 128.
Y	Opens the Devices window where the devices can be selected and new firmware can be downloaded.
Devices	For more information about downloading firmware, see Page 12.

Hardware,
ContinuedThis table continues to outline the capabilities available from the Hardware
section of the Home tab toolbar.

Icon	Description
Clear All	Sets the value of all the controls in the current configuration to their default

Plug-Ins, Tables, Wavemaker and Datalink Simulation The **Plug-Ins**, **Tables**, **WaveMaker** and **Datalink Simulation** sections of the **Home** tab toolbar provide the ability to manage plug-ins, tables and waveforms as well as simulate datalink messages.

Icon	Description
Plugin Manager	View currently installed plugins
Tables	Opens the Table Management window where interpolation tables can be defined. For more information about working with interpolation tables, see Page 65.
Waveforms/Channels	Opens the WaveMaker Management window where waveforms can be defined for use with the WaveMaker application. For more information about the WaveMaker application see Page 78.

Plug-Ins, Tables, Wavemaker and Datalink Simulation, Continued This table continues to outline the capabilities available from the **Plug-Ins**, **Tables**, **WaveMaker** and **Datalink Simulation** sections of the **Home** tab toolbar.

Icon	Description
SAE J1939 0x49 0x53	Opens the J1939 Datalink Sensor Simulation Management window where J1939 messages can be defined.
Sensors	For more information about J1939 Datalink Sensor
Datalink Simulation	Simulation see Page 108.

Manipulating Configuration Files

The **Configuration** section of the **Home** tab toolbar provides the ability the work with configuration files.

Icon	Description
Open	Opens the <i>Configuration File</i> dialog box where a configuration can be selected and opened.
Save	Opens the <i>Configuration File</i> dialog box where a configuration file can be saved.

Manipulating	This table continues to outline the capabilities available from the
Configuration	Configuration section of the Home tab toolbar.
Files	

Icon	Description
Clear	Clears the configuration.
🚇 Send Configuration	Sends the currently open configuration to the LUIS Gen2 hardware.
🥹 Save Defaults	Saves the current values of all controls as the new defaults.

Attaching Files The Attachments icon on the Home tab toolbar opens the Attachments window where the user can attach a document, such as a wiring diagram, to the configuration. Once a file has been attached, the **<Detach and Save>** button can be used to save the file to the hard drive, and the **<Open>** button can be used to attempt to open the file using the default program for the file type.

le Attachments	Toto Water	
Files		
	File Name:	Attach
	Comment:	Detach and Save
		Open
		Remove
	Update Comment	Close
	 Any file can be attached to this configuration. The attachment can be detached and saved by pressin By pressing the Open button, the attachment will be ope application. 	

Continued on next page

Defaults The **Defaults** icon on the **Home** tab toolbar opens the **Options** window where defaults can be set for startup, configuration and interface.

The **Startup** defaults allow the user to set whether or not a configuration is loaded as well as if the Startup Page should be displayed at startup.

Options	23
Startup Configuration Interface Options	
Load Configuration	
Yes (Load default configuration on Startup)	
No (Do nothing upon Startup)	
Current Default Configuration: None	
Display Startup Page	
● Yes (Statup Page is loaded) ◎ No (No Startup Page)	
	OK Cancel

The **Configuration** defaults allow the user to set what should happen after a configuration file is loaded as well as set a default configuration file.

oput	ons						-	X
Startup	Config	uration	Interfac	ce Options				
Select	Default C	Configurat	ion					
None								
					ſ	0		-
					L	Clear	Select	
					ſ	ОК	Cancel	

Defaults,
ContinuedThe Interface defaults allow the user to set grid options for laying out
controls on windows. The F9 key toggles the snap option on and off.

Startup Configuration	Interface Options			
Snap and Grid				
Snap On (F9)				
Grid X spacing: 5	Grid Y s	pacing: 5	V Equ	ual X and Y spacing

Section 2 – The Tools Tab

The Tools Tab

Introduction Configuration files are built in user defined windows. The **Tools** tab provides the toolbar for adding windows in the workspace as well as tiles within windows. It also provides the interface for adding the desired controls to build the configuration.

Definitions To easily work within the LUIS Gen2 GUI, it is necessary to understand some terminology.

Term	Definition
Window	A container in a configuration to which tiles can be added
Tile	A space within a window to which controls can be added and manipulated as a group. Every window has at least one tile.
Digital Display	A control that displays Engine Units, Counts and Millivolts digitally
Gauge	A control that displays values in a round or slider display
Indicator	A control that displays the status of resistive loads
Text Panel	A control that allows the user to add text to a configuration
Switch	A display that allows the user to add a momentary or toggle switch to the configuration
Closed Loop Control	A control that allows the user to create a simple closed loop engine speed model. This control is only available when using an ECM that outputs a public broadcast on the J1939 datalink
Dock	The process of fixing the position of a window within the workspace
Pin	The process of fixing the position of a window within the workspace in a way that it "window shades" to the last docked position when not active

The Tools Tab, Continued

In This Section This table outlines the topics covered in this section.

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Working with Tiles	40
Working with Controls	48

Notes

Working with Windows

Introduction Windows are the "containers" of tiles, and every window has at least one tile. Windows make up the base of a configuration file and display in the workspace. When a configuration file is saved, the position and status of all the windows are saved as well.

Window Status
and PositionsWindows are placed within the workspace and can have one of four states:
tabbed, dockable, dockable and floating or hidden.

Status	Description
Tabbed	When a window is tabbed, it remains in full screen mode and a tab with the window's name displays at the top of the workspace. Tabbed windows cannot be moved or resized.
Dockable	When a window is dockable, it can be docked to the top, bottom, left or right side of the workspace. The width or length of the window can be adjusted from the dockable position by hovering over the edge of the window until the cursor changes to the re-sizing cursor.
Dockable and Floating	When a window is dockable and floating it floats above the workspace until it is re-docked. When the window is floating, it can be moved around the workspace by dragging it by the title bar. It can also be resized by hovering over the edges until the cursor changes to the re-sizing cursor.
Hidden	When a window is hidden, it no longer displays in the workspace. A hidden window can be unhidden by selecting it on the View tab.

Pinned / Unpinned When a window is pinned, it will remain in the docked position whether it is the active window or not. When a window is unpinned, (auto hide), the window will "window shade" into a tab in the last docked position when not active. A window can be switched between pinned and unpinned by clicking the push pin icon in the upper right-hand corner of the window.

Window Status In this image, the Main window is currently docked to the left-hand side of the workspace and unpinned. It window shades to the left-hand side of the workspace when not active. The **Frequency** window is docked to the bottom of the workspace, and the rest of the windows are tabbed across the top of the workspace.



Adding This table outlines the steps for adding a new window. Windows

Step		Action			
1	Add a new window.				
	Add Through Action				
	Tools tab	Click the Add Window icon			
	Quick Access Toolbar	Click the Add Window icon			
	Workspace	Right-click any empty spot in the workspace, not inside a tile, and select the <i>Add Window Pane</i> option			
	<u>Result</u> : The Add Window Figure 5.	Pane window displays, as shown in			
2	In the Dock Location sect should be docked within the	ion, select where the new window ne workspace.			
3		npinned, (window shade to the docked select the <i>Unpin</i> checkbox.			
4	In the Window Name field	, type the name for the window.			
5	In the Tile Layout section and rows.	, type the minimum number of columns			
6	When the window has bee	n defined, click the <add></add> button.			
		led to the workspace, as shown in rindow automatically has one tile called			

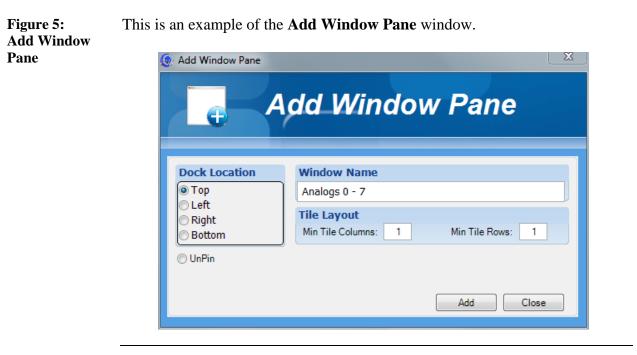
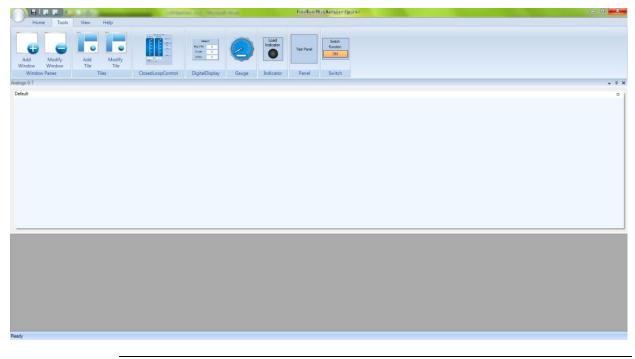


Figure 6:This is an example of a new window added to the workspace that is docked to
the top.New Windowthe top.



Changing a Window's Status A window's status can be changed between tabbed, dockable, dockable and floating and hidden in a couple of ways. This table describes changing status.

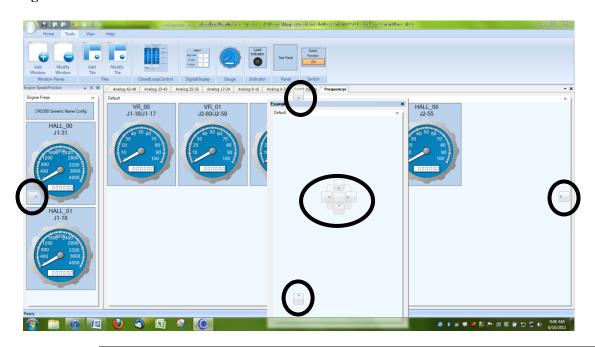
Change Status To	Action
Floating	To change any window's status to floating, right- click the title bar of the window and select the <i>Floating</i> option. A docked window can also be changed to floating by grabbing the window's title bar and pulling it away from its docked position. When moving a window that is floating, the
	Docking tools, shown in Figure 8, display. Dropping a window to the selected position in the workspace. Dropping a window in the middle of the center docking tools changes the window's status to tabbed.
Dockable	To change a tabbed window's status to dockable, right-click the title bar of the window and select the <i>Dockable</i> option. The window docks to the last docked position.Note: Pinned windows must be unpinned before they can be changed.
Tabbed	To change a window to the tabbed status, right- click the title bar of the window and de-select the <i>Dockable</i> option. Alternatively, grab any window by the title bar and drag it to the middle of the center docking tools.
Hidden	To change any window's status to hidden, right- click the title bar of the window and select the <i>Hidden</i> option. Alternatively, click the X in the upper right-hand corner of the window's title bar. To un-hide the window, go to the View tab and click on the window in the toolbar.

Figure 7: In this image, the **Main** window is currently unpinned and window shades to the left-hand side of the workspace. The **Frequency** window is docked to the bottom of the workspace, and the rest of the windows are tabbed across the top of the workspace.



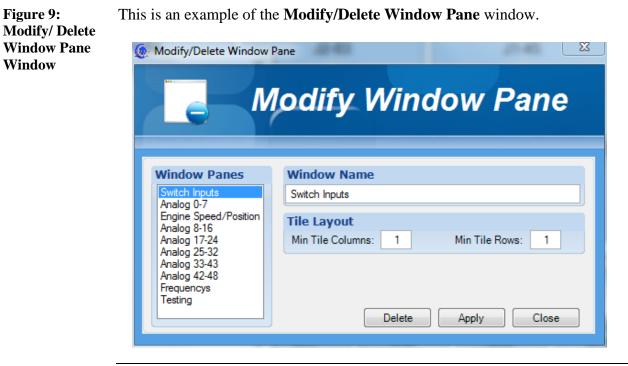
Figure 8 Docking Tools

This image shows the docking tools.



Continued on next page

Rows and Columns	Rows and columns within a window help organize the tiles within the widow. The number of rows and columns set in a window can be changed in a couple of ways.
	From the Tools tab, click the Modify Window icon to open the Modify/Delete Window Pane window, shown in Figure 9. Select the window to modify from the <i>Window Panes</i> field, and change the number of rows and/or columns on the right. When finished, click the <apply></apply> button and then <close></close> .
	Right-click in any empty space in the window and select the <i>Change Rows</i> or <i>Change Columns</i> option.
Renaming a Window	A window's name can be changed in a couple of ways. From the Tools tab, click the Modify Window icon to open the Modify/Delete Window Pane window. Select the window to modify from the <i>Window Panes</i> field and change the window's name on the right. When
	finished, click the <apply></apply> button and then <close></close> . Right-click in any empty space in the window and select the <i>Rename</i> <i>Window Pane</i> option.
Deleting a Window	To permanently delete a window from the configuration, right-click in an empty space in the window and select the <i>Delete Window Pane</i> option from the menu. Alternatively, from the Tools tab, click the Modify Window icon to open the Modify/Delete Window Pane window. Select the window to delete from the <i>Window Panes</i> field and click the <delete< b="">> button.</delete<>
	<u>Note</u> : Clicking the \mathbf{X} in the upper right-hand side of the title bar removes the window from the workspace but does not delete it from the configuration file.
	Continued on part page



Exercise: Working with Windows	The purpose of this exercise is to familiarize users with the manipulation of windows in the LUIS Gen2 environment. This exercise assumes that the LUIS Gen2 hardware and software is already installed, the hardware is connected and turned on, and the software is open with no configuration file
	loaded.

Step	Action
Open a c	onfiguration file
1	If the Start window is displayed in the workspace, click the X on the right-hand side of the title bar to close it.
2	On the Home tab, click the Open icon.
	<u>Result</u> : The Configuration File window displays.
3	Locate the sample.l2c file, select it and click <open></open> .
	<u>Result</u> : The configuration file loads. This configuration file has 7 windows. The Main window is docked and unpinned to the left hand side of the screen and the remaining windows re tabbed.
Add a wi	ndow
5	On the Tools tab, click the Add Window icon.
	<u>Result</u> : The Add Window Pane window displays, as shown in Figure 10
6	In the Dock Location section, select the <i>Bottom</i> option.
7	In the Window Name field, type Frequency.
8	Leave the Tile Layout options set to the defaults of 1.
9	Leave the Unpinned option un-selected.
10	Click <add></add> to add the window and <close></close> to close the Add Window Pane window.
	<u>Result</u> : A new window called Frequency displays at the bottom of the workspace, as shown in Figure 11.
11	Resize the Frequency window to display the controls in the Throttle tab.

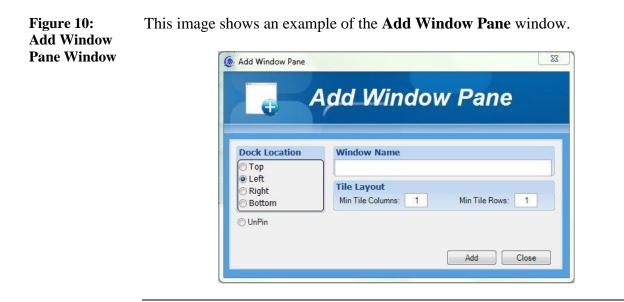


Figure 11:This image shows the workspace after adding the Frequency window to the
sample configuration.WindowSample configuration.



Exercise: Working with Windows, Continued	The purpose of this exercise is to familiarize users with the manipulation of windows in the LUIS Gen2 environment. This exercise assumes that the LUIS Gen2 hardware and software is already installed, the hardware is connected and turned on, and the software is open with no configuration file
	loaded.

Step	Action
Work wi	th an unpinned window
11	Locate the Main tab on the left-hand side of the workspace and hover over it.
	<u>Result</u> : The window slides out from the hidden position.
12	Click the push pin icon in the right-hand corner of the title bar.
	<u>Result</u> : The window is now pinned to the workspace, as shown in Figure 12. The Main tab disappears from its location on the left-hand side of the workspace. All the other windows resize to accommodate the new pinned window.
13	Click the push pin icon in the right-hand corner of the title bar again
	<u>Result</u> : The window is now unpinned, in auto-hide mode, and slides back into the tab on the left-hand side of the workspace.
Work wi	th a floating window
14	Right-click the title bar of the Frequency window and select the <i>Floating</i> option from the menu.
	<u>Result</u> : The window now floats above the workspace.
15	Drag the Frequency window by the title bar and drop it on the middle of the center docking tools, shown in Figure 13.
	<u>Result</u> : The Frequency window is now a tabbed window and displays at the end of the other window tabs.
16	Right-click on the Frequency tab and select the <i>Dockable</i> option from the menu.
	<u>Result</u> : The Frequency window returns to its docked position at the bottom of the workspace.

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Working with Windows, Continued

Figure 12:This image shows the Main window in the pinned status.Pinned EngineSpeed/PositionWindowVindow



Figure 13:This image shows dropping the Frequency floating window into the center
docking tool.Floating to
Tabbeddocking tool.WindowImage shows dropping the Frequency floating window into the center



Step	Action
Hide a w	vindow
17	Click the X icon on the right-hand side of the Frequency window title bar. <u>Result</u> : The Frequency window is removed from the workspace.
18	Go to the View tab, shown in Figure 14, and click the Frequency window icon.Result: The Frequency window returns to the workspace in its previous position.
Delete a	window
19	On the Tools tab, click the Add Window icon. <u>Result</u> : The Add Window Pane window displays.
20	In the <i>Window Name</i> field, type Testing and click <apply></apply> . <u>Result</u> : The new window is added to the workspace and the other windows resize to accommodate it.
21	Click the < Close > button. <u>Result</u> : The Add Window Pane window closes.
22	Right-click in the Testing window just above the Default tile and select the Delete Window Pane option, as shown in Figure 15. A dialog box displays to confirm the deletion. Click <yes> to confirm.Result: The Testing window is removed from the workspace.</yes>
Save a c	onfiguration
23	Save the current configuration to a new configuration file name by clicking the LUIS icon in the upper left-hand side of the window and selecting the <i>Save As</i> option. <u>Result</u> : The <i>Configuration File</i> dialog box displays where the new filename and location can be set.

Figure 14:This is an example of the View tab which shows all the windows in the
configuration.



Figure 15:This is an example of the menu that displays when right-clicking within aDeleting awindow but not on a tile.Window

Default Add Tile Delete All Tiles In Pane Change Rows Change Columns Rename Window Pane	Delete All Tiles In Pane Change Rows Change Columns	Testing		
Change Rows Change Columns	Change Rows Change Columns Rename Window Pane	Default	Add Tile	
Change Columns	Change Columns Rename Window Pane		Delete All Tiles In Pane	
	Rename Window Pane		Change Rows	
Rename Window Pane			Change Columns	
	Delete Window Pane		Rename Window Pane	
Delete Window Pane			Delete Window Pane	

Working with Tiles

Introduction	Tiles are defined spaces within a window to which controls can be added. All the controls within a tile are moved and removed from a window as a group. Every window must have at least one tile.
Adding Tiles	Whenever a window is added to the workspace, a tile named Default is automatically created. Additional tiles can be added by clicking the Add Tile icon on the Tools tab. Alternatively, additional tiles can be added by right-clicking anywhere in a window and selecting the <i>Add Tile</i> option from the menu.
	If the number of rows and/or columns has been set for the window, the new tile will fill in the next open column or row. If the number of rows and columns has not been set, the new tile will fill in where it will fit. Figure 16 shows an example of a window with two tiles.
Renaming Tiles	Tiles can be renamed using the <i>Modify Tile</i> dialog box, shown in Figure 17. This dialog box can be opened by right-clicking on a tile and selecting the <i>Rename Tile</i> option from the menu or by clicking the Modify Tile icon on the Tools tab. On the <i>Modify Tile</i> dialog box, select the window where the tile resides in the <i>Window Panes</i> field; select the tile in the <i>Tiles</i> field and type in a new name in the <i>Tile Name</i> field.
Moving and Resizing Tiles	Tiles can be moved by grabbing the title bar of the tile and dragging it to a new position within the window.
	Tiles automatically resize as the window is resized. One tile can be enlarged to occupy the majority of the window, decreasing the size of the others, by clicking the Enlarge icon in the upper right-hand side of the title bar. Figure 18 shows an example of one tile being enlarged to occupy the majority of a tile.
Clearing Tiles	All controls can be removed from a tile by right-clicking in the tile and selecting the <i>Clear Tile</i> option from the menu
Deleting Tiles	Tiles can be deleted by right-clicking in the tile and selecting the <i>Delete Tile</i> option from the menu. Alternatively, tiles can be deleted using the Oelete > button on the <i>Modify Tiles</i> dialog box.
	Continued on next page

Figure 16:This is an example of a window with two tiles named Speed and Tach.Window withTwo Tiles



Figure 17: Modify Tile Window This is an example of the **Modify Tile** window.

Window Panes	Tile Name
Throttle Switches Pressures Temps Misc Main Loads Frequency	Speed Tiles Default Tach

Figure 18:This is an example of a window with two tiles where one tile is enlarged.Enlarged Tile



Exercise:
Working with
TilesThe purpose of this exercise is to familiarize users with the manipulation of
tiles in the LUIS Gen2 environment. This exercise assumes that the LUIS
Gen2 hardware and software is already installed, the hardware is connected
and turned on, and the software is open with the configuration file saved in
the previous exercise open.

Step	Action
Add a til	e
1	From the Tools tab, click the Add Tile icon.
	Result: The Add Tile window displays, as shown in Figure 19.
2	In the Window Panes section, select the <i>Frequency</i> option.
3	In the Tile Name field, type Tach.
4	Click the < Add > button.
	<u>Result</u> : A new tile named Tach is added to the Frequency window. The Default tile shrinks to accommodate the new tile.
Modify a	n Tile
5	On the Tools tab, click the Modify Tile icon.
	Result: The Modify Tile window displays, as shown in Figure 20.
6	In the Window Panes section, select the <i>Frequency</i> option.
7	In the Tile section, select the <i>Default</i> option.
8	In the Tile Name field, type Speed.
9	Click the <apply< b="">> button.</apply<>
	Result: The Default tile's name changes to Speed.
10	Click the <close< b="">> button.</close<>
	Result: The Modify Tile window closes.

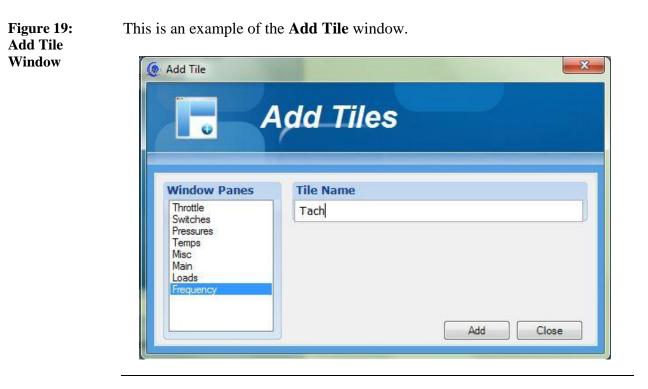


Figure 20: Modify Tile Window This is an example of the **Modify Tile** window.

	Aodify Tiles
Window Panes	Tile Name
Throttle Switches Pressures Temps Misc	Speed Tiles Default
Main Loads Frequency	Tach

Exercise: Working with Tiles	The purpose of this exercise is to familiarize users with the manipulation of tiles in the LUIS Gen2 environment. This exercise assumes that the LUIS Gen2 hardware and software is already installed, the hardware is connected and turned on, and the software is open with the configuration file saved in
	the previous exercise open.

Step	Action	
Enlarge	a tile	
11	Click the Enlarge icon in the upper right-hand corner of the Speed tile's title bar.	
	<u>Result</u> : The Speed tile expands within the Frequency window and the Tach tile automatically shrinks, as shown in Figure 21.	
12	Click the Switch to Normal Mode icon in the upper right-hand corner of the Speed tile's title bar.	
	<u>Result</u> : The Speed tile shrink back within the Frequency window and the Tach tile automatically resizes.	
Change	tile configuration	
13	From the Tools tab, click the Modify Window icon.	
	<u>Result</u> : The Modify/Delete Window Pane window opens, as shown in Figure 22.	
14	In the Window Panes section, select the <i>Frequency</i> option.	
15	In the Tile Layout section, change the <i>Min Tile Rows</i> to 2.	
16	Click the <apply></apply> button.	
	<u>Result</u> : The tiles within the Frequency window are now stacked to fill the minimum 2 rows set for the window, as shown in Figure 23.	
17	Change the <i>Min Tile Rows</i> back to 1 and click the <apply></apply> button.	
	<u>Result</u> : The tiles move back to one row and display next to each other.	
18	Click the <close< b="">> button.</close<>	
	Result: The Modify/Delete Window Pane window closes.	



Figure 23: This image an example of a window with two tiles and a minimum of 2 rows. Window with 2 Rows



Exercise: Working with Tiles	The purpose of this exercise is to familiarize users with the manipulation of tiles in the LUIS Gen2 environment. This exercise assumes that the LUIS Gen2 hardware and software is already installed, the hardware is connected and turned on, and the software is open with the configuration file saved in
	the previous exercise open.

Step	Action
Reorgan	ize tiles
19	Grab the title bar of the Speed tile and drag it to the other side of the Tach tile.
	<u>Result</u> : The Speed tile moves to the other side of the Tach tile, as shown in Figure 24.
Deleting	tiles
20	Right-click on one of the tiles in the Frequency window and select the <i>Add Tile</i> option.
	Result: The Tile Creation Entry widow displays.
21	In the field, type Test and click <ok></ok> .
	<u>Result</u> : A new tile named Test is added to the Frequency window.
22	Right-click on the Test tile and select the <i>Delete Tile</i> option. A dialog box displays to confirm the deletion. Click <yes></yes> to delete the tile.
	<u>Result</u> : The tile is removed and the other tiles automatically resize.
Save a co	onfiguration
23	Save the current configuration by clicking the Save icon on the Home toolbar.
	Result: The Configuration File is saved.

Figure 24:This is an example of a window with two tiles named Speed and Tach.Window with
Two Tiles

Frequency	+ # X
Speed	Tach
· · · · · · · · · · · · · · · · · · ·	

Working with Controls

Introduction	Controls are the gauges, switches, digital displays and text that display the values from the hardware. This section gives an overview of how to work with the control on the Tools Tab . For more information about each specific control, see Chapter 7 – Controls beginning on page 136.
Adding Controls	Controls are added to tiles within windows; they cannot sit directly on a window. To add a control, grab the desired control icon from the Tools tab and drag it to the desired tile.
Moving Controls	A control can be moved within the same tile by grabbing its title bar and dragging it to a new position. The grid spacing as well as whether or not controls should be snapped to the grid are set on the Interface Options tab on the Options window opened through the Defaults icon on the Home tab.
Copying and Pasting Controls	Any control can be copied by right-clicking on the control and selecting the <i>Copy</i> option from the menu, shown in Figure 25. To paste a control, right-click where the new control should be pasted and select the <i>Paste</i> option from the menu. Controls can be pasted between tiles and windows within an instance of the LUIS Gen2 GUI. Controls can also be pasted between multiple instances of the LUIS Gen2 GUI open on the same PC.
Paste Special	The properties of any control can be pasted onto another control by right- clicking on the original control and selecting the <i>Copy</i> option from the menu and then right-clicking on the recipient control and selecting the <i>Paste</i> <i>Special</i> option. The <i>Paste Special</i> dialog box, shown in Figure 26, displays where the user can select what properties should be pasted onto the control. These options include both appearance and operation.
	Continued on next page

Figure 25: Working with Controls

This image depicts the menu that displays when right-clicking on a control.

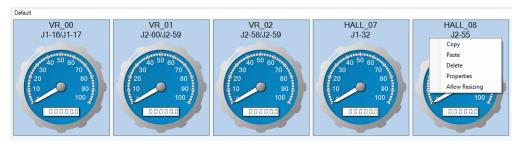


Figure 26: Paste Special This image depicts the *Paste Special* dialog box.

A		
Appearance Allow Move	Component Fort	
	Component Font	
Allow Resize	Component Text Colo	
Background Color	Text Font	
Control Specific	V Text Color	
V Size	V Border Style	
Operation		
Interlock	Scale	
Hardware	Server	
Interpolation Table	Default Value	
Clear All	OK Cancel	

Resizing Controls	A control can be resized by right-clicking on it and selecting the <i>Allow Resizing</i> option. Once resizing has been activated, click and drag the edges of the control to resize it. Once the control is the desired size, right-click it and select the <i>Lock Size</i> option to prevent accidentally resizing again.
Deleting Controls	To delete a control, right-click on the control and select the <i>Delete</i> option.
Formatting Controls	To format a control, right-click the control and select the <i>Properties</i> option from the menu. The <i>ToolBox</i> dialog box opens, as shown in Figure 27. The properties list varies with the type of control being formatted. For more information about formatting controls, see Chapter 7 – Controls beginning on page 136.

Figure 27:This is an example of the *Toolbox* dialog box. The options available in the
Toolbox depend on the type of control selected.Dialog Box

	perties	
•]⊉↓ 🖻	
Ξ	Appearance	
	Allow Resize	False
	Background Color	Gradient ActiveCaption
	Background Image	(none)
	BorderStyle	None
	Component Size	200, 240
	Gauge Font	Microsoft Sans Serif, 9.75pt, style=Bold
	Text Color	ControlText
_	Text Font	Microsoft Sans Serif, 12pt
	Component Options	
	FreezeValue	True
	Gauge Type	Round
	InterlockSetup	
_	Hardware	
	Hardware Setup	
	Interpolation Table	
	TableName	
_	Scale	
	Maximum	100
	Minimum	0
	Multiplier	1
	Scale Resolution	1
_	Server	
	Name	LUISGen2_#1
	Text	
	TextLine1	VR_00
	TextLine2	J1-16/J1-17
_	Value Definition	
	Default Value	0
	Gauge Value	0
Те	xtLine2	
	its of the Gauge	

Exercise: Working with Controls	The purpose of this exercise is to familiarize users with the manipulation of controls in the LUIS Gen2 environment. This exercise assumes that the LUIS Gen2 hardware and software is already installed, the hardware is connected and turned on, and the software is open with the configuration file saved in
	the previous exercise open.

Step	Action
Adding c	ontrols
1	On the Tools tab, grab and drag the Gauge icon to the Speed tile on the Frequency window.
	<u>Note</u> : When the gauge is dropped on the window a warning symbol displays on it. This indicates that the control has not yet been configured.
Formatti	ng a control's operation
2	Right-click on the gauge in the Speed tile on the Frequency window and select the Properties option from the menu.
	<u>Result</u> : The <i>Toolbox</i> dialog box displays, as shown in Figure 28.
3	In the Hardware section, next to the <i>Hardware Setup</i> field, click the <> button.
	<u>Result</u> : The <i>Hardware I/O Selection</i> dialog box displays, as shown in Figure 29.
4	In the Hardware Unit field, select Wavemaker.
	<u>Result</u> : The <i>Channel</i> field populates with the available channels in the selected hardware unit.
5	In the <i>Channel</i> field, select <i>Digital_CH#1</i> and click <ok>.</ok>
	<u>Result</u> : The <i>Hardware I/O Selection</i> dialog box closes and the <i>Channel</i> and <i>Type</i> fields are completed on the <i>Toolbox</i> dialog box.

Figure 29:

Box

Hardware I/O **Selection Dialog**

Figure 28: The Toolbox	alog box.
Dialog Box	
5	
	-
	True
	False
	InactiveCaption
	(none)
	Tile
	None
	185, 210
	Microsoft Sans Serif, 8.25pt
	ControlText
	Microsoft Sans Serif, 8.75pt
	True
	Bound
	(Collection)
	(concentral)
	WaveMaker, Arbitrary_CH#1
	find of the second s
	FREQ
	Theu
	0.0
	1
	3000
	0
	1
	WaveMaker #1
	Indivendical_#1
	ENGINE SPEED
	1 M PT
	10
	ENGINE SPEED RPM 10 0

This is an example of the *Hardware I/O Selection* dialog box.

Hardware Unit:	Channel:	OK
WaveMaker	Arbitrary_CH#1	
Analog Output Child 1 Analog Cutput (LUISGen1) Child 1 Main (LUISGen1) Child 1 Switch (LUISGen1) Child 2 Analog Output (LUISGen1) Child 2 Avalog Output (LUISGen1) Main Module (LUISGen1) Parent Analog Output (LUISGen1) Parent Main (LUISGen1) Parent Main (LUISGen1) Parent Main (LUISGen1) Parent Match (LUISGen1) Sidecar Analog Output (LUISGen1) Sidecar Analog Output (LUISGen1) Sidecar Switch (LUISGen1) Sidecar Switch (LUISGen1) Sidecar Switch (LUISGen1) Sidecar Main (LUISGen1) Sidecar Main (LUISGen1) Sidecar Main (LUISGen1) Sidecar Main (LUISGen1) Sidecar Main (LUISGen1)	Abbirary_CH#1 Arbitrary_CH#2 Arbitrary_CH#3 Arbitrary_CH#3 Arbitrary_CH#5 Arbitrary_CH#5 Digital_CH#7 Digital_CH#7 Digital_CH#2 Digital_CH#2 Digital_CH#2 Digital_CH#3 Digital_CH#4 Digital_CH#5 Digital_CH#5 Digital_CH#6 Digital_CH#7 Digital_CH#9 Digital_CH#9 Digital_CH#10	Cancel
Description	I L	

Exercise: Working with Controls

The purpose of this exercise is to familiarize users with the manipulation of controls in the LUIS Gen2 environment. This exercise assumes that the LUIS Gen2 hardware and software is already installed, the hardware is connected and turned on, and the software is open with the configuration file saved in the previous exercise open.

Step	Action
6	In the Interpolation Table section, in the <i>Table Name</i> field, select the <i>FREQ</i> option from the dropdown list.
7	In the Scale section, in the <i>Maximum</i> field, type 3000. <u>Note</u> : The scale on the gauge changes.
8	In the Scale section, in the <i>Minimum</i> field, type 1.
9	In the Scale section, in the <i>Multiplier</i> field, type 1.
10	In the Server section, in the <i>Name</i> field, select <i>WaveMaker_#1</i> from the dropdown list.
11	In the Text section, in the <i>TextLine1</i> field, type ENGINE SPEED. <u>Result</u> : The text on the gauge changes.
12	In the Text section, in the <i>TextLine2</i> field, type RPM. <u>Result</u> : The text on the gauge changes.
Formatt	ing a control's appearance
13	On the <i>Toolbox</i> dialog box, in the Appearance section, click the drop-down arrow next to the <i>Background Color</i> field. From the drop-down, pick the Web tab and select the <i>Dark Red</i> option. <u>Result</u> : The background color of the gauge changes.
14	In the Gauge Font section, click the <> button. <u>Result</u> : The <i>Font</i> dialog box displays.
15	In the <i>Size</i> field, type 6 and click <ok< b="">>.</ok<>
	<u>Result</u> : The <i>Font</i> dialog box closes and the size of the gauge font changes.
16	Close the <i>Toolbox</i> dialog box.

×

Working with Controls, Continued

Figure 30: The Toolbox	This is an example	e of the <i>Toolbox</i> dialog box.	
Dialog Box		ToolBax	
		Properties	
		Allow Move True	1
		Allow Resize False	
		Background Color DarkRed	
		Background Image (none)	
		BackgroundImageLayout Tile	
		BorderStyle None	
		E Component Size 210, 240	
		Gauge Font Microsoft Sans Serif, 6pt	
		Text Color Control Text	
		Text Font Arial Narrow, 9pt	
		Component Options	
		Enable True	
		Gauge Type Round	10
		Interlock Dependencies (Collection)	
		InterlockSetup	
		Hardware	
		Hardware Setup WaveMaker,Arbitrary_CH#1	
		Interpolation Table	
		TableName FREQ	
		Layout	
		E Location 5, 0	
		Digits Displayed 1	- 11
		Maximum 3000	- 11
		Minimum O	-
		Multiplier 1	
		E Server	
		Name WaveMaker_#1	
		Text	_
		TextLine1 ENGINE SPEED	-
		Text Font Text Font	

Figure 31: This image shows the gauge after the modifications have been made.

Modified Gauge



Exercise: Working with Controls	The purpose of this exercise is to familiarize users with the manipulation of controls in the LUIS Gen2 environment. This exercise assumes that the LUIS Gen2 hardware and software is already installed, the hardware is connected and turned on, and the software is open with the configuration file saved in
	the previous exercise open.

Step	Action						
Resizing controls							
17	Right-click on the gauge and select the <i>Allow Resizing</i> option from the menu.						
	<u>Result</u> : The gauge can now be resized by grabbing the outline of the gauge and pulling it in and out.						
18	When the gauge has been resized, right-click on it and select the <i>Lock Size</i> option from the menu.						
	<u>Result</u> : The gauge's size is now locked.						
Moving	controls						
19	Grab the gauge control by the title bar and drag it to a new position on the tile.						
Copying	and pasting controls						
20	Right-click on the gauge and select the <i>Copy</i> option from the menu.						
21	Right-click anywhere in the current tile or another tile and select the <i>Paste</i> option.						
	<u>Result</u> : A copy of the gauge is pasted on the tile.						
Deleting	controls						
22	Right-click on the gauge that was just pasted and select the <i>Delete</i> option from the menu.						
	<u>Result</u> : The control is removed from the tile.						
	·						

Figure 32:This is an example of the formatted gauge on the Frequency window.FormattedGauge



Exercise: The purpose of this exercise is to familiarize users with the manipulation of controls in the LUIS Gen2 environment. This exercise assumes that the LUIS Gen2 hardware and software is already installed, the hardware is connected and turned on, and the software is open with the configuration file saved in the previous exercise open.

Step	Action							
Paste Sp	Paste Special							
23	Right-click on the ENGINE SPEED gauge in the Frequency window and select the <i>Copy</i> option.							
24	Right-click on the THROTTLE gauge in the Throttle window tab and select the <i>Paste Special</i> option.							
	Result: The <i>Paste Special</i> dialog box displays, as shown in Figure 33.							
25	Ensure the <i>Background Color</i> and <i>Component Font</i> options are selected and all other are deselected. Then click <ok< b="">>.</ok<>							
	<u>Result</u> : The background color and component font properties from the ENGINE SPEED gauge are applied to the THROTTLE gauge, as shown in Figure 34.							
Save a c	onfiguration							
26	Save the current configuration by clicking the Save icon on the Home toolbar.							
	Result: The Configuration File is saved.							

Paste Special	
Appearance	
Allow Move	Component Font
Allow Resize	Component Text Color
Background Color	Text Font
Control Specific	Text Color
Size	Border Style
Operation	
Interlock	Scale
Hardware	Server
Interpolation Table	Default Value
Clear All	OK Cancel

Figure 34:This is an example of pasting options from one gauge to another.ReformattingControl

Throttle Switches Pressures Temps Misc Loads		•
Default		-
NINCTLL SO IS ON IDLE ON DLE OFFIDLE OFFIDLE	Closed Loop Control Panel Closed Loop Control Panel Closed Loop Control Panel Closed Loop Panel Closed Loop Panel Closed Loop Panel Closed Loop Panel Closed Loop Panel	
Frequency		* *
Default	n Tach	

Section 3 – The View and Help Tabs

The View and Help Tabs

The View Tab The **View** tab is a way to easily navigate between all windows within a configuration whether or not they are hidden. It is also the way to unhide a hidden window.

Hon	ne Tools	View	Help					
					-			
	*******			eale		-		
Throttle	Switches	Pressures	Temps	Misc	Main	Loads	Frequency	

The Help Tab The **Help** tab provides information about the current version of LUIS as well as on-line help.

Notes

Section 4 – Printing a Configuration File Summary

Printing a Configuration File Summary

Introduction LUIS Gen2 provides the ability to print a summary of all the controls within a configuration.

ConfigurationThe Configuration File dialog box displays all the controls in the
configuration listed by server. To open the Configuration File dialog box,
click the LUIS icon in the upper left-hand corner of the application and select
the Print option.

The *Configuration File* dialog box, shown in Figure 35, provides a toolbar for navigating the summary as well as setting up the print options. This table and image describe the options on the toolbar.

🔚 | 🕅 🖣 1 of 2 🕨 🔰 | 🐗 🔕 🛃 🗐 🛄 🎝 🚽 100% 🔹 Find | Next

Icon	Description		
I	These icons are used to navigate through the pages of the summary within the <i>Configuration File</i> dialog box.		
¢	This icon is used to refresh the control list.		
4	This icon is used to open the <i>Print</i> dialog box to print the summary.		
	This icon is used to toggle between a print preview view and the standard view.		
۹	This is used to set up the print options such as margins and orientation.		
-	This icon is used to export the file in either MS Excel or Adobe PDF format.		
100% -	This icon is used to set the size of the view within the <i>Configuration File</i> dialog box.		
Find Next	These icons are used to search for text within the <i>Configuration File</i> dialog box.		

Printing a Configuration File Summary, Continued

Figure 35:	
Example	
Configuration	
File Dialog Box	

This is an example of a configuration in the *Configuration File* dialog box.

	of 2 🕨 🎽 🖨 🙆	2 4 🔲 🛍 🔒 -	100%	-		Find Next	
	onfiguration File:						
Sample_2.12c							
Server Name	Control Name	I/O Name	Min	Max	Multiplier	Resolution	Table Name
LUISGen2_#1							
	VBATT	Main Module,VBATT Relay#1	0	0	1	1	switch
	Keyswitch #1 J2-5	Main Module,Switched VBATT Relay#1	0	0	1	1	switch
	Keyswitch #2 J2-29	Main Module,Switched VBATT Relay#2	0	0	1	1	switch
	SW_00 J2-11	Relay,Relay#1	0	0	1	1	switch
	SW_01 J2-12	Relay,Relay#2	0	0	1	1	switch
	SW_02 J2-86	Relay,Relay#3	0	0	1	1	switch
	SW_03 J2-87	Relay,Relay#4	0	0	1	1	switch
	SW_04 J2-88	Relay,Relay#5	0	0	1	1	switch
	SW_05 J2-89	Relay,Relay#6	0	0	1	1	switch
	SW_06 J2-90	Relay,Relay#7	0	0	1	1	switch
	SW_07 J2-91	Relay,Relay#8	0	0	1	1	switch
	SW_08 J2-92	Relay,Relay#9	0	0	1	1	switch
	SW_09 J2-93	Relay,Relay#10	0	0	1	1	switch
	SW_10 J2-94	Relay,Relay#11	0	0	1	1	switch
	SW_11 J1-52	Relay,Relay#22	0	0	1	1	switch
	SW_12 J2-66	Relay,Relay#12	0	0	1	1	switch
	SW_13 J2-67	Relay,Relay#13	0	0	1	1	switch
	SW_14 J2-68	Relay,Relay#14	0	0	1	1	switch
	SW_15 J2-69	Relay,Relay#15	0	0	1	1	switch
	SW_16 J2-70	Relay,Relay#16	0	0	1	1	switch
	SW_17 J2-47	Relay,Relay#17	0	0	1	1	switch
	SW_18 J2-19	Relay,Relay#18	0	0	1	1	switch
	SW_19 J2-20	Relay,Relay#19	0	0	1	1	switch
	SW_20 J2-44	Relay,Relay#20	0	0	1	1	switch
	SW_21 J2-43	Relay,Relay#21	0	0	1	1	switch
	AD_00	Analog Output,Analog Output#5	0	100	1	1	Test Table

Notes

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Chapter 3 –Interpolation Tables

Overview

Introduction	Some of the components controlled by the LUIS Gen2 required interpolation table to match the engineering unit that is on t counts value. For example 32 PSI is 500 counts, which is a that LUIS Gen2 outputs. The Table Management window Gen2 GUI provides the capability for building interpolation	he gauge to a specific voltage within the LUIS			
In This Chapter	In This This table outlines the topics covered in this chapter. Chapter				
	Торіс	See Page			
	Creating an Interpolation Table	66			
	Editing an Interpolation Table	72			

Importing an Interpolation Table

Deleting an Interpolation Table

Section 1 – Creating an Interpolation Table

Creating an Interpolation Table

Introduction	Interpolation tables can be created from the Home tab by clicking the Tables icon. The data can be entered manually or cut and pasted from another application such as Microsoft Excel.
Creating an Interpolation Table	This table outlines the steps for creating an interpolation table.

Step	Action
1	From the Home tab, click the Tables icon.
	<u>Result</u> : The Table Management window opens, as shown in Figure 36.
2	Click the <add b="" new<="">> button.</add>
	<u>Result</u> : The New Table Creation dialog box displays, as shown in Figure 37.
3	In the field, type the name of the new interpolation table and click <i><</i> OK <i>></i> .
	<u>Result</u> : The new table name displays in the name field and the default values fill in the other fields. The table name also displays in the <i>Tables</i> field on the left-hand side of the frame.
4	In the <i>Input Units</i> field, type the engineering units of the table input or use None.
5	In the <i>Output Units</i> field, type the units of the table output.
6	In the <i>Resolution Scalar</i> field, type the multiplier that should be used to match the table output to the hardware limitations.
	<u>Example</u> : If the table output is set up for 10 bit, (1023 counts), and the hardware output is 16 bit, (65535 counts), then the conversion formula is Hardware Output / Table Output or $65535/1023 = 64$. The resolution scalar is 64.

Creating an Interpolation Table, Continued

6	Table Manageme	nt				· · · · · · · · · · · · · · · · · · ·		
Г	Counts	Engineering Units (None)	-	Tables EGROrificeTmptr	_	Clear	EGROrificeTmptr	
	10	351.78		switch	_			Add N
	15	318.27		Test Table FREQ		Input Units:	None	Dele
	32	263.52		Default		Output Units:	Counts	Sav
	54	230.39		RAR_Switch Coolant_Level		Resolution Scalar:	64	
	70	215.05		EGROrificeTmptr Diesel_Oxidation_Catalyst		Notes:		
	95	197.72		Doser_Part_Filter_Out =	=			Imp
	120	184.88	E	OEM_Pressure_Sensor DPF_DeltaP				Clos
	165	167.77		Compress_Inlet_Temp Oil Pressure		Hardware Output F	Ranne:	
	210	154.92		WIF		Min Value (mV);		_
	250	145.59		Soot_Filter_Delta_P PPS2				
	332	130.03		PPS1 OIL_PRS_SW		Max Value(mV):		
	450	112.11		INTAKE_TEMP		Max Raw Value:	1023	
	580	94.94		FUEL_PRS Exhaust_Pressure				
	712	77.67		Crankcase_Pressure Coolant Temperature	÷			
	813	62.7	-	Description:				
	905	44.86	-	Create or Add Tables to be us	sed	in the configuration. To	Add a Table, enter all data on	the worksheet inc
	968	25.38	-	breakpoints and click Add				
	995	10.59						

Figure 37: New Table **Creation Dialog** Box

This is an example of the **New Table Creation** dialog box.

Enter the name of the Table.	
	OK
	Cancel

Creating an Interpolation Table, Continued

Creating an Interpolation Table, Continued This table continues to outline the steps for creating an interpolation table.

Step	Action
7	In the <i>Notes</i> section, type any notes to describe the table.
8	The <i>Min Value</i> (mV) field is the minimum hardware value used to calculate output voltages when digital to analog converters are used. The value is typically 0 mV.
	<u>Note</u> : This is only used for display purposes and does not affect hardware output.
9	The <i>Max Value</i> (mV) field is the maximum hardware value used to calculate output voltages when digital to analog converters are used. The value is typically 5000 mV.
	<u>Note</u> : This is only used for display purposes and does not affect hardware output.
10	The <i>Max Raw Value</i> field is the value used to calculate output voltages when digital to analog converters are used. A typical table would be set up for 10 bit output and a max raw value of 1023 would be needed.
	<u>Note</u> : This is only used for display purposes and does not affect hardware output.

Creating an Interpolation Table, Continued

Figure 38: Table

	Engineering				
Counts	Engineering Units (None)		Clear	EGROrificeTmptr	Add
10	351.78				Maa
15	318.27		Input Units:	None	De
32	263.52		Output Units:	Counts	S
54	230.39		Resolution Scalar:	64	
70	215.05		st Notes:		
95	197.72		=		Im
120	184.88	E			C
165	167.77		Hardware Outpu	t Range:	
210	154.92		Min Value (mV):		
250	145.59		Max Value(mV):		
332	130.03				
450	112.11		Max Raw Value:	1023	
580	94.94				
712	77.67	_	-		
813	62.7				
905	44.86	_		o Add a Table, enter all data on the	e worksheet in
968	25.38	_	dd		
995	10.59	-			

This is an example of the **Table Management** window.

Creating an Interpolation Table, Continued

Creating an Interpolation Table, Continued This table continues to outline the steps for creating an interpolation table.

Step	A	ction						
11	Once the interpolation table is set up, the table values should be entered. <u>Note</u> : Before entering values, ensure that the correct table is highlighted in the <i>Tables</i> list.							
	То	Then						
	Enter values manually	Type the values into the table on the left-hand side of the window using the TAB key to move between fields.						
	Paste from another program	Copy the values from the other program.						
		Return to the Table Management window and right-click in the first cell of the table on the left-hand side and select <i>Paste</i> from the menu.						
12	Once the table has been set up a click the <save< b="">> button.</save<>	and the values have been entered,						
	<u>Result</u> : The interpolation table is the Interpolation Table <i>Table</i> formatting controls.							
13	Close the Table Management configuration file.	window and save the						

Creating an Interpolation Table, Continued

Figure 39: Table

gement 🛛 👩 T	able Managemer	nt		
ow	Counts	Engineering Units (None)	Tables EGROrficeTmptr Clear Name: EGROrficeTmptr Add	
•	10	351.78	switch	d Nev
	15	318.27	Test Table Input Units: None	elete
	32	263.52	Default Output Units: Counts	Save
	54	230.39	RAR_Switch Coolant_Level Resolution Scalar: 64	
	70	215.05	EGROrficeTmptr Diesel Oxidation Catalyst Notes:	
	95	197.72		nport
	120	184.88	= DPF_DeltaP	Close
	165	167.77	Compress_Inlet_Temp Oil Pressure Hardware Output Range:	
	210	154.92	WIF Soot_Filter_Delta_P Min Value (mV): 0	
	250	145.59	PPS2	
	332	130.03	OIL PRS SW	
	450	112.11	INTAKE_TEMP Max Raw Value: 1023	
	580	94.94	Exhaust_Pressure	
	712	77.67	Crankcase_Pressure Coolant_Temperature	
	813	62.7	Description:	
	905	44.86	Create or Add Tables to be used in the configuration. To Add a Table, enter all data on the worksheet	includ
	968	25.38	breakpoints and click Add	
	995	10.59	v	

This is an example of the **Table Management** window.

Section 2 – Editing an Interpolation Table

Editing an Interpolation Table

Introduction	Interpolation tables can be edited if the set up for the table or the values in the table need to change.						
Editing an Interpolation Table	This table	outlines the steps for editing an interpolation table.					
	Step	Action					
	1	Ensure that the correct configuration file is open and then from the Home tab, click the Tables icon.					
		<u>Result</u> : The Table Management window displays, as shown in Figure 40.					
	2	In the <i>Tables</i> list, highlight the table to edit.					
		<u>Result</u> : The setup information displays on the right-hand side of the window and the table data is filled in on the left-hand side.					
	3	Make the required changes to the setup and/or the data.					
	4	Click the <save></save> button.					

 Result: The changes are saved.

 5
 Close the Table Management window and save the configuration file.

Editing an Interpolation Table, Continued

Figure 40: Table

agement 🛛 👩 Ta	ble Management						
dow	Counts	Engineering Units (None)	-	ables GROnficeTmptr	Clear	5000 A T .	
	10	351.78		witch		EGROrificeTmptr	Add New
	15	318.27		est Table REQ	Input Units:	None	Delete
	32	263.52		lefault	Output Units:	Counts	Save
	54	230.39		AR_Switch oolant Level	Resolution Scalar:	64	
	70	215.05		GROrificeTmptr liesel Oxidation Catalyst	Notes:		
	95	197.72		loser_Part_Filter_Out =			Import
	120	184.88	=	EM_Pressure_Sensor			Close
	165	167.77		ompress_Inlet_Temp lil_Pressure	Hardware Output	Range:	
	210	154.92		VIF	Min Value (mV);		
	250	145.59		oot_Filter_Delta_P PS2			
	332	130.03		PS1 IL_PRS_SW	Max Value(mV):		
	450	112.11		NTAKE_TEMP UEL_PRS	Max Raw Value:	1023	
	580	94.94		xhaust_Pressure			
	712	77.67		rankcase_Pressure oolant_Temperature			
	813	62.7		Description:			
	905	44.86			the configuration. To	Add a Table, enter all data on the w	orksheet includi
	968	25.38		breakpoints and click Add			
	995	10.59	-				

This is an example of the **Table Management** window.

Section 3 – Importing an Interpolation Table

Importing an Interpolation Table

Introduction		g interpolation table can be imported into a configuration file. LUIS mport both Gen1 and Gen2 files.
Importing and Interpolation Table	This table of	outlines the steps for importing an interpolation table.
	Step	Action

Step	Action
1	Ensure that the correct configuration file is open then from the Home tab, click the Tables icon.
	<u>Result</u> : The Table Management window displays, as shown in Figure 41.
2	Click the <import< b="">> button.</import<>
	Result: The Import Tables dialog box displays.
3	Browse for and select the appropriate configuration file that contains the desired interpolation table.
	<u>Note</u> : To import a Gen1 file or other text file, select .txt instead of .l2c in the file type dropdown list.
4	Click the <open></open> button.
	<u>Result</u> : The Select Items window, shown in Figure 42, displays with all the interpolation tables in that configuration file.
5	Select each of the interpolation tables to import and click the <i></i> Import <i>></i> button.
	<u>Note</u> : If all the interpolation tables should be imported, click the Select All > button.
	<u>Result</u> : The selected table(s) is/are imported and display in the <i>Tables</i> list on the Table Management window.
6	Close the Table Management window and save the configuration file.

Importing an Interpolation Table, Continued

Table Managemen	t					
Counts	Engineering Units (None)	Â	Tables EGROrificeTmptr	Clear Name:	EGROrificeTmptr	Add New
10	351.78		switch			Add New
15	318.27		Test Table FREQ	Input Units:	None	Delete
32	263.52		Default	Output Units:	Counts	Save
54	230.39		RAR_Switch Coolant_Level	Resolution Scalar:	64	
70	215.05		EGROrifice Tmptr Diesel_Oxidation_Catalyst	Notes:		
95	197.72		Doser_Part_Filter_Out OEM_Pressure_Sensor			Import
120	184.88	E	DPF_DeltaP			Close
165	167.77		Compress_Inlet_Temp Oil_Pressure	Hardware Output	Rance:	
210	154.92		WIF Soot_Filter_Delta_P	Min Value (mV):		
250	145.59		PPS2			_
332	130.03		PPS1 OIL_PRS_SW	Max Value(mV):		_
450	112.11		INTAKE_TEMP FUEL_PRS	Max Raw Value:	1023	
580	94.94		Exhaust_Pressure			
712	77.67	_	Crankcase_Pressure Coolant_Temperature			
813	62.7		Description:			
905	44.86		Create or Add Tables to be used	in the configuration. To	Add a Table, enter all data or	the worksheet includir
968	25.38		breakpoints and click Add			
995	10.59	-				

This is an example of the **Table Management** window.

This is an example of the **Select Items** window.

Figure 42: Select Items Window

Figure 41:

Select Items	23
switch Test Table FREQ Default RAR_Switch Coolant_Level EGROrificeTmptr Diesel_Oxidation_Catalyst Doser_Part_Filter_Out OEM_Pressure_Sensor DPF_DeltaP Compress_Inlet_Temp Oil_Pressure	WIF Soot_Fil PPS2 PPS1 OIL_PR INTAKE FUEL_F Exhaust Crankca Coolant BOOST Ambient DPF_OI
< III	4
Description:	
Select items from the list and selected items into the config	

Section 4 – Deleting an Interpolation Table

Deleting an Interpolation Table

Introduction	deleted. Ar	polation table is no longer needed in a configuration, it can be in interpolation table can only be deleted if it is not associated with l within the configuration.
Deleting an Interpolation Table	This table	outlines the steps for deleting an interpolation table.
	Step	Action
	1	Ensure that the correct configuration file is open than from the

Step	Action
1	Ensure that the correct configuration file is open then from the Home tab, click the Tables icon.
	<u>Result</u> : The Table Management window displays, as shown in Figure 43.
2	In the <i>Tables</i> list, highlight the table to delete.
3	Click the <delete< b="">> button.</delete<>
	<u>Result</u> : A dialog box displays to confirm the action. Click yes to delete the table. The table is removed from the <i>Tables</i> list and the configuration file.
4	Close the Table Management window and save the configuration file.

Deleting an Interpolation Table, Continued

Figure 43: Table

Г	Counts	Engineering	-	Tables			
		Units (None)	- 1	EGROrifice Tmptr Cle	Name:	EGROrifice Tmptr	Add Ne
	10	351.78		switch	Input Units:	None	
	15	318.27		FREQ			Delet
	32	263.52		Default RAR_Switch	Output Units:	Counts	Save
	54	230.39		Coolant_Level R	Resolution Scalar:	64	
	70	215.05		EGROrificeTmptr Diesel Oxidation Catalyst	Notes:		
	95	197.72		Doser_Part_Filter_Out OEM_Pressure_Sensor			Impo
	120	184.88	E	DPF_DeltaP			Close
	165	167.77		Compress_Inlet_Temp Oil_Pressure	Hardware Output	Range:	
	210	154.92		WIF	Min Value (mV):		_
	250	145.59		Soot_Filter_Delta_P PPS2			_
	332	130.03		PPS1 OIL_PRS_SW	Max Value(mV):	5000	
	450	112.11		INTAKE_TEMP	Max Raw Value:	1023	
	580	94.94		FUEL_PRS Exhaust_Pressure			
	712	77.67	_	Crankcase_Pressure Coolant_Temperature			
	813	62.7		Description:			
	905	44.86		Create or Add Tables to be used in the	e configuration. To	Add a Table, enter all data on	the worksheet inclu
	968	25.38	_	breakpoints and click Add			
	995	10.59	-				

This is an example of the **Table Management** window.

Chapter 4 – Waveforms

Overview		
Introduction	The Wavemaker module has built in support for specific wa LUIS Gen2 supports both Generation 1 and Generation 2 w management. Generation 1 uses the Peak Adapter servers, a waveforms are resident in the firmware. Generation 2 uses t servers, and users can define and import waveforms. Each w have a unique name within a configuration file. The Wavem Management window is used for viewing and defining wave for assigning waveforms to channels.	aveform nd the available he WaveMaker vaveform must naker
In This Chapter	This table outlines the topics covered in this chapter.	
	Торіс	See Page
	Working with Gen2 Waveforms	79
	Working with Gen1 Waveforms	98

Section 1 – Working with Gen2 Waveforms

Overview

Introduction	LUIS Gen2 waveforms use the WaveMaker server. The use waveforms on the server and then assigns these waveforms arbitrary channels. LUIS Gen2 has 8 specific arbitrary chan specific digital channels.	to either digital o	
In This Section	This table outlines the topics covered in this section.		
	Topic	See Page	
	Topic Defining a Gen2 Waveform	See Page 80	
	-		
	Defining a Gen2 Waveform	80	
	Defining a Gen2 Waveform Importing a Gen2 Waveform	80 84	

Defining a Gen2 Waveform

IntroductionWaveforms are defined within a configuration on the Waveform
Management window. The left-hand side of this window provides the
interface for defining waveforms as well as maintaining a list of all the
waveforms in this configuration.

This table outlines the steps for defining a waveform.

Defining a Gen2 Waveform

Step	Action		
1	With the appropriate configuration file open, from the Home tab, click the Waveforms/Channels icon.		
	<u>Result</u> : The WaveMaker Management window displays, as shown in Figure 44.		
2	Click the LUIS Gen2 tab at the top of the window.		
	Result: The interface for de them to channels displays.	fining Gen2 waveforms and assigning	
3	On the left-hand side of the window in the Waveform Definition section, click the <add new=""></add> button.		
	<u>Result</u> : The <i>New Waveform Creation</i> dialog box displays, as shown in Figure 45.		
4	In the field, type the name	of the waveform and click <ok< b="">>.</ok<>	
	<u>Result</u> : The name displays in the <i>Name</i> field as well as being listed in the waveform library field.		
5	In the <i>Card Output (mv)</i> table, create the waveform.		
	То	Then	
	Create manually	Type in the values for the	
		waveform using the TAB key to navigate the table.	

Figure 44: WaveMaker Management Window This is an example of the **WaveMaker Management** window open to the LUIS Gen2 tab.

🜔 Wa	veMaker Management	27.225 Same	
	Card Output (mV)	Waveform Definition:	Channel Definition:
▶ 1	5000	Name: 24+1 hhp hall Add New	Name: Server: Save
2	5000		Input: Freq Close
3	5000	Length: 7200 Delete	
4	5000	Import	Hardware Synchronizing
5	5000		O Master 🔲 Ext Sync Drive
6	5000		
7	5000		◎ Slave
8	5000		Master Channel
9	5000	60-2 missing teeth low	
10	5000	6+1 60-2 missing teeth hi	
11	5000	24+1 hhp hall	
12	5000		
13	5000		
14	5000		
15	5000		
16	5000		
17	5000		
18	5000	Description:	
19	5000	Create or Add Waveforms to be used in the configuration.	To Add a Waveform, click Add and give it a name.
20	5000	Configure the channel and click Save.	
1	+ 0003 4 III		Whore Melzer

Figure 45: New Waveform Creation Dialog Box This is an example of the *New Waveform Creation* dialog box.

Enter the name of the Waveform.	
	ОК
	Cance

Defining a Gen2 Waveform, Continued This table continues to outline the steps for defining a waveform.

Step	Action		
5	Continued		
	То	Then	
	Copy from an alternate source such as Microsoft Excel	Open the source and copy the data.	
		Return to the WaveMaker Management window, right- click in the first cell and select the <i>Paste</i> option from the menu.	
6	As the waveform data is entered, the <i>Length</i> field is automatically populated with the number of cells.		
7	When the waveform has been de <u>Note</u> : To save the changes perma click the <save< b="">> icon on the LU</save<>	anently to the configuration file,	

Figure 46: WaveMaker Management Window This is an example of the **WaveMaker Management** window open to the LUIS Gen2 tab.

	Card Output (mV)	Waveform Definition:	Channel Definition:	
1	5000	Name: 24+1 hhp hall Add New	Name: Server:	Save
2	5000			
3	5000	Length: 7200 Delete	input. (rioq	Close
4	5000	Import	Hardware Synchronizing	
5	5000		Master Ext Sync Drive	
6	5000			
7	5000		© Slave ⊤	
8	5000		Master Channel	
9	5000	60-2 missing teeth low		
10	5000	6+1		
11	5000	60-2 missing teeth hi 24+1 hhp hall		
12	5000			
13	5000			
14	5000			
15	5000			
16	5000			
17	5000			
18	5000	Description:		
19	5000	Create or Add Waveforms to be used in the configuratio	n. To Add a Waveform, click Add and give it a name.	
20	5000	Configure the channel and click Save.		
21	0003	~		Wava Makar

Importing a Gen2 Waveform

Introduction Waveforms can be imported from other configuration files. Remember that each waveform within a configuration file must have a unique name. The next section describes how to rename a waveform.

This table outlines the steps for importing a waveform.

Importing a
Gen2
Waveform

Step	Action	
1	With the appropriate configuration file open, from the Home tab, click the Waveforms/Channels icon.	
	<u>Result</u> : The WaveMaker Management window displays, as shown in Figure 47.	
2	Click the LUIS Gen2 tab at the top of the window.	
	<u>Result</u> : The interface for defining Gen2 waveforms and assigning them to channels displays.	
3	On the left-hand side of the window in the Waveform Definition section, click the <import< b="">> button.</import<>	
	Result: The Import Waveform dialog box displays.	
4	Browse for and select the configuration file that has the desired waveform(s) and click the <open></open> button.	
	<u>Result</u> : The Select Items window, shown in Figure 48, displays listing all the waveforms defined in the selected configuration file.	
	<u>Note</u> : To select a Gen1 waveform file, change the file type dropdown list from .12c to .cff.	
5	Select the waveform(s) to import and click the <import< b="">> button.</import<>	
	Note: To import all the waveforms in the configuration, click the Select All > button.	
	<u>Result</u> : The waveforms selected are imported and display in the library field.	

Importing a Gen2 Waveform, Continued

Figure 47: WaveMaker Management Window This is an example of the **WaveMaker Management** window open to the LUIS Gen2 tab.

🧔 Wa	veMaker Management		
	Card Output (mV)	Waveform Definition:	Channel Definition:
▶ 1	5000	Name: 24+1 hhp hall Add New	Name: Server: Save
2	5000		
3	5000	Length: 7200 Delete	
4	5000	Import	Hardware Synchronizing
5	5000		O Master Est Sync Drive
6	5000		
7	5000		◎ Slave
8	5000		Master Channel
9	5000	60-2 missing teeth low	
10	5000	6+1	
11	5000	60-2 missing teeth hi 24+1 hhp hall	
12	5000		
13	5000		
14	5000		
15	5000		
16	5000		
17	5000		
18	5000	Description:	
19	5000	Create or Add Waveforms to be used in the configuration.	To Add a Waveform, click Add and give it a name.
20	5000	Configure the channel and click Save.	
1 21	5000		Weya Meiza

This is an example of the **Select Items** window.

Figure 48: Select Items Window

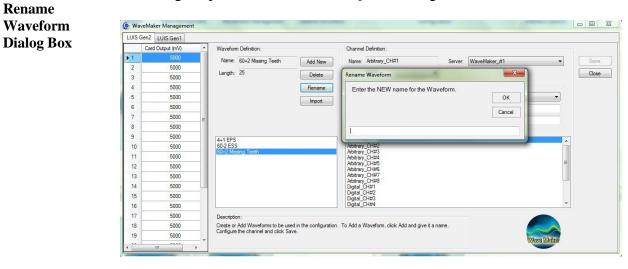
6	Select Items	
	 60-2 missing teeth low 6+1 60-2 missing teeth hi 24+1 hhp hall 	Import Close
		Select All
	Description: Select items from the list and click Import to selected items into the configuration.	transfer the

Renaming a Gen2 Waveform

Introduction	After a waveform has been defined, its name can be changed through the WaveMaker Management window.		
Renaming a Gen2 Waveform	This table	outlines the steps for renaming a waveform.	
	Step	Action	
	1	With the appropriate configuration file open, from the Home tab, click the Waveforms/Channels icon.	
		Result: The WaveMaker Management window displays.	
	2	Click the LUIS Gen2 tab at the top of the window.	
		<u>Result</u> : The interface for defining Gen2 waveforms and assigning them to channels displays.	
	3	On the left-hand side of the window, in the waveform library field, highlight the waveform to rename.	
		Result: The waveform's data displays.	
	4	Click the <rename< b="">> button.</rename<>	
		<u>Result</u> : The <i>Rename Waveform</i> dialog box, shown in Figure 49, displays.	
	5	Type the new name for the waveform and click <ok< b="">>.</ok<>	
		<u>Result</u> : The dialog box closes and the name of the waveform is changed in both the <i>Name</i> field and waveform library list.	
		<u>Note</u> : The change is automatically saved to the waveform, but the configuration needs to be saved to make the changes permanent in the configuration file.	

Renaming a Gen2 Waveform, Continued

Figure 49:



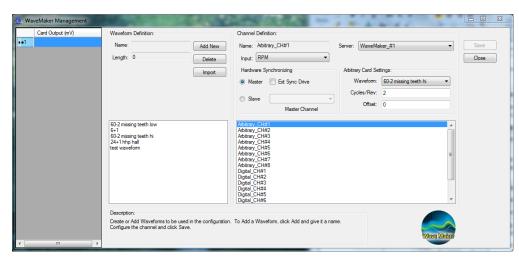
This image depicts the *Rename Waveform* dialog box.

Assigning a Gen2 Waveform

Introduction	After waveforms have been defined, they can be assigned to channels on the WaveMaker Management window. The same waveform can be assigned to multiple channels within a configuration.
Hardware Synchronizing	Channels can be set to be synchronized. When using this option, one channel must be set to be the master. Any channel that should sync with that channel will be a slave to it.
	Channels can also be synchronized with an external drive. When this is the case, the master channel must be set as a master and also as an external sync drive. This allows the channel to output its drive signal externally and other WaveMaker units can use it as a master.
Assigning a Gen2 Waveform	This table outlines the steps for assigning a waveform to a channel.

Step	Action
1	With the appropriate configuration file open, from the Home tab, click the Waveforms/Channels icon.
	<u>Result</u> : The WaveMaker Management window displays, as shown in Figure 50.
2	Click the LUIS Gen2 tab at the top of the window.
	<u>Result</u> : The interface for defining Gen2 waveforms and assigning them to channels displays.
3	In the <i>Server</i> field, select the correct server for the channel to assign.
	<u>Result</u> : The channels available on the selected server display in the channels list and the first channel's information is filled in to the fields.
4	Select the desired channel from the channel list.
	<u>Result</u> : The channel's information populates the fields.
5	In the <i>Input</i> field, select the correct input.

Figure 50: WaveMaker Management LUIS Gen2 Window



This is an example of the **WaveMaker Management** window when assigning a LUIS Gen2 waveform.

Assigning a Gen2 Waveform, Continued This table continues to outline the steps for assigning a waveform to a channel.

Step		Action
6	 In the Hardware Synchronizing section, select if this channel should be a <i>Master</i>, <i>Slave</i> or <i>Master</i> and <i>External Sync Drive</i> <u>Note</u>: Unless this channel is to be a slave to another, the Mast option should be selected. If the channel is a <i>Slave</i>, select its <i>Master Channel</i> from the dropdown list. <u>Note</u>: If this channel is to sync to an external sync drive, select the <i>Ext Sync Drive</i> option. This channel will automatically sy with whichever channel on the external sync drive was set up the external sync master. 	
7		
8		ection will differ depending on whether the bitrary or digital channel.
	Channel Type	Settings
	Arbitrary	In the <i>Waveform</i> field, select the desired waveform from the list. <u>Note</u> : Only waveforms in this configuration are available.
		If the <i>Input</i> setting is set to RPM, the <i>Cycles/Rev</i> must be set correctly to complete the required calculations. In the <i>Cycles/Rev</i> field, type the number of cycles per revolution for the waveform data pattern.
		<u>Note</u> : Two revolutions are typically used to make a complete cycle of data
		The <i>Offset</i> field allows arbitrary channels that sync with each other to shift the waveform by a number of data points. If an offset is required,

Figure 51: WaveMaker Management Window This is an example of the **WaveMaker Management** window when defining an arbitrary channel for LUIS Gen2.

	Card Output (mV)	Waveform Definition:	Channel Definition:		
1	Cald Odtpot (IIV)				
		Name:	Add New Name: Arbitrary_CH#1	Server: WaveMaker_#1	Save
		Length: 0	Delete Input: RPM		Close
			Import Hardware Synchronizing	Arbitrary Card Settings:	
			Master Ext Sync Drive	Waveform: 60-2 missing teeth hi	•
			-	Cycles/Rev: 2	
			⊘ Slave	Offset: 0	
			Master Channel		
	602 missing teeth low 6+1 602 missing teeth hi 24+1 hip hall teet waveform	Abdray, CHE1 Abdray, CHE2 Abdray, CHE3 Abdray, CHE3 Abdray, CHE5 Abdray, CHE6 Abdray, CHE6 Digital, CHE1 Digital, CHE1 Digital, CHE3 Digital, CHE5 Digital, CHE5 Digital, CHE5 Digital, CHE5		E	
		Description: Create or Add Waveforms to be used in Configure the channel and click Save.	the configuration. To Add a Waveform, click Add and give it a r	name. Waya Ma	nizar

Continued on next page

Assigning a Gen2 Waveform, Continued This table continues to outline the steps for assigning a waveform to a channel.

Step	Action		
8	Continued		
	Channel Type	Settings	
	Digital	In the <i>Output</i> field, select the correct output type.	
		If the number of teeth per revolution of the flywheel is necessary, enter this number in the <i>Teeth/Rev</i> field.	
		If PWM operation is desired for the channel, enter its heart beat frequency in the <i>PWM HB Freq</i> field. If PWM operation is not desired, this value should be set to 0.	
9	When all the assignments have been made, click the Save >		
1	button.		
		ves the changes to the waveforms, but the to be saved to make the changes permanent file.	

Figure 52: WaveMaker Management Window This is an example of the **WaveMaker Management** window when defining a digital channel for LUIS Gen2.

15 G	en2 LUIS Gen1			
_	Card Output (mV)	Waveform Definition:	Channel Definition:	
1	0	Name: 4+1 EPS Add New	Name: Digital_CH#1 Server: WaveMaker_#1	• Sa
2	0	Length: 7200 Delete	Input: Freq 🔹	
3	0	Delete		
4	0	Rename	Hardware Synchronizing Digital Card Settings:	
5	0	Import	Master Ext Sync Drive Output Type: Hall	•
6	0		Teeth/Rev:	
7	0		Slave PWM HB Freq: 0	
8	0		Master Channel	
9	0	4+1 EPS	Arbitrary CH#1	
10	0	60-2 ESS	Arbitrary_CH#2	- All
11	0	60+2 Missing Teeth	Arbitrary_CH#3 Arbitrary_CH#4	
12	0		Arbitrary_CH#5 Arbitrary_CH#6	
13	0		Arbitrary CH#7	1.17
14	0		Arbitrary_CH#8 Digital_CH#1	
15	0		Digtal_CH#2 Digtal_CH#3	
16	0		Digtal_CH#4	v
17	0	Description:		
18	0	Create or Add Waveforms to be used in the configuration	n. To Add a Waveform, click Add and give it a name.	
19	0	Configure the channel and click Save.		The Marker
			W6	SKE WEEKEN

Exercise: Defining and Assigning a Gen2 Waveform

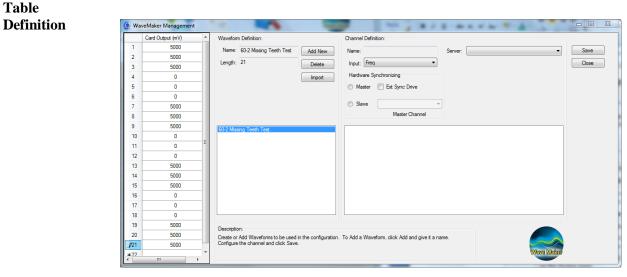
Exercise: Defining and Assigning a Gen2 Waveform The purpose of this exercise is to familiarize the user with using the **WaveMaker Management** window to define and assign Gen2 waveforms.

Step	Action		
Define a	Define a waveform		
1	On the Home tab, click the Waveforms/Channels icon.		
	Result: The WaveMaker Management window opens, as shown in Figure 53.		
2	Click the LUIS Gen2 tab at the top of the window.		
	<u>Result</u> : The interface for working with Gen2 waveforms displays.		
3	On the left-hand side of the window, in the Waveform Definition section, click the <add new=""></add> button.		
	Result: The New Waveform Creation window displays.		
4	In the field, type 60-2 Missing Teeth Test and click <ok>.</ok>		
	<u>Result</u> : The new waveform is added to the waveform library list and the name displays in the <i>Name</i> field.		
5	In the <i>Card Output</i> table, fill in the value displayed in the image on the facing page.		
	<u>Result</u> : As the table is populated, the <i>Length</i> field reflects the number of values in the table.		
6	Click the <save< b="">> button.</save<>		
	<u>Result</u> : The waveform is saved to the library. It is important to note that if the configuration file is closed without saving, this waveform will be lost.		

Exercise: Defining and Assigning a Gen2 Waveform, Continued

Figure 53:

Table



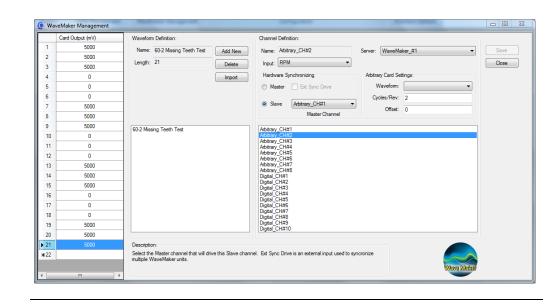
This image displays the value for the table being created in Step 5.

Exercise: Defining and Assigning a Gen2 Waveform, Continued

Exercise: Defining and Assigning a Waveform, Continued The purpose of this exercise is to familiarize the user with using the **WaveMaker Management** window to define and assign waveforms.

Step	Action
Assign a	waveform
7	On the right-hand side of the WaveMaker Management window, in the Channel Definition section, from the <i>Server</i> dropdown list, select WaveMaker_#1.
	<u>Result</u> : The list of channels available in WaveMaker_#1 display in the channel list field. The first channel is highlighted, and its information displays in the fields.
8	Ensure that Arbitrary_CH#1 is highlighted in the channels list. In the Arbitrary Card Settings section, from the <i>Waveform</i> dropdown list, select 60-2 Missing Teeth Test.
9	Click the <save< b="">> button.</save<>
10	In the channel list field, click on Arbitrary_CH#2.
	<u>Result</u> : The fields are filled with the information for this channel.
11	In the Hardware Synchronizing section, select the <i>Slave</i> option.
12	From the <i>Master Channel</i> select the Arbitrary_CH#1 option. <u>Note</u> : This sets Arbitrary_CH#2 to be synced with Arbitrary_CH#1.
13	In the Arbitrary Card Settings section, from the Waveform dropdown list, select 60-2 Missing Teeth Test.
14	Click the <save< b="">> button.</save<>
	<u>Result</u> : The waveform information is saved.
15	Close the WaveMaker Management window and save the configuration.

Exercise: Defining and Assigning a Gen2 Waveform, Continued



This image is an example of assigning a waveform.

Figure 54:

Assigning a Waveform

Notes

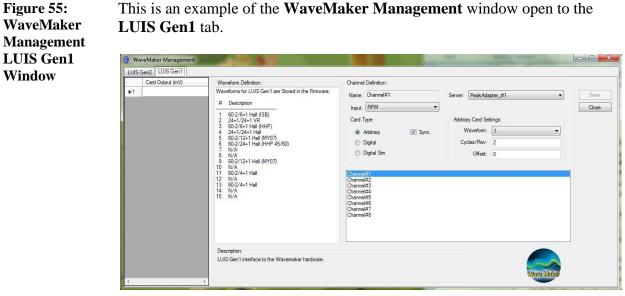
Section 2 – Working with Gen1 Waveforms

Overview		
Introduction	LUIS Gen1 waveforms use the Peak Adapter servers. The w resident in the firmware and cannot be modified by the user way the Gen1 firmware was coded, Gen1 waveforms must b Channel 1. The waveform combination will automatically b Channel 1 and Channel 2. The WaveMaker Management assign the desired waveform into Channel 1.	Because of the be loaded into e loaded into
In This Section	This table outlines the topics covered in this section.	
	Торіс	See Page
	Assigning a Gen1 Waveform	100
	Exercise: Assigning a Gen1 Waveform	106

Assigning a Gen1 Waveform

Introduction	All Gen1 waveforms are resident in the firmware, and they can be assigned to Channel 1 on the WaveMaker Management window.
Hardware Synchronizing	Channels can be set to be synchronized. When using this option, Channel #1 will be used as the master, and any other channel that is set to sync will be a slave to that channel.
Assigning a Gen1 Waveform	This table outlines the steps for assigning a waveform to a channel.

n, from the Home tab, ndow displays.
ndow displays.
window.
1 waveforms resident e 55.
for the channel to
#1 is selected. If ed channel from the
es the fields.
rbitrary, Digital, or
rbitrary channels.
l #1, select the Sync



This is an example of the WaveMaker Management window open to the

Assigning a Gen1 Waveform, Continued This table continues to outline the steps for assigning a waveform to a channel.

Step		Action
8		ection will differ depending on whether the bitrary or digital channel.
	Channel Type	Settings
	Arbitrary	In the <i>Waveform</i> field, select the desired waveform number from the list.
		<u>Note</u> : The numbers in the list correspond to the numbers listed in the <i>Waveform Definition</i> field on the left-hand side of the window.
		If the <i>Input</i> setting is set to RPM, the <i>Cycles/Rev</i> must be set correctly to complete the required calculations. In the <i>Cycles/Rev</i> field, type the number of cycles per revolution for the waveform data pattern.
		<u>Note</u> : Two revolutions are typically used to make a complete cycle of data
		The <i>Offset</i> field allows arbitrary channels that sync with the master to shift the waveform by a number of data points. If an offset is required, type the amount to offset in this field.

Figure 56: WaveMaker Management LUIS Gen1 Window This is an example of the **WaveMaker Management** window when defining an arbitrary channel for LUIS Gen1.

Card Output (mV)	Waveform Definition:	Channel Definition:		
	Waveforms for LUIS Gen1 are Stored in the Firmware:	Name: Channel#1	Server: PeakAdapter_#1	
# Description	# Description	Input: RPM 💌		(
	1 62-26-1 Hail (166) 2 54-7 (24-1 V) 3 562-26-1 Hail (HHP) 4 24-7 (24-1 Hail (HHP) 4 24-7 (24-1 Hail (HHP) 5 662-212-1 Hail (HHP) 6 60-22/24-1 Hail (HHP 45/60) 7 N/A 8 N/A		1	
		Card Type	Arbitrary Card Settings:	
		Arbitrary Sync	Waveform: 1	
		O Digital	Cycles/Rev: 2	
		Oigital Sim	Offset: 0	
	9 60-2/12+1 Hall (MY07) 10 N/A			
	11 60-2/4-1 Hall 12 N/A 13 60-2/4-1 Hall 14 N/A 15 N/A	Channel#1 Channel#2		
		Channel#3 Channel#4		
		Channel#5 Channel#6		
		Channel#7		
		Channel#8		
Description: LUIS Gen 1 interface				
	Description:			
	LUIS Gen 1 interface to the Wavemaker hardware.			
			Waya Makar	

Continued on next page

Assigning a Gen1 Waveform, Continued This table continues to outline the steps for assigning a waveform to a channel.

Step	Action			
8	Continued			
	Channel Type	Settings		
	Digital or Digital Sim	In the <i>Output</i> field, select the correct output type.		
		If the number of teeth per revolution of the flywheel is necessary, enter this number in the <i>Teeth/Rev</i> field.		
		If PWM operation is desired for the channel, enter its heart beat frequency in the <i>PWM HB Freq</i> field. If PWM operation is not desired, this value should be set to 0.		
9	When all the assignments have been made, click the Save button. Note: This button saves the changes to the waveforms, but the			
	configuration needs to be saved to make the changes permanent in the configuration file.			

Assigning a Gen1 Waveform, Continued

Figure 57: WaveMaker Management LUIS Gen1 Window This is an example of the **WaveMaker Management** window when defining a digital channel for LUIS Gen1.

Card Output (mV)	Waveform Definition:	Channel Definition:		
	Waveforms for LUIS Gen 1 are Stored in the Filmware: # Description 1 60-2/6-114al (SB) 2 24-12/24-1 VR 3 60-2/6-114al (MP) 4 24-12/24-114al (MPO7) 6 60-2/2-114al (MPO7) 7 N/A 9 60-2/12-114al (MPO7) 10 N/A 11 60-2/12-114al (MPO7) 10 N/A 13 60-2/12-114al (MPO7) 14 N/A 15 N/A 15 N/A	Name: Channel#1 Input: RPM Card Type Card Type Arbitrary Sync Digital Digital Sin Channel#2 Channel#3 Channel#3 Channel#3 Channel#4 Ch	Server: PeakAdapter_#1	Close
	Description: LUIS Gen1 interface to the Wavemaker hardware.		Wava Malzar	

Exercise: Assigning a Gen1 Waveform

Exercise: Defining and Assigning a Gen1 Waveform The purpose of this exercise is to familiarize the user with using the **WaveMaker Management** window to define and assign waveforms.

Step	Action
1	On the Home tab, click the Waveforms/Channels icon.
	Result: The WaveMaker Management window opens.
2	Click the LUIS Gen1 tab at the top of the window.
	<u>Result</u> : The interface for assigning the Gen1 waveforms resident in the firmware displays, as shown in Figure 58.
3	On the right-hand side of the WaveMaker Management window, in the Channel Definition section, from the <i>Server</i> dropdown list, select PeakAdapter_#1.
	<u>Result</u> : The first channel is highlighted, and its information displays in the fields.
4	Select Channel#1 in the channels list. In the <i>Input</i> field, select RPM.
5	In the Card Type section, select the <i>Arbitrary</i> option.
7	In the Arbitrary Card Settings section, in the <i>Waveform</i> field, select 2 from the dropdown list.
	<u>Note</u> : This sets the waveform to be $24+1/24+1$ VR as indicated in the <i>Waveform Definition</i> field on the left-hand side of the window.
8	In the Cycles/Rev field, type 2.
9	In the <i>Offset</i> field, type 0.
10	Click the Save > button.
	<u>Result</u> : The waveform information is saved.
11	Close the WaveMaker Management window and save the configuration.

Exercise: Assigning a Gen1 Waveform, Continued

Figure 58: Assigning a

Waveform

Card Output (mV)	Waveform Definition	Channel Definition	
*1	Waveforms for LUIS Gen 1 are Stored in the Firmware: # Description 1 60-2/6-11 Hall (SB) 2 24-12/24-1 VR 3 60-2/6-11 Hall (HP) 4 24-12/24-1 Hall (HP) 4 24-12/24-1 Hall (HP707) 6 60-2/2-1 Hall (HP707) 7 7/24-1 Hall (HP707) 8 N/A 9 60-2/12-1 Hall (MY07) 10 N/A 11 60-2/4-1 Hall (MY07) 12 N/A 13 60-2/4-1 Hall 14 N/A 15 N/A	Nane: Charnel#2 Server: PeakAdapter_#1 • Input: RFM • • Card Type Abtrary Card Settings: • Ø Dgital © Uges/Rev: 2 O Dgital Offeet: 0 Ö Dannel#1 • • Ohannel#3 Ohannel#3 • Ohannel#3 Ohannel#3 • Ohannel#3 • • Ohannel#3 • • Ohannel#3 • •	Cie
	Description: LUIS Gen1 interface to the Wavemaker hardware.	Vibra Mater	

This image is an example of assigning a waveform.

Notes

Chapter 5 – J1939 Sensors

Introduction Luis Gen2 provides the ability to receive J1939 messages through either the CAN servers or the Peak Adapter servers. The Main Module is used to broadcast J1939 messages. Messages and parameters are defined through J1939 Datalink Sensor Simulation Management window.				
n This Chapter	This table outlines the topics covered in this chapte	r.		
	This table outlines the topics covered in this chapte	r. See Page		
	Торіс	See Page		

Section 1 – Setting up J1939 Messages

Overview		
Introduction	User can define J1939 messages that can transmit da Module or receive data through the Peak Adapter or	U
In This Section	This table outlines the topics covered in this section.	
In This Section	This table outlines the topics covered in this section. Topic	See Page
In This Section	•	
In This Section	Торіс	See Page

Notes

Setting Up J1939 Messages to Transmit

Setting Up J1939 Messages to Transmit This table outlines the steps for setting up J1939 messages to transmit through the CAN servers.

Step	Action
1	With the appropriate configuration file open, from the Home tab, click the SAE J1939 Sensors icon.
	<u>Result</u> : The J1939 Datalink Sensor Simulation Management window displays, as shown in Figure 59.
2	On the left-hand side of the window click the <add b="" new<="">> button.</add>
	Result: The New Message Creation dialog box displays.
3	In the field, type the unique name of the J1939 message and click OK >.
	<u>Result</u> : The name displays in the <i>Name</i> field as well as in the message list below. Defaults are loaded into the other fields.
4	In the <i>Desc</i> field, type a description of the message.
5	In the <i>ID</i> field, type the message ID. The message ID is the Parameter Group Number along with its Priority Bits and Source/Destination address.
	<u>Note</u> : Decimal values are valid. As the ID is typed, the Hex name displays.
6	In the <i>Rate</i> field, select the appropriate rate, in milliseconds, from the dropdown list.
	Note: This is the rate the message is transmitting on the CAN bus.
7	In the <i>Length</i> field, select the number of bytes that make up the data load for the message from the dropdown list.

Setting Up J1939 Messages to Transmit to Transmit, Continued

Figure 59:This is an example of the J1939 Datalink Sensor Simulation Management
Window.SensorSimulation
Management
Window

Message I	Definition:		Message Para	meter Definition:		
	Electronic Engine Controller #1 217056256 Hex: 0CF00400 20 vms I Transmit Baud	Add New Delete Clear Import	Name: [Start Bit: [Length: [Resolution: (Offset: (16 v bits 0.125	Add New Delete Clear	Save Close Bit Reference Byte Start Bit 1 1 2 9 3 17
EC1 TSC1			Driver's Demai	ter Torque Modes nd Engine Torque ss of Controlling Device		4 25 5 33 6 37 7 49 8 57
Description	n: LUIS Gen2 hardware to broadcast the message.					

Setting Up J1939 Messages to Transmit to Transmit, Continued

Setting Up J1939 Messages to Transmit, Continued This table continues to outline the steps for setting up J1939 messages to transmit through the CAN servers.

Step	Action		
8	Ensure that the <i>Transmit</i> option is selected.		
9	Click the <baud></baud> button. <u>Result</u> : The <i>Configure the Baud Rate for CAN Bus</i> dialog box displays, as shown in Figure 61.		
10	From the CAN Bus Plugin field, select the appropriate plugin.		
11	From the <i>Baud Rate</i> dropdown list, select the desired baud rate for the data transmission.		
12	When the rate has been set up, click the <save> button.Result: The changes are saved and the dialog box closes.</save>		
13	When the message has been defined, click the <save> button.<u>Result</u>: The message definition is saved, but the configurationneeds to be saved to make the changes permanent in theconfiguration file.</save>		

Setting Up J1939 Messages to Transmit to Transmit, Continued

Figure 60:This is an example of the J1939 Datalink Sensor Simulation ManagementJ1939 Datalinkwindow.SensorSimulationManagementWindow

essage	Definition:	Message Parameter Definition:	
	Electronic Engine Controller #1 217056256 Hex: 0CF00400 20 ms Transmit Baud	New Name: Engine Speed Add New stee Start Bit: 25 ▼ Delete Length: 16 ▼ bits Clear ort Offset: 0	Save Close Bit Reference Byte Start B 1 1 2 9
EC1 SC1		Engine Speed Engine /Retarder Torque Modes Driver's Demand Engine Torque Source Address of Controlling Device	3 17 4 25 5 33 6 41 7 49 8 57
escriptio	n:		

This is an example of the *Configure the Baud Rate for Can Bus* dialog box.

CAN Bus Plugin MainModuleJ1939PortAPlugin		Save
Manmodules (555) of Arlugin	Baud Rate: 250k ▼	Close

Figure 61: Configure the Baud Rate for Can Bus Dialog Box

Setting Up J1939 Messages to Receive

Setting Up J1939 Messages to Receive This table outlines the steps for setting up J1939 messages to receive through the Peak Adapter servers.

Step	Action
1	With the appropriate configuration file open, from the Home tab, click the SAE J1939 Sensors icon. Result: The J1939 Datalink Sensor Simulation Management
	window displays, as shown in Figure 62.
2	On the left-hand side of the window click the <add b="" new<="">> button.</add>
	Result: The <i>New Message Creation</i> dialog box displays, as shown in Figure 63.
3	In the field, type the unique name of the J1939 message and click < OK >.
	<u>Result</u> : The name displays in the <i>Name</i> field as well as in the message list below. Defaults are loaded into the other fields.
4	In the <i>Desc</i> field, type a description of the message.
5	In the <i>ID</i> field, type the message ID. The message ID is the Parameter Group Number along with its Priority Bits and Source/Destination address.
	Note: Decimal values are valid. As the ID is typed, the Hex name displays.
6	The <i>Rate</i> and <i>Length</i> fields are not necessary when setting up J1939 messages to receive.
7	Ensure that the <i>Receive via Peak Adapter</i> option is selected.
8	When the message has been defined, click the \langle Save> button.Result: The message definition is saved, but the configurationneeds to be saved to make the changes permanent in theconfiguration file.

Setting Up J1939 Messages to Receive to Receive, Continued

Figure 62:This is an example of the J1939 Datalink Sensor Simulation ManagementJ1939 Datalinkwindow.SensorSimulationManagementWindow

Aessage	Definition:		Message Parameter Definition:	
	Electronic Engine Controller #1 217056256 Hex: 0CF00400 20 • ms © Transmit Baud	Add New Delete Clear Import	Ctat Dt. 25	Save Delete Close Clear Bit Reference Byte Start E 1 2 3 17 4 25 5 33 6 41 7 49 8 57
Descriptio Jses <mark>a P</mark> e	n: vak Adapter to receive messages.			

This image is an example of the New Message Creation dialog box.

New Message Creation Dialog Box

Figure 63:

Enter the name of the Message.	
Line no name et no moseuge.	ОК
	Cancel

J1939 Definitions

Importing J1939 Messages

J1939 Messages and their parameters defined in other configuration files can Introduction be imported in to the current configuration. Importing

This table outlines the steps for importing J1939 messages and parameters.

Step	Action	
1	With the appropriate configuration file open, from the Home tab, click the SAE J1939 Sensors icon.	
	<u>Result</u> : The J1939 Datalink Sensor Simulation Management window displays, as shown in Figure 64.	
2	Click the <import< b="">> button.</import<>	
	Result: The Import Message dialog box displays.	
3	Browse for and find the configuration from which the J1939 Messages should be imported then click <open< b="">>.</open<>	
	<u>Result</u> : The <i>Select Items</i> dialog box displays, as shown in Figure 65, with the message definitions displayed.	
4	Select each of the messages to import and click < Import >. <u>Note</u> : The messages and their parameters are imported. If attempting to import a message with a duplicate name, LUIS will prompt whether or not to continue.	
5	Once the messages have been imported, click the Save > button on the far right-hand side of the window to save the changes. <u>Note</u> : Save the configuration to make the changes permanent to the configuration file.	

Importing J1939 MessagesImporting J1939 Messages,

Continued

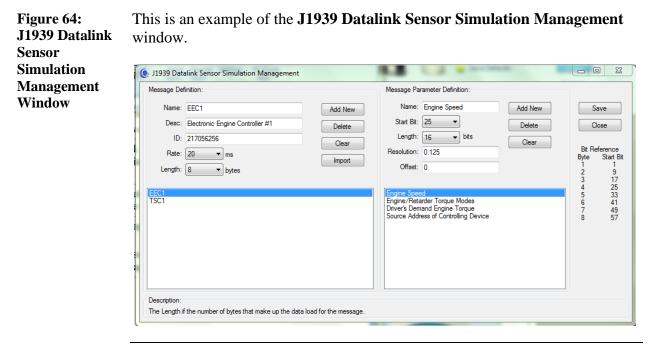


Figure 65: Select Items Dialog Box This is an example of the *Select Items* dialog box.

Select Items		23
EEC1 TSC1	Impor	
	Select	All
Description: Select items from the list and click Import to	transfer th	e
selected items into the configuration.		

Setting Up J1939 Parameters

Setting Up J1939 Parameters

IntroductionOnce a J1939 message has been set up, the user can define the parameters
within that message. This is accomplished through the J1939 Datalink
Sensor Simulation Management window..

Setting Up	This table outlines the steps for setting up J1939 message parameters.
J1939 Message	
Parameters	

Step	Action	
1	With the appropriate configuration file open, from the Home tab, click the SAE J1939 Sensors icon.	
	<u>Result</u> : The J1939 Datalink Sensor Simulation Management window displays, as shown in Figure 66.	
2	Verify the correct message definition has been set up. If it has not, set it up according to the steps in the previous sections of this chapter.	
3	On the Message Definition side of the window, select the desired J1939 Message.	
4	On the Message Parameter Definition side of the window, in the <i>Name</i> field, type a name for the parameter. <u>Note</u> : Parameter names must be unique.	
5	In the <i>Start Bit</i> field, select the start bit for the parameter. <u>Note</u> : The start bit is the first bit in the data load for the message where this parameter data starts.	
6	In the <i>Length</i> field, select the number of bits that make up the parameter.	
7	In the <i>Resolution</i> field, enter the value per bit in engineering units.	
	<u>Note</u> : This value is used to convert the engineering units on a gauge to the actual transmitted data.	

Setting Up J1939 Parameters, Continued

Figure 66: J1939 Datalink Sensor Simulation Management Window This is an example of the **J1939 Datalink Sensor Simulation Management** window.

Name: Desc:	EEC1	Add New	Name: Engine Speed		
ID: Rate: (Length: (Delete Clear Import	Start Bit: 25 Length: 16 Resolution: 0.125 Offset: 0	Add New Delete Clear	Save Close Bit Reference Byte Start I 1 1 2 9 3 17
EC1 SC1			Engine Speed Engine/Retarder Torque Modes Driver's Demand Engine Torque Source Address of Controlling Device		4 25 5 36 41 7 49 8 57

Setting Up J1939 Parameters, Continued

Setting Up J1939 Message Parameters, Continued This table continues to outline the steps for setting up J1939 message parameters.

Step	Action	
8	In the Offset field, that the value of the data is offset.	
	<u>Note</u> : This value is used to convert the engineering units on a gauge to the actual transmitted data.	
9	Once the parameter has been defined, click the <add b="" new<="">> button.</add>	
	<u>Result</u> : The parameter is saved to the message and displays in the field below the parameter definition fields.	
10	To save the changes to the configuration, click the Save > button on the far right-hand side of the window.	
	<u>Note</u> : Save the configuration to make the changes permanent to the configuration file.	

Setting Up J1939 Parameters, Continued

Figure 67: J1939 Datalink Sensor Simulation Management Window This is an example of the **J1939 Datalink Sensor Simulation Management** window.

Message Def	finition:		Message Parameter Definition:		
	Electronic Engine Controller #1 217056256 20 ms	Add New Delete Clear Import	Name: Engine Speed Start Bit: 25 Length: 16 bits Resolution: 0.125 Offset: 0	Add New Delete Clear	Save Close Bit Reference Byte Start 1 1 2 9 3 17 7
EC1 TSC1			Engine Speed Engine/Retarder Torque Modes Driver's Demand Engine Torque Source Address of Controlling Device		4 25 5 33 6 41 7 49 8 57
Description:	f the number of bytes that make up the da	ta load for the message			-

Section 3 – Assigning J1939 Parameters to Gauges

Assigning J1939 Parameters to Gauges

IntroductionOnce J1939 messages and parameters have been defined, the parameters can
be assigned to gauges within the LUIS Gen2 workspace.

Assigning a This table outlines the steps for assigning a J1939 parameter to a gauge.

J1939 Parameter to a Gauge

Step	Action	
1	Add a gauge to the appropriate tile within the configuration.	
2	Right-Click the control and select the <i>Properties</i> option from the menu.Result: The <i>Toolbox</i> dialog box displays, as shown in Figure 68.	
3	In the Component Options section, use <i>Enable</i> option to determine if the value of the control should be enabled, <i>True</i> , or not disabled, <i>False</i> .	
4	In the Component Options section, use the <i>Gauge Type</i> option to set if the gauge is <i>Round</i> or <i>Slider</i> .	
5	In the Hardware section, click the <> button next to the <i>Hardware Setup</i> option. <u>Result</u> : The <i>Hardware I/O Selection</i> dialog box displays, as shown in Figure 69.	
6	In the <i>Hardware Unit</i> field, select either the <i>MainModuleJ1939PortAPlugin</i> or the <i>PeakAdapterPlugin</i> option. <u>Result</u> : The channels available in that module display in the <i>Channel</i> field.	
7	In the <i>Channel</i> field, select the appropriate channel.	
8	Click < OK > to close the dialog box. <u>Result</u> : The dialog box closes and the <i>Channel</i> and <i>Type</i> under <i>Hardware Setup</i> are filled in with the selection.	

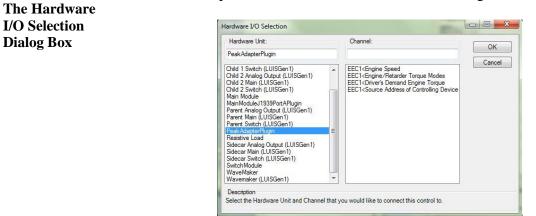
Assigning J1939 Parameters to Gauges, Continued

Figure 68: Toolbox Dialog	This is an example of t	th	e <i>Toolbox</i> d	ialog box.
Box		Too	IBox	×
		-		
		Pro	operties	- 1
			Appearance	
			Allow Resize	False
			Background Color	GradientActiveCaption
	1		Background Image	(none)
			BorderStyle	None
		Ð	Component Size	200, 240
			Gauge Font	Microsoft Sans Serif, 9.75pt, style
			Text Color	ControlText
		Ŧ	Text Font	Microsoft Sans Serif, 12pt
		Ξ	Component Options	
			FreezeValue	True
			Gauge Type	Round
		Ŧ	InterlockSetup	
		Ξ	Hardware	
		Ξ	Hardware Setup	MainModuleJ1939PortAPlugin,EEC
			Channel	EEC1>Engine/Retarder Torque Modes
			Туре	MainModuleJ1939PortAPlugin
		Ξ	Interpolation Table	
			TableName	
		Ξ	Scale	
			Maximum	100
			Minimum	0
			Multiplier	1
			Scale Resolution	1
		Ξ	Server	
			Name	LUISGen2_#1
		Ξ	Text	
			TextLine1	DefaultName
			TextLine2	Units
		Ξ	Value Definition	
			Default Value	0
			Gauge Value	0

This is an example of the Hardware I/O Selection dialog box.

Figure 69:

Hardware Setup I/O number associated with this control



Assigning J1939 Parameters to Gauges, Continued

Assigning a J1939 Parameter to a Gauge, Continued This table continues to outline the steps for assigning a J1939 parameter to a gauge.

Step	Action	
9	In the Interpolation Table section, use the down arrow next to the <i>Table Name</i> option to select the appropriate interpolation table.	
10	In the Scale section, the scale for the control can be set including the <i>Minimum</i> and <i>Maximum</i> values as well as the <i>Multiplier</i> and <i>Scale Resolution</i> .	
11	In the Server section, use the down arrow next to the <i>Name</i> option to select the appropriate server.	
12	In the Text section, the <i>TextLine1</i> and <i>TextLine2</i> options are used to define the label that displays at the top of the control.	
13	The Value Definition section can be used to set the Default <i>Value</i> for the control.	
14	The rest of the options on the <i>Properties</i> dialog box are used to control the look of the control. These can be set as desired by the user. <u>Note</u> : More information about Interlock Setup can be found in the following chapter.	

Assigning J1939 Parameters to Gauges, Continued

Figure 70:

Box

Toolbox Dialog

ToolBox × Properties <mark>₽₽</mark>↓ 🖻 Allow Resize False Gradient ActiveCaption
(none)
None Background Color Background Image BorderStyle E Component Size 200, 240 Microsoft Sans Serif, 9.75pt, style: ControlText Microsoft Sans Serif, 12pt Text Font Component Options True Round FreezeValue Gauge Type ⊡ InterlockSetup Hardware MainModuleJ1939PortAPlugin,EEC Hardware Setup Channel EEC1>Engine/Retarder Torque Туре MainModuleJ1939PortAPlugin Interpolation Table
 TableName Scale Maximum 100 Minimum 0 Multiplier 1 Scale Resolution 1 Server Name LUISGen2_#1 🗆 Text TextLine1 TextLine2 **Default Name** Units Value Definition Default Value 0 Gauge Value 0 Hardware Setup I/O number associated with this control

This is an example of the *Toolbox* dialog box.

Notes

Chapter 6 – Servers

Overview

Introduction The LUIS Gen2 has the ability to run multiple servers which connect to a separate USB interface. Each server can have multiple clients so that when data is sent to hardware devices, the data is reflected to any client connected.

PC Servers and Applications LUISGen2_#1 Server Clients can connect to multiple servers LUIS Gen2 Pipeline USB Interface Hardware LUIS PC Software Client DLL (Client) WaveMaker_#1 Server USB Interface Pipeline WaveMaker III - Internal Client/Server connections are Pipelines. PeakAdapter_#1 Server CAN Bus **Cummins Accepts** LUIS Gen1 Peak Adapter 250k/500k Software Client DLL Pipeline WaveMaker II baud (Client) Client DLL Performs: - All transactions - Callbacks from servers - load configurations and push waveform data to PeakAdapter_#2 Server Wavemaker units CAN Bus Peak Adapter 250k/500k Pipeline baud Servers can have multiple Clients. When clients send data to hardware devices, that data is reflected to any client connected. Pipelines can connect to multiple Clients

This diagram illustrates the hardware/software architecture.

In this architecture, the Client DLL performs all transactions, callbacks from servers as well as loading configurations and pushing waveform data to Wavemaker units.

Overview, Continued

Interface Types There are three types of interfaces for servers. This table describes each type.

Interface Type	Description
Pipe	An internal Windows connection in the PC
ТСР	Network interface connection utilizing Transmission Control Protocol
НТТР	Network interface connection utilizing HyperText Transport Protocol

In This This table outlines the topics covered in this chapter. Chapter

Торіс	See Page
Setting Up Servers	104
Deleting Servers	134

Notes

Section 1 – Setting Up Servers

Setting Up Servers

Introduction	Before a server can be used in the LUIS Gen2 software, the server and interface types must be set up.		
Setting Up Servers	This table	outlines the steps for setting up a server.	
	Step	Action	
	1	On the Home tab, click the Server List icon.	
		<u>Result</u> : The Server Management window, shown in Figure 71, displays and the current servers are listed in the <i>Servers</i> field on the left-hand side.	
	2	Click the < Add New > button. <u>Result</u> : The <i>New Server Creation</i> dialog box displays, as shown in Figure 72.	
	3	Type the name of the new server and click <ok< b="">>.</ok<>	
		<u>Result</u> : The new server is added to the <i>Servers</i> field on the left- hand side of the window, the name of the new server displays in the <i>Name</i> field on the right-hand side of the window, and the default information is filled in.	
	4	From the <i>Server Type</i> dropdown list, select the appropriate server type.	
	5	From the <i>Interface Type</i> dropdown list, select the appropriate interface type.	
	6	If the <i>Interface Type</i> is Pipe, then in the <i>Pipename</i> field type the correct pipename.	
	7	In the <i>Description</i> field, type a brief description of the server, if desired.	
	8	If the <i>Server Type</i> is Peak Adapter, then in the <i>NetName</i> field, type the name of the net to which the server should connect.	
	8	The <i>Status</i> field indicates the status of the server. If the server is disconnected, attempt to connect to the server by clicking the < Connect > button.	
	9	When the server is set up, click the Save > button.	
	10	Close the Server Management window and save the configuration file.	

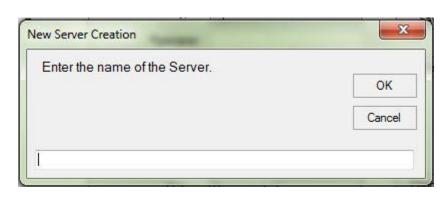
Setting Up Servers, Continued

Servers			
PeakAdapter_#1	Name:	PeakAdapter_#1	Add New
PeakAdapter_#1 PeakAdapter_#2 LUISGen2 #1	Server Type:	PeakAdapter 👻	Delete
WaveMaker_#1	Interface Type:	Pipe 🔻	Save
	Pipename:	PeakAdapter_#1	
	IP Address:	127.0.0.1	Close
	Port:	0	
	Description:	Standard Pipe connection to Server	
	NetName:	Cummins_Net	
	Status:	Connected	Reconnect

This is an example of the Server Management window

This image is an example of the *New Server Creation* dialog box.

Figure 72: New Server **Creation Dialog** Box



Section 2 – Deleting Servers

Deleting Servers

Deleting a Server To delete a server, open the **Server Management** window by clicking the **Server List** icon on the **Home** tab. Select the server to delete from the *Servers* list on the left-hand side of the window and click the **<Delete**> button. A dialog box displays to confirm the removal of the server. Click **<OK>** to delete the server. To make the changes permanent in the configuration file, be sure to save the configuration.

Deleting Servers, Continued

Servers			
PeakAdapter_#1	Name:	PeakAdapter_#1	Add Nev
PeakAdapter_#1 PeakAdapter_#2	Server Type:	PeakAdapter 🔹	Delete
LUISGen2_#1 WaveMaker_#1	Interface Type:	Pipe 🔹	Save
	Pipename:	PeakAdapter_#1	C
	IP Address:	127.0.0.1	Close
	Port:	0	
	Description:	Standard Pipe connection to Server	
	NetName:	Cummins_Net	
	Status:	Connected	Reconnec

Notes

Chapter 7 – Controls

Overview				
Introduction In This Chapter	There are four types of controls used within the LUIS Gen2 environment to interact with the hardware: Closed Loop Control , Digital Display , Gauge and Switch . In addition, there is the Panel control that provides the option of adding labels. How these controls are manipulated within the GUI is explained in Chapter 2 – Navigating the LUIS Gen2 GUI . This chapter provides additional information about setting up and using each control type to interact with the hardware.			
	Торіс	See Page		
	Closed Loop Control	138		
	Digital Displays	143		
	Gauges	148		
	Indicators	152		
	Switches	154		
	Interlocking Controls	160		
	Panels	163		

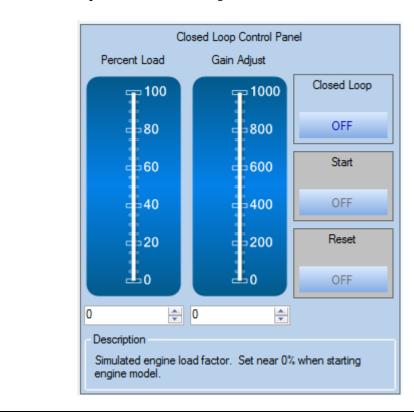
Section 1 – Closed Loop Control

Closed Loop Control

Introduction	The LUIS Gen2 can be set to run closed loop engine speed control. In this mode, the engine speed signal generated by the load box responds similarly to an actual engine. J1939 public broadcast must be running in the ECM to run in closed loop mode.		
Closed Loop Control Panel	The Closed Loop Control Panel consists of five elements. Figure 74 and thi table describe these elements.		
	Element	Description	
	Percent Load	Either the slider or the digital display can be	

Percent Load	used to set the percent load for the model.
Gain Adjust	Either the slider or the digital display can be used to set the gain adjust for the model.
<closed loop=""></closed>	This button is used to set the loop to closed or open. The button reads the current status, so when the button says <on></on> it indicates that closed loop mode is on.
<start></start>	This button is used to start closed loop control. This control is only available when the Closed Loop mode is ON .
< Reset >	This button sets the model back to zero load/rpm. This control is only available when the Closed Loop mode is ON .

Closed Loop Control, Continued



This is an example of a **Closed Loop Panel** control.

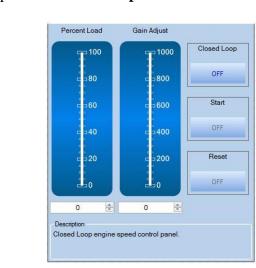
Figure 74: Closed Loop Panel

Closed Loop Control, Continued

Configuring the This table outlines the steps for configuration a **Closed Loop Control**. **Closed Loop Control**

Step	Action
1	Add a Closed Loop Control , as shown in Figure 75, to a tile by dragging it from the Tools Tab .
2	Right-Click the control and Select the Properties option from the menu.Result: The Toolbox dialog box displays, as shown in Figure 76.
3	In the Hardware section, the <i>ECM Source ID</i> is the J1939 source address of the ECM that should be used for the control when running multiple ECMs. If only running one ECM, the source ID will be 0.
4	In the Hardware section, click the <> button next to the <i>Hardware Setup</i> option.
	Result: The Hardware I/O Selection dialog box displays.
5	In the Hardware Unit field, select the Wavemaker.
	<u>Result</u> : The channels available in that module displays in the <i>Channel</i> field.
6	In the <i>Channel</i> field, select the appropriate channel.
	<i><u>Important Note</u></i> : The Closed Loop Control must be set to the Engine Speed Channel in the WaveMaker.
7	Click <ok< b="">> to closed the dialog box.</ok<>
	<u>Result</u> : The dialog box closes and the <i>Channel</i> and <i>Type</i> under <i>Hardware Setup</i> are filled in with the selections.
8	In the Interpolation Table section, use the down arrow next to the <i>Table Name</i> option to select the appropriate interpolation table.
	<u><i>Important Note</i></u> : The Interpolation Table must match the interpolation table used for the Engine Speed channel.
9	In the Server section, use the down arrow next to the <i>Name</i> option to select the appropriate server.
	Note: Gen1 uses the Peak Adapter and Gen2 uses the Wavemaker server.

Closed Loop Control, Continued



This is an example of a **Closed Loop Panel** control.

Figure 75: Closed Loop Panel Control

Figure 76: Closed Loop Control Properties This is an example of the *Toolbox* dialog box for a **Closed Loop Control**.

Properties		
Allow Move		-
Allow Nove		True
	1222	False
Background Co		GradientActiveCaption
Background Im		Tile
BackgroundIma E Component Size	and the second s	360, 290
 Component Size Gauge Font 		
Text Color		Microsoft Sans Serif, 9.75pt, style
Text Color		Microsoft Sans Serif, 8,75pt
		microsoft Jans Jeni, 6.75pt
ECM Source ID		0
Hardware Setur		WaveMaker,Arbitrary_CH#1
Interpolation		Travemaker, Abitrary_Ch#1
TableName	Table	FREQ
		THE
E Location		17238
		172, 30
Name		WaveMaker #1
Value Definit	ion	indicidata
Gain Value		0
Percent Load V	alue	0
Appearance		

Closed Loop Control, Continued

Step	Action
10	The Value Definition section can be used to set the <i>Gain Value</i> and <i>Percent Load Value</i> . These values can also be set using the slider or the digital display on the panel.
11	The rest of the options on the <i>Toolbox</i> dialog box are used to control the look of the control. These can be set as desired by the user.

Closed Loop Control, Continued

×	ToolBox
-	Properties
	₽ 2↓ •
True	Allow Move
False	Allow Resize
GradientActiveCaption	Background Color
(none)	Background Image
Tile	BackgroundImageLayout
360, 290	Component Size
Microsoft Sans Serif, 9.75pt, style	⊞ Gauge Font
ControlText	Text Color
Microsoft Sans Serif, 8.75pt	Text Font
	Hardware
0	ECM Source ID
WaveMaker, Arbitrary_CH#1	Hardware Setup
	Interpolation Table
FREQ	TableName
	Layout
172, -38	Location
	⊡ Server
WaveMaker_#1	Name
	Value Definition
0	Gain Value
0	Percent Load Value
	Appearance

Section 2 – Digital Displays

Digital Displays

Introduction	ntroduction The Digital Display control provides a simple digital display of engineering units, counts and/or millivolts for an assigned channel.		
Digital Display	The Digital Display consists of four elements. The label is always present, but the <i>Eng Units</i> , <i>Counts</i> , and <i>mVolts</i> displays can be displayed or hidden. Figure 77 and this table describe these elements.		
	Element	Description	
	Label	Displays a user defined label for the control	
	Eng Units	Displays the engineering units	
	Counts	Displays the counts	
	mVolts	Displays the millivolts	

Configuring the This table outlines the steps for configuring a **Digital Display** control. **Digital Display** Control

Step	Action
1	Add a Digital Display , shown in Figure 77, to a tile by dragging it from the Tools tab.
2	Right-Click the control and Select the Properties option from the menu.Result: The Toolbox dialog box displays, as shown in Figure 78.
3	Determine which of the elements to display on the control. To remove an element from the display, in the Appearance section of the <i>Toolbox</i> , delete the units for the appropriate element: <i>Eng Units</i> , <i>Table Units</i> , and/or <i>Hardware Output Units</i> . <u>Result</u> : When the units are deleted, the element is removed from the Digital Display .

Digital Displays, Continued

Figure 77: This is an example of a digital display control displaying all elements. **Digital Display**

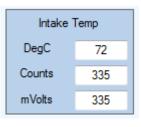


 Figure 78:
 This is an example of the *Toolbox* dialog box for a Digital Display control.

 Digital Display
 ToolBox

 Properties
 X

00	IBox		
Pro	operties		
	2 ↓ □		
Ξ	Appearance		
	Allow Resize	False	
	Background Color	GradientActiveCaption	
	Background Image	(none)	
+	Component Size	128, 105	
	Engineering Units	DegC	
	ForeColor	ControlText	
	Hardware Output Units	mVolts	
	Table Units	Counts	
	Text Color	ControlText	
+	Text Font	Microsoft Sans Serif, 8.25pt	
	Component Options		
	InterlockSetup		
_	Hardware		
Ξ	Hardware Setup	Analog Output, Analog Output#4	
	Channel	Analog Output#4	
	Туре	Analog Output	
Ξ	Interpolation Table		
_	TableName	Test Table	
Ξ	Scale		
	Maximum	1273	
	Minimum	233	
	Multiplier	1	
	Scale Resolution	0	
Ξ	Server		
	Name	LUISGen2_#1	
-	Text		
	TextLine1	Intake Temp	
-	Value Definition		
	Default Value	72	
	Engineering Value	72	
	Hardware Value	0	
	Table Value	0	
	ardware Setup		
1/1	O number associated with this con	troi	

Digital Displays, Continued

Digital Display Control, Control

Configuring the This table continues to outline the steps for configuring a **Digital Display** control.

Step	Action
4	In the Hardware section, click the <> button next to the <i>Hardware Setup</i> option.
	Result: The Hardware I/O Selection dialog box displays.
5	In the Hardware Unit field, select the appropriate module.
	<u>Result</u> : The channels available in that module displays in the <i>Channel</i> field.
6	In the <i>Channel</i> field, select the appropriate channel.
7	Click <ok< b="">> to closed the dialog box.</ok<>
	<u>Result</u> : The dialog box closes and the <i>Channel</i> and <i>Type</i> under <i>Hardware Setup</i> are filled in with the selection.
8	In the Interpolation Table section, use the down arrow next to the <i>Table Name</i> option to select the appropriate interpolation table.
9	In the Scale section, the scale for the control can be set including the <i>Minimum</i> and <i>Maximum</i> values as well as the <i>Multiplier</i> and <i>Scale Resolution</i> .
10	In the Server section, use the down arrow next to the <i>Name</i> option to select the appropriate server.
11	In the Text section, the <i>TextLine1</i> option is used to define the label that displays at the top of the control.
12	The Value Definition section can be used to set the <i>Default Value</i> for the control.
13	The Interlock section is used to interlock the value of this control with a parent control. More information about using interlocks can be found on Page 160.
14	The rest of the options on the <i>Properties</i> dialog box are used to control the look of the control. These can be set as desired by the user.
	<u>Note</u> : More information about Interlock Setup can be found later in this chapter.

Digital Displays, Continued

Figure 79: Digital Display	This is an example	of the <i>Toolbox</i> of	lialog box for a Digital Displa	y cont
Properties	То	olBox	×	
		Properties		
			-	
	l	2↓ □		
	ſ	Appearance		
		Allow Resize	False	
		Background Color	GradientActiveCaption	
		Background Image	(none)	
	ſ	E Component Size	128, 105	
		Engineering Units	DegC	
		ForeColor	ControlText	
		Hardware Output Units	mVolts	
		Table Units	Counts	
		Text Color	ControlText	
		Text Font	Microsoft Sans Serif, 8.25pt	
		Component Options		
		∃ InterlockSetup		
		∃ Hardware		
		∃ Hardware Setup	Analog Output, Analog Output#4	
	ſ	Interpolation Table		
		TableName	INTAKE_TEMP	
	[∃ Scale		
		Maximum	1273	
		Minimum	233	
		Multiplier	1	
		Scale Resolution	0	
	(∃ Server		
		Name	LUISGen2_#1	
	(∃ Text		
		TextLine1	Intake Temp	
	Į	3 Value Definition		
		Default Value	72	
		Engineering Value	72	
		Hardware Value	335	
		Table Value	335	
		Appearance		

Section 3 – Gauges

Gauges

Introduction	The Gauge control provides a round or slider gauge to display and interact
	with the value of the assigned channel.

Gauges The Gauge control consists of three elements. This table and Figure 80 describe the Gauge control.

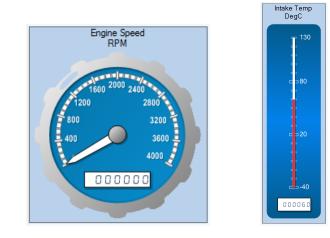
Element	Description
Label	Displays a user defined label for the control
Gauge	Graphical display of the value of the control
Digital Display	Digital readout of the value of the control

Configuring the This table outlines the steps for configuring a **Digital Display** control. **Gauge Control**

Step	Action
1	Add a Gauge , shown in Figure 80, to a tile by dragging it from the Tools tab.
2	Right-Click the control and Select the <i>Properties</i> option from the menu. Result: The <i>Toolbox</i> dialog box displays, as shown in Figure 81.
3	In the Component Options section, use <i>Enable</i> option to determine if the value of the control should be enabled, <i>True</i> , or disabled, <i>False</i> .
4	In the Component Options section, use the <i>Gauge Type</i> option to set if the gauge is <i>Round</i> or <i>Slider</i> .
5	In the Hardware section, click the <> button next to the <i>Hardware Setup</i> option. <u>Result</u> : The <i>Hardware I/O Selection</i> dialog box displays.
6	In the <i>Hardware Unit</i> field, select the appropriate module. <u>Result</u> : The channels available in that module displays in the <i>Channel</i> field.
7	In the <i>Channel</i> field, select the appropriate channel.

Gauges, Continued

Figure 80:These images are examples of both the round and slider gauge controls.Gauges



This is an example of the *ToolBox* dialog box for configuring gauges.

Figure 81: Gauge Properties

2↓ □ ppearance low Move low Resize ackground Color ackground Image	True False	
low Move low Resize ackground Color	False	
low Resize ackground Color	False	
ackground Color		
	GradientActiveCaption	
ackground Image		
	(none)	
ackgroundImageLayout	Tile	
orderStyle	None	
omponent Size	180, 220	
auge Font	Microsoft Sans Serif, 8pt	
ext Color	ControlText	
ext Font	Microsoft Sans Serif, 8.75pt	
omponent Options		
nable	True	
auge Type	Round	
terlock Dependencies	(Collection)	
terlock Setup		
lardware		
ardware Setup	Analog Output, Analog Output#22	
Channel	Analog Output#22	
Туре	Analog Output	
terpolation Table		
ableName	Remote_Throttle	
ayout		
ocation	-838	
cale		
igits Displayed	0	
aximum	100	
linimum	0	
lultiplier	1	
erver		
ame	LUISGen2_#1	
ext		
extLine1	Remote_Trottle	
extLine2	2	
alue Definition		
efault Value	0	
	omponent Size suge Font sut Color omponent Options act Color omponent Options able suge Type terdock Dependencies terdockSetup andware andware andware terdockSetup andware setup channel Type terpolation Table ableName gits Displayed aximum titpler erver ame ame setutine1	omponent Size 180, 220 suge Fort Microsoft Sans Serif, 8pt at Color Control Text at Color True mable True auge Type Round terlock Dependencies (Collection) terlockSetup analog Output, Analog Output, 4222. Type Analog Output advare Analog Output terpockston Analog Output advare Semote_Throttle agout - terpockston - advare Benote_Throttle agout - terpockston - advare - advare - advare - get Displayed 0 adamm 100 aninum 0 uttpler 1 ame LUISGen2_#11 ext -

Gauges, Continued

Configuring the	This table continues to outline the steps for configuring a Digital Display
Gauge Control,	control.
Continued	

Step	Action
8	Click <ok></ok> to close the dialog box.
	<u>Result</u> : The dialog box closes and the <i>Channel</i> and <i>Type</i> under <i>Hardware Setup</i> are filled in with the selection.
9	In the Interpolation Table section, use the down arrow next to the <i>Table Name</i> option to select the appropriate interpolation table.
10	In the Scale section, the scale for the control can be set including the <i>Minimum</i> and <i>Maximum</i> values as well as the <i>Multiplier</i> and <i>Scale Resolution</i> .
11	In the Server section, use the down arrow next to the <i>Name</i> option to select the appropriate server.
12	In the Text section, the <i>TextLine1</i> and <i>TextLine2</i> options are used to define the label that displays at the top of the control.
13	The Value Definition section can be used to set the <i>Default Value</i> for the control.
14	The Interlock section is used to interlock the value of this control with a parent control. More information about using interlocks can be found on Page 160.
15	The rest of the options on the <i>Properties</i> dialog box are used to control the look of the control. These can be set as desired by the user.

Gauges, Continued

Properties	rties	ToolBax	,
Appearance Allow Move True Allow Move False Background Color Gradient ActiveCaption Background Image (none) Background Image (none) Background Image (none) Background Image None Component Size 180, 220 Gauge Font Microsoft Sans Serif, 8pt Text Color Control Text Text Color Component Options Enable True Gauge Type Round Interfock Dependencies (Collection) Interfock Setup Analog Output, Analog Output#22 Type Analog Output Interpolation Table TableName TableName Remote_Throttle Location -8, -38 Scale		Properties	
Appearance Alow Move True Alow Resize False Background Color Gradient Active Caption Background Image (none) Background Image Layout Tile BorderStyle None Text Color Control Text BorderStyle Fatse Component Options Enable Enable True Gauge Type Round Interfock/Setup Analog Output Analog Output#22 Type Analog Output#22 Type Analog Output#22 Type Analog Output#22 TableName Remote_Throttle Layout Itextion Scale			
Allow Move True Allow Resize False Background Color GradientActiveCaption Background Image (none) Background Image (none) Background Image (none) Background Image None E Component Size 180, 220 B Gauge Font Microsoft Sans Serif, 8pt Text Color Control Text B Text Font Microsoft Sans Serif, 8,75pt Enable True Gauge Type Round Interfock Dependencies (Collection) B Interfock Setup Analog Output Analog Output#22 Type Analog Output #Analog Output#22 Type Analog Output #22 Type Analog Output Channel Analog Output Interpolation Table Elayout E Layout Elayout B Location -8, -38 Scale O Digits Displayed 0 Maximum 100 Maximum 0 Muitplier 1 Scale Value Definition			
Allow Resize False Background Color GradientActiveCaption Background Image (none) BackgroundImageLayout Tile BorderStyle None B Component Size 180, 220 B Gauge Font Microsoft Sans Serif, 8pt Text Color Control Text B Text Font Microsoft Sans Serif, 875pt B Component Options Enable Enable True Gauge Type Round Interlock Dependencies (Collection) B InterlockSetup Analog Output #Aalog Output #22 Type Analog Output #22 Type Analog Output #22 TableName Remote_Throttle Layout Elayout B Location 1 B Location 0 Maximum 100 Maximum 0 Maximum 0 Maximum 100 Maximum 100 Maximum 100 Maximum 1 Server Name Name LUISGen2_#1 <td></td> <td>The second s</td> <td>True</td>		The second s	True
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BorderStyle None ■ Component Size 180, 220 ■ Gauge Font Microsoft Sans Serif, 8pt Text Color ■ Control Text ■ Text Font Microsoft Sans Serif, 8.75pt ■ Component Options ■ True Enable True Gauge Type Round Interlock Dependencies (Collection) ■ Interlock Setup ■ ■ Hardware Analog Output Analog Output#22 () Type Analog Output#22 Type Analog Output#22 Type Analog Output#22 Type Analog Output#22 Digts Displayed 0 Maximum 100 Minimum 0 Multiplier 1 ■ Server Name Name LUISGen2_#1 ■ Text TextLine1 TextLine2 % ■ Value Definition 0 Default Value 0			V Berran
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Text Color Control Text B Text Font Microsoft Sans Serif, 8.75pt Component Options Enable True Gauge Type Round Interlock Dependencies (Collection) Interlock Setup Interlock Setup Hardware Analog Output, Analog Output#22 Channel Analog Output#22 Type Analog Output Interpolation Table Table Name TableName Remote_Throttle Location -8, -38 Scale 0 Miximum 100 Minimum 0 Mutiplier 1 E Server Name LUISGen2_#1 E Value Definition Default Value 0			
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Interlock Dependencies (Collection) Interlock Setup Hardware Hardware Setup Channel Type Analog Output,Analog Output#22 Type Analog Output#22			True
 InterlockSetup Hardware Hardware Setup Analog Output, Analog Output#22 Type Analog Output#22 An		Gauge Type	Round
Hardware Hardware Hardware Analog Output, Analog Output#22 Channel Analog Output#22 Type Analog Output Interpolation Table TableName TableName Remote_Throttle Layout -8, -38 Scale		Interlock Dependencies	(Collection)
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Type Analog Output Interpolation Table Table Name Table Name Remote_Throttle Isocation -8, -38 Isocation -8, -38 Isocation 0 Maximum 100 Multiplier 1 Isocation Scale Value Definition VUISGen2_#1 Isotation %		Hardware Setup	Analog Output Analog Output#22 🛛 🛄
Interpolation Table TableName Remote_Throttle Layout -8, -38 Scale -0 Digits Displayed 0 Maximum 100 Minimum 0 Multiplier 1 Server		Channel	Analog Output#22
TableName Remote_Throttle Layout -838 Scale -0 Digits Displayed 0 Maximum 100 Multiplier 1 Server Name Name LUISGen2_#11 Text Text TextLine1 Remote_Trottle TextLine2 % Value Definition 0 Default Value 0		Туре	Analog Output
Image: Second		Interpolation Table	
Image: big		TableName	Remote_Throttle
Scale Digits Displayed 0 Maximum 100 Minimum 0 Multiplier 1 Server LUISGen2_#1 Name LUISGen2_#1 Text TextLine1 TextLine2 % Value Definition Default Value Default Value 0		Layout	
Digits Displayed 0 Maximum 100 Minimum 0 Multiplier 1 Server LUISGen2_#1 Name LUISGen2_#1 Text TextLine1 TextLine2 % Value Definition Default Value Default Value 0		Location	-8, -38
Maximum 100 Minimum 0 Multiplier 1 Server 1 Name LUISGen2_#1 E Text TextLine1 Remote_Trottle TextLine2 % Value Definition Default Value Default Value 0		□ Scale	10.000
Minimum 0 Multiplier 1 Server LUISGen2_#1 Name LUISGen2_#1 Text TextLine1 TextLine2 % Value Definition Default Value Default Value 0		Digits Displayed	A COLORADO A
Multiplier 1 Server LUISGen2_#1 Name LUISGen2_#1 Text TextLine1 TextLine2 % Value Definition Default Value Default Value 0		Maximum	1.22
Server LUISGen2_#1 Name LUISGen2_#1 Text TextLine1 TextLine2 % Value Definition Default Value Default Value 0		1414.D2040.	
Name LUISGen2_#1 Text TextLine1 TextLine2 % Value Definition Default Value 0			1
□ Text TextLine1 Remote_Trottle TextLine2 % □ Value Definition Default Value 0		and the second se	
TextLine1 Remote_Trottle TextLine2 % Value Definition Default Value 0			LUISGen2_#1
TextLine2 %		and the second sec	
Value Definition Default Value 0			
Default Value 0		And the second se	76
Gauge Value U		ALL MACCOLLAR DUCK DUCK	11.28
		Gauge Value	U
Hardware Setup I/O number associated with this control		Hardware Setup	

Section 4 – Indicators

Indicators

Introduction	The Indicator control updated every 100 mil	displays the status of a resistive load. The status is liseconds.	
Indicators	The Indicator control consists of two elements. Figure 83 and this table describe these elements.		
	Element	Description	
	Label	Displays a user defined label for the control	
	Indicator	Graphical indicator that is grey when OFF and the user defined color when ON.	
		Note: The default indicator ON color is red.	

Configuring the This table outlines the steps for configuring an **Indicator** control. **Indicator Control**

Step	Action
1	Add an Indicator , as shown in Figure 83, to a tile by dragging it from the Tools tab.
2	Right-Click the control and Select the <i>Properties</i> option from the menu.
	<u>Result</u> : The <i>Toolbox</i> dialog box displays, as shown in Figure 84.
3	In the Appearance section, set the <i>Indicator Color</i> to the desired color.
4	In the Hardware section, click the <> button next to the <i>Hardware Setup</i> option.
	Result: The Hardware I/O Selection dialog box displays.
5	In the Hardware Unit field, select the Resistive Load option.
	<u>Result</u> : The channels available in that module displays in the <i>Channel</i> field.
6	In the <i>Channel</i> field, select the appropriate channel.

Indicators, Continued

Figure 83: Indicators	This is an exampl	e of an Indicator c	Fan Clutch	
Figure 84: Indicator	This is an exampl	e of the <i>ToolBox</i> di	alog box for an Indic	ator control.
Control	Тоо	IBox		×
Properties	Pr	operties		
		-		
		2 ↓ □		
		Appearance		
		Allow Resize	False	
		Background Color	GradientActiveCaption	
		Background Image	(none)	-
	E Contraction of the second se	BorderStyle Component Size	None 55, 65	-
		Indicator Color	Red	
		Text Color	ControlText	
	Ŧ	Text Font	Microsoft Sans Serif, 8pt	
		Hardware		
		Hardware Setup	Resistive Load, Resistive Loa	ad#2
		Channel	Resistive Load#2	
		Туре	Resistive Load	
		Server		
		Name	LUISGen2_#1	
	E	Text	F	
		TextLine1 TextLine2	Fan Clutch	
		Value Definition	Guidi	
		Indicator Value	0	
			_	
	V	alue Definition		
	L.,			

Indicators, Continued

Configuring the This table continues to outline the steps for configuring an **Indicator** control. **Indicator Control,** Continued

Step	Action
7	Click <ok></ok> to close the dialog box.
	<u>Result</u> : The dialog box closes and the <i>Channel</i> and <i>Type</i> under
	Hardware Setup are filled in with the selection.
8	In the Text section, the <i>TextLine1</i> and <i>TextLine2</i> options are used to define the label that displays at the top of the control.
9	The Value Definition section can be used to set the <i>Indicator Value</i> for the control.
10	The rest of the options on the <i>Properties</i> dialog box are used to control the look of the control. These can be set as desired by the user.

Indicators, Continued

To	olBox	\$
ies P	roperties	
	2↓ 🖻	
	Appearance	
	Allow Resize	False
	Background Color	GradientActiveCaption
	Background Image	(none)
	BorderStyle	None
E	Component Size	55, 65
	Indicator Color	Red
	Text Color	ControlText
Œ	Text Font	Microsoft Sans Serif, 8pt
E	Hardware	
E	Hardware Setup	Resistive Load, Resistive Load#2
	Channel	Resistive Load#2
	Туре	Resistive Load
E	Server	
	Name	LUISGen2_#1
E	Text	
	TextLine1	Fan
	TextLine2	Clutch
E	Value Definition	-
	Indicator Value	0
	Value Definition	

Section 5 – Switches

Switches Introduction The Switch control provides the ability to interact with On/Off or True/False values in the hardware. Switches can be set as a toggle where the value remains in the current state until the switch is tripped again or momentary which trips the switch and then immediately returns to the default state. Switches The Switch control consists of two elements. Figure 86 and this table describe these elements. Element Description Displays a user defined label for the control Label Graphical button that trips the switch Switch This table outlines the steps for configuring a **Switch** control. Configuring the **Switch Control**

Step	Action
1	Add a Switch , shown in Figure 86, to a tile by dragging it from the Tools tab.
2	Right-Click the control and Select the Properties option from the menu.Result: The Toolbox dialog box displays, as shown in Figure 87.
3	In the Component Options section, use the <i>Enable</i> option to determine if the value of the control should be enabled, <i>True</i> , or disabled, <i>False</i> .
4	In the <i>Switch Type</i> field, select either <i>Toggle</i> or <i>Momentary</i> .
5	In the <i>SwitchClosedText</i> field, type the word that should display when the switch is closed.
6	In the <i>SwitchOpenText</i> field, type the word that should display when the switch is open.

Switches, Continued

Figure 86: Switches	This image is an	example of a Switc	h control. I Pressure ON	
Figure 87: Switch Control Properties		le of the <i>ToolBox</i> de Froperties	False Gradient ActiveCaption (none) None 100, 70 Microsoft Sans Serif, 8.25pt 0, 0, 192 Control Text Microsoft Sans Serif, 8.25pt False Toggle ON OFF Relay, Relay#13 switch 1 1 SW_13 J2-67 Open Open Open Open	control.

Switches, Continued

Configuring the This table outlines the steps for configuring a **Switch** control. **Switch Control**

Step	Action
8	In the Hardware section, click the <> button next to the <i>Hardware Setup</i> option.
	<u>Result</u> : The <i>Hardware I/O Selection</i> dialog box displays.
9	In the <i>Hardware Unit</i> field, select the appropriate module. <u>Result</u> : The channels available in that module displays in the
	Channel field.
10	In the <i>Channel</i> field, select the appropriate channel.
11	Click <ok></ok> to close the dialog box.
	<u>Result</u> : The dialog box closes and the <i>Channel</i> and <i>Type</i> under <i>Hardware Setup</i> are filled in with the selection.
12	In the Interpolation Table section, use the down arrow next to the <i>Table Name</i> option to select the appropriate interpolation table.
13	In the Scale section, the scale for the control can be set including the <i>Multiplier</i> and <i>Scale Resolution</i> .
14	In the Server section, use the down arrow next to the <i>Name</i> option to select the appropriate server.
15	In the Text section, the <i>TextLine1</i> and <i>TextLine2</i> options are used to define the label that displays at the top of the control.
16	The Value Definition section can be used to set the <i>Default Value</i> for the control.
17	The Interlock section is used to interlock the value of this control with a parent control. More information about using interlocks can be found on Page 160.
18	The rest of the options on the <i>Properties</i> dialog box are used to control the look of the control. These can be set as desired by the user.

Switches, Continued

Figure 88: Switch Control	This is an exampl	e	of the <i>ToolBox</i> dia	alog box for a switch con	ntrol
Properties	Т	oo	Box	×	< .
		Pro	operties		
			12 ↓ □	_	
		_			
		Ξ	Appearance		
			Allow Resize	False	
			Background Color	Gradient ActiveCaption	
			Background Image BorderStyle	None (none)	
			Component Size	100, 70	
			Switch Font	Microsoft Sans Serif, 8.25pt	
		۷	Switch Text Color	0, 0, 192	
			Text Color	Control Text	
		Ŧ	Text Font	Microsoft Sans Serif, 8.25pt	
			Component Options	moroadit adna aciii, o.zapt	
		-	FreezeValue	False	
		F	InterlockSetup	1 dibb	
		_	Switch Type	Toggle	
			SwitchClosedText	ON	
			SwitchOpenText	OFF	
		Ξ	Hardware		
			Hardware Setup	Relay,Relay#13	
			Interpolation Table	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
			TableName	switch	
		Ξ	Scale		
			Multiplier	1	
			Scale Resolution	1	
		Ξ	Server		
			Name	LUISGen2_#1	
		Ξ	Text	_	
			TextLine1	SW_13	
			TextLine2	J2-67	
		Ξ	Value Definition		
			Default Value	Open	
			Switch Value	Open	
		Ą	opearance		
	l	-			

Section 6 – Interlocking Controls

Interlocking Controls

Introduction LUIS Gen2 supports the option of interlocking controls causing the values of the interlocked control(s) to change with the parent control. It is important to note that interlocks are only one level deep. Multiple child interlocks ca not be nested. The interlocking options for the child controls are set up in the *ToolBox* dialog box for the controls.

InterlockingThis table outlines the steps for setting up a child control to be interlockedControlswith another control.

Step	Action
1	Ensure that the parent control has been set up.
2	Right-click the control that should be set up as the child. <u>Result</u> : The <i>ToolBox</i> dialog box displays.
3	In the Interlock Setup section, click the <> button. <u>Result</u> : The <i>Interlock Options</i> dialog box displays, as shown in Figure 89.
4	In the Interlock section, set the interlock to be <i>Non-Inverting</i> or <i>Inverting</i> . When the interlock is set to inverting, the child control value changes in the inverse of the parent.
5	In the Hardware Unit section, select the hardware unit of the parent control. <u>Result</u> : The <i>Channel</i> field populates with the available channels.
6	In the Channel section, select the channel of the parent control.
7	In the Interlock On Value section, select the appropriate value on which to interlock.
8	When finished, click the <ok></ok> button. <u>Result</u> : The dialog box closes and the <i>Channel</i> , <i>InterlockOperation</i> , <i>InterlockValueName</i> , and <i>Type</i> fields are filled in on the ToolBox dialog box.

Interlocking Controls, Continued

ons Dialog	Interlock Options				
	Hardware Unit:	Channel:	Interlock	Interlock On Value	ОК
	Analog Output Child 1 Analog Output (LL Child 1 Main (LUISGen1) Child 1 Switch (LUISGen1 Child 2 Analog Output (LL Child 2 Analog Output (LL Child 2 Amalog Output (LL Child 2 Switch (LUISGen1) Child 2 Switch (LUISGen1) Main Module	VBATT Relay#1 Switched VBATT Relay#1 Switched VBATT Relay#2 Switched VBATT Relay#3 Switched VBATT Relay#4	 None Non-Inverting Inverting 	 Engineering Value Hardware Value 	Cancel
	Description The Interlock Feature will le	et a control activate another co	ontrol in an Inverting or No	n-Inverting connection.	

Interlocking Controls, Continued

Viewing
ChildrenThe Interlock Dependencies dialog box allows the user to see all other
controls interlocked to the selected control. This table outlines the steps for
viewing the children of a selected control.

Step	Action
1	Right-click the control.
	Result: The ToolBox dialog box displays.
2	Next to the <i>Interlock Dependencies</i> field, click the <> button.
	<u>Result</u> : The <i>Interlock Dependencies</i> dialog box displays, as shown in Figure 90. This dialog box lists each of the channels that are interlocked with the selected control.

Interlocking Controls, Continued

ependencies alog Box	Inter	lock Dependencies		23
0		Name	Channel Info	
	•	PPS2	Analog Output,A	
		IVS ON Idle	SwitchModule,S	
		IVS OFF Idle	SwitchModule,S	
		PPS2	Analog Output,A	

Section 7 – Panels

Panels

Introduction The **Panel** control provides the ability to create text boxes for labels.

Using the Panel This table outlines the steps for using the **Panel** control as a label. **Control**

Step	Action
1	Add a Panel control to a window by dragging it from the Tools tab.
2	Click in the default text.
	<u>Result</u> : The cursor changes to a text editing cursor.
3	Type the desired label using CTRL+ENTER to move to a new line.
4	To change the text color, size or alignment right-click the control and select the <i>Properties</i> option from the menu.
	<u>Result</u> : The <i>ToolBox</i> dialog box displays, as shown in Figure 91.
5	Use the options in the Appearance section to make changes to the text.

Panels, Continued

roperties	ToolBax		×
	Properties		i.
	₽ ↓ ==		L
	Appearance		1
	Allow Resize	False	U.
	Background Color	Gradient ActiveCaption	Ш
	Background Image	(none)	Ш
	BorderStyle	None	U.
	Component Size	150, 150	U.
	Text Color	ControlText	Ш
	Text Font	Microsoft Sans Serif, 8.25pt	Ш
	Text		L
	TextLine	Default	Ш
	Appearance		
			L

Notes

176

178

Chapter 8 – Module Descriptions

Overview

Overview	This chapter provides additional technical information about the LUIS Gen2 module hardware.				
Introduction	A standard LUIS Gen2 system configuration contains:				
	 Main Module Wavemaker Module 2 Analog Modules Switch Module Resistive Loads Module Injector and Application Specific Loads Module In addition, the user can request additional modules of each on what is needed for their application. New modules are contended for their application.	onstantly being			
	developed along with the ability to create custom modules applications. Check with the GarTech engineering staff for information.	-			
In This Chapter	This table outlines the topic covered in this section.				
	Торіс	See Page			
	Main Module	168			
	Wavemaker Module	171			
	Analog Module	174			

Switch Module

Resistive Loads Module

Section 1 – Main Module

Main Module

Front Panel Description

This table outlines the controls found on the front panel of the Main LUIS Gen2 module.



Control	Function
Power LED	Indicates the internal power supply is powered on and functioning normally.
Status LED	Indicates that the module has completed its power up sequence and is ready to accept commands from the PC.
VBATT LED	Indicates that a VBATT source is connected and the VBATT relay is turned on. <u>Note</u> : If the relay is on, but no VBATT source is connected, the LED will not turn on.
VBATT Test Point	Provides a method for measuring VBATT voltage. <u>Note</u> : The test point is current limited to 20mA.
RELAY 1-4 LEDs	Indicates that a relay source is connected and is turned on. <u>Note</u> : If the relay is on, but no source is connected, the LED will not turn on.
RELAY 1-4 Test Points	Provides a method for measuring relay voltage. <u>Note</u> : The relay is current limited to 20mA.

Main Module, Continued

Back PanelThis table outlines the controls found on the back panel of the Main LUISDescriptionGen2 module.



Control	Function
AC inlet	Provides connection to AC power.
VBATT IN	Provides connection to VBATT source.
	<u>Note</u> : Acceptable VBATT source range is $0 - 32V$, $30A$.
USB Inlet	Provides connection to PC via standard USB cable.
Power Out	Provides 8 pin connection for the application harness.
J1939 SENSOR SIMULATION	Provides a J1939 port for sensor simulation broadcast and RS232 connection for serial port control using legacy DLB commands.
LOADS MODULE	Provides power and GarTech proprietary control bus connections to the injector loads module.

Main Module, Continued

Main ModuleThis diagram illustrates the pinout for the main module.Pinout

VBATT Supply Mating Connector: 42816-0212 Loads Module Mating Connector: 09-50-3061	Ground VBATT_IN +24V GND CAN0_H CAN0_L GND +12V	$\begin{array}{r} P1-1 \\ P3-1 \\ P3-2 \\ P3-3 \\ P3-4 \\ P3-5 \\ P3-6 \\ P3-6 \\ P3-6 \\ \end{array}$
Automated Test / Sensor Simulation Mating Connector: DB9-M	RS232 TX RS232 RX GND CAN1_H CAN1_L GND	DB9-4 DB9-6 DB9-8 DB9-7 DB9-7 DB9-2 DB9-3
Power Out Mating Connector: 43914-1102	RLY1_OUT RLY2_OUT RLY3_OUT RLY4_OUT GND GND VBATT_OUT VBATT_OUT	P2-1 P2-2 P2-3 P2-4 P2-5 P2-6 P2-7 P2-8

Section 2 – Wavemaker Module

Wavemaker Module

Introduction	Each Wavemaker Module supports up to 8 arbitrary waveform outputs with an arbitrary waveform card required for each channel. The arbitrary waveform outputs may range +/-6v, 12 bit resolution and up to 32 k datapoints per channel. In addition, any channel may be synchronized with any other channel.
	Each Wavemaker Module includes 10 digital outputs. These outputs can be set for 0-5v or +/-5v square wave output, up to 1MHz. Any digital channel may be synchronized with any other digital or arbitrary channel.
Panel Descriptions	The front panel of the Wavemaker Module provides indicator LEDS as well as output test points. The rear panel provides the connection to the ECM.



This table describes the controls found on the front panel.

Control	Function
POWER LED	Indicates that the internal power supply is powered on and functioning normally.
STATUS LED	Indicates that the module has completed its power up sequence and is ready to accept commands from the PC.

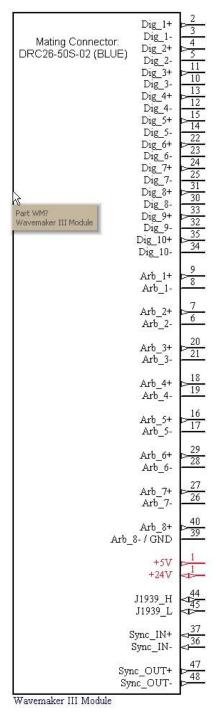
Wavemaker Module, Continued

Panel Descriptions, Continued	This table continues Wavemaker Module	to describe the controls found on the front panel of the c.
	Control	Eurotion

Control	Function
Output Test Points	Provides a method for measuring voltage for each of the outputs.
ARBITRARY LEDs	Indicates if a card is installed for each of the arbitrary channels.
DIGITAL LEDs	Indicates if a card is installed for each of the digital channels.

Wavemaker Module, Continued

WavemakerThis diagram illustrates the pinout for the Wavemaker module.Module Pinout



Section 3 - Analog Module Description

Analog Module Description

IntroductionThe analog outputs are arranged in groups of 4, and each group requires a
reference voltage input. The reference voltage range is 0=15v. All outputs are
16 bit and are scaled from 0-Vref with a 20mA current limit per output. Up to
4 Analog Modules are supported by the system.

Panel Descriptions The front panel of the Analog Module provides indicates LEDS and test points, and the rear panel provides the connection to the ECM.



This table describes the controls on the front panel.

Control	Function
POWER LED	Indicates that the internal power supply is powered on and functioning normally.
STATUS LED	Indicates that the module has completed its power up sequence and is ready to accept commands from the PC.
Test Points	Provides a method for measuring voltage for each of the outputs.<u>Note</u>: The test points are limited to 20mA output.

Analog Module Description, Continued

Analog Module This diagram illustrates the pinout for the Analog module. **Pinout**

Mating Connector: AO_1 1 DRC26-50S-03 (RED) AO_2 3 AO_3 AO_3 4 Vref Range Vref_1-4 44 0-15∨ Vref_Rtn_1-4 46	
AO_5 AO_6 7 AO_7 8 AO_8 AO_8 AO_8 AO_8 AO_8 AO_8 AO_8 AO	
AO_9 > 10 AO_10 > 10 AO_11 > 11 AO_11 > 12 AO_12 > 35 Vref_9-12 < 48 Vref_Rtn_9-12 <	-
$\begin{array}{c c} & & & AO_{-13} & & \frac{13}{14} \\ & & & AO_{-14} & & \frac{15}{15} \\ & & & AO_{-15} & & \frac{16}{16} \\ & & & AO_{-16} & & \frac{36}{26} \\ & & & Vref_{-13-16} & & \frac{36}{44} \\ & & & Vref_{-Rtm_{-13-16}} & & \frac{44}{44} \end{array}$	-
$\begin{array}{c c} AO_{-17} & 17 \\ AO_{-18} & 19 \\ AO_{-19} & 20 \\ AO_{-20} & 27 \\ Vref_{-17-20} & \sqrt{37} \\ Vref_{-Rtm_{-17-20}} & 45 \end{array}$	
$\begin{array}{c c} AO_{21} & \geq \frac{21}{22} \\ AO_{22} & \geq \frac{23}{23} \\ AO_{23} & \geq \frac{24}{24} \\ AO_{24} & \geq \frac{38}{43} \\ Vref_{21-24} & \leq \frac{38}{43} \\ Vref_{21-24} & \leq \frac{38}{43} \end{array}$	
AO_25 AO_26 AO_27 AO_27 AO_28 Vref_25-28 Vref_Rtm_25-28	_
AO_29 AO_30 AO_31 AO_31 AO_32 Vref_29-32 Vref_Rtn_29-32 41	
Analog Module 1	

Section 4 – Switch Module Description

Switch Module Description

Introduction Switch contacts are rated for 1.5A. The internal switch relay commons are connected in groups of 5. If a jumper is inserted between pins 41 and 50 at the rear panel, the commons remain in the groups of 5. However, if no jumper is connected, all 8 group commons are in turn tied together making all switch commons equal. Up to 2 switch modules are supported by the system.

Panel Descriptions The front panel of the Switch Module provides indicates LEDS and the rear panel provides the connection to the ECM.

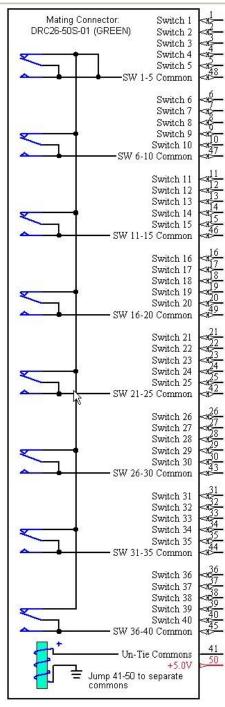


This table describes the controls found on the front panel.

Control	Function
POWER LED	Indicates that the internal power supply is powered on and functioning normally.
STATUS LED	Indicates that module has completed its power up sequence and is ready to accept commands from the PC.
SWITCH STATUS LEDs	Indicates the ON/OFF state of each switch.

Switch Module Description, Continued

Switch Module This diagram illustrates the pinout for the Switch Module. **Pinout**



Panel

Section 5 – Resistive Loads Module Description

Resistive Loads Module Description

Introduction The Resistive Loads Module contains a total of twelve 1k ohm loads and twenty-four 100 ohm loads. Four of the 100 ohm loads are used to drive 30A automotive relays, and the relay contracts are available at the back panel of the connector.

The front panel of the Resistive Loads Module provides indicator LEDS and Descriptions the rear panel provides the relay contacts.



This table describes the controls found on the front panel.

Control	Function
POWER LED	Indicates that the internal power supply is powered on and functioning normally.
STATUS LED	Indicates that the module has completed its power up sequence and is ready to accept commands from the PC.
RELAY STAUS LEDs	Indicates whether each load is being driven.

Resistive Loads Module Description, Continued

Resistive Loads This diagram illustrates the pinouts for the Resistive Loads Module. **Pinout**

