How to Measure Digital Baseband and IF Signals Using Agilent Logic Analyzers with 89600 Vector Signal Analysis Software

Application Note 1559

Measure, evaluate, and troubleshoot digital baseband and IF signals with the Agilent 1680, 1690, 16800 and 16900 Series logic analyzers, the 89600 Series vector signal analysis (VSA) software (v6.1). This combination works with all 89600 measurement software options including the W-CDMA, WLAN (including 802.11N HT), OFDM, OFDMA, and flexible demodulation options.

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Agilent Technologies

Overview

If you are an RF designer, you are probably beginning to see the appearance of more and more digital baseband and IF interfaces. You need to continue performing modulation quality measurements on these interfaces. If you are a digital baseband designer, you are likely to face constant trade-offs between signal quality and power consumption and battery life. You need signal analysis measurements to find the optimal encoding and filtering designs. A digital vector signal analyzer would be the perfect tool for both these applications.

This application note describes the characteristics, setup, and operation of a digital vector signal analyzer (VSA) created by combining an Agilent logic analyzer and 89601A vector signal analysis software. Whether you are an RF or baseband designer, this combination of logic analysis with vector signal analysis enables you to access a robust suite of signal analysis measurements from the same software console, saving you valuable time in test and debug.

If you would prefer to familiarize yourself with the capabilities of the hardware and software individually before you delve into the details of using them together, please see Appendices A and B.

Benefits of Using Logic Analyzers and 89600 VSA Software in Combination

With the logic analyzer/89600 software combination, you use the 1680, 1690, 16800 or 16900 Series logic analyzers to perform basic digital timing and state analysis on digital memory, control, and IO buses. With flexible voltage thresholds, sampling depths and trigger conditions, the logic analyzer is a powerful and flexible digital debug tool. For digital buses carrying digitized baseband or IF signal data, you can use the VSA software to do everything from displaying a simple spectrum to measuring the modulation quality of your digitally modulated communication signal. Or, use it to extend testing and evaluation of GSM, W-CDMA, cdma2000 (including code domain power or CDP measurements), WLAN, WLAN-HT, IEEE-802.16-2004, IEEE-802.16e OFDMA,and Bluetooth™ signals measured by the advanced measurement personalities in the VSA software.

With this hardware/software combination, you can measure active signals or signals captured in the logic analyzer memory. You can use the logic analyzer alone, or the logic analyzer/89600 VSA combination to examine active signals. You can easily switch between the two products using a convenient disconnect/restart menu selection in the 89600 user interface.

The 89600 software can run on a PC connected to the logic analyzer via LAN, or it can run directly on the built-in Windows® XP system of the 1680, 16800 and 16900 Series logic analyzers. A host PC running the VSA software can also be the controlling PC for the 1690 Series logic analyzers,

which connects to the PC via a FireWire (IEEE 1394) connection. The VSA software provides hardware control, modulation analysis, evaluation and troubleshooting along with complete results displays. The controls and display of the logic analyzer are disabled while it is operating with the VSA software.

89600 VSA software feature availability

When the VSA software is used with Agilent logic analyzers, almost all of its features and options are available (see Appendix B for details). These include:

- Simultaneous display of time, frequency (spectrum), and modulation results

- Recording of time waveforms, allowing you to re-analyze signals and store them for future comparisons

- Many multi-format flexible digital demodulators settable in center frequency, symbol rate, filter type, and filter α/BT (option AYA)

- A complete set of vector signal analysis and modulation analysis displays including constellation, eye diagram, EVM spectrum, EVM time, error screens, multiple trace displays, and a spectrogram display

- Flexible marker capabilities including time gating, integrated band power, offset (delta), occupied bandwidth, adjacent channel power, and limit test markers

- A link to the Agilent ESG series signal sources for download and playback of signals in the signal capture memory

- Complete save and recall of your signals, trace data, and measurement screens

- Easy cut and paste to other PC applications

The 89600 software's swept spectrum application is not supported.

When the 89600 VSA software is controlling the logic analyzer, you can suspend the 89600 software control of the logic analyzer without exiting the VSA software. You can then operate the logic analyzer from its front panel. Immediate restart of 89600 VSA control of the logic analyzer with automatic reset to the last measurement state is also provided.

Performance implications

When an Agilent logic analyzer is used with the 89600 software, typical analog signal specifications do not apply. Because the signal is digital when it enters the analyzer, there is no specification of the instrument's dynamic range, noise floor, or bandwidth. Dynamic range is purely a function of the bit width of the captured signal, and the target device under test defines other analog parameters.

How to Set Up and Use the Combined Hardware/Software

This tutorial shows you how to use an Agilent logic analyzer with the 89600 VSA software. You can refer to it when you are getting started the first time you connect the two products.

Before you begin

For our demonstration, we will use the 89600 VSA software and a PC meeting the requirements shown in tables Table 1 and Table 2. If you are using an Agilent 1680, 16800 or 16900 Series logic analyzer, the logic analyzer's built-in PC meets the system requirements. No measurement hardware or Device Under Test is required because the demonstration uses a pre-captured signal recalled from a logic analyzer configuration file, with the logic analyzer's offline analysis capability. Note that all software options are available when you use the trial license for the 89600 VSA software.

PC requirement	Desktop	Laptop
CPU	> 600 MHz Pentium$^{®}$ or AMD-K6 (> 2 GHz recommended)	> 600 MHz Pentium or AMD-K6 (>2 GHz recommended)
Empty slots (required only if using measurement hardware)	1 PCI-bus slot	1 CardBus type II slot
RAM	512 MB (1 GB recommended)	512 MB (1 GB recommended)
Video RAM	4 MB (16 MB recommended)	4 MB (16 MB recommended)
Hard disk space	300 MB available	300 MB available
Operating system	Microsoft Windows 2000 SP2 or XP Professional	Microsoft Windows 2000 SP2 or XP Professional
Additional drive	CD-ROM to load the software; License transfer requires 3.5 inch floppy drive, network access or USB memory stick	CD-ROM to load the software; License transfer requires 3.5 inch floppy drive, network access or USB memory stick
Interface support (required only if using measurement hardware)	LAN, FireWire, USB or GPIB	LAN, FireWire, USB or GPIB

Table 1. User-provided PC requirements

Software requirements	
89601A version	V6.1, or higher
Option	- 200: Basic vector signal analysis - 300: Hardware connectivity - AYA: Flexible modulation analysis

Table 2. 89600 VSA software configuration used to analyze demonstration signal

Logic analyzer requirements	
Logic analyzer software version	V3.50, or higher
Logic analyzer hardware	PC meeting requirements from Table 1 (if no live measurements are to be made), 16900 Series modular system, or 16800 Series portable logic analyzer, or 1680 Series portable logic analyzer, or 1690 Series PC-hosted (with a host PC meeting above PC requirements plus an IEEE 1394 FireWire host adapter)

Table 3. Logic analyzer hardware and software requirements

Setup procedures

This procedure is intended to help you get started using the 89600 VSA software with an Agilent logic analyzer to analyze digital signals.

1. Download and install software applications

Logic analyzer software
The Agilent logic analyzer software application is downloadable from **www.agilent.com/find/16900_SW_Download.** Download and run the executable to install.

89600 VSA software
You can order the 89600 Demonstration Software CD from **www.agilent.com/find/89600**. In the Key Library Information, choose "Order Free 89600 Demonstration Software."

Or, you can download the 89600 VSA software by going to **http://sa.tm.agilent.com/89600/Software/**

Either method you choose will provide you with a 14-day trial license.

The CD contains some extra video demos that aren't available from the Internet download.

When you install the 89600 software, you may select the "*Software-Only Installation,*" even if you are using logic analyzer hardware.

Detailed information and explanations of the operation of the software are available in the 89600's on-line Help located on the software's toolbar.

2. Start the logic analyzer application

The logic analyzer software is found under **Start > Programs > Agilent Logic Analyzer**.

When prompted what to do, click the "Open File" icon.

When they are used together, the 89600 VSA software retrieves data from the logic analyzer. Before starting VSA measurements, you must configure the following items on the logic analyzer:

• Bus and signal setup – select which logic analyzer channels are connected to I and Q, or other baseband or IF buses

• Sampling setup – always use "state mode" (synchronous sampling), selecting the rising, falling, or both edges of the baseband bus clock

• Trigger setup – use the default trigger ("trigger on anything") or select a trigger signal indicating a start of frame

• Select real-time filtering if your bus contains interleaved control and data signals

In this demo the setup is done for you in the configuration file. See the online help in the logic analyzer application software for more detailed information.

3. Recall logic analyzer QPSK example signal

The 89600 VSA Software CD includes a pre-recorded QPSK signal designed to be read by the logic analyzer. Load this data file into the logic analyzer software as shown in Table 4. You should see a waveform display like the one shown in Figure 1. Note that the digital I/Q buses are rendered as chart-style waveforms that resemble an oscilloscope display or other analog time-domain display. To see the individual bits in a digital waveform display, click the plus sign ("+") next to the signal label on the left side of the screen.

Instructions	Toolbar menus
Open the file browser	File > Open...
Browse to the VSA directory with logic analyzer information	C:\Program Files\Agilent\89600 VSA\LogicAnalyzer\
Load the QPSK signal	QPSK.ala

Table 4. Logic analyzer signal recall instructions
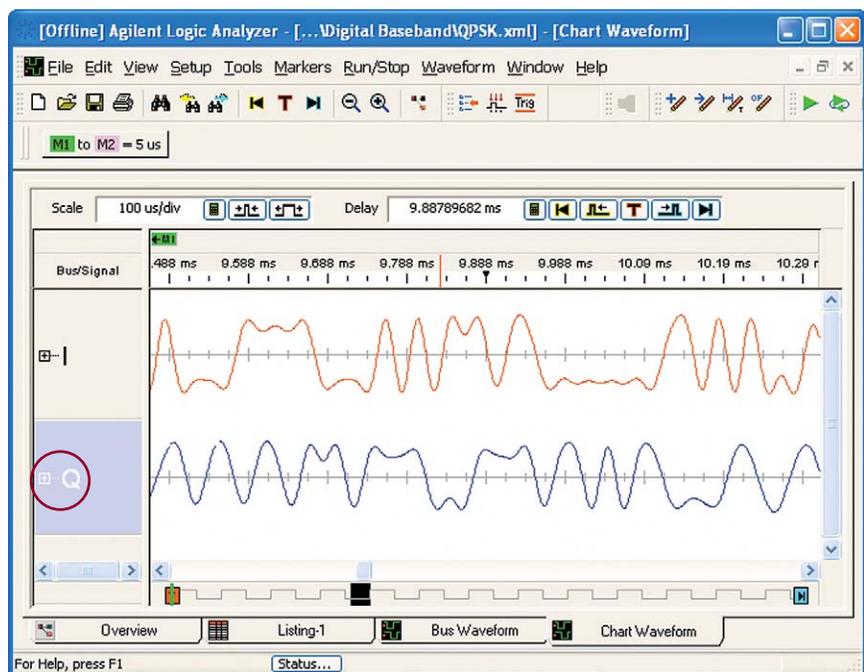
Figure 1. QPSK waveform in logic analyzer

How to Set Up and Use the Combined Hardware/Software (continued)

4. Note the logic analyzer's configuration

While this data is already properly set up and captured, it's useful to note how the logic analyzer was configured to capture this data. Open the Bus/Signal menu by clicking the toolbar button as shown in Figure 2.

In Figure 3, you can see how we have captured two 16-bit parallel buses, "I" and "Q." "I" is the 16 channels on Pod 2, and "Q" is the 16 channels on logic analyzer Pod 1. Setting up your channel connections is as easy as checking the channel boxes, even when your bit order is non-standard.
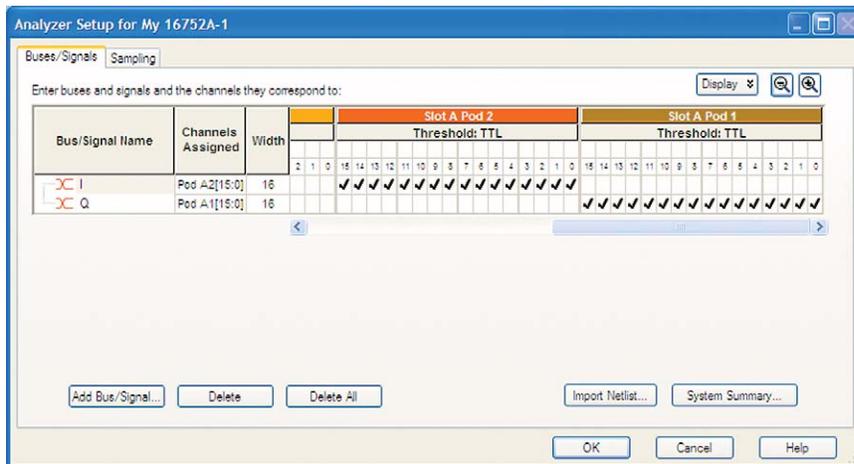
Now open the Sampling menu either by clicking the Sampling tab at the top of the Bus/Signal dialog box, or from the logic analyzer setup toolbar, and you will see settings similar to those shown in Figure 4. Notice we are using State mode (synchronous sampling), sampling on the "falling edge of clock 1." Also note the memory depth of the capture is 32 K samples, with the trigger positioned at the beginning of the trace.

Figure 2. Logic analyzer setup toolbar

Figure 3. Bus/Signal menu
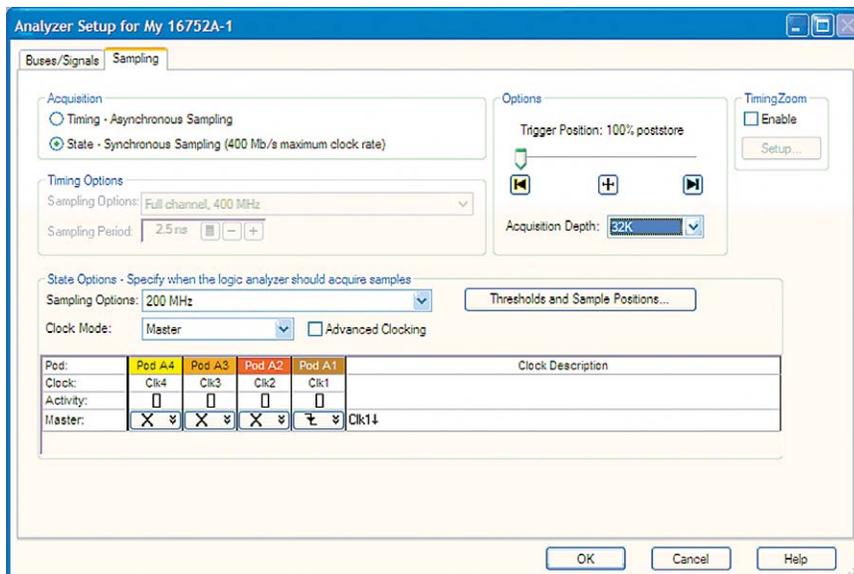
Figure 4. Sampling dialog box

How to Set Up and Use the Combined Hardware/Software (continued)

5. Start the VSA software and configure it for logic analyzer input

First, run **Start > (All) Programs > Agilent 89600 VSA > Logic Analyzer > IO Connections** and ensure that Agilent Logic Analyzer (TCPIP::localhost) is selected, as in Figure 5. If it is not already there, select Add Instrument and enter "*localhost*" as the hostname.

Next, start the VSA software. The VSA software can be found via a Desktop shortcut, or from **Start > (All) Programs > Agilent 89600 VSA > Vector Signal Analyzer**.

Select the logic analyzer as ADC 1 by selecting **Utilities > Hardware** and checking the TCPIP::localhost checkbox, as shown in Figure 6. You may need to clear the "Default Configuration" and "Simulate Hardware" checkboxes to find the selection. Also, clear any checked boxes on any other tab.
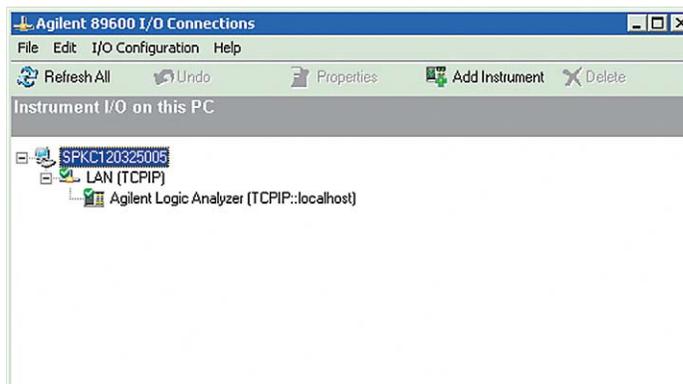
Figure 5. Set logic analyzer address
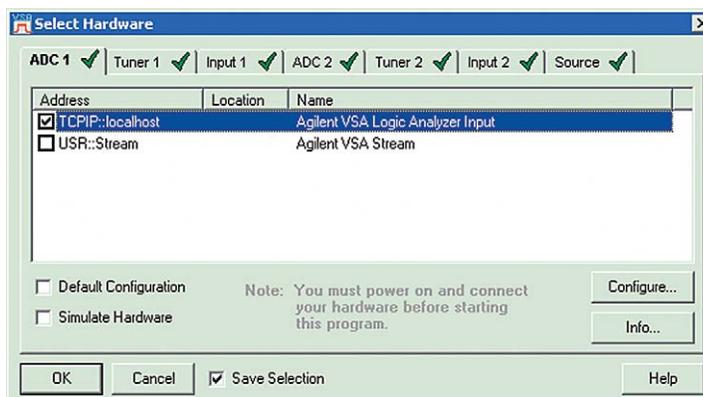
Figure 6. Select TCPIP::localhost logic analyzer

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6. Setup the digital measurement parameters

First, preset the VSA analyzer by clicking "**File > Preset > Preset Setup**." Set the Digital Input parameters, as shown in Figure 7, to measure the pre-recorded QPSK signal. Click "**Input > Digital...**" to find the input properties. Make sure that your settings match those shown in Figure 7.
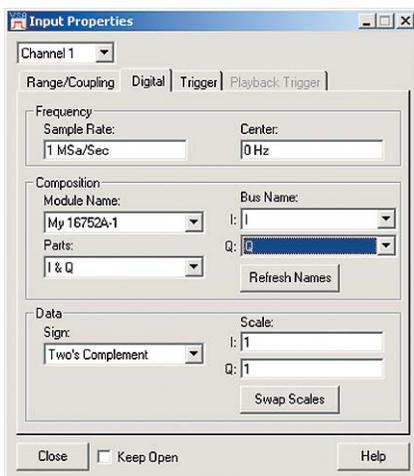
Figure 7. Input properties

Sample Rate – This is the sample rate for I/Q values (*symbol rate x samples/symbol*). In many cases this is the same as the digital bus clock rate, however if your digital bus transmits in bursts or using a serial interface, this value can be different.

Center – The center frequency for digital baseband data is 0 Hz.

Module Name – With this parameter you can select which analyzer module to collect data from (if you have multiple modules, or are using the "split analyzer" feature of the logic analyzer). If you have only one module, the software will automatically select it.

Parts – Input data can be represented in the following forms:

• Real – this is scalar IF or baseband data

• I and Q – I and Q are on separate digital buses, and are represented by two unique bus label names in the logic analyzer

• I and Q (interleaved) – I and Q are transmitted on a single digital bus, on alternating clock cycles (I then Q, I then Q, etc.)

• Q and I (interleaved) – the same as I and Q (interleaved), but Q comes before I

• Phase – when using polar baseband format with a fixed magnitude

• Mag and Phase – polar baseband with magnitude and phase

• Mag and Phase (interleaved) – polar baseband with Mag and Phase interleaved on one bus

• Phase and Mag (interleaved) – like Mag and Phase (interleaved) but Phase comes first

Bus Name – This is where you select the matching logic analyzer label names for the buses carrying the I/Q, Mag/Phase, etc.

Sign – Digital signal data is normally one of two formats:

• Offset binary (unsigned)

• Two's complement (signed)

In this example the data is Two's Complement.

Refresh Names – It is often necessary to switch logic analyzer modules or to disconnect the 89601A software from the logic analyzer. Clicking on this button will cause the VSA software to make a new enquiry of the logic analyzer to determine the available modules. These modules will be shown under the Module Name window.

Scale – Since digital values are simple binary numbers, you may wish to multiply by a scaling factor to represent analog voltages. This is not necessary for signal analysis, but it changes the scale and ranges of the numeric measurements and displays.

How to Set Up and Use the Combined Hardware/Software (continued)

Start the VSA measurement and view the spectrum

Click the **Restart [▶]** button on the VSA software if it is not already running. Change the span to 100 kHz by double-clicking on the span value at the lower right-hand corner of the spectrum display and type **100 kHz** <OK>. You should see something like Figure 8. You can right-click each display and select **Auto Scale** to make the trace fit better.

Setup the demodulator
Select the Digital Demod demodulator as shown in Table 5.

After selecting the demodulator, you need to set its configuration parameters. The software will do this automatically if you select one of the available **Preset to Default** choices, or you can configure the demodulator manually using the **Demod Properties** menu.
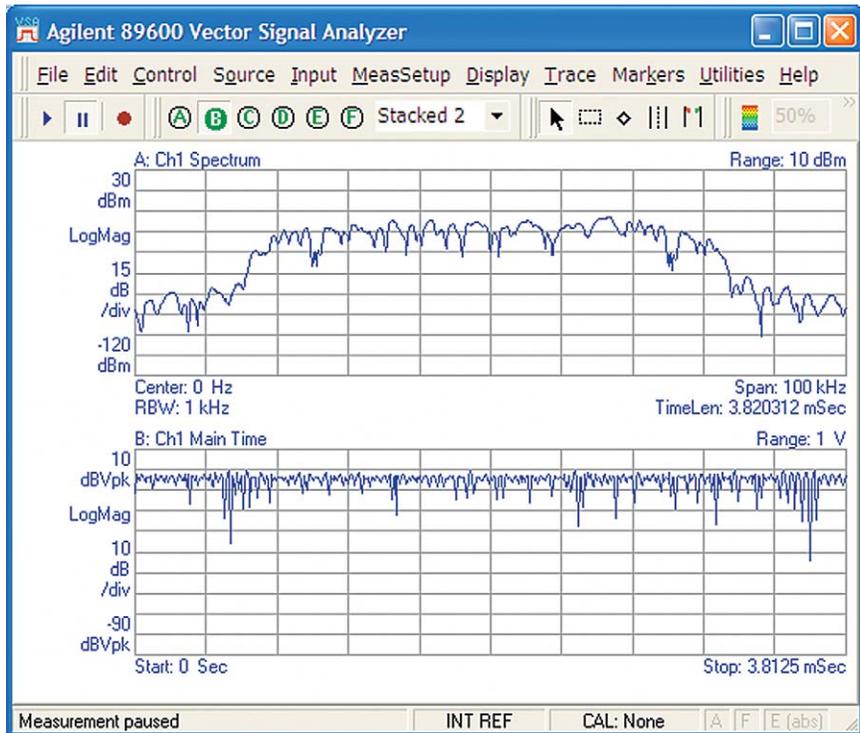
Figure 8. Spectrum and time domain display

Instructions	Toolbar menus
Select the demodulator	MeasSetup > Demodulator > Digital Demod
(See Figure 9 for the location of the format, filter and search tabs in the next steps.)	
Preset demodulator parameters to QPSK, 50 kHz symbol rate, 10 points/symbol	MeasSetup > Demod Properties > Format (tab) > Format > **QPSK** > Symbol Rate **50 kHz** > Points / Symbol **10**
Set filtering parameters	Filter (tab) > Measurement filter > **Root Raised Cosine** > Reference Filter > **Raised Cosine** > Alpha/BT > **0.35**
Turn pulse search OFF	Search (tab) > Pulse Search (uncheck) > Close
Add two traces to the display	Display > Layout > Grid 2x2
Start the measurement (if not already running)	Click the "Restart" [▶]button
Auto-scale the spectrum	Right-click the Spectrum trace and select "Y Auto Scale"

Table 5. 89600 VSA software demodulation setup
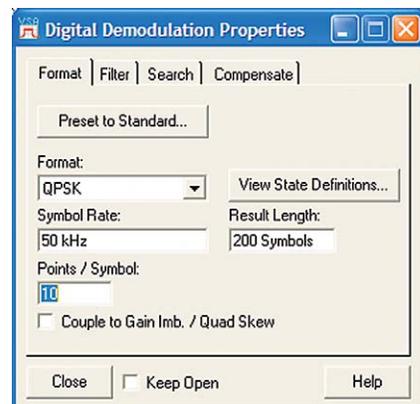
Figure 9: 89600 VSA software digital demodulation properties

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How to Set Up and Use the Combined Hardware/Software (continued)

As you can see in Figure 10, by default, traces A, B, and C show displays of the composite signal. Trace B shows the signal's spectrum. Note that trace D shows the Error Summary table. This table contains error information for your signal. Common error parameters, such as error vector magnitude (EVM) and frequency error (Freq Err) provide quick indicators that show you the quality of your signal.

For details about QPSK displays, see **QPSK Signals** in the 89600 VSA software's online **Help**.
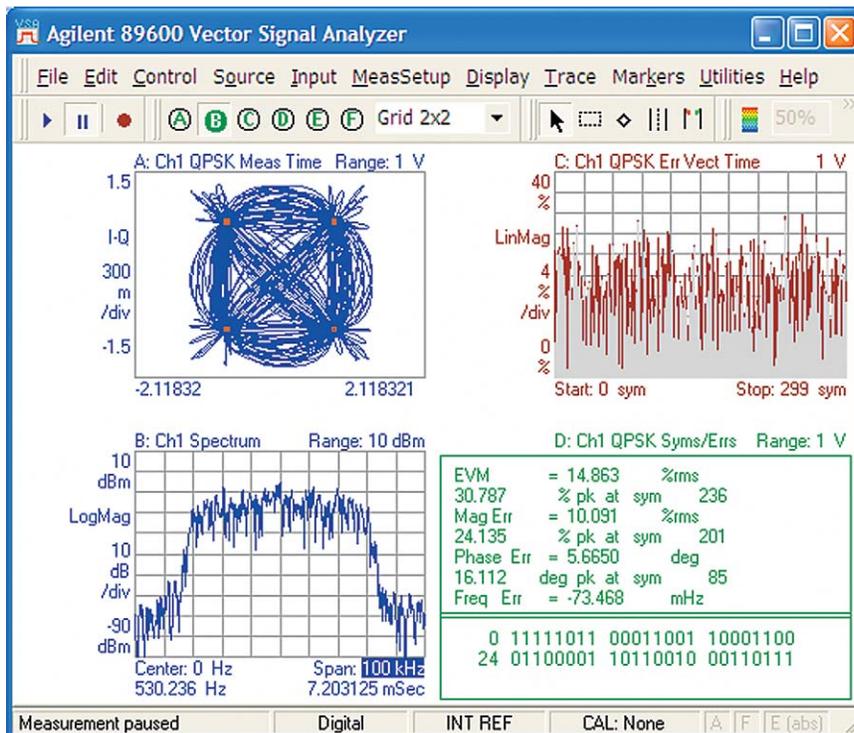
Figure 10: 89600 VSA software – QPSK demodulation display

Explore the built-in VSA Tutorial

There is a great deal of built-in measurement capability in the VSA software, including markers, frequency, time, and modulation measurements. This tutorial can teach you the full capability, and is well worth exploring at this point. To access the tutorial, select **Help > Tutorial...** which brings up the display shown in Figure 11.
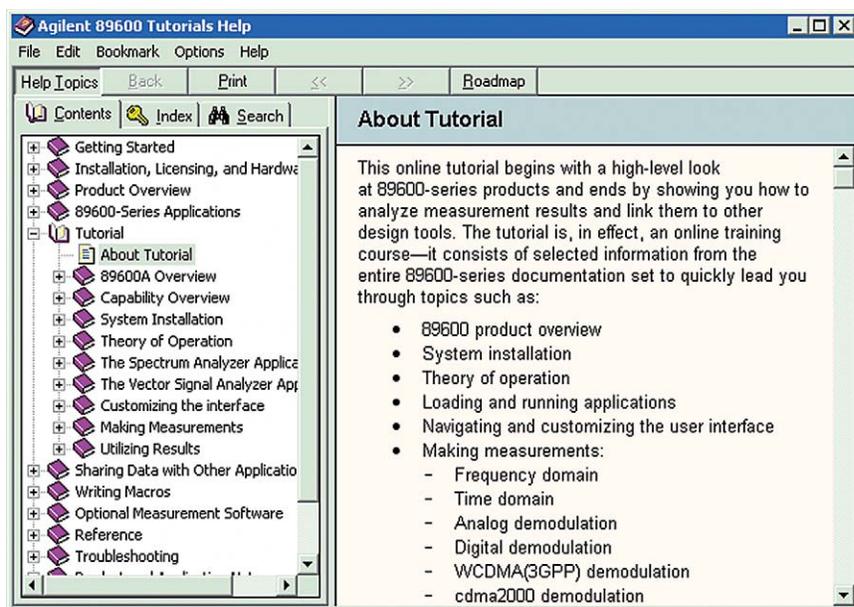
Figure 11. Tutorial display

Conclusion

With the logic analyzer/89600 software combination, you use the 1680, 1690, 16800 or 16900 Series logic analyzers to perform basic digital timing and state analysis on digital memory, control, and IO buses. With flexible voltage thresholds, sampling depths and trigger conditions, the logic analyzer is a powerful and flexible digital debug tool. For digital buses carrying digitized baseband or IF signal data, you can use the VSA software to do everything from displaying a simple spectrum to measuring the modulation quality of your digitally modulated communication signal.

With the logic analyzer/89600 VSA combination, now you can make measurements at digital baseband or IF portions of your design as well as at the analog RF portion. This allows you to use consistent measurement algorithms, as well as benefit from one single user interface. Now you can truly see changes as the signal traverses your digital baseband, IF, and RF portions of your design.

Appendix A: 1680, 1690, 16800 and 16900 Series Logic Analyzer Capabilities and Configuration Information

Logic analyzer capabilities

Agilent logic analysis systems help you solve tough debug problems, minimize your project risk, and get your leading-edge products to market faster. These systems provide the performance you need for making accurate, reliable measurements. All Agilent logic analyzers offer the familiarity of Windows® XP Pro, an intuitive graphical user interface and straightforward triggering capability – so you spend more time on design and debug and less time learning how to use them.

With Agilent 1680, 1690, 16800 and 16900 Series logic analyzers you can:

- Reliably capture digital buses with clock rates up to 1.5 Gb/s, sampling synchronously with the target device's clock, or asynchronously for bus timing analysis.

- Automatically configure accurate synchronous sampling by measuring data valid eyes on all bus channels simultaneously.

- Use a wide variety of triggering utilities from simple (e.g., a rising edge) to complex (e.g., a 16-step sequence of if/then events).

- Quickly render graphical waveforms of data captures up to 256 M in sample depth using on-board hardware acceleration.

- Perform fast digital pattern searches on captured data using the same acceleration hardware.

Agilent logic analyzers are designed to minimize the time required to configure your measurements and give you more time to debug your system. For example, you can easily set up triggers using several convenient methods:

- Set triggers directly from the waveform and listing displays by selecting an edge or a pattern.

- Draw a box around a particular set of signals you see in the waveform, and automatically set the trigger to that set of patterns.

- Drag and drop from a palette of programmable trigger macros to create an in-depth trigger sequence in the Advanced Trigger menu.

You can also display digital data in bus- or analog-like chart-style displays, for digital signal processing applications.

And, because you can't measure what you can't probe, we've used innovative probing technologies so you can access critical signals in your designs. You can use Agilent connectorless probes that are easy to route in printed circuit boards, support single-ended and differential signals, and create less than 0.7 pF of capacitive load. Or use Agilent's high-performance flying lead probes to debug systems where logic analyzer probing was not incorporated in the original board design.

Agilent logic analyzers also make it easy for you to share your instrument. When you install the Windows-based logic analyzer application software on your remote PC, you can view captured data offline. Or use your PC to remotely control the logic analyzer, then share the instrument with your colleagues easily by working offline.

Logic analyzer configuration information

The 89600 VSA software is compatible with any of the Agilent 1680, 1690, 16800 and 16900 Series logic analyzers. In general, there are three main things to select when configuring a logic analyzer:

1. Modular mainframe (16900 Series), portable (1680 or 16800 Series), or hosted logic (1690 Series) analyzer

2. Acquisition cards (modular system only)

3. Probes

4. Analysis tools

Modular systems are the most flexible, with more choices for measurement performance, and are upgradeable in the future as new acquisition technologies are developed. There are four models of modular mainframes:

1. 16901A, a 2-slot mainframe with built-in 15 inch (38.1 cm) color touch display

2. 16903A, a 3-slot mainframe with built-in 12 inch (30.7 cm) color touch display

3. 16902A, a 6-slot mainframe with built-in 12 inch (30.7 cm) color touch display

4. 16900A, a 6-slot mainframe with no built-in display

The 16901A provides a low-cost entry point into modular systems. The two 6-slot options provide maximum configurability.

The acquisition cards available for the 16900 Series logic analyzers range from 250 MHz synchronous capture speed to 1.5 Gb/sec, with variable numbers of channels per card. Typical cards have 68 or 102 channels. Acquisition cards have two types of cables. The traditional 40-pin cable is compatible with 20 years of legacy probe adapters. The higher performance cards employ a 90-pin cable for improved

bandwidth. You will need to match probe options (discussed below) to the cabling type of the card. Table 6 lists the current acquisition modules with their state speeds, channel counts, and cabling type.

The 16740 Series, 16750 Series and 16753/4/5/6 cards, although now discontinued, are also supported.

Model	Max state clock rate	Channels	Depth	Cable
16910A	450 MHz	102	Up to 32 M	40-pin
16911A	450 MHz	68	Up to 32 M	40-pin
16950A	600 MHz	68	Up to 64 M	90-pin
16950B	667 MHz	68	Up to 64 M	90-pin
16951B	667 MHz	68	Up to 256 M	90-pin
16760A	1.5 Gb/s	34 / 17	64 M	90-pin

Table 6. Acquisition cards

Appendix A: 1680, 1690, 16800 and 16900 Series Logic Analyzer Capabilities and Configuration Information (continued)

The 16800 Series portable logic analyzers provide synchronous capture up to 500 Mb/s, with models ranging from 34 to 204 channels. Memory depths of up to 32 M are available.

The 1680 Series portable logic analyzers provide synchronous capture up to 200 MHz, with models ranging from 34 to 136 channels. Memory depths of 512 K and 2 M samples are available according to Table 8.

The 1690 Series hosted logic analyzers work much like the 1680 Series, with 200 MHz state speed, variable number of channels and memory depths. The main difference is that you control the logic analyzer from your own host PC running Windows 2000 and a FireWire connection, rather than using the built-in PC in the 1680, 16800 or 16900 Series. Table 9 provides the range of options for the 1690 Series.

Model	Memory depth options*	Channels
16801A	1 M, 4 M, 16 M, 32 M	34
16802A	1 M, 4 M, 16 M, 32 M	68
16803A	1 M, 4 M, 16 M, 32 M	102
16804A	1 M, 4 M, 16 M, 32 M	136
16806A	1 M, 4 M, 16 M, 32 M	204
16821A	1 M, 4 M, 16 M, 32 M	34
16822A	1 M, 4 M, 16 M, 32 M	68
16823A	1 M, 4 M, 16 M, 32 M	102

* 1 M of memory depth is provided standard. The memory depth can be increased at time of purchase or upgraded later as your needs evolve.

Table 7. 16800 Series logic analyzers

Model	Memory depth	Channels
1680A	512 K	136
1680AD	2 M	136
1681A	512 K	102
1681AD	2 M	102
1682A	512 K	68
1682AD	2 M	68
1683A	512 K	34
1683AD	2 M	34

Table 8. 1680 Series logic analyzers

Model	Memory depth	Channels
1690A	512 K	136
1690AD	2 M	136
1691A	512 K	102
1691AD	2 M	102
1692A	512 K	68
1692AD	2 M	68
1693A	512 K	34
1693AD	2 M	34

Table 9. 1690 Series PC-hosted logic analyzers

Appendix A: 1680, 1690, 16800 and 16900 Series Logic Analyzer Capabilities and Configuration Information (continued)

Probes come in two types, matching the cabling types mentioned earlier – 40-pin and 90-pin. There are many options in connection type:

1. Mictor connector – while it has drawbacks in routability and mechanical reliability, it has been the historical standard logic analyzer connection.

2. Samtec connector – this connector is purely surface-mount, and has more ground connections for lower loading and improved cross-channel isolation.

3. Soft touch connectorless probing – no connector is needed on the circuit board; instead a pattern of pads is placed on the board, and spring-loaded pins make the signal connection.

4. Flying leads – when a circuit board was not planned ahead for debug (i.e., none of the previous choices were designed into the board), a flying lead probe can be used to make a solder connection to a signal. These leads can also connect to header pins on a board, but this is less convenient for a large number of signals.

Table 10 lists a selection of probe model numbers:

Model	Type	Channels	SE/Diff	Cable
E5383A	Flying leads	17	Single-ended	40-pin
E5404A	Pro Series soft touch	34	Single-ended	40-pin
E5396A	Soft touch	17	Single-ended	40-pin
E5394A	Soft touch	34	Single-ended	40-pin
E5385A	Samtec	34	Single-ended	40-pin
E5346A	Mictor	34	Single-ended	40-pin
E5382A	Flying leads	17	Single-ended	90-pin
E5381A	Flying leads	17	Differential	90-pin
E5406A	Pro Series soft touch	34	Single-ended	90-pin
E5405A	Pro Series soft touch	17	Differential	90-pin
E5402A	Pro Series soft touch, low profile	34	Single-ended	90-pin
E5398A	Soft touch	17	Single-ended	90-pin
E5390A	Soft touch	34	Single-ended	90-pin
E5387A	Soft touch	17	Differential	90-pin
E5378A	Samtec	34	Single-ended	90-pin
E5379A	Samtec	17	Differential	90-pin
E5380A	Mictor	34	Single-ended	90-pin

Table 10. Logic analyzer probes

Appendix A: 1680, 1690, 16800 and 16900 Series Logic Analyzer Capabilities and Configuration Information (continued)

Analysis tools rapidly consolidate measurement data into displays that provide insight into your system's behavior.

Optional analysis packages for logic analyzers

B4655A FPGA dynamic probe for Xilinx B4656A FPGA dynamic probe for Altera	Gain unprecedented visibility into your Xilinx or Altera FPGA's internal activity. Make incremental real-time measurements in seconds without stopping the FPGA, changing the design or modifying design timing. Quickly set up the logic analyzer's signal bus naming by leveraging work you did in your design environment. **www.agilent.com/find/fpga**
89601A-200 and -300 digital vector signal analysis	Perform time-domain, spectrum, and modulation quality analysis on digital Baseband and IF signals. Both options are required to provide hardware and software connectivity for logic analyzers. **www.agilent.com/find/dvsa**
B4602A signal extractor tool	Extract and process signals from the logic analyzer data for output onto new buses/signals. Analysis on the new buses/signals can be done within the logic analyzer or by other tools. The tool is suited to: • Extract I and Q data from serial data streams. The IQ data can be ported directly to the 89601A software for physical layer test and analysis • Create algorithms for use with Agilent's N5110B Baseband Studio • Re-multiplex high-speed A/D digital data that has been de-multiplexed onto additional logic analyzer channels due to high state speeds • Includes sample DigRF algorithms for synchronization of signal extraction to any pattern in the digital stream
B4601C serial-to-parallel analysis package	Eliminate the tedious, time-consuming, and error-prone task of sifting through thousands of analysis package serial bits by looking at long vertical columns of captured 1's and 0's. The B4601C serial-to-parallel analysis package is general-purpose software that allows easy viewing and analysis of serial data. **www.agilent.com/find/logic-sw-apps**
B4606A advanced customization environment – development and runtime package	Tailor your logic analyzer interface with a wide range of control, analysis and display capabilities specific to your measurement application. Create integrated dialogs, graphical displays and analysis functions to quickly manipulate measurement data into a format that provides additional insight and answers. **www.agilent.com/find/logic-customview**
B4607A advanced customization environment – runtime package	Run the macros and graphical views created with a B4606A development package or obtain and run a variety of commonly requested tools from Agilent and it's partners to help customize your measurement environment.
B4608A ASCII remote programming interface	Remotely control a 16900-, 16800-, 1680-, or 1690-Series logic analysis system by issuing ASCII commands. This interface is designed to be as similar as possible to the RPI on the 16700 Series logic analysis system, so that you can reuse existing programs. Requires either B4606A or B4607A to be enabled. You can also use the B4606A to customize and add RPI commands.
B4610A data import package	Use the logic analyzer GUI to view data obtained from tools other than a logic analyzer.
B4630A MATLAB® connectivity and analysis package	Make an easy connection to MATLAB and transfer your logic analyzer measurement data for processing. Display the results on the logic analyzer in an XY scattergram chart.

Appendix B 89600 VSA Software Capabilities and Configuration Information

89600 Series VSA software capabilities

The 89600 vector signal analysis software provides flexible tools for making RF and modulation quality measurements on digital communications signals.

You can analyze a wide variety of standard and non-standard signal formats with the VSA software. Standard signal presets cover GSM, GSM (EDGE), cdmaOne, cdma2000, W-CDMA, WLAN, WLAN-HT, IEEE-802.16-2004, IEEE-802.16 OFDMA, and many more. For proprietary standards, the 89600 VSA software series offers numerous digital demodulators with variable center frequency, symbol rate, filter type, and filter alpha/BT. A user-adjustable adaptive equalizer is also provided.

The VSA software lets you:

• Quickly evaluate and troubleshoot digitally modulated signals with the modulation analysis tools.

• Use the constellation and vector diagrams for an overall indication of signal behavior and to obtain clues to the cause of a problem.

• Take advantage of the EVM, EVM spectrum, and EVM time capabilities for a more sensitive examination of signal errors.

You can perform time domain analysis using the 89601A software RF scope capability. It is easy to evaluate pulse shape with the main time display, select specific portions of a burst for analysis with the time gating feature, and use statistical tools like CCDF and CDF to characterize the noise-like behavior of your modern communications signal.

In addition, you can simplify the characterization of your signal with the FFT-based spectrum analysis tools in the 89600 VSA analysis software. Match your measurement span to your signal bandwidth, thus maximizing analysis signal-to-noise ratio (SNR), with the wide selection of spans available in the software. FFT-based resolution bandwidths provide all the resolution you need for frequency domain investigations. A power spectral density (PSD) function is useful for estimating the level of the noise floor when you calculate SNR. And, a spectrogram display is provided for monitoring the wideband behavior of hopping signals over time.

Appendix B 89600 VSA Software Capabilities and Configuration Information

(continued)

89600 Series VSA software configuration information

The 89600 VSA software is available with either a node-locked license or a floating license. The node-locked version is locked to a PC, which can either be a remote PC, or the logic analyzer itself. The floating license runs on a network server, which can be the same remote PC running the VSA software. It is not recommended for use running inside the logic analyzer. For more information on these products, see the *89600 VSA Software Technical Overview*, literature number 5989-1679EN.

89601A Options	Vector signal analysis software, including 1-year of software update subscription service. Option 200 required.
89601A-200	Basic vector signal analysis software
89601A-300	Hardware connectivity (includes link to Logic Analyzers)
89601A-AYA	Flexible modulation analysis
89601A-B7N	3G modulation analysis bundle
89601A-B7T	cdma2000/1xEV-DV modulation analysis
89601A-B7U	W-CDMA/HSDPA modulation analysis
89601A-B7W	1xEV-DO modulation analysis
89601A-B7X	TD-SCDMA modulation analysis
89601A-B7R	WLAN modulation analysis
89601A-B7S	IEEE-802.16-2004 OFDM modulation analysis
89601A-B7Y	IEEE-802.16 OFDMA modulation analysis
89601A-B7Z	IEEE-802.11n MIMO modulation analysis
89601A-105	Dynamic link to EEsof/ADS

Related Literature for logic analyzers

Publication Title	Publication Type	Publication Number
16900 Series Logic Analysis Systems	Brochure	5989-0420EN
16900 Series Logic Analysis Systems	Data sheet	5989-0421EN
Timing and State Modules for the 16900 Series	Data sheet	5989-0422EN
16800 Series Logic Analyzers	Brochure	5989-5062EN
16800 Series Logic Analyzers	Data sheet	5989-5063EN
B4655A FPGA Dynamic Probe for Xilinx	Data sheet	5989-0423EN
B4655A Frequently Asked Questions	Data sheet	5989-1170EN
B4656A FPGA Dynamic Probe for Altera	Data sheet	5989-5595EN
B4656A Frequently Asked Questions	Data sheet	5989-5716EN
Probing Solutions for Logic Analyzers	Brochure	5968-4632E

Product Web site

For the most up-to-date and complete application and product information, please visit our product Web site at:
www.agilent.com/find/logic
www.agilent.com/find/fpga
www.agilent.com/find/logic-sw-apps

Related Literature for vector signal analyzers

Publication Title	Publication Type	Publication Number
89600S Vector Signal Analyzer	CD	5980-1989E
89600 Series Vector Signal Analysis Software 89601A/89601AN/89601N12	Technical overview	5989-1679EN
89600 Series Vector Signal Analysis Software 89601A/89601AN/89601N12	Data sheet	5989-1786EN
Hardware Measurement Platforms for the Agilent 89600 Series Vector Signal Analysis Software	Data sheet	5989-1753EN
89600 Series Vector Signal Analyzers	VXI configuration guide	5968-9350E
89650S Wideband Vector Signal Analyzer System with High-Performance Spectrum Analysis	Technical overview	5989-0871EN
89650S Wideband Vector Signal Analyzer System with High-Performance Spectrum Analysis	Configuration guide	5989-1435EN
89604A Distortion Test Suite Software	Technical overview	5988-7812EN

Product Web site

For the most up-to-date and complete application and product information, please visit our product Web site at:
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