



DigRF v4 Analysis Tools

User's Guide

Notices

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Manual Part Number

Version 03.81.0121

Edition

December 15, 2009

Available in electronic format only

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Safety Notices

CAUTION









A **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

WARNING

A **WARNING** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a **WARNING** notice until the indicated conditions are fully understood and met.

Safety Summary

Safety Symbols on Instruments

Safety Symbol	Description
	Indicates warning or caution. If you see this symbol on a product, you must refer to the manuals for specific Warning or Caution information to avoid personal injury or damage to the product.
	Frame or chassis ground terminal. Typically connects to the equipment's metal frame.
	Indicates hazardous voltages and potential for electrical shock.
	Indicates that antistatic precautions should be taken.
	Indicates hot surface. Please do not touch.
	Indicates laser radiation turned on.
	CSA is the Canadian certification mark to demonstrate compliance with the Safety requirements.
	CE compliance marking to the EU Safety and EMC Directives. ISM GRP-1A classification according to the international EMC standard. ICES/NMB-001 compliance marking to the Canadian EMC standard.

General Safety Precautions

The following general safety precautions must be observed during all phases of operation of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument.

Agilent Technologies Inc. assumes no liability for the customer's failure to comply with these requirements.

Before operation, review the instrument and manual for safety markings and instructions. You must follow these to ensure safe operation and to maintain the instrument in safe condition.

General

This product is a Safety Class 1 instrument (provided with a protective earth terminal). The protective features of this product may be impaired if it is used in a manner not specified in the operation instructions.

All Light Emitting Diodes (LEDs) used in this product are Class 1 LEDs as per IEC 60825-1.

Environment Conditions

This instrument is intended for indoor use in an installation category II, pollution degree 2 environment. It is designed to operate at a maximum relative humidity of 95% and at altitudes of up to 2000 meters.

Refer to the specifications tables for the ac mains voltage requirements and ambient operating temperature range.

Before Applying Power

Verify that all safety precautions are taken. The power cable inlet of the instrument serves as a device to disconnect from the mains in case of hazard. The instrument must be positioned so that the operator can easily access the power cable inlet. When the instrument is rack mounted the rack must be provided with an easily accessible mains switch.

Ground the Instrument

To minimize shock hazard, the instrument chassis and cover must be connected to an electrical protective earth ground. The instrument must be connected to the ac power mains through a grounded power cable, with the ground wire firmly connected to an electrical ground (safety ground) at the power outlet. Any interruption of the protective (grounding) conductor or disconnection of the protective earth terminal will cause a potential shock hazard that could result in personal injury.

Do Not Operate in an Explosive Atmosphere


Do not operate the instrument in the presence of flammable gases or fumes.

Do Not Remove the Instrument Cover

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made only by qualified personnel.

Instruments that appear damaged or defective should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel.

Environmental Information

	<p>This product complies with the WEEE Directive (2002/96/EC) marking requirements. The affixed label indicates that you must not discard this electrical/ electronic product in domestic household waste.</p> <p><i>Product Category: With reference to the equipment types in the WEEE Directive Annex I, this product is classed as a "Monitoring and Control instrumentation" product.</i></p> <p>Do not dispose in domestic household waste.</p> <p>To return unwanted products, contact your local Agilent office, or see www.agilent.com/environment/product/ for more information.</p>
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DigRF v4 Analysis Tools—At a Glance

The Agilent N5343A DigRF exerciser module (for the N5302A/N5304A chassis) provides serial stimulus capabilities required for DigRF v3 or v4 based IC evaluation and characterization. A single module combines stimulus and capture capabilities to generate configurable control and data traffic and observe the response from the Device Under Test (DUT).

The Agilent N5344A DigRF analyzer module (for the N5302A/N5304A chassis) transparently monitors DigRF v3 and v4 bus activity, helping you integrate and troubleshoot devices incorporating the DigRF digital serial bus across a wide variety of over the air standards.

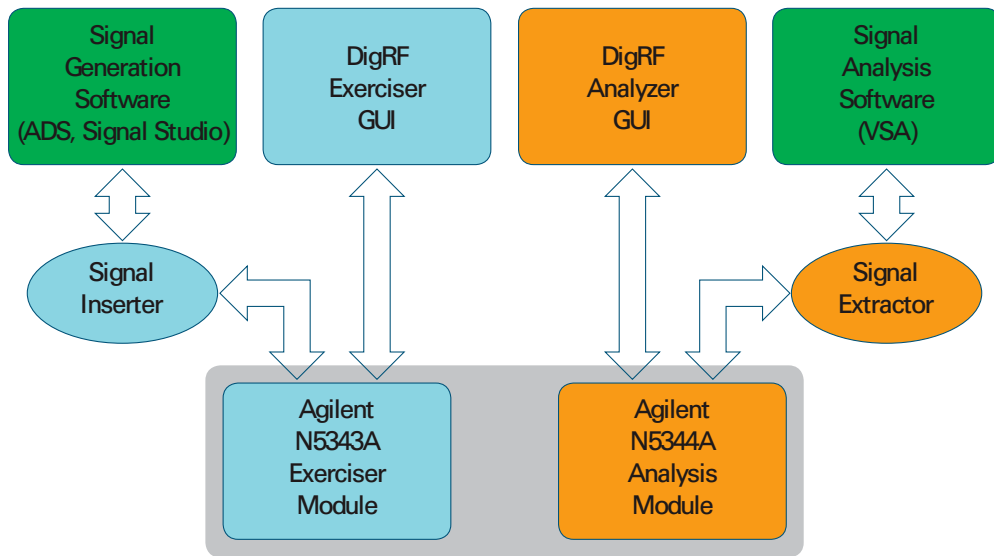


Figure 1 DigRF v4 Exerciser and Analysis Tools

Captured data from the analyzer and/or exerciser can be decoded and viewed by the *Agilent Logic Analyzer* application's Packet Decoder tool and Packet Viewer window (DigRF analyzer GUI).

Also, the logic analysis software lets you extract digital I/Q data from DigRF packets and pass it on to the 89601A VSA software for RF domain analysis (Signal Extractor).

Included with the logic analysis software is the Signal Inserter tool which is used to generate DigRF data that drives the exerciser.


See • ["In This Guide"](#) on page 6

In This Guide

For an overview and list of features, see: "[DigRF v4 Analysis Tools—At a Glance](#)" on page 5

This guide describes the DigRF v4 analysis tools. It contains these chapters:

- [Chapter 1](#), "Getting DigRF Data," starting on page 9
- [Chapter 2](#), "Decoding and Viewing Packets," starting on page 25
- [Chapter 3](#), "Capturing Packets," starting on page 31
- [Chapter 4](#), "Extracting Digital I/Q Data," starting on page 33
- [Chapter 5](#), "Sending IQ Data to VSA," starting on page 37
- [Chapter 6](#), "Generating Stimulus with Signal Inserter," starting on page 39

For a printable version of this guide, see:  "[Agilent DigRF v4 Analysis Tools User's Guide](#)".

See Also Protocol Exerciser has a graphical user interface (GUI) for controlling the Agilent N5343A exerciser card for DigRF v4. For information on using the exerciser GUI, please refer to:

- *Agilent N5343A Exerciser for DigRF User's Guide*

Protocol Exerciser has a application programming interface (API) in addition to the graphical user interface (GUI). For information on the API, please refer to:

- *DigRF v4 API Reference*

To understand the exerciser hardware, please refer to:

- *Agilent DigRF v4 Protocol Tester Installation Guide*
- *Agilent DigRF v4 Protocol Tester Hardware Reference Guide*

For additional information on the Agilent N5343A exerciser for DigRF, you can also refer to:

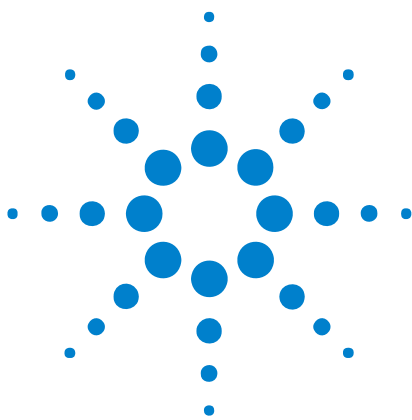
- *"Agilent RDX Test Solutions for DigRF v3 and v4 Data Sheet"*

You can also access this data sheet by visiting the "<http://www.agilent.com/find/digrf>" web page, then exploring the MIPI DigRF v4 Test link under Related Products.

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1 Getting DigRF Data

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In the *Agilent Logic Analyzer* application, External Protocol Analyzer modules are used to get captured data from N5344A DigRF analyzer modules or N5343A DigRF exerciser modules in N5302A/N5304A chassis.

You can also import "module CSV" format data saved from exercisers in N5302A/N5304A chassis.



Starting the Agilent Logic Analyzer Application

To start the *Agilent Logic Analyzer* application:

- 1 On the Windows task bar, click **Start>Programs>Agilent Logic Analyzer>Agilent Logic Analyzer**.
- 2 In the Offline Startup Options screen, click **Continue Offline** if you do not wish to connect to logic analyzer hardware.

Or, click **Go Online** if you wish to connect to logic analyzer hardware. This may be useful if you want to use a logic analyzer to capture other signal in the DUT and correlate them with the DigRF data you are analyzing.

As far as the DigRF analysis tools are concerned, it makes no difference if you go online or continue offline.

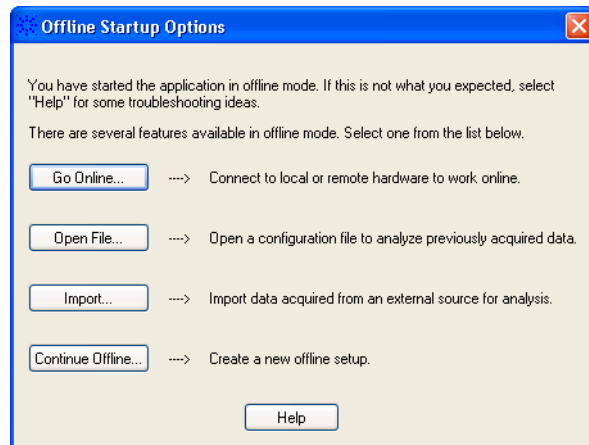


Figure 2 Offline Startup Options screen

The *Agilent Logic Analyzer* application appears.

Connecting to DigRF v4 Analyzers or Exercisers

In the Agilent Logic analyzer application, you connect to DigRF v4 analyzers or exercisers (in an N5302A/N5304A chassis) using External Protocol Analyzer modules.

To add external protocol analyzer modules:

- 1 From the *Agilent Logic Analyzer* application's main menu, choose **Setup>Add External Protocol Analyzer...**

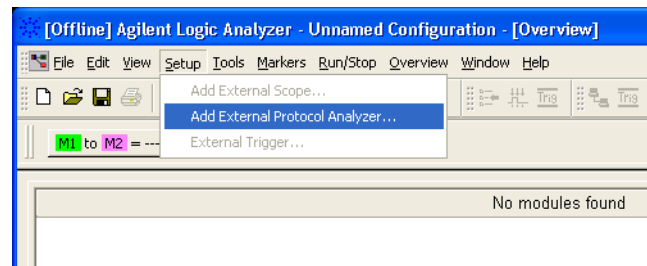
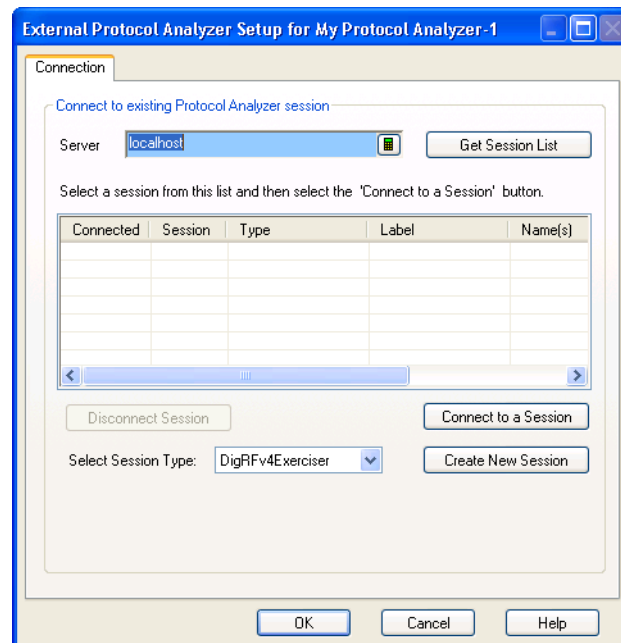


Figure 3 Add External Protocol Analyzer

The External Protocol Analyzer Setup dialog appears.



The steps to view the frames on the Rx memory are discussed in the following sections:

- “Making the Connection” on page 12
- “Setting the DigRF v4 Analyzer/Exerciser Properties” on page 15
- “Enabling Capture on Trigger” on page 17
- “Starting and Stopping Captures and Viewing Status” on page 18
- “Setting RX Control Properties” on page 20
- “Viewing External Protocol Analyzer Modules in the Overview Tab” on page 21

Making the Connection

You can connect to a session in two different ways:

- “To create a new session” on page 12
- “To connect to an existing session” on page 13

To create a new session

- 1 Click **Connection** on the External Protocol setup screen.
- 2 Click **Create New Session**.

The Create New Session dialog box opens up and the session appears.

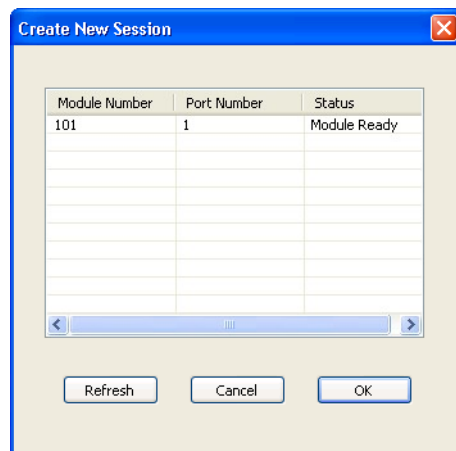


Figure 4 Create New Session Dialog Box

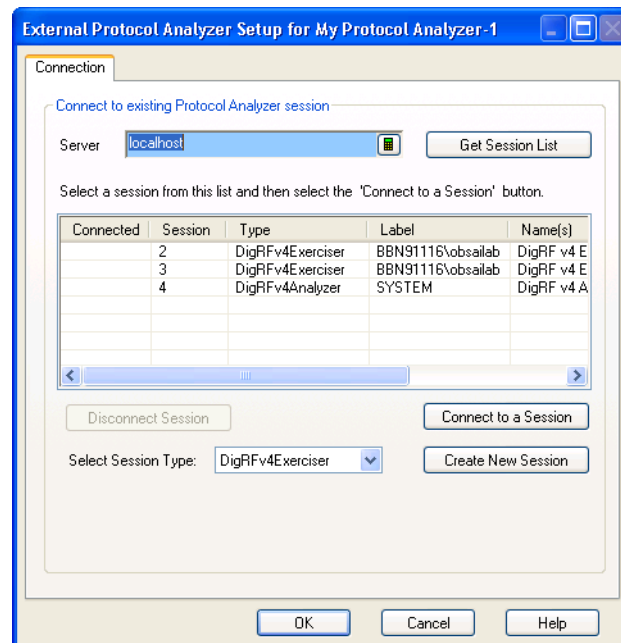
- 3 Select a module from the list of modules attached.
- 4 Click **OK**.
- 5 The selected module appears on the Connection screen.
- 6 Click **Refresh** to update the module number, port number, and the status of the modules.

- 7 Select a module from the list of modules attached from the Connection screen.

To connect to an existing session

- 1 In the Connection tab of the External Protocol Analyzer Setup dialog, click **Get Session List**.

The existing sessions are listed in the dialog.

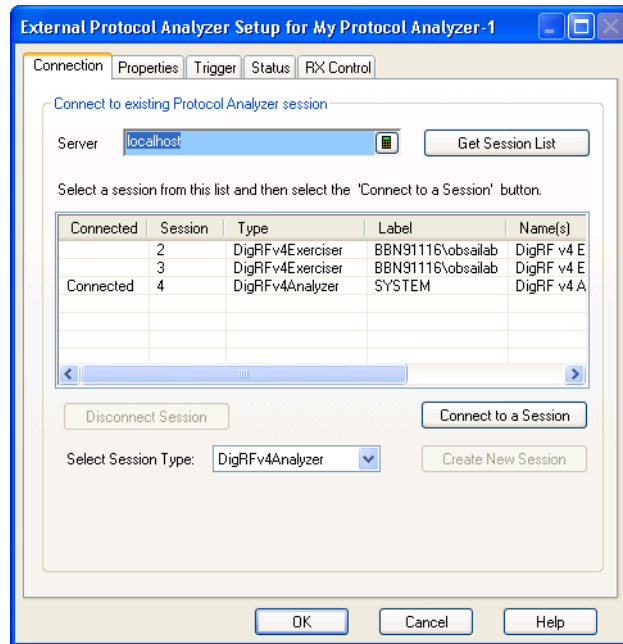


- 2 Select one of the existing sessions (highlight it by clicking).
- 3 Click **Connect to a Session**.

The DigRF analyzer/exerciser module session is connected.

Notice that **Connected** appears in the Connected column.


1 Getting DigRF Data



Also, notice there are additional tabs in the dialog for setting options for the connected DigRF v4 analyzer or exerciser.

- See Also**
- [“Making the Connection”](#) on page 12
 - [“Setting the DigRF v4 Analyzer/Exerciser Properties”](#) on page 15
 - [“Enabling Capture on Trigger”](#) on page 17
 - [“Starting and Stopping Captures and Viewing Status”](#) on page 18
 - [“Setting RX Control Properties”](#) on page 20
 - [“Viewing External Protocol Analyzer Modules in the Overview Tab”](#) on page 21

Setting the DigRF v4 Analyzer/Exerciser Properties

- 1 Click the external protocol analyzer's Properties icon  or, if the External Protocol Analyzer Setup dialog is already open, select the **Properties** tab.

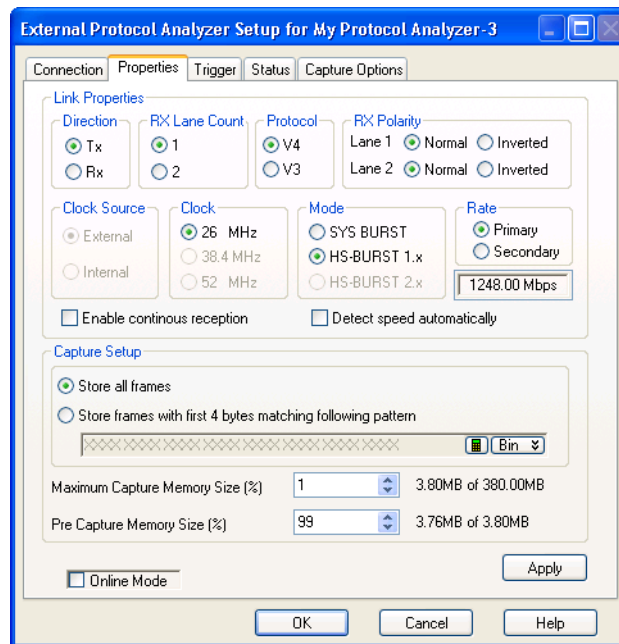


Figure 5 Properties tab

2 Set the **Link Properties**:

- **Direction** – can be either **TX** or **RX**.

With a DigRFv4Analyzer session, you can select either **TX** or **RX**.

With a DigRFv4Exerciser session, the direction is selected automatically based on the type of exerciser link.

- **Lane Count** – either **1** or **2**.
- **Protocol** – either **V4** or **V3**.
- **Polarity** – either **Normal** or **Inverted**.
- **Clock Source** – either **External** or **Internal**.
- **Clock** – **26 MHz**, **38.4 MHz**, or **52 MHz**.
- **Mode** – **SYS BURST**, **HS-BURST 1.x**, or **HS-BURST 2.x**.
- **Rate** – **Primary** or **Secondary**.

- **Detect speed automatically** – This options specifies what happens when there is a speed change in the protocol (for example, from slow to high speed).

When checked, the receiver changes the its speed accordingly.

When unchecked, the receiver ignores the speed change command (which is part of the protocol) and waits for you to change the speed manually.


3 Set the **Capture Setup** frame storage options:

NOTE

With 512 MB of external memory, data and timestamps are stored in 380 MB. The rest of memory (approximately 132 MB) is consumed by internal bookkeeping logic.

- **Store all frames** – if you want to store all frames.
- **Store frames with first 4 bytes matching the following pattern** – if you want to store only the frames whose first four bytes match the entered pattern.
- Enter the **Maximum Capture Memory Size** percentage.
- Enter the **Pre Capture Memory Size** percentage.

This is the percentage of the specified maximum capture memory size. For example, if you specify 10% as maximum capture memory size (38.00 MB of 380 MB) and 48% as pre capture memory size, then precapture memory is 18.24 MB (48% of 38.00 MB).

- 4 Check **Go Online** to cause the run button  (or F5) in the *Agilent Logic Analyzer* application to start an external protocol analyzer capture each time. When checked, it is not necessary to press the **Start** button in the Status tab to begin another capture.

The 89601A VSA software uses the logic analysis software's run routine, so checking **Go Online** lets VSA draw real-time graphs without you having to manually start and stop protocol analyzer captures before each VSA run.


When unchecked, the run button causes data to be uploaded from the external protocol analyzer, but not recaptured.

- 5 Click **Apply** to make the properties settings.

See Also

- ["Making the Connection"](#) on page 12
- ["Enabling Capture on Trigger"](#) on page 17
- ["Starting and Stopping Captures and Viewing Status"](#) on page 18
- ["Setting RX Control Properties"](#) on page 20
- ["Viewing External Protocol Analyzer Modules in the Overview Tab"](#) on page 21

Enabling Capture on Trigger

- 1 Click the external protocol analyzer's Trigger icon  or, if the External Protocol Analyzer Setup dialog is already open, select the **Trigger** tab.

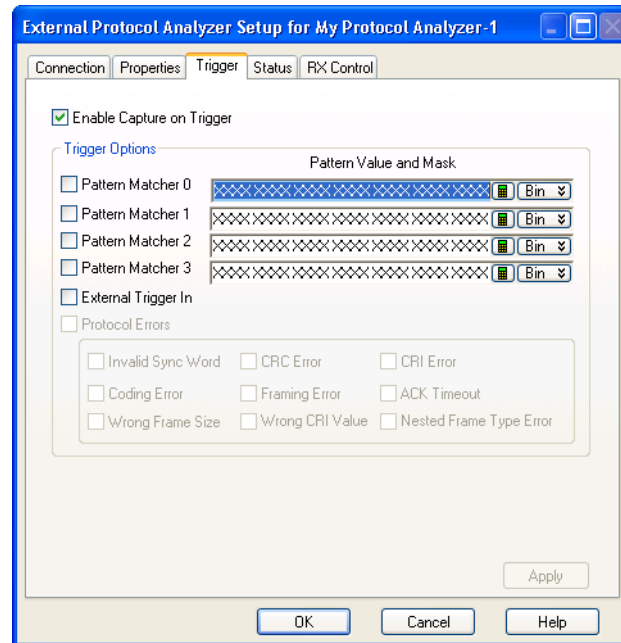


Figure 6 Trigger tab


- 2 Check **Enable Capture on Trigger**.
- 3 Enter up to four **Pattern Matcher** values and masks.

If desired, the trigger options can be set using the pattern matcher from 0 to 3. The setup will trigger if any of the specified pattern options is satisfied.

- 4 Check the **Pattern Matcher** values, **External Trigger In**, or **Protocol Errors** to enable trigger conditions.
- 5 Click **Apply** to apply the changes made.

- See Also**
- [“Making the Connection”](#) on page 12
 - [“Setting the DigRF v4 Analyzer/Exerciser Properties”](#) on page 15
 - [“Starting and Stopping Captures and Viewing Status”](#) on page 18
 - [“Setting RX Control Properties”](#) on page 20
 - [“Viewing External Protocol Analyzer Modules in the Overview Tab”](#) on page 21

Starting and Stopping Captures and Viewing Status

- 1 Click the external protocol analyzer's Status icon  or, if the External Protocol Analyzer Setup dialog is already open, select the **Status** tab.

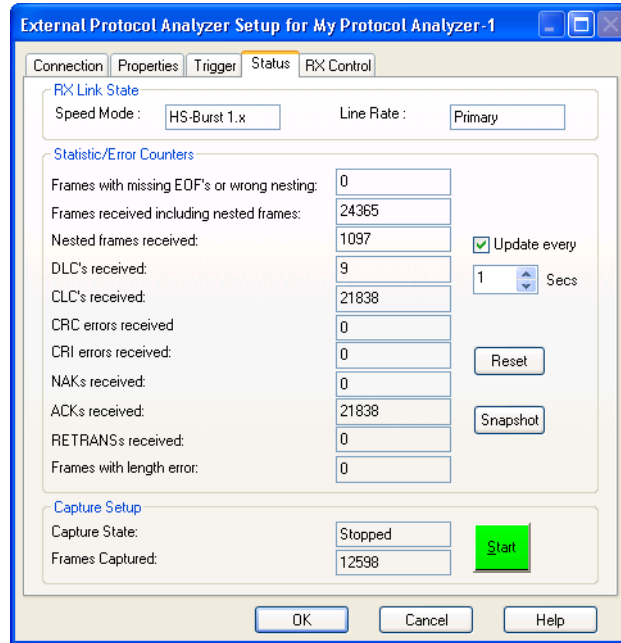
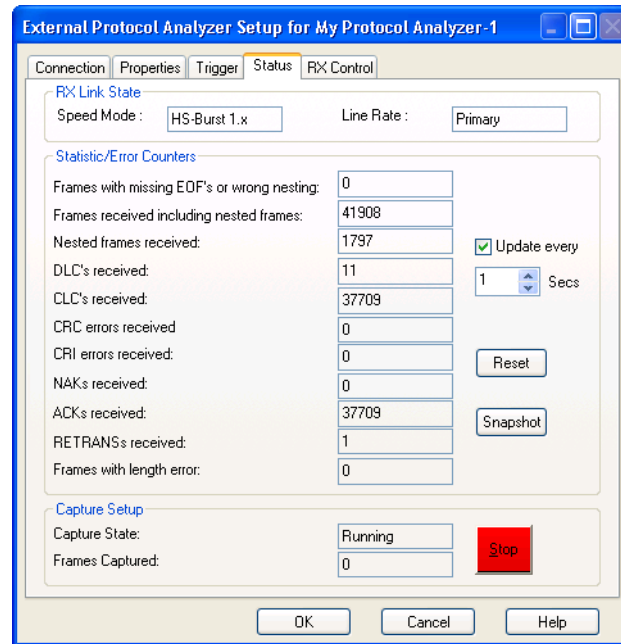


Figure 7 Status tab

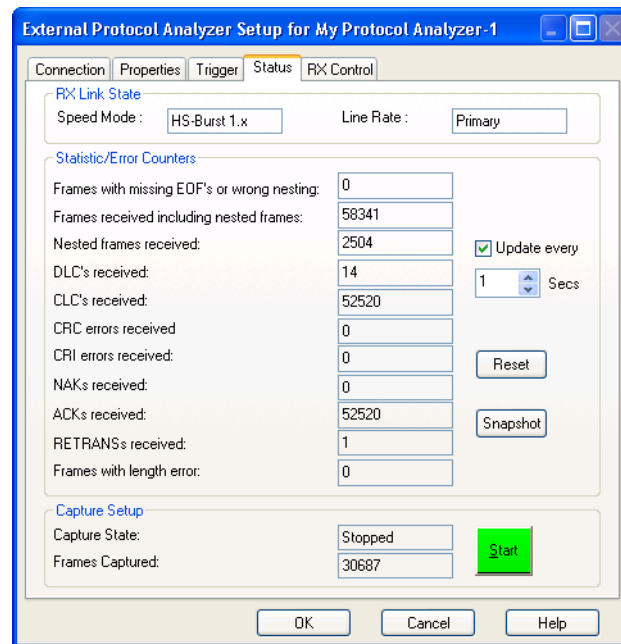
- 2 Click **Start** to start a capture.

The green Start button turns into a red Stop button, and the capture state shows "Running". The number of frames captured is not updated until the capture is stopped.



3 Click **Stop** to stop a capture.

The red Stop button turns into a green Start button, the capture state shows "Stopped", and the number of frames captured is displayed.



4 View the **Statistic/Error Counters**.

To have the counters updated periodically, check **Update every** and enter the number of seconds.

To reset the counters, click **Reset**.

To take a snapshot of the dialog, click **Snapshot**.

- See Also**
- “Making the Connection” on page 12
 - “Setting the DigRF v4 Analyzer/Exerciser Properties” on page 15
 - “Enabling Capture on Trigger” on page 17
 - “Setting RX Control Properties” on page 20
 - “Viewing External Protocol Analyzer Modules in the Overview Tab” on page 21

Setting RX Control Properties

- 1 Open the External Protocol Analyzer Setup dialog, and select the **RX Control** tab.

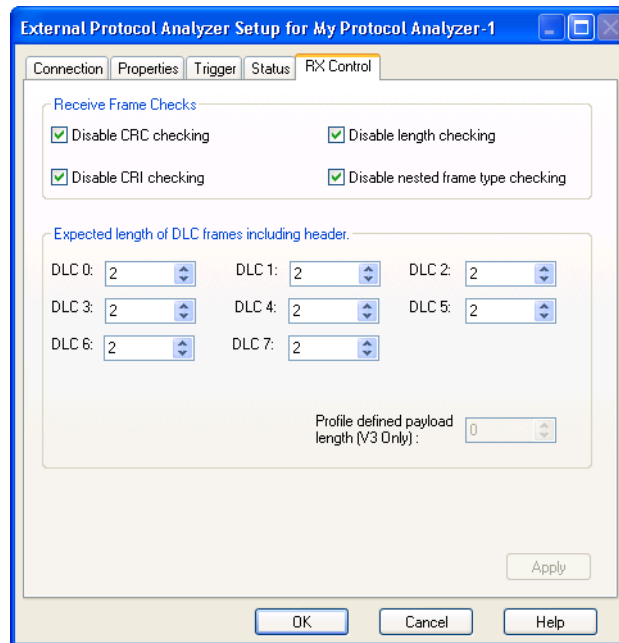


Figure 8 RX Control tab

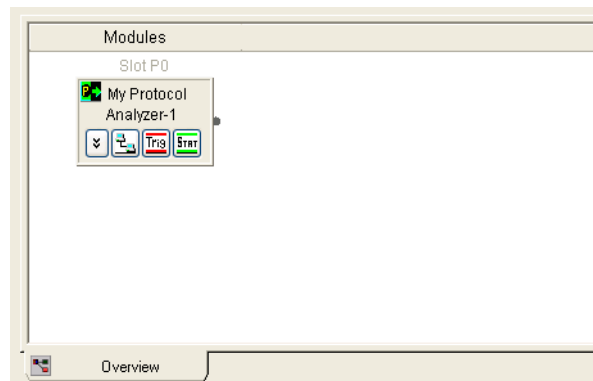
- 2 Enable or disable the **Receive Frame Checks**.
- 3 Enter the **Expected length of DLC frames including header**.
- 4 If analyzing a DigRF v3 link, enter the **Profile defined payload length**.
- 5 Click **Apply** to apply the changes made.

- See Also**
- “Making the Connection” on page 12
 - “Setting the DigRF v4 Analyzer/Exerciser Properties” on page 15
 - “Enabling Capture on Trigger” on page 17
 - “Starting and Stopping Captures and Viewing Status” on page 18
 - “Viewing External Protocol Analyzer Modules in the Overview Tab” on page 21

Viewing External Protocol Analyzer Modules in the Overview Tab

After you have made the connection to a DigRF v4 analyzer/exerciser module, you can view the External Protocol Analyzer module in the Overview tab.

- 1 In the *Agilent Logic Analyzer* application, select the **Overview** tab.



Note that the module has icon buttons for opening the Properties, Trigger, and Status tabs in the Setup dialog.

Once you have connected to a DigRF v4 analyzer/exerciser via the external protocol analyzer module and set it up, you can add Packet Decoder tools, Packet Viewer windows, Signal Extractor tools, etc.

- See Also**
- [Chapter 2](#), “Decoding and Viewing Packets,” starting on page 25
 - [Chapter 3](#), “Capturing Packets,” starting on page 31
 - [Chapter 4](#), “Extracting Digital I/Q Data,” starting on page 33
 - [Chapter 5](#), “Sending IQ Data to VSA,” starting on page 37

Importing Data

In addition to getting DigRF data from External Protocol Analyzer modules, you can also import "module CSV" format data saved from exercisers in N5302A/N5304A chassis.

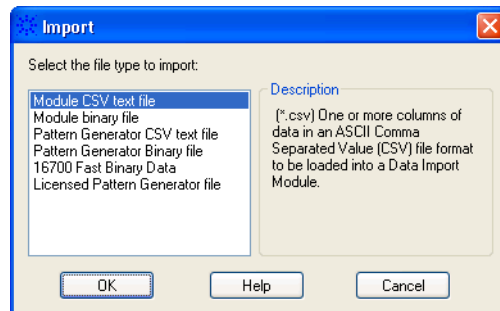
Module CSV files must have been previously saved from the DigRF v4 exerciser. Then, you can import the "module CSV" data into the *Agilent Logic Analyzer* application.

Being able to import data from CSV files lets you perform analysis offline, that is, without being connected to DigRF v4 analyzer/exerciser hardware.

- ["Importing Saved CSV Files"](#) on page 22

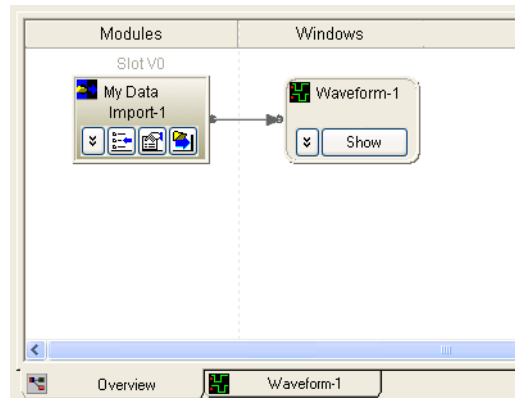
Importing Saved CSV Files

- 1 In the *Agilent Logic Analyzer* application, choose **File>Import...** from the main menu.
- 2 In the Import dialog, select **Module CSV text file**; then, click **OK**.



- 3 In the file browser dialog, select the name of your CSV file; then, click **Import**.

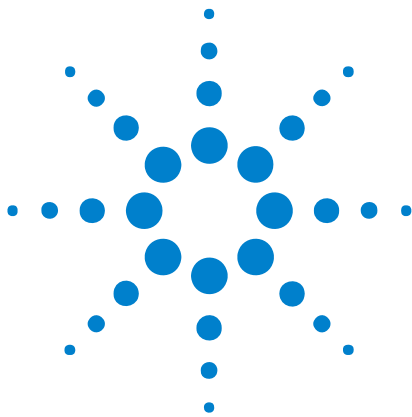
You will see the Data Import module in the Overview tab.



Once data has been imported, you can add Packet Decoder tools, Packet Viewer windows, Signal Extractor tools, etc., just as if the data was coming from an External Protocol Analyzer module.

- See Also**
- [Chapter 2](#), “Decoding and Viewing Packets,” starting on page 25
 - [Chapter 3](#), “Capturing Packets,” starting on page 31
 - [Chapter 4](#), “Extracting Digital I/Q Data,” starting on page 33
 - [Chapter 5](#), “Sending IQ Data to VSA,” starting on page 37

1 Getting DigRF Data



2 Decoding and Viewing Packets

Decoding DigRF Packets 26

Viewing Decoded DigRF Packets 28

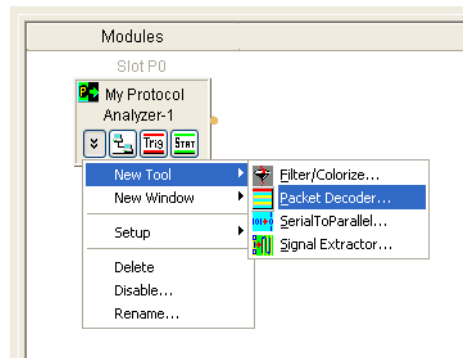
Once a connection has been made to a DigRF v4 analyzer/exerciser, or data previously saved from an analyzer/exerciser has been imported, you can add Packet Decoder tools and PAcKet Viewer windows to view the captured data.



Decoding DigRF Packets

Packet Decoder tools are used to decode the captured data from External Protocol Analyzer modules.

- 1 In the *Agilent Logic Analyzer* application's Overview tab, from the External Protocol Analyzer module's drop-down menu, choose **New Tool>Packet Decoder...**



- 2 In the Packet Decode Properties dialog:

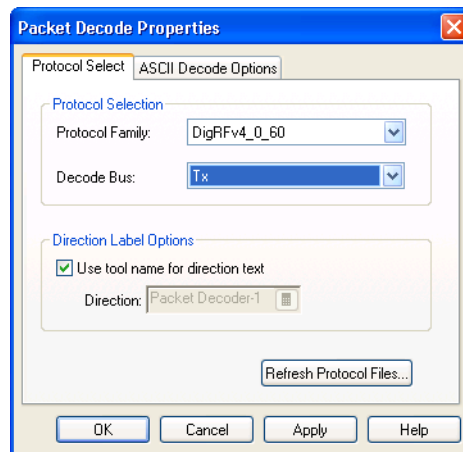
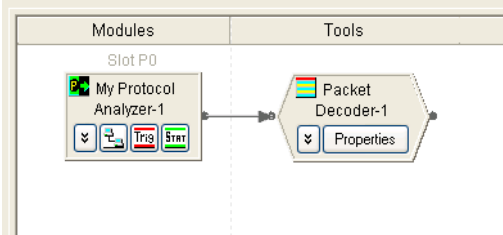


Figure 9 Packet Decoder Properties dialog

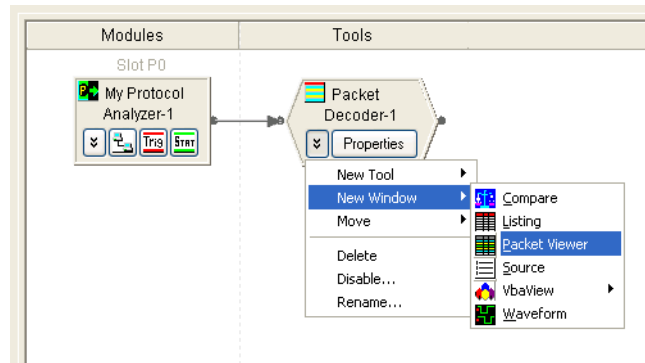
- a Select the appropriate DigRF **Protocol Family** (typically **DigRFv4_0_60**).
- b Select the appropriate **Decode Bus**.
- c Click **OK**.

In the Overview tab, you see the Packet Decoder tool has been added.

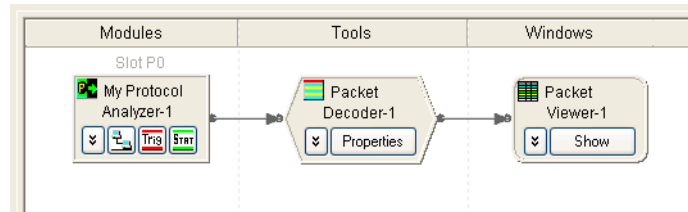


Viewing Decoded DigRF Packets

- 1 In the *Agilent Logic Analyzer* application's Overview tab, from the Packet Decoder tool's drop-down menu, choose **New Window>Packet Viewer**.



In the Overview tab, you see the Packet Viewer window has been added.



- 2 Click **Show** on Packet Viewer.

The Packet Viewer window appears.

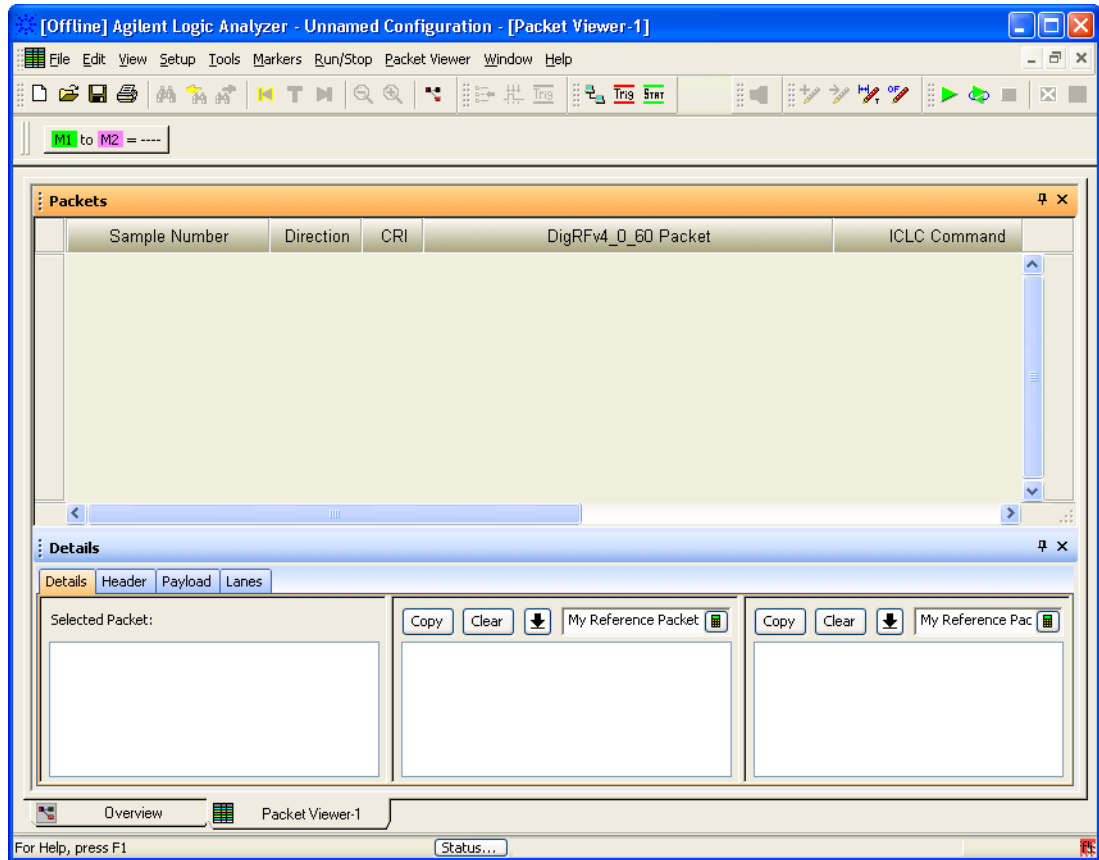
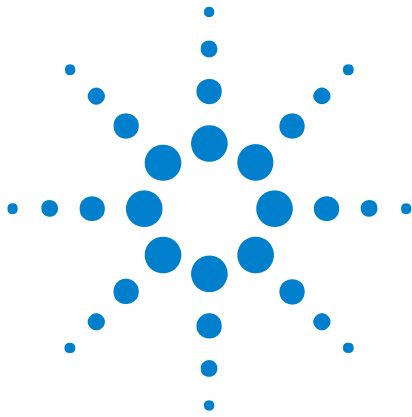


Figure 10 Packet Viewer window


If there is no data displayed in the Packet Viewer window, you may need to capture packets.

See Also • [Chapter 3](#), “Capturing Packets,” starting on page 31

2 Decoding and Viewing Packets



3 Capturing Packets

- 1 In the *Agilent Logic Analyzer* application, click the run icon  to capture data.

The Status screen appears.

NOTE

If the *Agilent Logic Analyzer* application is running without logic analyzer hardware, the status screen appears.

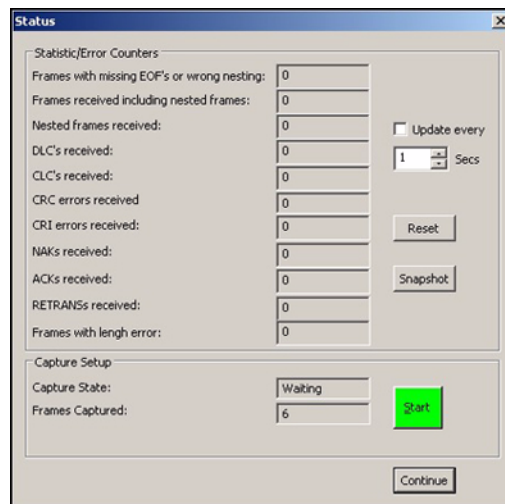


Figure 11 Status screen

- 2 Click **Start**.

Frames are captured, and the Start button changes to Stop.

- 3 Click **Stop**.
- 4 Click **Continue**.

The number of packets captured appears on the Packets screen.

3 Capturing Packets

NOTE

If a trigger condition is enabled, the capture stops automatically when the trigger condition is met and post trigger storage is filled.

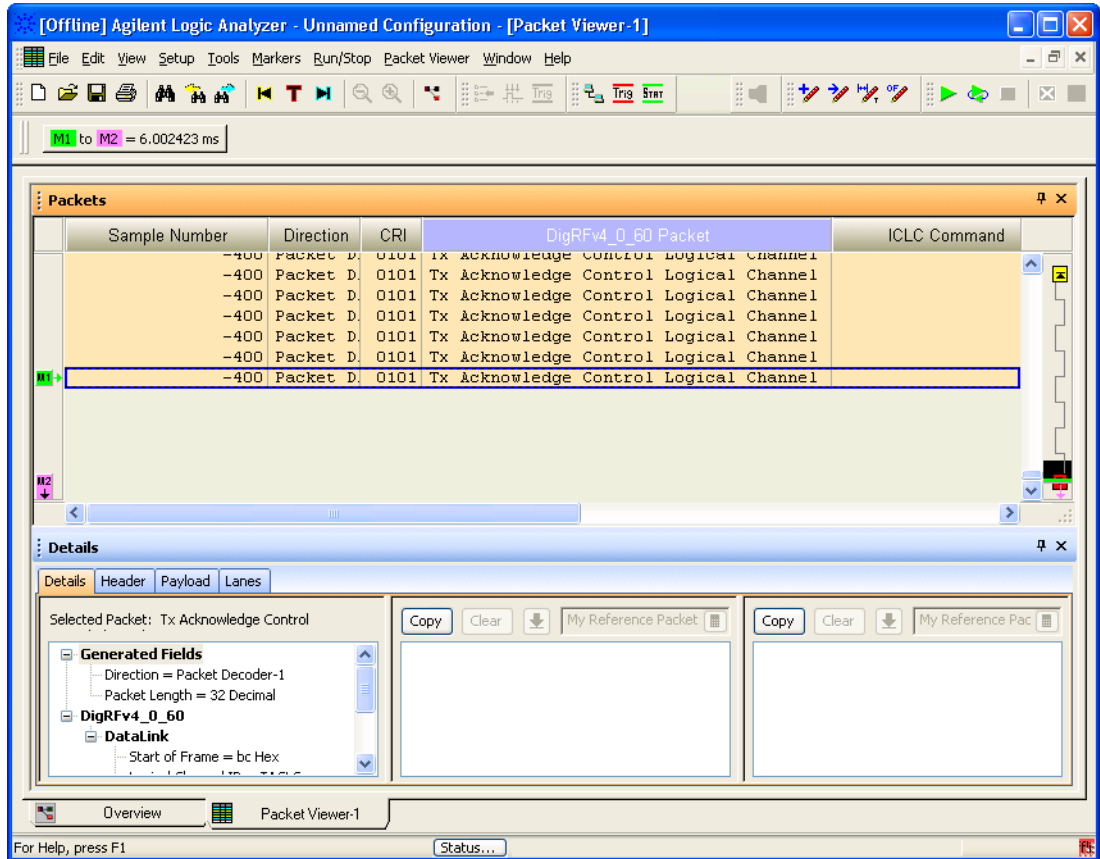


Figure 12 Packets captured



4 Extracting Digital I/Q Data

Signal Extractor tools are used to extract I/Q data which can be displayed with Listing or Waveform windows or sent to the 89601A VSA software.

- 1 Import a module CSV file (see "[Importing Data](#)" on page 22).
- 2 Goto **Overview** tab to add the signal extractor tool.
- 3 Right click on the slot A already present under the modules column.
- 4 Goto **New Tool>Signal Extractor**.

The Signal Extractor appears.

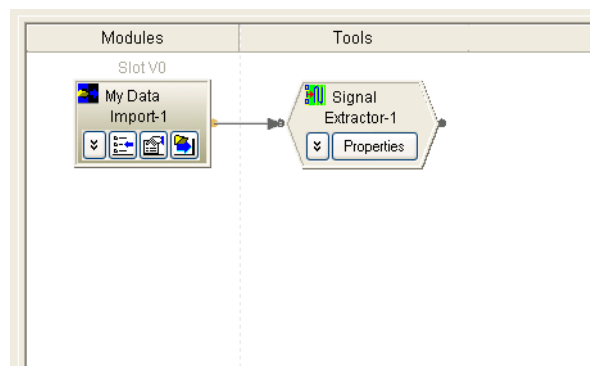


Figure 13 Signal Extractor

- 5 Click **Properties** of the Signal Extractor.

The Signal Extractor screen appears.

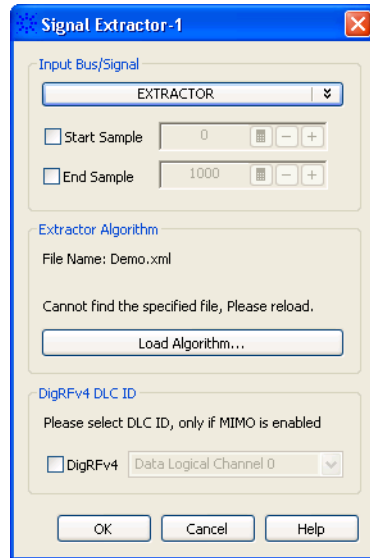


Figure 14 Signal Extractor screen

- 6 Select **Extractor** under **Input Bus/Signal**.
- 7 Select the **DigRFv4** checkbox, and select the desired Data Logical Channel from 0 to 1 under **DigRFv4 DLC ID**. This is applicable in case you load the MIMO algorithm.

NOTE

- In the process of extracting MIMO, you need to add two Signal Extractor in parallel. One for the primary frame and the other for the secondary frame.
- Load the MIMO algorithm from the primary folder for the primary frames and load the Diversity folder for the secondary frame.
- Ensure that the Load Algorithm in Extractor is exactly same as the algorithm used in the data in IQ file or the data format in Signal Inserter, if used.

- 8 Click **OK**.
- 9 Goto **New Window of Signal Extractor>Listing**.

The Listing screen appears.

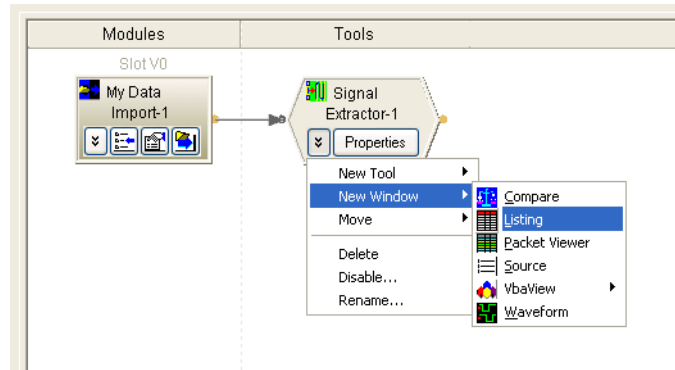


Figure 15 Listing Selection screen

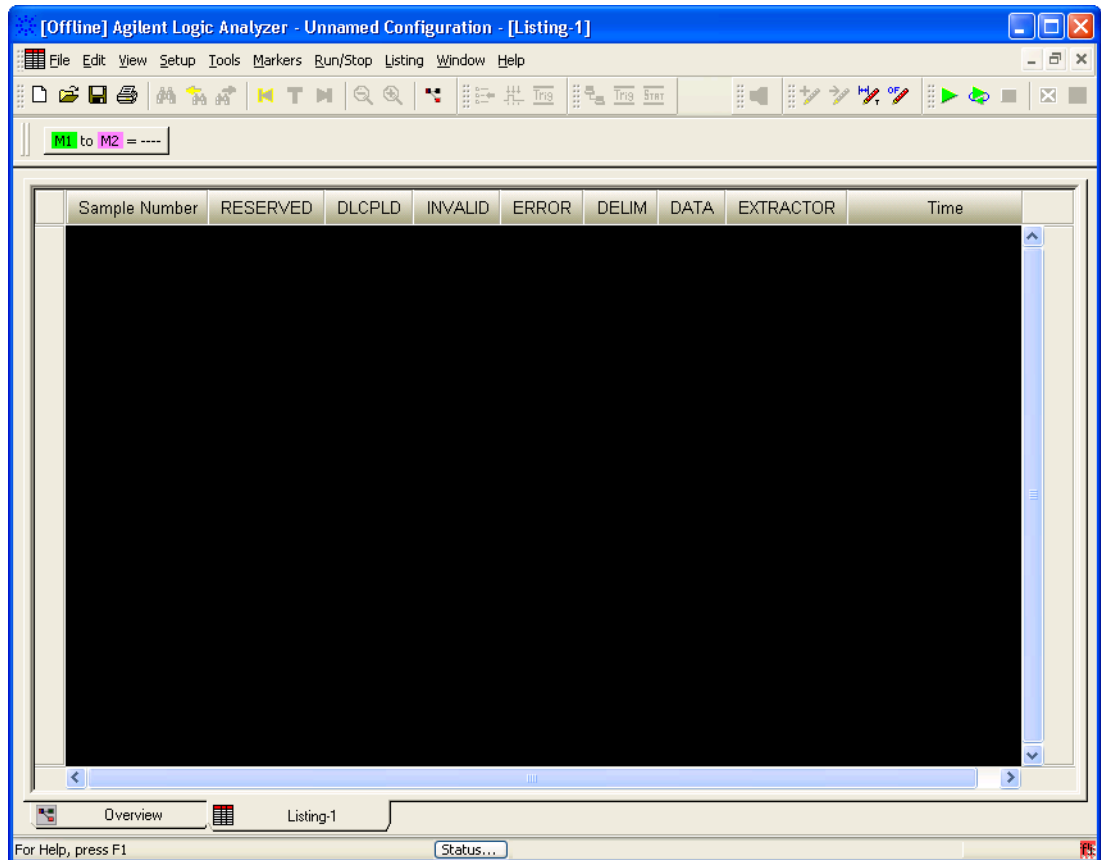
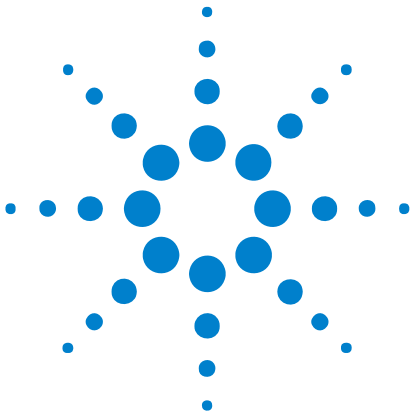


Figure 16 Listing window

4 Extracting Digital I/O Data



5 Sending IQ Data to VSA

VSA connection with External protocol Analyzer module can be made both in offline mode as well as online mode.

Digital VSA is used to display I/Q data in the RF domain.

When Data is Imported

In offline mode, VSA can extract the data that is already captured at logic analyzer end. The VSA will not be able to trigger capture on external protocol analyzer module. VSA will run the captured data repeatedly.

The trace size can be controlled by specifying required Max and Pre capture values in the properties tab.

When Connected to a DigRF v4 Analyzer or Exerciser

In online mode, VSA will trigger capture on external protocol analyzer module. So, it is important that trigger conditions are specified in external protocol analyzer module **Setup** dialog > **Trigger** tab.

Other than that, capture memory size needs to be configured correctly. The system will stop capturing as soon as post capture memory is filled.

Example: To set ~1 MB post trigger capture size, set following values in Max and Pre capture settings in the properties tab:

Maximum Capture Memory Size (%)	1	3.80MB of 380.00MB
Pre Capture Memory Size (%)	74	2.81MB of 3.80MB

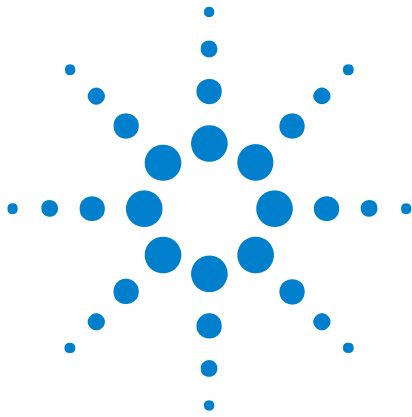
Figure 17 Max and Pre capture settings in the Properties Tab

Besides, on the Trigger tab do the following:

- 1 Click the **Enable capture on trigger** checkbox.
- 2 Select at least one pattern matcher from the trigger options. Mask all bytes with X

In this way, the trigger will happen immediately and pre capture memory will be 0 and all data will be captured in post trigger capture memory.

5 Sending IQ Data to VSA



6 Generating Stimulus with Signal Inserter

Generate DigRFv4	40
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Generate DigRF	45

The Signal Inserter tool is used to translate IQ data from other tools into a CSV or TCL format. This CSV or TCL format is used by the DigRF v4 exerciser.

To run the Signal Inserter tool, click **Start>Programs>Agilent Logic Analyzer>Utilities>Signal Inserter**.



Generate DigRFv4

The Generate DigRFv4 tab is used to generate a pattern generator CSV file from an IQ data file for DigRFv4.

The steps to generate the output CSV file are as follows:

- 1 Click **Generate DigRFv4**.
- 2 Select the file type.
- 3 Specify the path of the input file.
- 4 Set the required options for **Insert Signal Frames in Main**.
- 5 Enable the **Insert Control Frames from ASCII Format File** options and specify the file names if desired.
- 6 Select the path of the output file to generate the CSV file.
- 7 Click **Generate the Output CSV and TCL Files**.

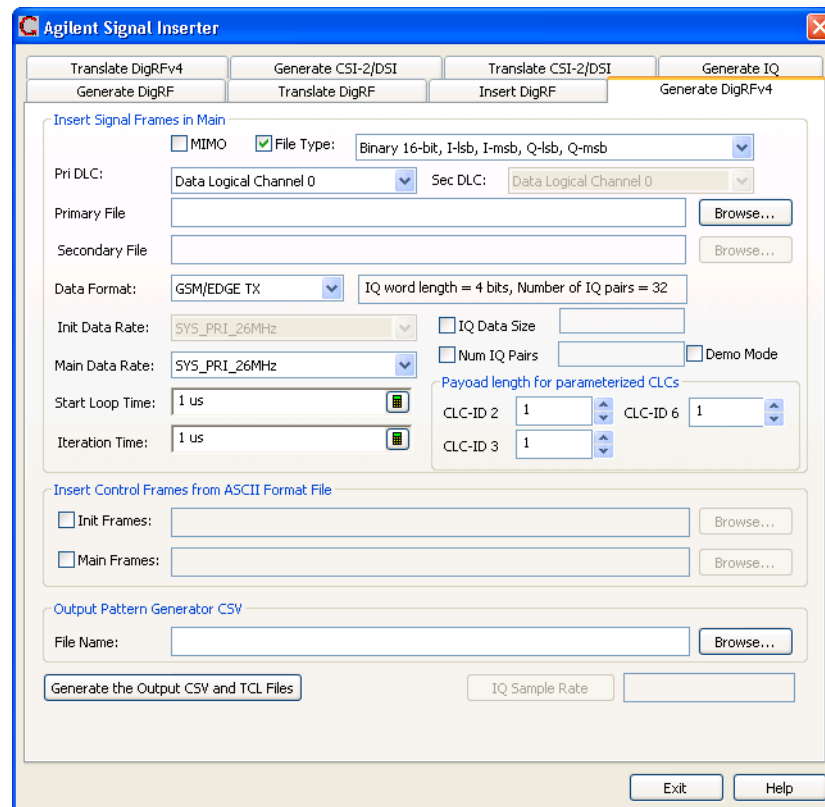


Figure 18 Generate DigRFv4 screen

Options for Insert Signal Frames in Main:

The screenshot shows the 'Insert Signal Frames in Main' configuration window. It includes the following elements:

- MIMO:** A checkbox that is currently unchecked.
- File Type:** A checked checkbox with a dropdown menu set to 'Binary 16-bit, I-lsb, I-msb, Q-lsb, Q-msb'.
- Pri DLC:** A dropdown menu set to 'Data Logical Channel 0'.
- Sec DLC:** A dropdown menu set to 'Data Logical Channel 0'.
- Primary File:** An empty text field with a 'Browse...' button.
- Secondary File:** An empty text field with a 'Browse...' button.
- Data Format:** A dropdown menu set to 'GSM/EDGE TX' and a text box showing 'IQ word length = 4 bits, Number of IQ pairs = 32'.
- Init Data Rate:** A dropdown menu set to 'SYS_PRI_26MHz'.
- Main Data Rate:** A dropdown menu set to 'SYS_PRI_26MHz'.
- Start Loop Time:** A text box set to '1 us' with a refresh icon.
- Iteration Time:** A text box set to '1 us' with a refresh icon.
- IQ Data Size:** An unchecked checkbox with an empty text box.
- Num IQ Pairs:** An unchecked checkbox with an empty text box.
- Demo Mode:** An unchecked checkbox.
- Payload length for parameterized CLCs:** Four spinners for CLC-ID 2, 3, 6, and another (likely 4 or 5) all set to '1'.

MIMO	The MIMO checkbox is used to enable the Secondary file and the Secondary Logical Channel. Here, first frame inserts from the primary file and second frame from the secondary file. This sequence remains same throughout.
File Type	The File Type check box is used to enable input of a signal file and generation of data frames. The check is selected by default. If it is de-selected, all controls related to Signal Frames in Main are disabled and only Control Frames will be output.
Pri DLC	Select the desired Data Logical Channel from 0 to 7 as the primary logical channel.
Sec DLC	Select the desired Data Logical Channel from 0 to 7 as the secondary logical channel. The Sec DLC gets enabled on clicking the MIMO checkbox.
Primary File	Specify the path of the input file.
Secondary File	The Secondary File is enabled only when the MIMO checkbox is selected. To specify the secondary file, select the MIMO checkbox. And then, specify the name of the secondary file.
Data Format	Select the desired data format to be used. The right box provides information on the IQ word length in bits and the number of IQ pairs based on the data format selected. You can also provide the IQ word length and number of IQ pairs by selecting the IQ Data Size checkbox and Num IQ Pairs checkbox. Enabling both or anyone IQ Data Size and Num IQ Pairs checkboxes disables the Data Format option.
Data Rate	Select the desired Data Rate from the drop down options, that is, Sys_pri_26MHZ, Sys_sec_26MHZ, HS_1.x_Pri_26MHZ, HS_1.x_sec_26MHZ.
Start Loop Time	Specify the required start loop time in microseconds.
Iteration Time	Specify the required loop iteration time in microseconds.

6 Generating Stimulus with Signal Inserter

Options for Insert Control Frames from ASCII Format File:



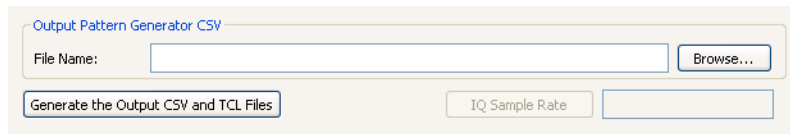
Insert Control Frames from ASCII Format File

Init Frames:

Main Frames:

The DigRF protocol supports the transmission of data frames and control frames. Control frames can be sent during the initialization (init) sequence or during the transmission of the data frames (main). You can select a file with the control frames that needs to be sent during initialization sequence or during the loop iteration (main).

Output Pattern Generator CSV:



Output Pattern Generator CSV

File Name:

Specify the path of the filename where you want to generate the output CSV or TCL file.

Generate the Output CSV and TCL Files:

Click **Generate the Output CSV and TCL Files** to generate the CSV file in the path specified file. The output file is generated in both CSV and TCL format.

Translate DigRFv4

The Translate DigRF tab is used to translate between pattern generator file formats.

The operation is chosen based upon the input file type. So in each case, the procedure is:

- 1 Select an input file.
- 2 Enter a name for the output CSV file.
- 3 Click **Generate the Output CSV file**.

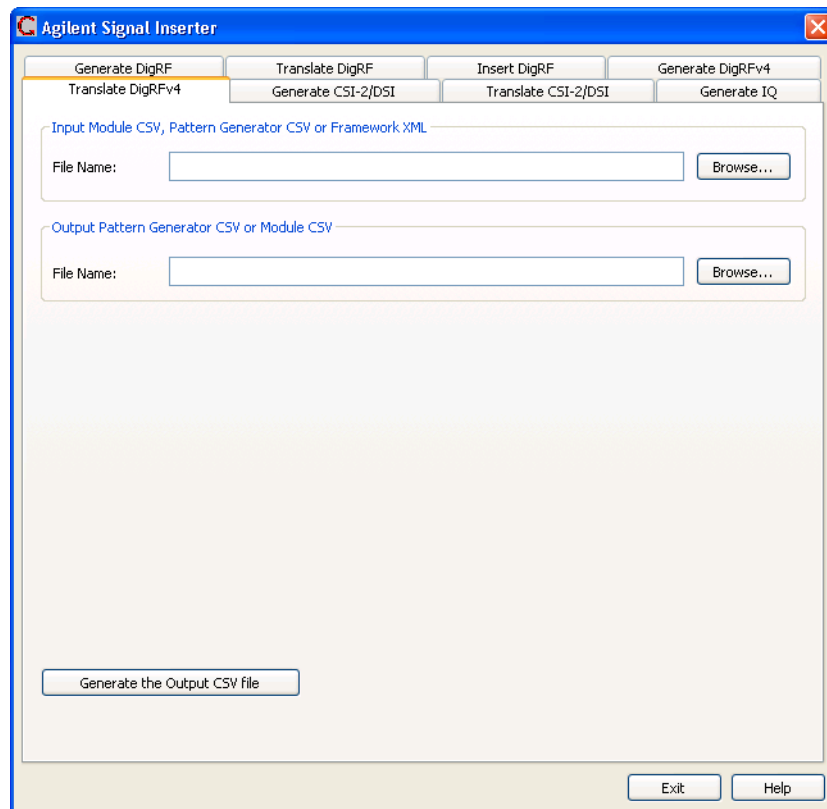


Figure 19 Translate DigRFv4

Translating to Pattern Generator CSV

If the input file is a Module CSV file or an XML description file, it will be translated to a Pattern Generator CSV file.

You can create a Module CSV file yourself. You can also capture a signal, save it as a CSV file, then translate it to Pattern Generator CSV for use as stimulus.

6 Generating Stimulus with Signal Inserter

Translating to Module CSV If the input is a Pattern Generator CSV file, it will be translated to a Module CSV file. The Module CSV is the same format as the output of the N4850A acquisition probe. You can load the Module CSV file into the logic analysis system, and use all the analysis tools available there (such as the Packet Decoder tool, the Packet Viewer display, and the Signal Extractor). This is useful for verifying that you have created the series of DigRFv4 packets correctly.

Licensed Pattern Generator format If the input file is Licensed Pattern Generator format, you will get an error message. Translating Licensed Pattern Generator format to Module CSV is not supported.

Generate DigRF

The Generate DigRF tab is used to generate a pattern generator CSV file from an IQ data file for DigRF v3.

The steps to generate the output CSV file are as follows:

- 1 Click **Generate DigRF**.
- 2 Select the file type.
- 3 Select the name of the input file.
- 4 Set the required "Options for Insert Signal Frames in Main in DigRF" on page 46
- 5 Specify up to four control frames to be inserted into the data at regular intervals.
- 6 Select the path of the output file to generate the CSV file.
- 7 Click **Generate the Output CSV File**.

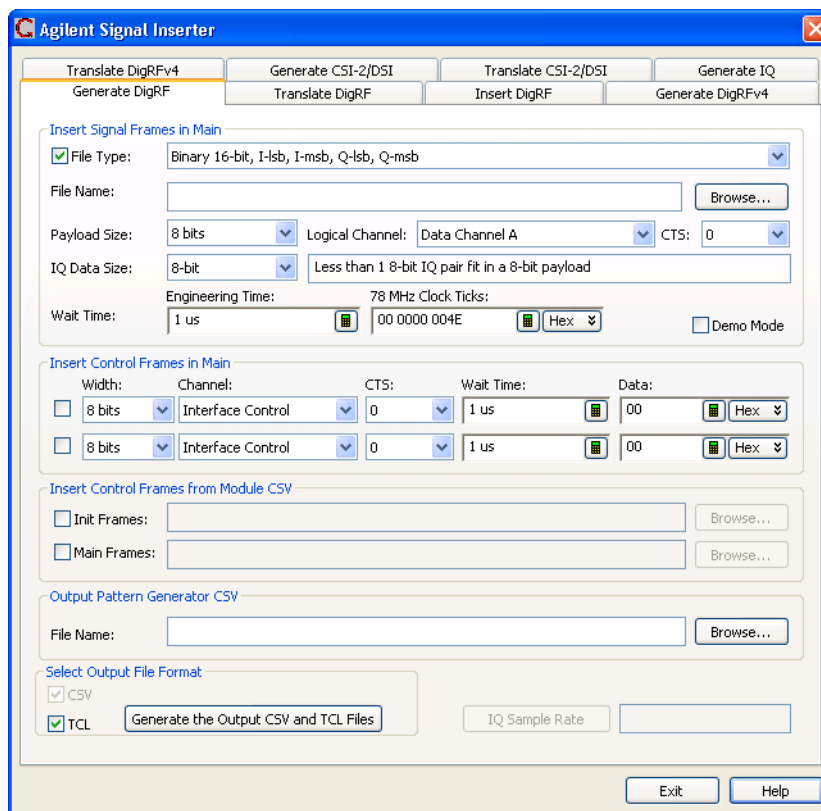


Figure 20 Generate DigRF screen

See Also • "Options for Insert Signal Frames in Main in DigRF" on page 46

- "Options for Insert Control Frames in Main" on page 46
- "Options for Insert Control Frames from Module CSV" on page 47

Options for Insert Signal Frames in Main in DigRF

Several controls allow you to specify how to packetize the IQ data.

Signal File Type: The **File Type** check box is used to enable input of a signal file and generation of data frames. The check is selected by default. If it is de-selected, all controls related to Signal Frames in Main are disabled and only Control Frames will be output.

Payload Size, Logical Channel: The Payload Size, Logical Channel, and CTS selections are used to encode the DigRF v3 Frame Header Byte.

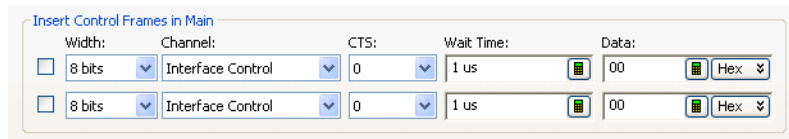
IQ Data Size: The IQ Data Size is used to specify the size of the individual I and Q values that are written in the payload. If you choose 8-bit or 12-bit, then the 16-bit values read from the data file are right-shifted to the appropriate size. The box beside the IQ Data Size tells you how many IQ pairs will fit in the chosen Payload Size.

Wait Time: The Wait Time is the length of time to wait between transmitting frames. This time is encoded as a time command in the Pattern Generator sequence.

The Wait Time can be input as Engineering Time (time in units of s, ms, us, ns, or ps) in the left box or as the number of 78 MHz Clock Ticks in the right box. These displays are kept in sync by the software. When you change the value in one box, the value automatically changes in the other box. Since a 78 MHz Clock Tick represents about 12.821 ns, the clock ticks do not represent time as precisely as Engineering Time.

Options for Insert Control Frames in Main

Control Frames can be inserted between Data Frames at selected intervals. Up to four different types of control frames can be selected.



Selecting the check box on the left of each row of controls indicates a control frame that is to be inserted.

Width, Channel: Control Frames can be either 8 bits or 32 bits and can be transmitted on channels 0..3.

CTS: The above two values and CTS are used to encode the header byte for the frame.

Wait Time: The Wait Time indicates the amount of time between each of these Control Frames.

Data: The Data field is the contents of the Control Frame payload.

Options for Insert Control Frames from Module CSV

The second method for inserting control frames reads control frames from a Module CSV file and inserts them in the sequence.



The check box on each row enables the option.

Init Frames: You can specify a file to insert in the INIT part of the sequence.

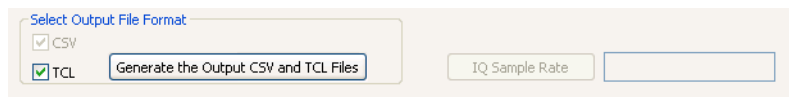
Main Frames: You can specify a file to insert the Main part of the sequence.

Output Pattern Generator CSV



Specify the path of the filename where you want to generate the output CSV file.

Select Output File Format



Select the format of the output file as CSV or TCL.

6 Generating Stimulus with Signal Inserter

Generate the Output CSV File: Click **Generate the Output CSV File** to generate the CSV file in the path specified.

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