Agilent Technologies

# VQT Undercradle

J4630A

Getting Started Guide

Agilent Technologies

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The following warnings and operating information are shown in English followed by the French translation.

WARNING This product is a Safety Class I instrument with a protective earth terminal.

WARNING For protection from electric shock hazard, power cord ground must not be defeated.

Operating Restrictions

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

Grounding

To minimize shock hazard, the instrument chassis and cabinet must be connected to an electrical ground. The instrument is equipped with a three-conductor AC power cable compatible with an approved three-contact electrical outlet. The power jack and mating plug of the power cord must meet International Electrotechnical Commission (IEC) safety standards.

Environment

Do not operate the instrument in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

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Dangerous voltages exist within this instrument. Service and adjustment of this instrument is to be performed only by trained service personnel.

Do not replace components with the power cable connected. Dangerous voltages may be present even when the power cable is disconnected.

Do not perform internal servicing or adjustment unless another person, capable of rendering first aid and resuscitation is present.

Hazardous Material

Should the LCD be damaged the liquid crystal material can leak. Avoid all contact with this material, especially swallowing. Use soap and water to thoroughly wash all skin and clothing contaminated with the liquid crystal material.

Unauthorized Service

The installation of substitute parts or the installation of any instrument modification not authorized by Agilent Technologies is specifically forbidden. The performance of such unauthorized service can negate the instrument warranty or any maintenance agreements.

Return the instrument to an Agilent Sales and Service Office for authorized service and repair.

MISE ENGARDE Cet appareil répond aux normes de la «Classe de sécurité I» et est muni d'un fil de mise à la terre pour votre protection.

MISE ENGARDE Pour prévenir les risques de choc électrique, la broche de mise à la terre du cordon d'alimentation ne doit pas être désactivée.

Restrictions d'utilisation

L'utilisateur se doit d'observer les mesures de précaution énumérées ci-dessous pour toutes les phases d'utilisation, de service et de réparation de cet appareil. Le fait de ne pas s'y conformer équivaut à ne pas respecter les mises en gardes spécifiques contenues dans ce manuel et constitue une violation des normes de sécurité relatives à la conception, la fabrication et l'utilisation prévue de cet appareil. La société Agilent n'assume aucune responsabilité envers un client qui manquerait de se conformer à ces exigences.

Mise à la terre

Afin de minimiser les risques de choc électrique, le chÀssis et le cabinet de l'appareil doivent être mis à la terre. L'appareil est équipé d'un cordon d'alimentation muni d'une fiche homoloquée à trois lames, compatible c.a. La prise murale et la

prise femelle de la rallonge électrique doivent respecter les normes de sécurité de la «Commision électrotechnique internationale» (IEC).

Environnement
Ne faites pas fonctionner cet appareil en présence de gaz inflammables ou de vapeurs dangereuses. L'utilisation de n'importe quel appareil électrique dans ces conditions constitue un risque élevé pour votre sécurité.

Service et ajustement
Des «tensions dangereuses» résident dans cet appareil. Par conséquent, le service et l'ajustement doivent être effectués uniquement par une personne qualifiée.

Ne remplacez pas de composantes lorsque le cordon d'alimentation est sous tension. Il pourrait y avoir présence de «tensions dangereuses» même lorsque l'appareil est déconnecté.

Ne faites pas de service interne ou d'ajustement sauf en présence d'une autre personne, capable de prodiguer les premiers soins et de pratiquer la réanimation.

Matière dangereuse
Si l'affichage LCD est endommagé, la matière constituant les cristaux liquides peut se répandre. Eviter tout contact avec cette matière, et en particulier ne pas l'avaler. Utiliser de l'eau et du savon pour nettoyer soigneusement la peau et les vêtements qui auraient été contaminés par la matière constituant les cristaux liquides.

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Explosion Hazard
Do not operate in the presence of flammable gases.

Fire Hazard
For continued protection against fire hazard replace only with fuse of same type and rating.

Cleaning
To clean the product, use a damp cloth moistened with a mild solution of soap and water. *Do not* use harsh chemicals. *Do not* let water get into the product.

Product Damage
Do not use this product when the product shows visible damage, fails to perform, has been stored in unfavorable conditions, or has been subject to severe transport stresses.

Whenever this product has become damaged or wet, make the product inoperative and secure it against any unintended operation. Contact your nearest Agilent Sales office for assistance.

Instruction book symbol - the product will be marked with this symbol when it is necessary for the user to refer to the instruction book in order to protect against damage.

A product marked with this symbol indicates it is a laser product. When necessary, this symbol will be included in the instruction book for the user to refer to in order to protect against personal injury and/or correct product handling.

Indicates potential for electrical shock.

WARNING
An operating procedure, practice, etc., that if not correctly followed could result in personal injury or loss of life.

CAUTION
An operating procedure, practice, etc., that if not strictly observed, could result in damage to, or destruction of, equipment or software.

This is an Installation Category II product.

This is a Pollution Degree 2 product.

This product is designed for indoor use only.

FCC Part 68 Disclaimer

This equipment must not be connected to the telephone network unless it is connected through protective circuitry that is registered pursuant to Part 68 of the Federal Communications Commission rules.

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# 1



# Introduction

# Introduction

Agilent Technologies' VQT Undercradle is an integrated software and hardware analysis tool designed to help you evaluate voice quality on voice-over-packet and traditional telephony systems. With the VQT Undercradle attached to the Agilent Advisor, you can:

- Test voice-over-packet network components such as routers, gateways, and switches.
- Test voice-over-packet systems to gather end-to-end voice quality information.
- Augment other traditional telephony test suites such as TIMS.

The VQT Undercradle provides a broad range of analysis options. You can:

- Measure fundamental voice quality metrics such as clarity and delay.
- Measure echo and evaluate the performance of echo cancellers.
- Evaluate voice-over-packet operations such as voice activity detection and DTMF tone detection.
- Utilize audio test tools such as tone and noise generation and wave file playback and record.
- Execute simple or complex automated test sequences.

The VQT gives you the analysis options for voice-over-packet environments that traditional tests do not.

The remaining sections of this chapter describe the components and features of the VQT, and voice quality testing concepts in general. To learn how to get started with the VQT, go to chapter 2. To see examples of how to use the VQT, go to chapter 3. To get detailed operating instructions, use the online Help.

**Note**

This Getting Started Guide focuses on using the VQT Undercradle (hardware platform) and the Telegra®VQT application as a single, portable, locally controlled test system. The VQT system, however can be used in a remote / distributed environment. Please contact your Agilent sales representative or refer to the *Remote / Distributed Voice Quality Testing Getting Started Guide* for more information.

# What is the Voice Quality Tester Undercradle?

Agilent Technologies' Voice Quality Tester (VQT) Undercradle consists of three main components:

## VQT FXO and E&M Acquisition Hardware

This custom analog signal acquisition card is the digital signal processing (DSP) engine for the VQT. This card interfaces directly with FXO and E&M devices and systems allowing high accuracy and high resolution measurements. It provides measurement results to the VQT application which displays them in multiple formats. This acquisition hardware resides in the VQT Undercradle Test Platform.

## VQT Undercradle Test Platform

The VQT Undercradle is another member of the Agilent Advisor family. It is designed to work in conjunction with the Advisor WAN platform, J2300D, or with the Advisor LAN platform, J3446D. Operating conditions for the VQT Undercradle can be found in Appendix A. Technical information for the Agilent Advisor can be found in its Mainframe Features Guide.

## Telegra®VQT Application

The VQT Application is a highly intuitive, scrollable, and easy to use software package that is installed on the Agilent Advisor. This software leads you through the necessary steps to test voice quality (using the TaskList Navigator), calculates and displays measurement results in both graphical and spreadsheet formats, and provides usage and interpretive information in a multi-mode embedded Help system. In addition, the application can be customized for your unique testing situations with user configurable TaskLists and persistent configuration settings. Future versions of the VQT Application will be compatible with other Agilent Technologies portable and distributed test systems.

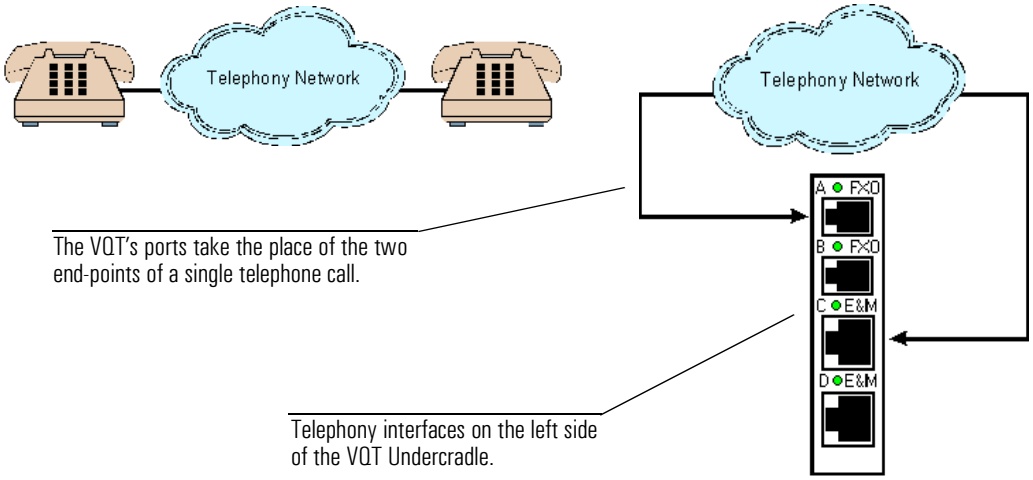
The VQT Undercradle and the Telegra®VQT Application can be used as part of a remote / distributed voice quality test system. However, the remaining sections of this Getting Start Guide focus on operating the VQT as a single, portable, locally controlled test system.

## How Does the VQT Work?

To enable you to test voice quality and measure audio characteristics, the VQT does essentially two things:

- It places and/or answers a telephone call to establish an audio circuit. You can think of the VQT as two telephones - in most test situations, the telephone call is placed from one of the VQT's ports to the other through a telephony network of some kind.
- Once a telephone circuit is established between ports, the VQT transmits audio test signals onto the circuit and measures how they are affected. You can send test signals in either direction independent of the port that placed the call.

This is the VQT's main operational mode, and the test scenario you will likely use most often. The following diagram illustrates conceptually how the VQT plays the role of two telephones in an end-to-end test environment.




**Note**

The VQT can also be used in 'call-only' and 'answer-only' modes. Please refer to the online Help for more information about these test options.

The previous illustration shows two ports of the VQT Undercradle controlling end-points of telephone calls. In the remote / distributed case, these end-points can be controlled by individual Agilent Advisors (with undercradle). Please refer to the *Remote / Distributed Voice Quality Testing Getting Started Guide* for more information.

# Voice Quality Testing - A Brief Overview

To better understand how and when the VQT Undercradle is used, it is useful to understand why voice quality is a concern, the components of voice quality, and the general test approaches that can be used. The VQT's online Help provides an expanded version of the concepts discussed here.

## Why Test Voice Quality with the VQT ?

Public switched telephone networks (PSTN) have long since addressed the voice quality problem by optimizing their circuits for the dynamic range of the human voice and the rhythms of human conversation. Users have become accustomed to PSTN levels of voice quality, and comparisons are often made in this context - that is, voice quality is viewed as relatively standard and predictable. However, significant technical changes are occurring in the telephony world that not only affect the quality of voice signals, but also make them more difficult to measure. Voice-over-packet technologies, particularly Voice-over-IP (VoIP), have made maintaining voice quality more complex by adding non-linear compression and the need for timely packet delivery to networks not originally set up for these operations. Transmission conditions that pose little real threat to non-real-time data traffic can introduce severe problems to real-time packetized voice traffic. These conditions are:

- Real-time Bandwidth - many data networks are not designed for the real-time bandwidth requirements of speech. As voice signals are introduced into these networks, methods are employed to ensure this real-time transport, but voice quality can still suffer if these methods do not work properly. Bandwidth capacity can also be an issue. Although many service providers have adequate capacity to handle real-time voice traffic on their data networks, linear and non-linear voice compression techniques are still being used, particularly when voice is transmitted to the desktop. Non-linear compression can be a major cause of reduced voice quality.
- Packet Loss - packet networks, particularly TCP/IP, rely on retransmissions for lost packets. Data applications such as file transfers and email are less sensitive to the time it takes for this to occur, but real-time voice traffic cannot tolerate this delay. In addition, VoIP networks use connectionless transfer protocols such as UDP that do not guarantee delivery at all. Lost packets mean lost voice information.

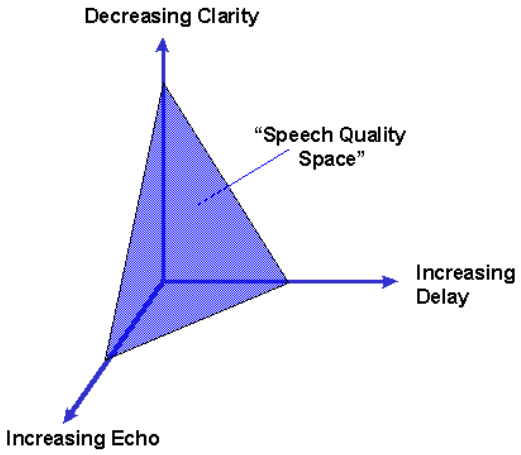
- Delay - the time it takes for a voice signal to be digitized, packetized, transmitted, routed, and buffered contributes to the delay experienced by a user. This delay can interfere with normal conversations and can exacerbate existing problems on the network such as echo.

## Voice Quality Defined

Voice quality can best be expressed (and therefore measured) with respect to the talker and the listener who experience it. Voice quality should be approached from an end-to-end perspective - that is, regardless of the systems, devices, and transmission methods used, any voice quality metric should be expressed in the context of the user's experience. This implies very specific measurement criteria. But the end-to-end aspect of voice quality is accompanied by the inherent subjective nature of qualitative evaluation. What a listener considers high quality (or, for that matter, low quality) is influenced by expectations, context, physiology, and mood. This makes defining and measuring voice quality an interesting challenge.

Ultimately, to measure voice quality, we need to understand the factors that contribute to it. In the context of voice-over-packet environments, a model that describes voice quality as the combined effect of three components is useful:

- Clarity - audio fidelity, clearness, and lack of distortion.
- End-to-end delay - the time it takes voice signals to pass from talker to listener.
- Echo - the sound of the talker’s voice returning to the talker’s ear via the telephone.




The relationships between clarity, delay, and echo can be quite complex as shown in the three dimensional figure above. If you think of voice quality as a single plotted point in the graph, you can see that voice quality improves as the point is plotted closer to the intersection of the three lines. In other words, as the distance between the voice quality "point" and the intersection increases, voice quality decreases.

Important Note: the previous illustration is provided as a conceptual model only. It is true that voice quality is influenced by clarity, delay, and echo, and that their relationship is roughly represented by the graph. However, there is no clear mathematical relationship that allows us to derive a *single* voice quality number. Any representation of voice quality, whether it be for individual devices, or voice-over-packet systems, should include at least a clarity and a delay component, and perhaps an echo component as well.

## Voice Quality Test Situations

The VQT can be used in a number of test situations:

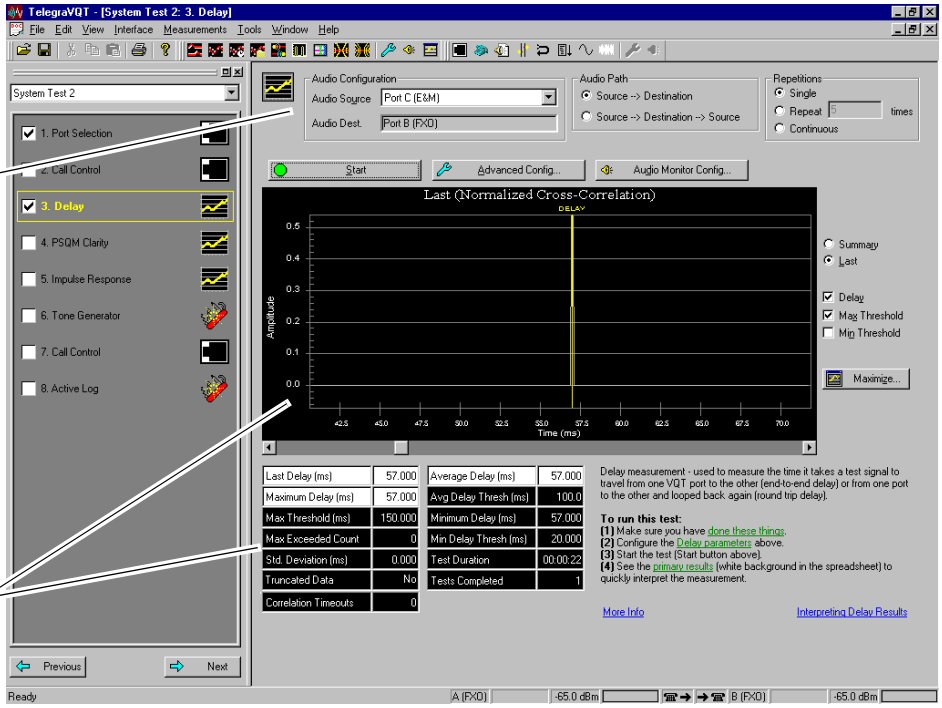
- Telephony hardware and software development - the VQT can be used during hardware and software development to test voice quality on new devices and new implementations of voice-over-packet processes. For example, it may be useful to confirm that codec implementations on voice gateways provide predictable PSQM or PAMS scores, and that delay is within acceptable ranges.
- System integration and evaluation - as voice-over-packet systems are assembled, they can be tested to ensure that the interactions between equipment and software from multiple vendors do not adversely affect voice quality. In addition, as voice-over-packet processes are implemented into legacy networks, testing may be required.
- System troubleshooting and performance testing - when traffic loads increase, network components are replaced, or system components fail, voice quality testing can be a key task during fault isolation.
- Remote / distributed test environments - on widely deployed voice networks, the end-points of a telephone call usually not in the same physical location. In addition, test personnel often require access to multiple test devices from a centralized location.

You can use the VQT in any situation in which voice quality measurements need to be made. Refer to the online Help for an expanded discussion of when and where voice quality testing is beneficial.

# Measuring End-to-End Delay

**Measure the latency introduced by devices and systems.**

A major differentiating factor in voice-over-packet devices and systems is end-to-end delay (that is, the time it takes for voice signals to go from talker to listener). Delay is introduced as voice is digitized, packetized, and transmitted. From a voice quality standpoint delay can disrupt the rhythm of a conversation, and in extreme cases, make conversation impossible. The VQT's Delay measurement provides this end-to-end evaluation in both graphical and spreadsheet formats.




Configure the behavior of the measurement in the upper portion of the view.

Delay results are shown in both graphical and spreadsheet formats.

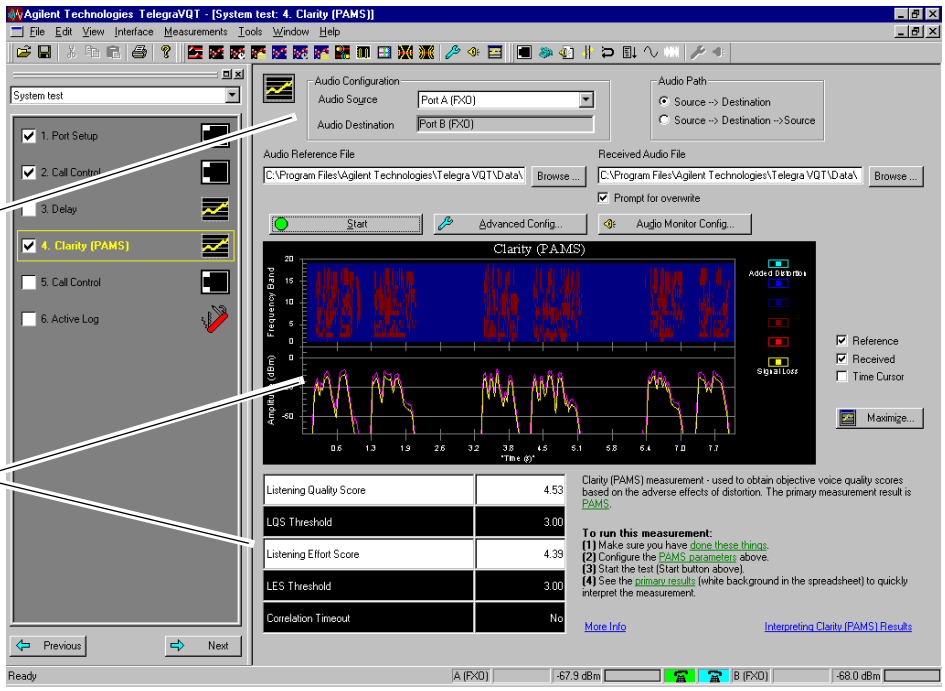
# Measuring Voice Clarity

**Measure the clarity of a particular voice channel using PSQM or PAMS.**

Another very important voice quality metric is Clarity. In the context of the VQT, clarity is the measure of the clearness, fidelity, and lack of noise/distortion of a voice signal. In voice-over-packet environments, clarity can be affected by packet loss, noise, non-linear codec compression, and common analog signal degradation. To obtain objective, reliable, and repeatable measures of a subjective phenomenon, the Clarity measurement uses one of two analysis algorithms: PSQM (Perceptual Speech Quality Measure) or PAMS (Perceptual Analysis Measurement System). The VQT provides three versions of this measurement: Clarity (single), Clarity Trend, and Clarity File. Clarity (PAMS) is shown below, and an example of Clarity (PSQM) is shown in chapter 3.

Configure the behavior of the measurement in the upper portion of the view.

PSQM or PAMS results are shown in the upper part of the graph and voice signal amplitudes are shown in the lower. In addition, Clarity statistics are shown in the spreadsheet.




**Note**

Either Clarity (PSQM) or Clarity (PAMS) may not be available depending on the option you purchased. Contact your Agilent sales representative for more details.

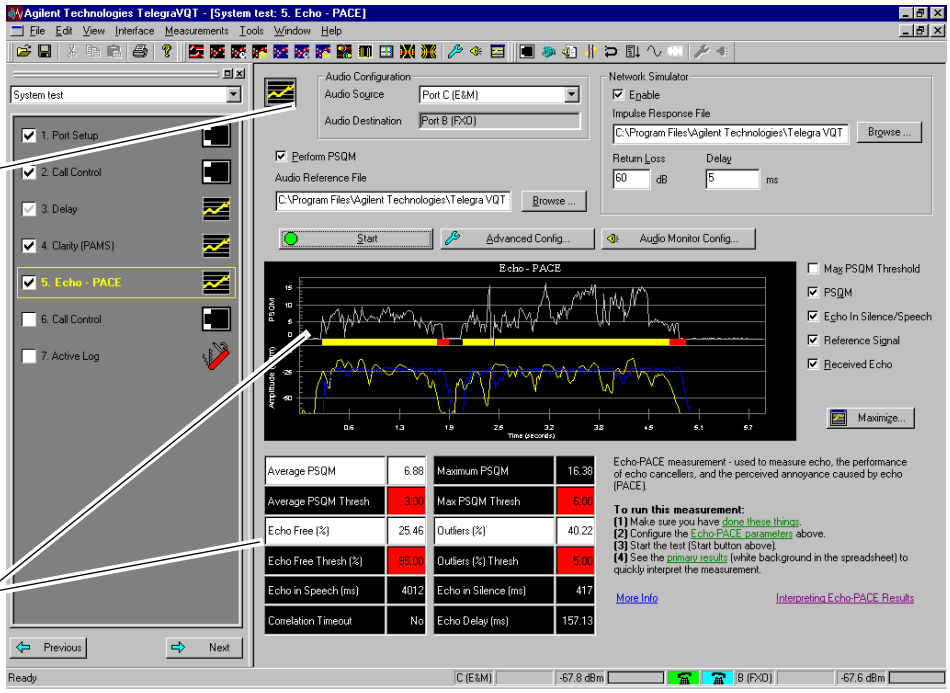
# Measuring Echo - PACE

**Measure the Perceived Annoyance Caused by Echo (PACE).**

Echo is a potential problem in telephony networks that can be made worse when voice-over-packet technologies are introduced. The Echo-PACE measurement can help you measure echo characteristics, evaluate the performance of echo cancellers, and objectively quantify the perceived annoyance caused by echo (PACE). Echo-PACE provides various options including the use of PSQM and Network Simulator to enhance the more traditional echo amplitude vs. time measurement result. Measurement statistics are also displayed in a spreadsheet.

Configure the behavior of the measurement in the upper portion of the view.

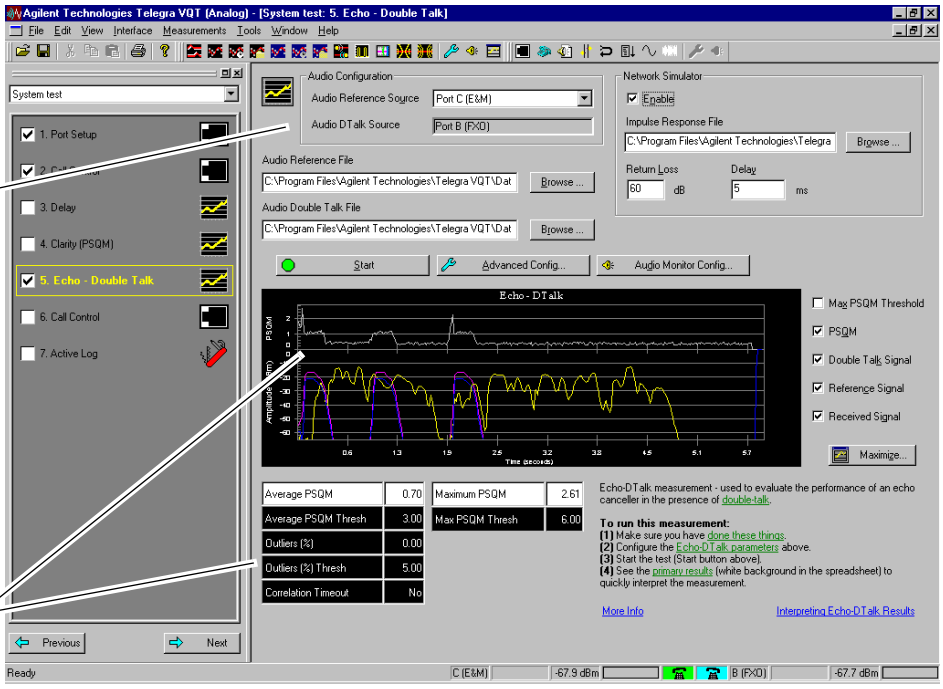
The graph displays the amplitude of the test signal and returning echo, PSQM scores, and whether echo occurs during periods of speech or silence. In addition, numerical statistics are displayed in the spreadsheet.



# Measuring Echo - DTalk

**Measure echo in the presence of double-talk.**

Echo cancellation during double-talk is an interesting problem and a possible failure mode that can impact overall voice quality. The Echo-DTalk measurement can help you evaluate the performance of an echo canceller in the presence of double-talk. Echo-DTalk can also help objectively measure the level of perceptually important distortion in an 'interrupting' voice signal as the echo canceller attempts to compensate for echo. Echo-DTalk does this using PSQM.



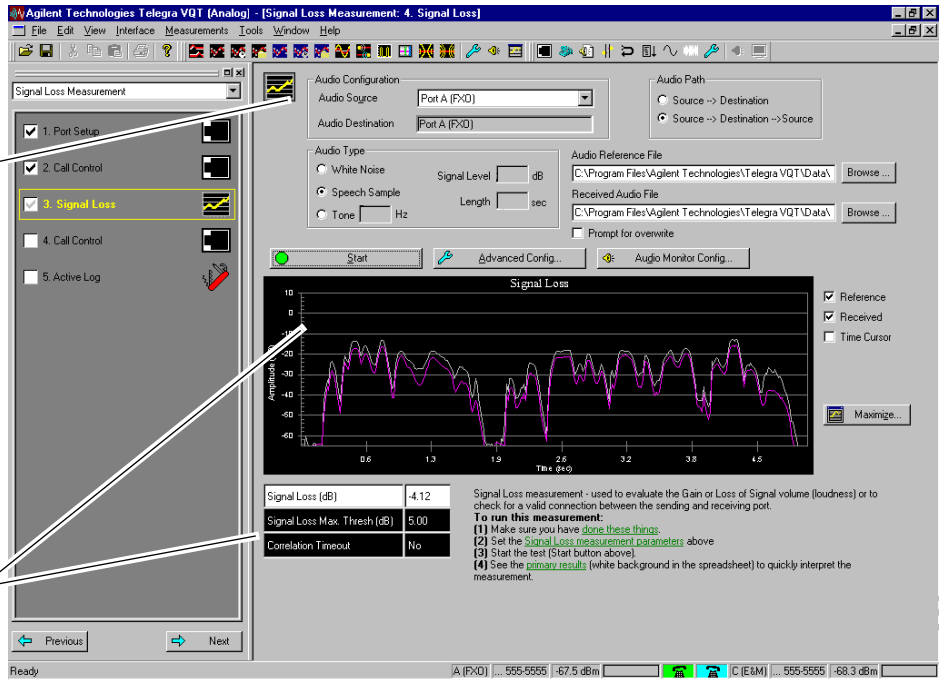

Configure the behavior of the measurement in the upper portion of the view.

The graph displays the amplitude of the test signal and the 'interrupting' DTalk signal. Resulting PSQM scores are displayed both graphically and in the spreadsheet.

# Measuring Signal Loss

**Measure attenuation or gain across a voice channel.**

Excessive signal attenuation or gain can have a significant impact on perceived voice quality and can affect voice circuit operations that depend on the reliable transmission of DTMF tones for signaling. The Signal Loss measurement can help you evaluate the gain or loss behavior across a particular voice circuit or across a telephony device. Various test signals are available and measurement results are displayed in graphical and spreadsheet formats.



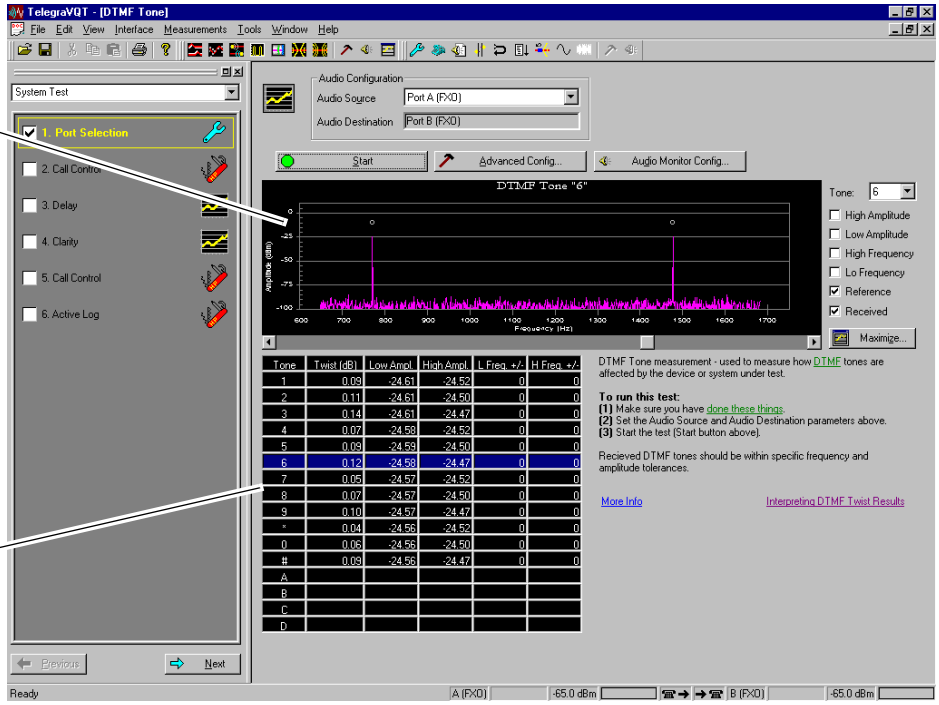

Configure the behavior of the measurement in the upper portion of the view.

The graph displays the amplitude of both the transmitted and received test signal. Mean gain/loss results are shown in the spreadsheet.

# Measuring DTMF Tones

**Evaluate the effect transmission has on DTMF Tones.**

You use the DTMF Tone measurement to evaluate what happens to DTMF tones as they are transmitted through a telephony device or system. While this measurement is valuable in both a traditional and a voice-over-packet (VoP) telephony environment, it is of particular value in situations where tone pairs are processed by low bit rate codecs on voice over IP networks. Because these codecs recreate the *sound* of an audio signal without necessarily recreating the waveform, tones could become distorted in frequency or amplitude.




Both the reference tones and the received tones are shown in the graph.

Twist, amplitude, and frequency statistics for each measured tone pair are shown in the spreadsheet.

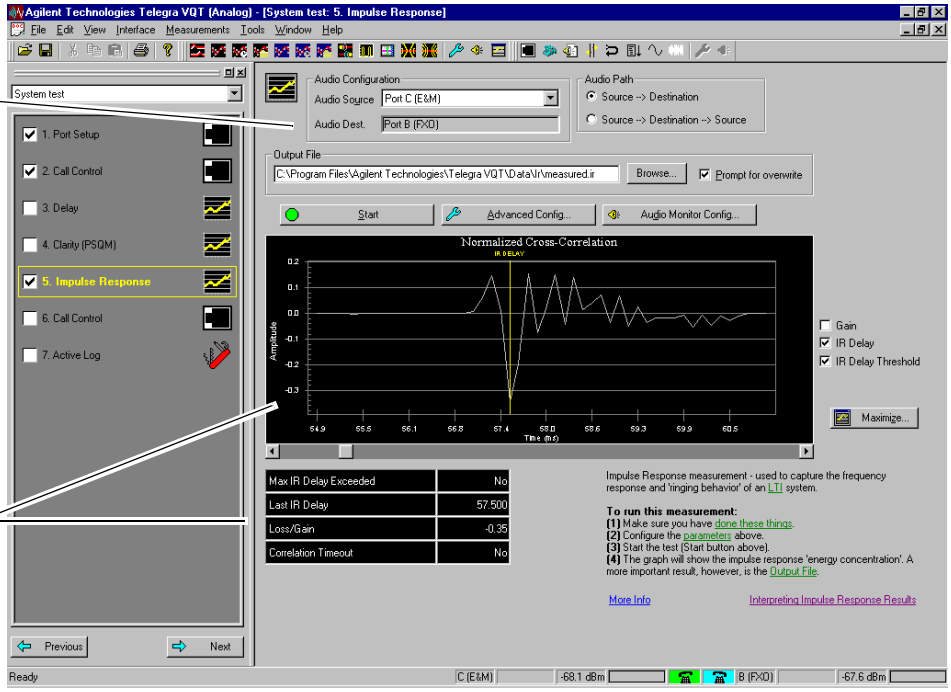
# Measuring the Impulse Response

**Capture and use the impulse response of an audio channel.**

You use the Impulse Response measurement to characterize the input - output relationship of an LTI (linear and time-invariant) system. This is a very powerful measurement that can be used to capture the behavior of a specific audio channel so that you can later emulate it with the Network Simulator tool or other DSP application. Impulse Response measurements are often used by R&D engineers and test bed technicians to recreate a specific network behavior as part of other types of device and system tests.

Configure the port on which the measurement is run and the result file that will contain the impulse response information.

Time-domain impulse response is shown graphically, and measurement statistics are shown in the spreadsheet.



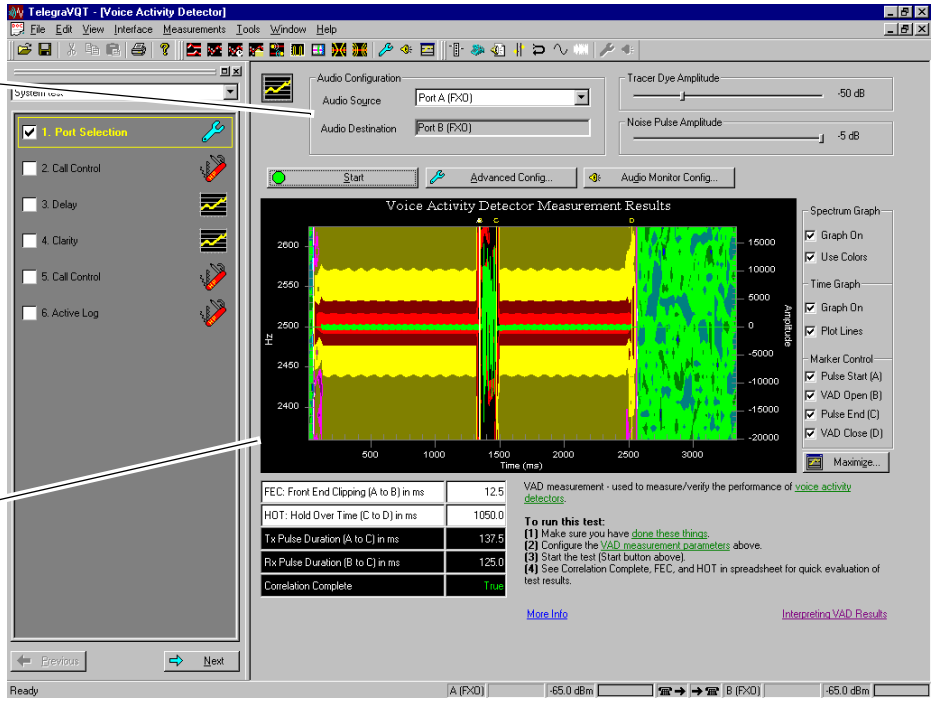
# Evaluating Voice Activity Detection

**Measure and verify VAD performance.**

You use the VAD measurement to evaluate or verify the performance of voice activity detectors in gateways, routers, or other voice-over-packet devices. The VAD measurement calculates and displays front end clipping (FEC) and hold over time (HOT), and in some cases, can provide information related to comfort noise generation match.

Configure the path of the measurement and set amplitudes for test signal components.

The multi-dimensional graph shows spectrum, intensity, and time-domain information so you can see VAD activity. FEC and HOT and other statistics are also shown in the spreadsheet.



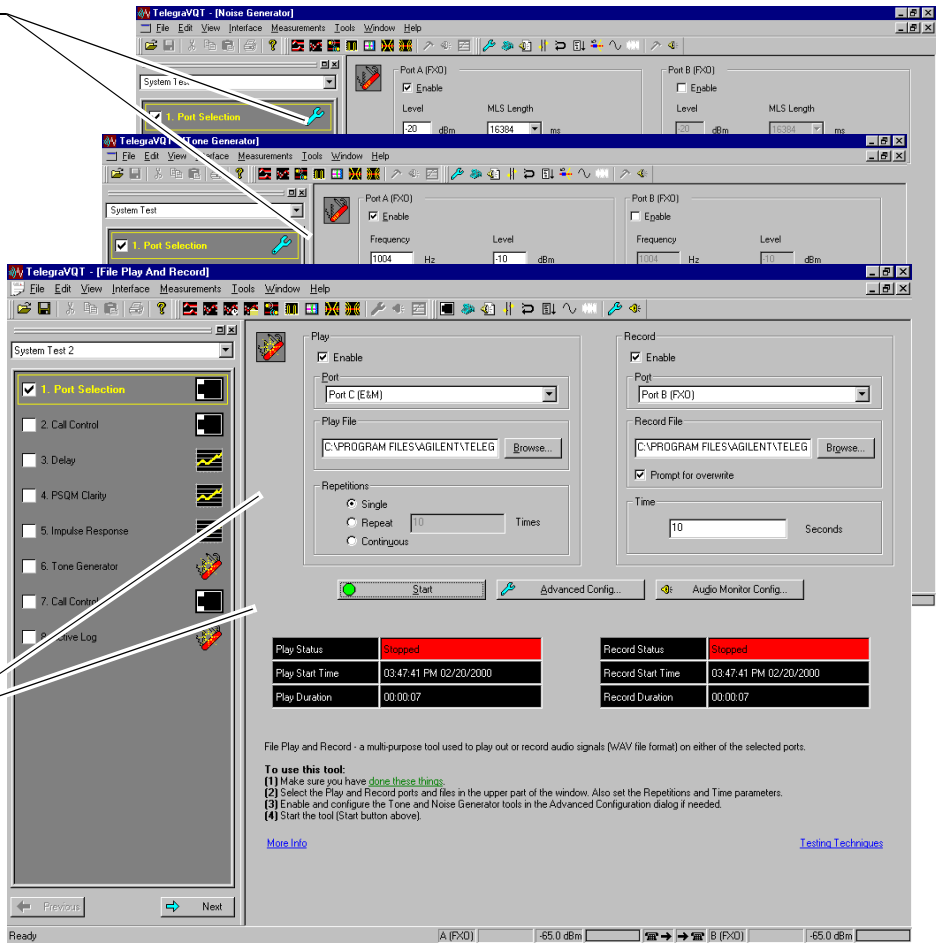
# Using Other Voice Quality Test Tools

In addition to the voice quality and system component measurements described earlier, the VQT Application provides a number of versatile, multipurpose tools that can enhance your testing capabilities.

## Tone and Noise Generation, File Play and Record

The Tone and Noise Generators, and the File Play and Record tool, each provide you with the ability to transmit audio signals onto the system under test.

Tone and Noise Generation give you the ability to send controllable sine waves and noise from any of the selected ports.



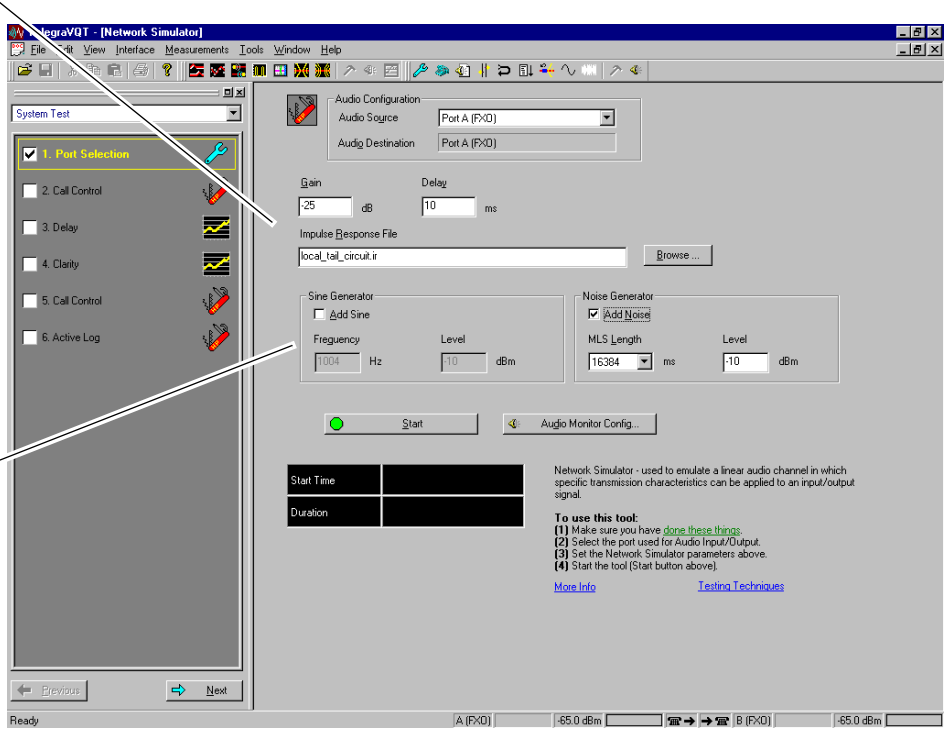

File Play and Record allows you to send and record wave files for any testing purposes you can devise. You can also add tones and noise to file playback.

## Emulate audio channels with the Network Simulator

The Network Simulator provides audio channel emulation capabilities for those situations in which you need to alter an audio stream in some controllable way. Network Simulator is very often used to emulate tail circuits and linear audio channels that have very distinct frequency responses and delay/attenuation characteristics.

Set the parameters that will alter/influence the output audio signal.

Add a sine wave or noise to the output audio signal in order to enhance your testing.

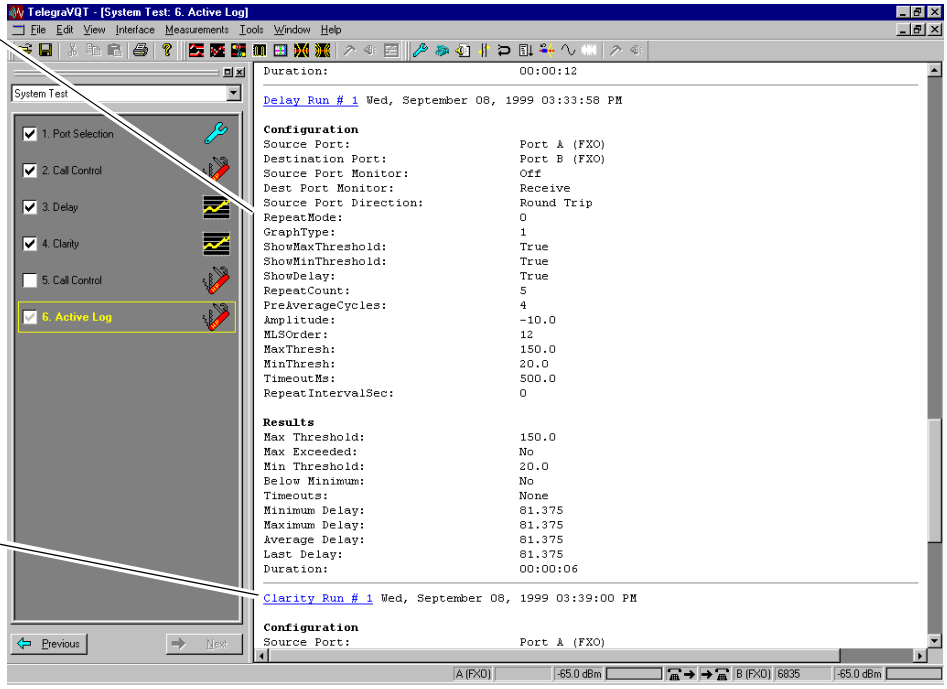


### Log measurement events

The VQT automatically creates a log of all your configuration and measurement activity. At any point during a test session, you can open the Active Log Viewer and see a record of your testing tasks. You can navigate directly from the log to view measurement results in the graph and spreadsheet of measurement itself.

Configuration information and measurement statistics are logged in an easy-to-read format.

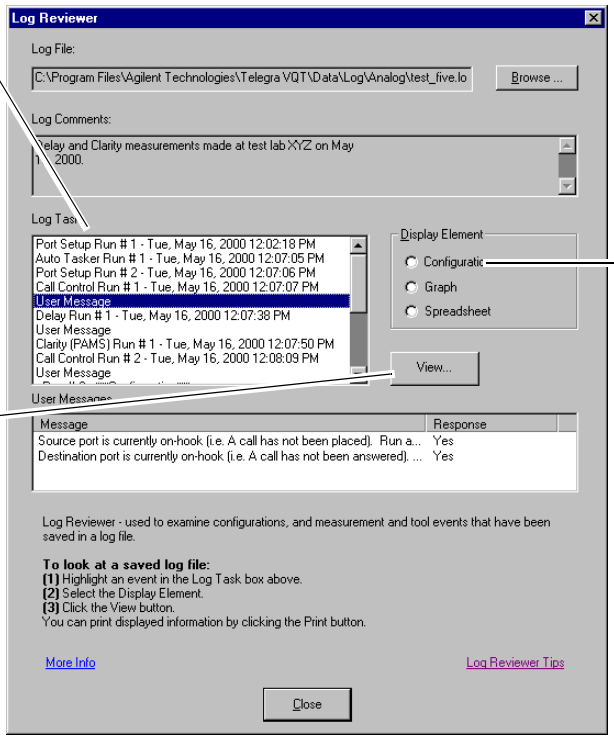
You can click on event hyperlinks to navigate directly to the tool or measurement used.




Once you have viewed the log, you can save it using the File menu. Opening and viewing saved log files is covered next.

You can use the File menu to open saved log files into the Log Reviewer. With the Log Reviewer, you can view the configuration, graph, or spreadsheet statistics in the context of the user interface in which it was set up or invoked.

You can select from the tasks and measurement events recorded by the log.




You can choose to see the configuration, graph (if available), or spreadsheet of the logged event.

View the selection. Once you display what you have selected.

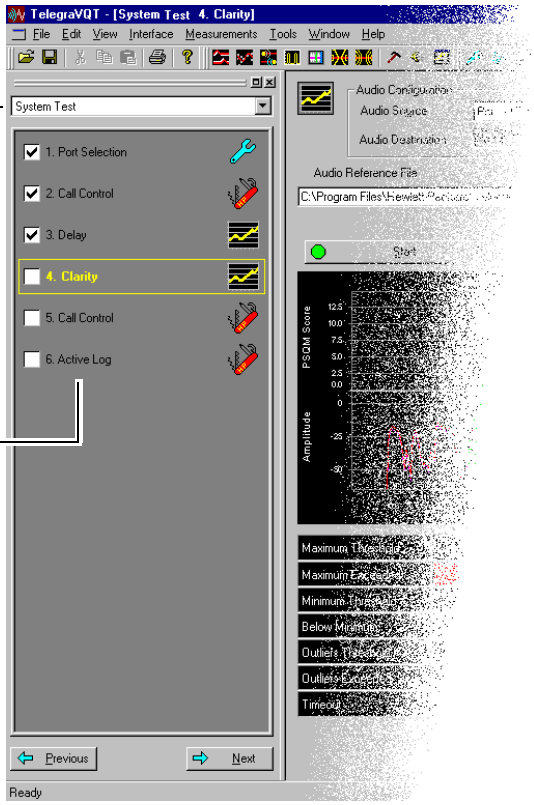
# Using the VQT TaskList Navigator

**Set up and run using the TaskList Navigator**

The TaskList Navigator is a user interface navigational aid that directs you through the necessary steps to set up and run voice quality tests. The TaskList Navigator is an excellent tool for new users, and for experienced users who want an easy way to repeat complex testing scenarios. The VQT ships with several useful TaskLists, and you can create your own.

You can select one of the TaskLists shipped with the VQT, or you can create and use one of your own.

VQT measurements and tools are accessed by clicking on the tasks shown in the list. Check marks show the tools or measurements you have used or visited.




**Note**

When used with the VQT Undercradle, the TaskList Navigator tool is not visible when you first start the VQT application. To display the TaskList Navigator and access TaskLists, select TaskList | Navigator from the View menu.

# Automating Voice Quality Testing

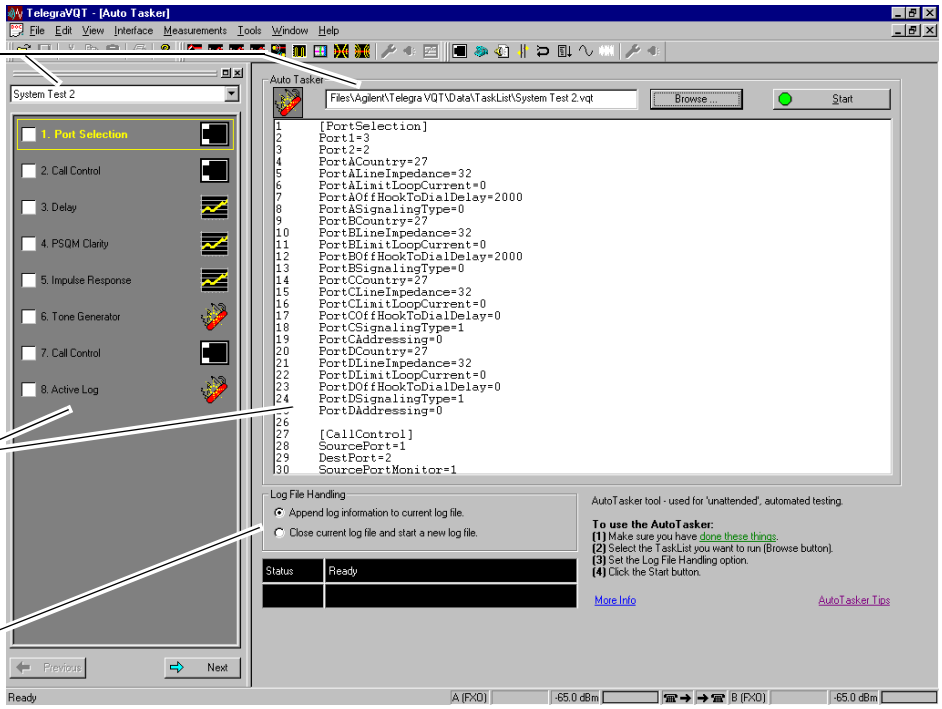
**Run TaskLists and collect measurement results automatically.**

Voice quality testing, like most network testing, can be enhanced by automation. The ability to launch unattended test sequences has numerous advantages because data obtained in this way sheds light on device or system performance in ways that manual testing does not. The VQT's AutoTasker tool allows you to automatically execute the steps shown in a TaskList when you need to run many measurements over extended periods of time, when you need to run tests at inconvenient hours, or when an inexperienced or extremely busy user needs to run a specific test sequence to produce a routine report.

When you select the TaskList you want the AutoTasker to run, it will be shown both in the TaskList Navigator and the AutoTasker display.

As the TaskList is run, each task will be highlighted so you can monitor AutoTasker's progress.

You can also control how setup and measurement data is logged.




You can also run VQT measurements and tools using the Windows command line. Refer to the online Help for more detailed operating instructions.

# 2



# Getting Started

# Getting Started

This chapter describes how test voice quality with a single VQT Undercradle and Telegra®VQT Application. Once you become more familiar with this powerful voice quality test tool, you can deviate from the procedures outlined here to suit your own test needs.

You can purchase the Agilent Advisor with the VQT Undercradle and the appropriate software already installed. If you purchased that system configuration, steps 1 and 2 below may not apply.

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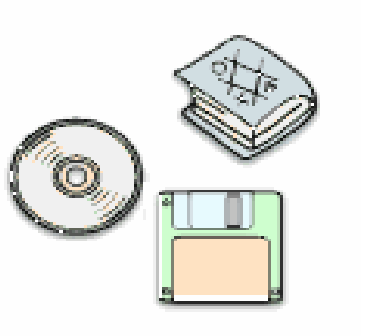
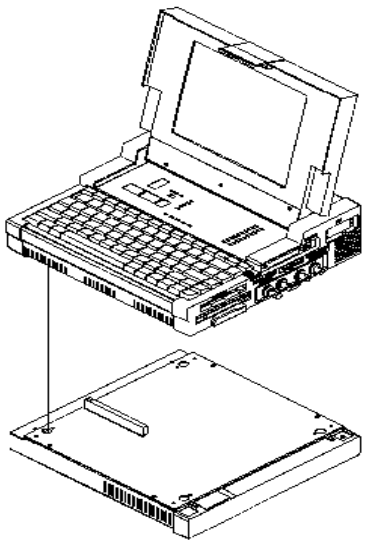
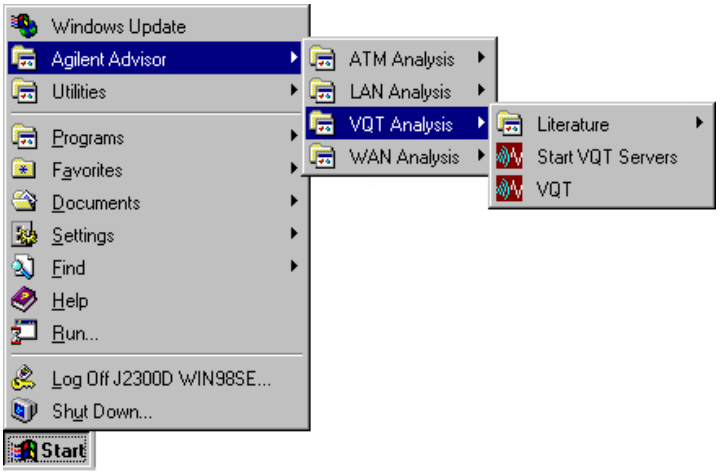
① Install the appropriate software. (Make sure your Agilent Advisor software is Version 11.5 or higher.) Use the CD-ROM Software Installation instructions provided with the CD-ROM to install or add software.



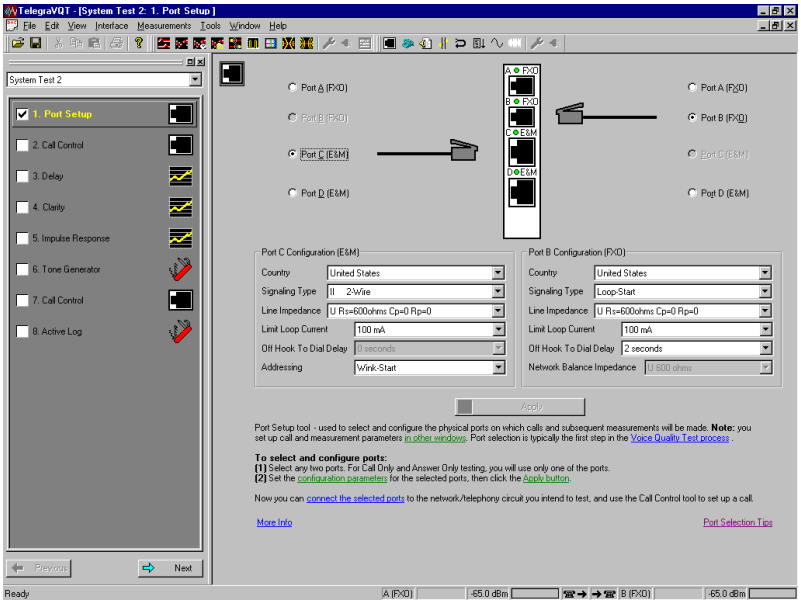
② Install the VQT undercradle. Refer to the Agilent Advisor Mainframe Features Guide for more information.



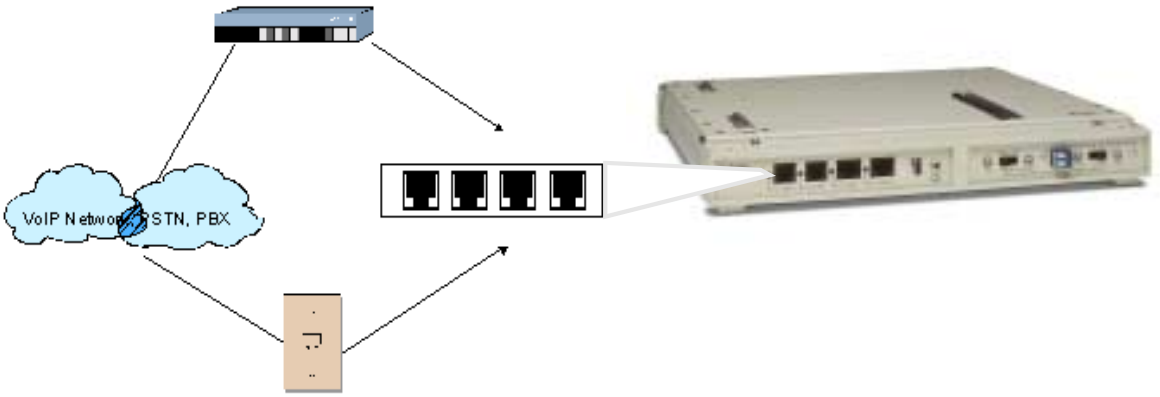
③ Start the VQT application.



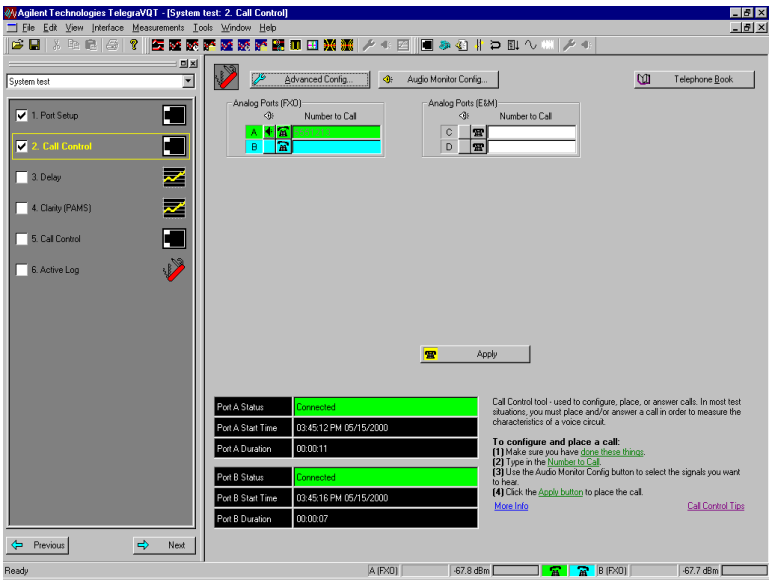

④ Select and configure the physical ports.



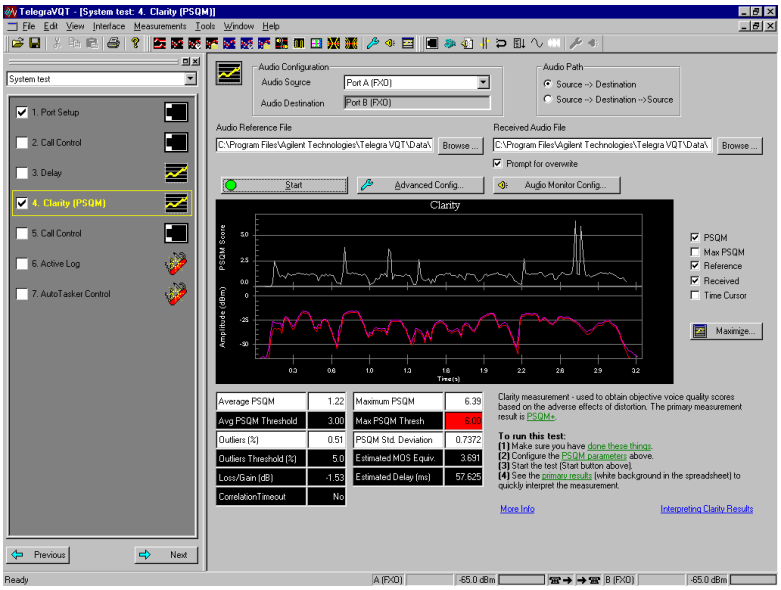
⑤ Connect the ports to the system or device you intend to test.



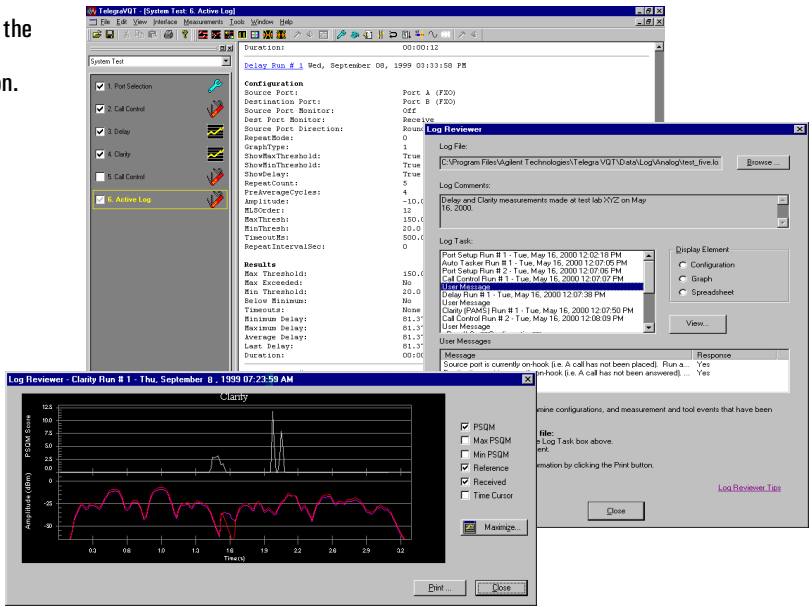

⑥ Place and answer a call.



⑦ Run a measurement or tool, and view the results.




⑧ View and save the log file created during operation.



# Setting Up the VQT Undercradle

**Setting up the Undercradle**

If you purchased the Agilent Advisor with the VQT Undercradle, the Advisor is shipped with the VQT application software installed on the hard drive. Refer to First-Time Startup for Agilent Advisor later in this section.

If you previously purchased the Agilent Advisor and are now adding a VQT Undercradle to your system, refer to the instructions in the Software Installation Guide supplied with the Advisor software CD to install the application software. Then use the Mainframe Features guide for instructions on how to connect the Undercradle to your Advisor. (Be sure the Internet Advisor power switch is set to Off before removing or installing Undercradles.)

After the hardware installation is completed, refer to Starting the VQT Application section later in this chapter.

The analog signal acquisition ports are located on the left side of the chassis.

Ground Connections

**Note**

Make sure your Agilent Advisor software is Version 11.5 or higher.

## First-time Startup for Agilent Advisor

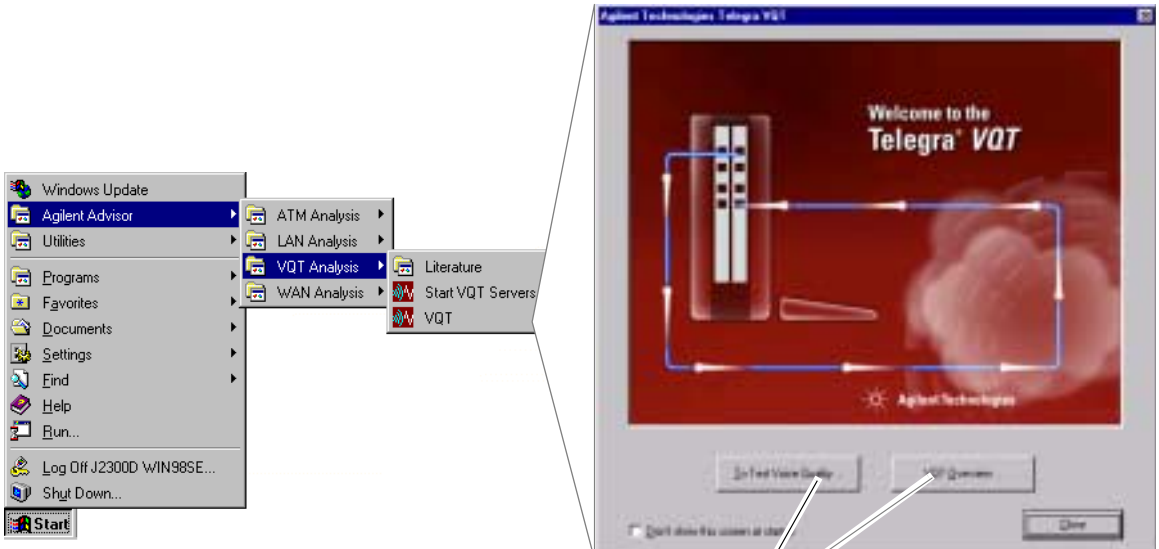
The first time you turn on the Advisor with the software shipped from Agilent Technologies, you are required to enter some basic information and configuration. Simply respond to the prompts as they are displayed. Note the following:

- When asked for your name and organization, type in the name of the primary user and the organization for which he/she works. Note, however, that this information is not used in later configuration or set up tasks - it is strictly for record keeping purposes.
- A Certificate of Authenticity box prompts you for an authenticity number. Enter the Microsoft Windows authenticity product ID# provided with the mainframe.

# Starting the VQT Application

**Start the software**

To start the VQT application, use the Windows Start menu (see Note below). The Welcome window provides access to testing overviews and the online Help. Once you close the Welcome window, the Server Setup tool is displayed.



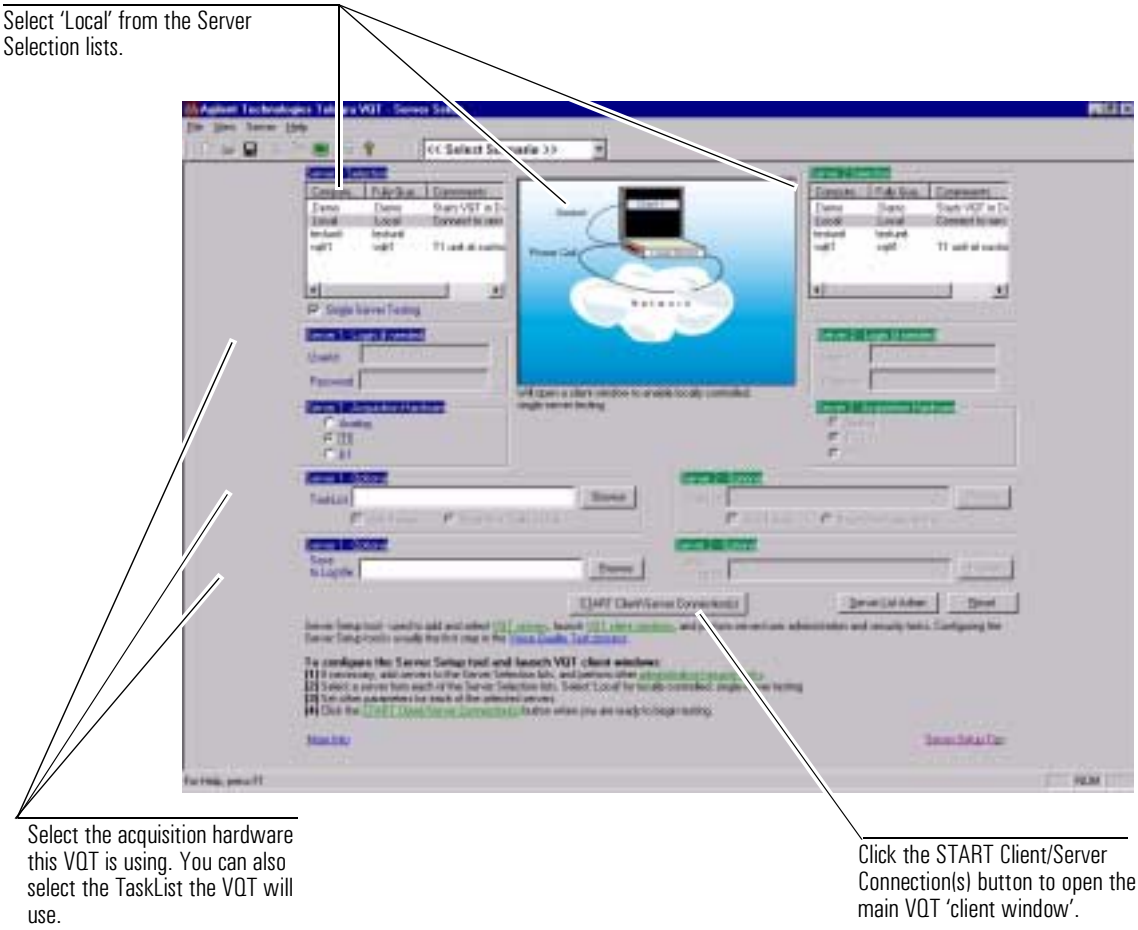

Start the VQT Application from Windows.

See an overview of voice quality test procedures or access the online Help for more extensive information.

## Server Setup Tool

**Using the Server Setup tool.**

The Server Setup tool is the main access point into the VQT application. To use the VQT Undercradle as a standalone portable tester (versus part of a remote / distributed voice quality test system), select 'Local' in the Server Selection lists, select analog acquisition hardware, and click the START Client/Server Connection(s) button.




**Note**

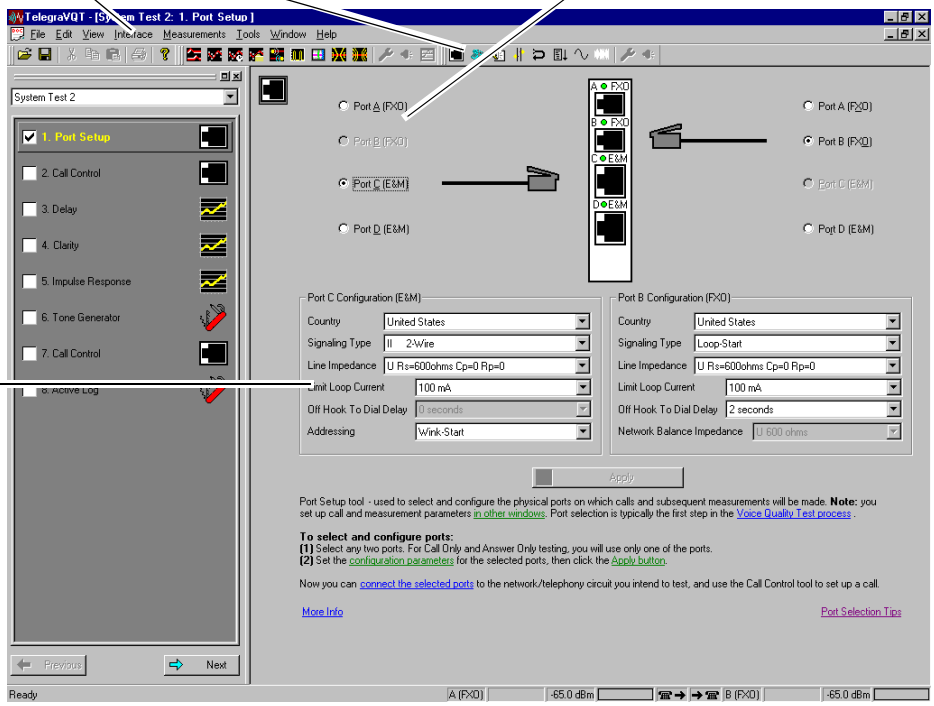
The first time you configure the Server Setup tool and open a 'client window', you will be prompted for your PAMS and/or PSQM software license keys.

# Selecting and Configuring Ports

Selecting and configuring ports is almost always the first step in real-time voice quality testing with the VQT. This is done in the Port Setup tool.

You can open the Port Setup Tool either from the Interface pulldown menu or by clicking the Port Setup Tool icon.

Select the physical ports in the upper portion of the view.



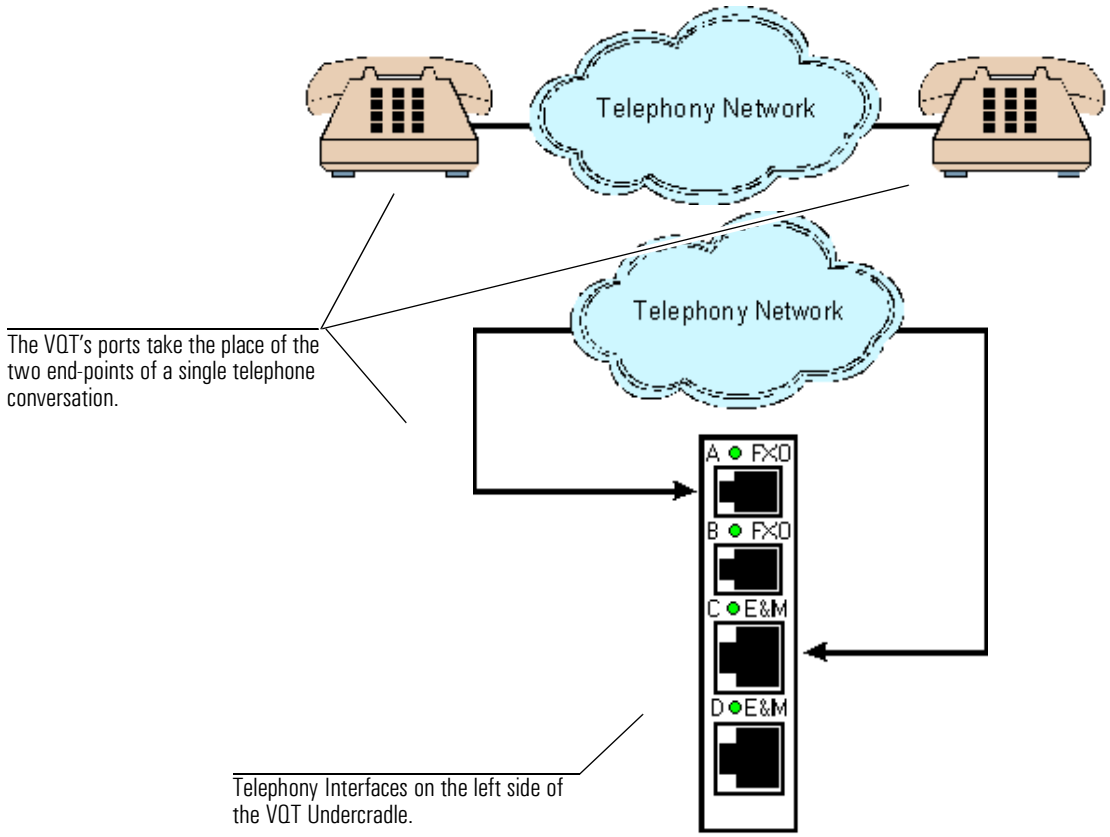

Configure the electrical characteristics of each of the selected ports.

**Note**

It is a good idea not to connect to the network until port parameters are set up correctly. Failure to configure the ports prior to network connectivity might adversely effect network operation.

# Connecting to the Device or System Under Test

Connecting the VQT to the device or system to be tested is relatively simple once you remember the VQT's basic test assumption - voice quality is tested end-to-end from the perspective of the human talker and listener. In many test situations, the VQT replaces the telephones at both ends of the connection so that you can place a call from one port through a telephony network (VoIP, PSTN, etc.) to the other.




**Note**

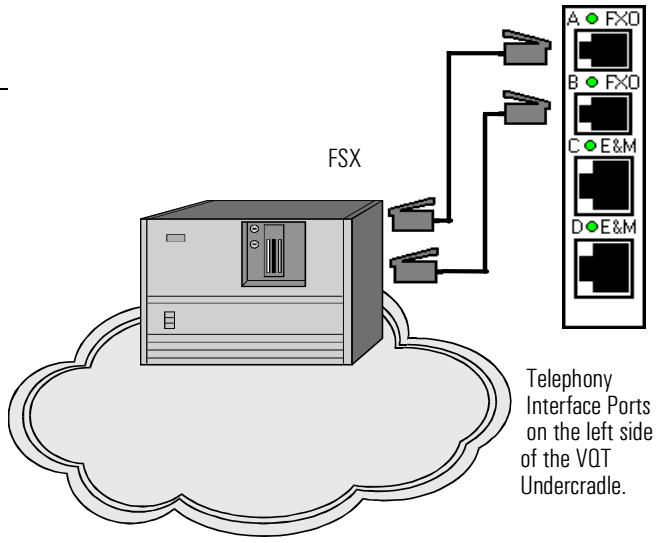
This equipment must not be connected to the telephone network unless it is connected through protective circuitry that is registered pursuant to Part 68 of the Federal Communications Commission rules.

## FXO/FXS Connections

The diagram below shows an end-to-end connection between FXO ports A / B of the VQT and telephony/network device(s) that supports the FXS interface. You need to use one custom Agilent Technologies RJ-11 cable to ensure the VQT communicates properly with the telephone network. You can use an additional 'off-the-shelf' RJ-11 cable and coupler to extend the cable length for 'Loop Start' operation. However, because of the way off-the-shelf cables can be wired, you must use one and only one Agilent custom RJ-11 cable for each port connection for 'Ground Start' operation. See the online Help for FXO wiring and pinouts and for more information about FXO connections in general.

The VQT provides for end-to-end testing regardless of the port used. In other words, you can place calls from an FXO port to an E&M port if the situation requires it.

Custom Agilent RJ-11 Cables
(part number 5065-1140)
- 6 pin slots / 4 conductors
- Twisted cable for noise reduction

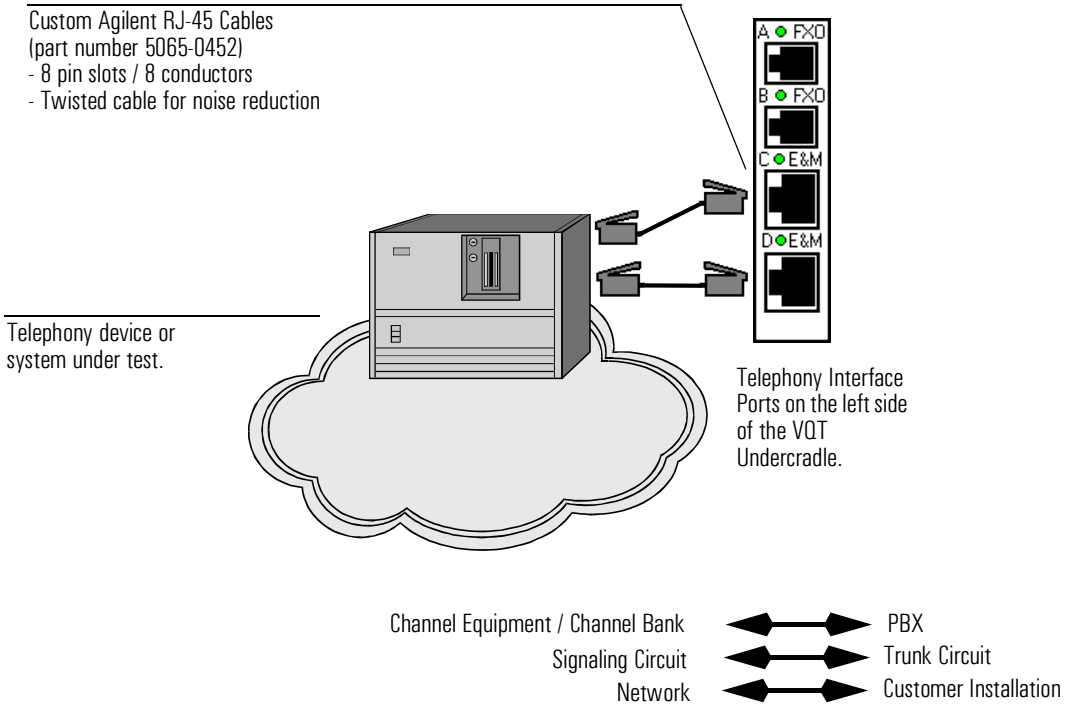



Telephony device or system under test.

**Note** Make sure to configure port parameters correctly prior to connecting to the network. Failure to configure the ports prior to network connectivity might adversely effect network operation.

# E&M Connections

E&M connections can be as simple as plugging the RJ-45 connector into the E&M port on the device/system under test, or as complex as connecting individual wires to punch-down blocks. The illustration below shows a common end-to-end E&M connection. Depending on the standards document to which you refer, there are several terms that can be used to describe which side of the E&M link the VQT is connected. As shown, the VQT is thought of as being on the 'PBX', 'Trunk Circuit', or 'Customer Installation' side of the link. See the online Help for descriptions of pinouts and wiring for Agilent's E&M cables and connectors.




**Note**

Make sure to configure port parameters correctly prior to connecting to the network. Failure to configure the ports prior to network connectivity might adversely effect network operation.

## Ground Connections

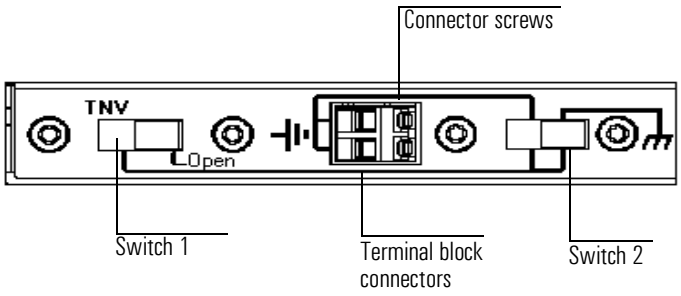
The VQT Undercradle is equipped with several electrical grounding options that increase the reliability of its operation and ensure compliance with domestic and international telecommunication and safety standards. To utilize these grounding options, use the switch and terminal block faceplate installed on the left side of the VQT Undercradle. Refer to the procedures on the following pages about the three different grounding options that are available for the VQT Undercradle.


Telephony Interface Ports

**Note** To assure that your physical Ground Connection Switch configuration matches the VQT software configuration, make sure that you selected the correct signaling type in the VQT Port Setup tool.

The following table shows the four possible switch setting combinations:

| Switch 1 | Switch 2 | Function |
|---|---|---|
| UP | UP | Earth Ground: The VQT Undercradle is Telecommunications Network Voltage (TNV) grounded via the terminal block connector. Attach one end of the ground cable (Part number J3953-61604) to the terminal block and the other end to a reliable earth ground. |
| UP | DOWN | Chassis Ground: The VQT Undercradle is TNV grounded via the ground wire in the power cable (no extra cable connection is needed). |
| DOWN | UP | TNV Ground (Internally isolated). |
| DOWN | DOWN | TNV Ground (Internally isolated). |



To ground the VQT Undercradle to 'true earth ground', perform the following:

1 Attach the supplied cable (J3953-61604) to one of the terminal block connectors.

2 Tighten the connector screw to hold it in place.

3 Connect the other end of the cable to 'earth ground' (usually provided by a metallic rod or pipe driven into the earth.)

4 Set the switches as shown in the table above.

To ground the VQT Undercradle via the ground wire in the power cable (Chassis Ground), set the switches as shown in the table above. The VQT is shipped with this configuration as the default connection because, in most cases, the 'Chassis Ground' provides adequate grounding and reliable operation.

As mentioned previously, in most test situations, the 'chassis ground' setting is adequate. In some situations, such as Scandinavian countries that use IT power systems or if equipment is a large distance from the grounding source, the 'Earth Ground' setting is required. 'TNV Ground' (internally isolated) should be used for FXO loop start operations. It is possible for the equipment to be functional under a specific configuration, but not conform to safety standards.

Refer to the table below to determine the correct switch settings for your situation.

| **Switch Modes** | **FXO Loop Start Only** | **FXO Ground Start Only** | **E&M Only** | **FXO Loop Start /FXO Ground Start** | **FXO Loop Start/E&M** | **FXO Ground Start/E&M** |
|---|---|---|---|---|---|---|
| Earth Ground | Functional: Yes<br>Safety: No | F: Yes<br>S: Yes | F: Yes<br>S: Yes | F: Yes<br>S: Yes | F: Yes<br>S: Yes | F: Yes<br>S: Yes |
| Chassis Ground | Functional: Yes<br>Safety: No | F: Depends on ground quality<br>S: Not all countries | F: Depends on ground quality<br>S: Not all countries | F: Depends on ground quality<br>S: Not all countries | F: Depends on ground quality<br>S: Not all countries | F: Depends on ground quality<br>S: Not all countries |
| TNV Ground (Internally isolated) | Functional: Yes<br>Safety: Yes | F: No | F: No | F: No | F: No | F: No |

**Note**

The Chassis Ground switch mode might be too noisy and a differential voltage from 'Earth Ground' might interfere with the test signal. To elevate this condition run a wire to 'Earth Ground'.

## Test Environment Examples

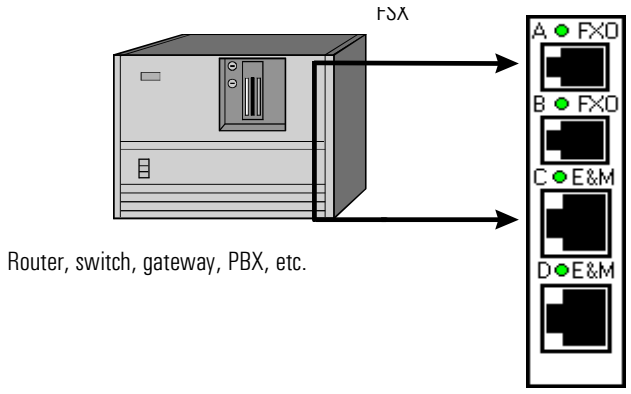
The VQT can be used in a wide range of test situations. Two examples of the system under test are shown below. For illustrational purposes the examples below show the telephony interface plate in a vertical position, note that on the VQT Undercradle the telephony interfaces are horizontal. Refer to the online Help for several other examples, particularly thos used in a multi-tester environment.

### Single Device Testing

Call is placed from one VQT port to another through a single telephony device.

This connection scenario is used to test the performance of the device in isolation (i.e. no effects from traffic load, system noise, etc.).

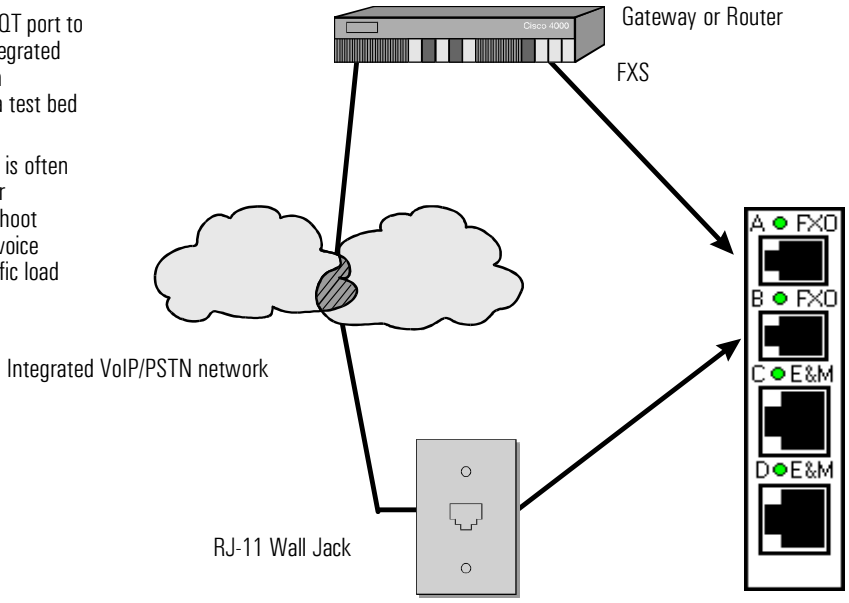
Often, several devices are linked together via an 'ideal' network to test interoperability.




### Integrated VoIP/PSTN Testing

Call is placed from one VQT port to the other through an integrated system. This could be an operational network or a test bed in a development lab.

This connection scenario is often used to test multi-vendor interoperability, troubleshoot problems, and evaluate voice quality in a dynamic traffic load environment.

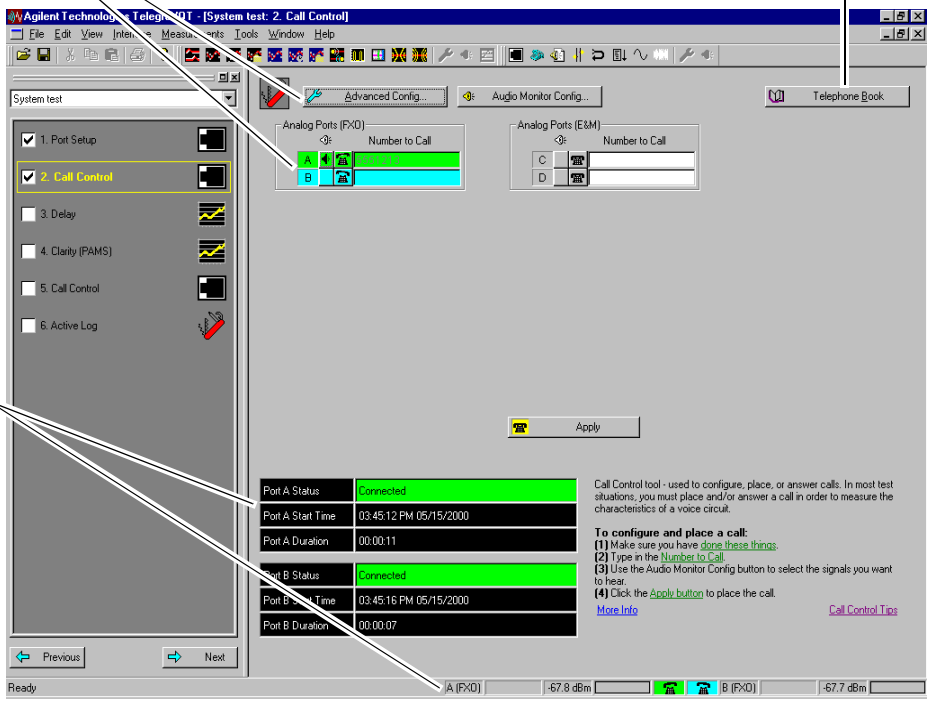


# Placing and Answering a Call

Once you have selected and configured the physical ports, and connected the VQT to the device or system under test, you need to establish the test circuit. That is, you need to place and answer a call from one VQT port to the other.

Select the calling port, type in the destination telephone number, and set other aspects of call setup and termination.

Use the Telephone Book to access telephone numbers you will use often.




Monitor the status of the call in the status indicators and the status bar of the application.

**Note**

Not only can you test end-to-end voice quality with the VQT (port-to-port through the system under test), you can perform tests that are call-only or answer-only. See the online Help for details.

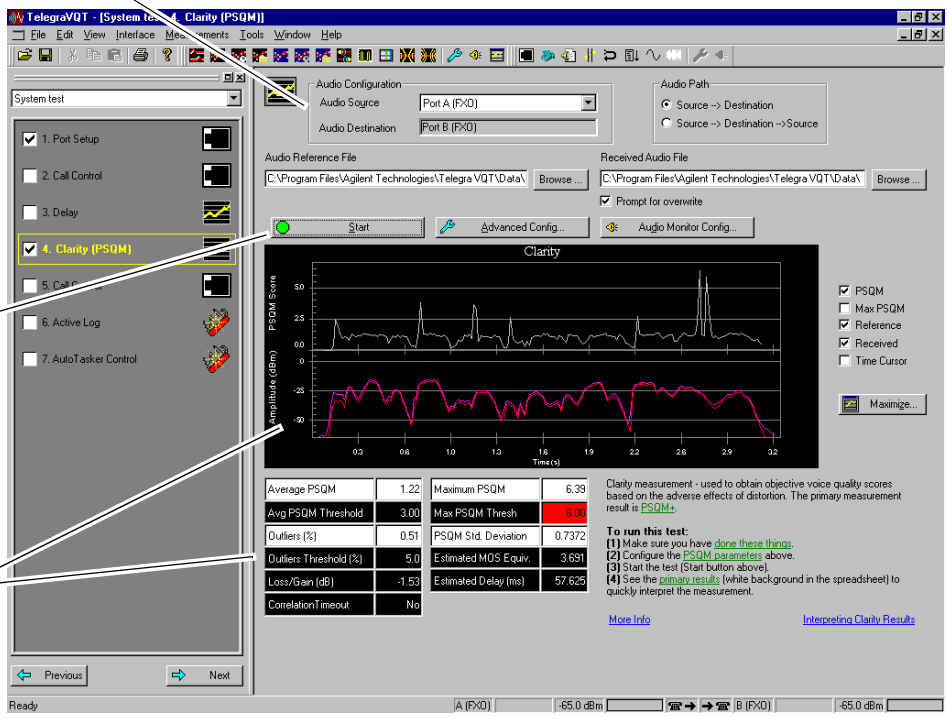
# Running Measurements or Tools

With a telephony circuit established between two VQT ports, you can now run any of the VQT's voice quality measurements or testing tools.

Configure the direction and path of test signals, and other measurement-specific parameters. Note: these parameters are set independent of the port that originates or answers the call.

Start the measurement.

Examine test results in both graphical and spreadsheet formats. Important pass/fail results are highlighted in the spreadsheet.



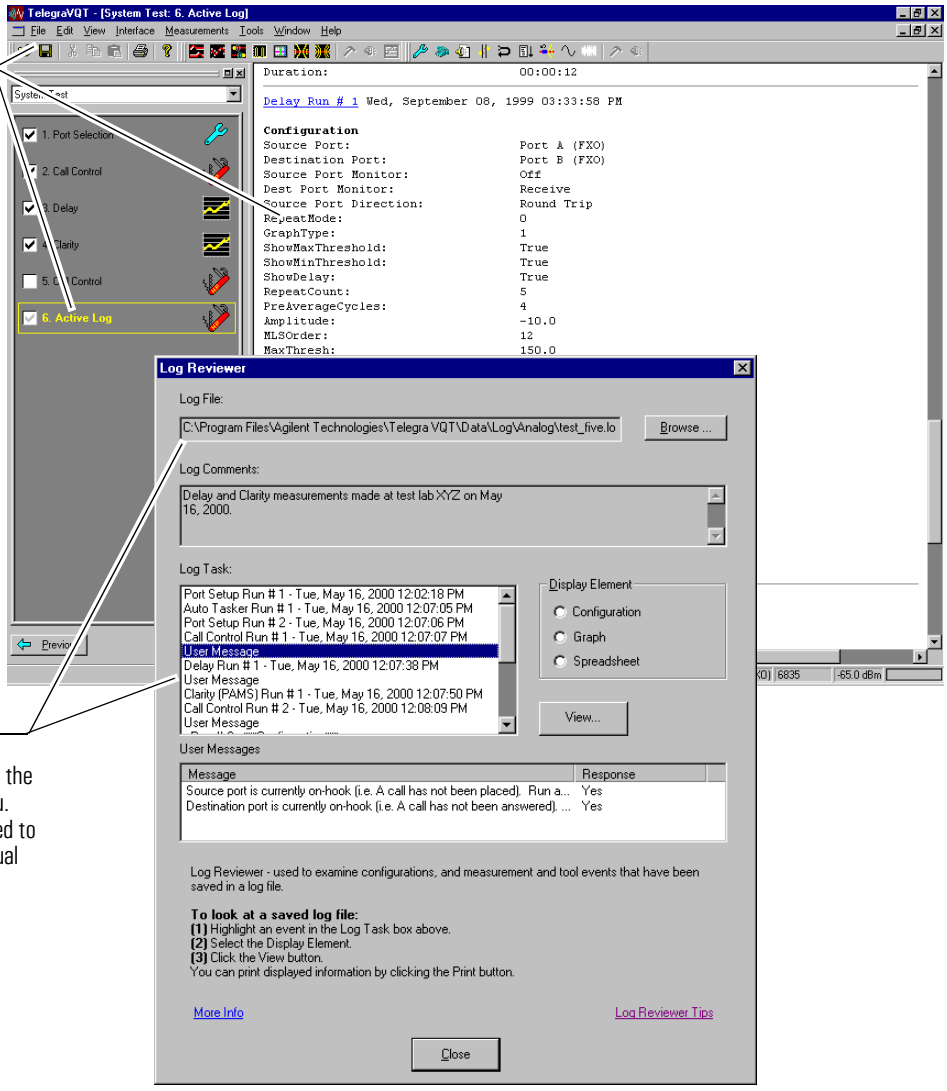

**Note**

Whether a device or system under test 'passes' or 'fails' a particular measurement depends entirely on how you have the measurement configured. *You* set test criteria that match your own test situation.

# Viewing and Saving Log Files

After a set of measurements have been run, you can view a log of the test session, save the log to file, and review the log at a later date.

For each set up, measurement, or tool task performed during a test session, configuration information and measurement results are automatically logged. View these logs during test sessions or immediately after with the Active Log viewer. To save this logged data to file, use the options in the File menu.




To open saved logs and review them, again use the options in the File menu. The Log Reviewer is used to select and open individual parts of the saved log.

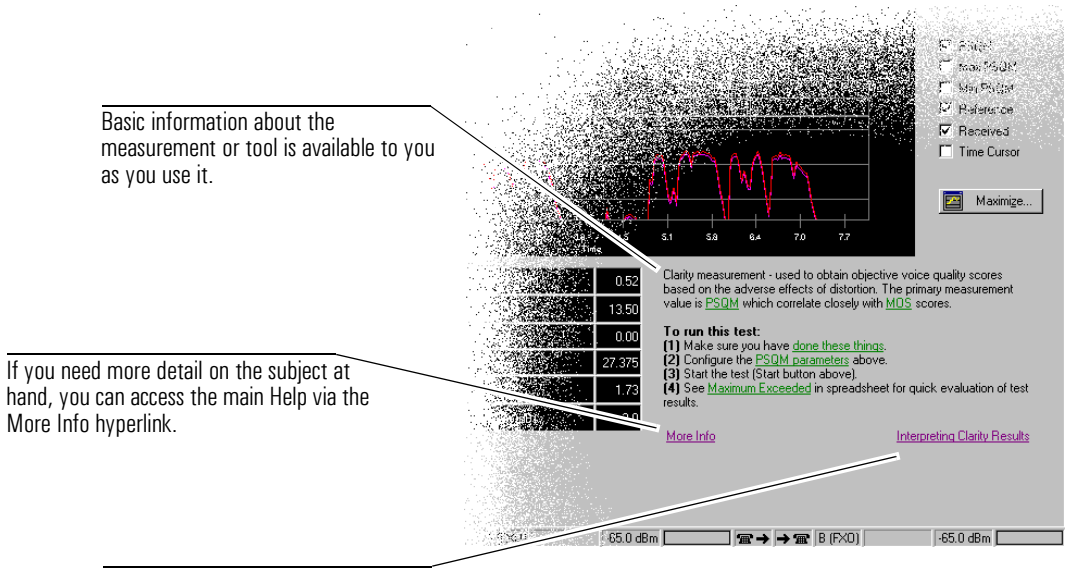
# Finding More Information

To learn more about voice quality testing with Agilent Technologies' VQT, please use the following resources.

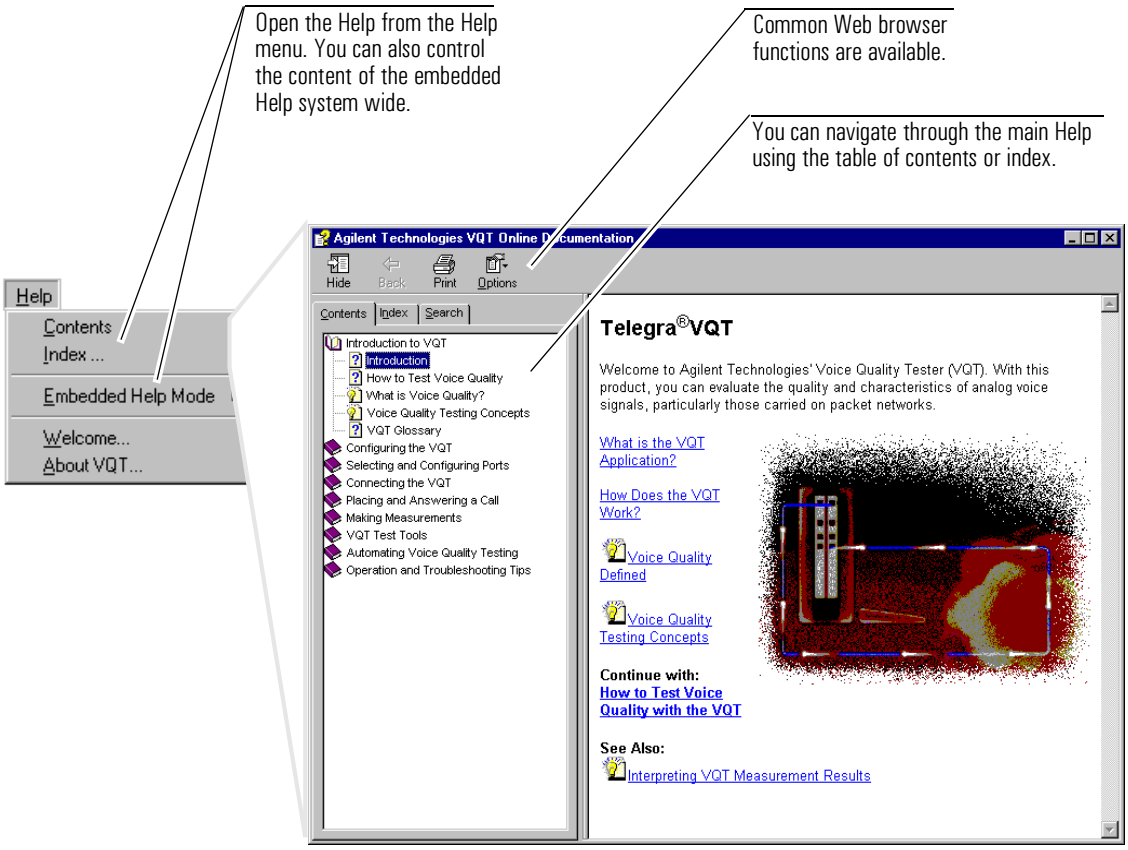
## Multi-mode Embedded Help System

The VQT is equipped with a modal embedded Help system that tells you how to use the VQT, how to interpret measurements, and about voice quality testing concepts in general. You can access the Help system in two ways:

- From the lower right corner of each measurement, tool, or dialog box.



- From the Help menu in the VQT Application.




## Voice/Fax White Papers and Application Notes

Agilent Technologies has published several white papers and application notes on subjects such as Voice over IP, Fax Technology Testing, Voice Quality Testing, and so on. Additional technology-based documents are published regularly. Please contact your Agilent representative to learn how to obtain these valuable publications.

# 3



# Sample Tests

# Sample Tests

This chapter provides three examples of how to use the Telegra®VQT Application to test voice quality on individual devices or integrated systems. The following examples are designed to demonstrate common test techniques and to familiarize you with the use of this powerful tool:

- Placing a Call and Transmitting Test Signals - this sample test shows you the basics of setting up and placing a call, configuring the audio monitor options so you can hear the test signals as they are transmitted and received, and setting up and running tools that transmit audio onto the device or system under test.
- Measuring Delay and Clarity - this sample test shows you how to set up and run two of the most important voice quality measurements. It will build on the basic information provided in the first sample test.
- Measuring Echo and Echo Canceller Performance - this sample test shows you how to set up and run the Echo-PACE measurement to characterize echo on an analog tail circuit.

You can adapt what you learn here for your own unique test situations.

**To learn more...**

Each measurement and tool contains basic usage information and interpretive/testing tips in the embedded Help window. You can also easily access the main online Help from either the Help menu or from the More Info link within the embedded Help.

**Note**

Throughout the examples in this chapter, you are shown how to navigate the user interface using the TaskList Navigator. However, when using the VQT application with the VQT Undercradle, the TaskList Navigator tool is not visible when you first start the VQT application. To display the TaskList Navigator and access the TaskLists, select TaskList | Navigator from the View menu.

The following examples show how you would use a single, locally controlled Agilent Advisor (with undercradle) to test voice quality in a number of situations. These examples can be adapted to remote / distributed voice quality testing. To learn more, and to see examples of this mode of operation, please refer to the *Remote / Distributed Voice Quality Testing Getting Started Guide* or contact your Agilent sales representative.

# Placing/Answering a Call, Sending Test Signals

This example demonstrates the processes that are fundamental to voice quality testing with the Telegra®R and Telegra®VQT Application - that is, the real-time testing concepts of call placement and audible signal verification. You will need to understand these techniques regardless of the other measurements you intend to run or the systems you intend to test. Specifically, this sample test shows you how to:

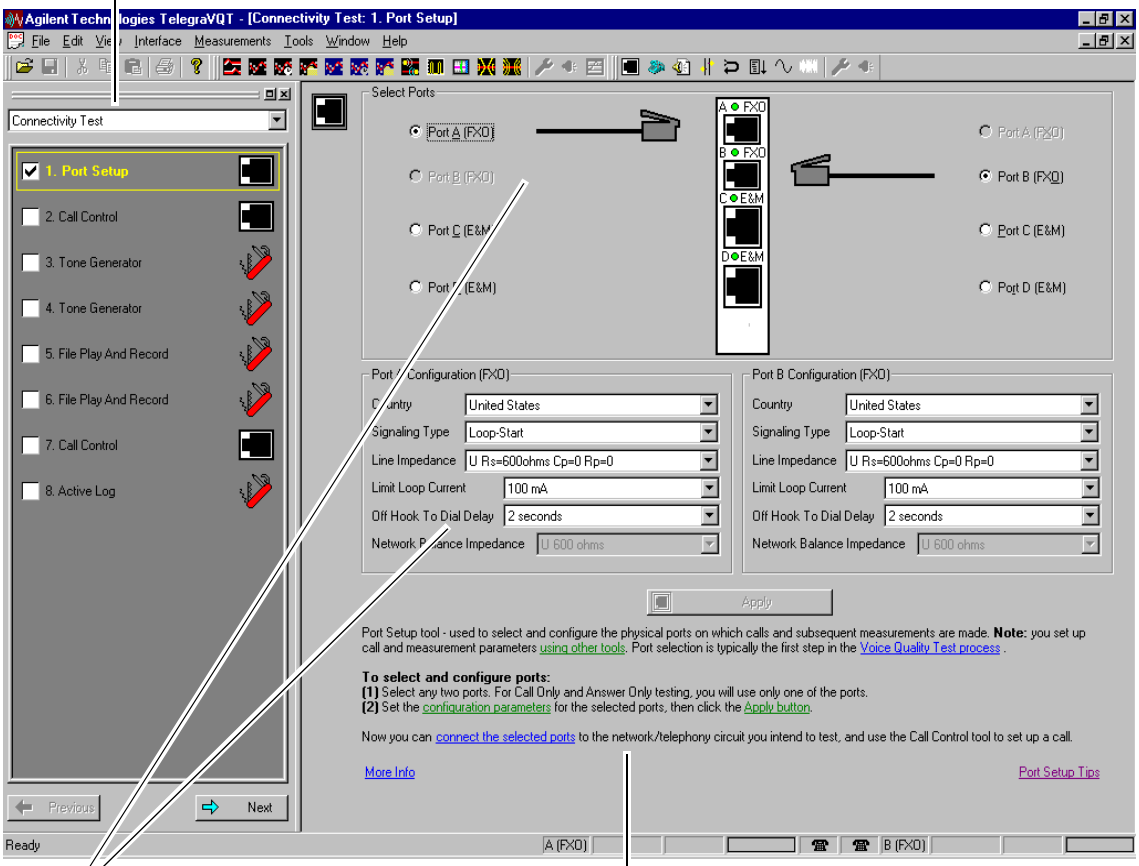
- Connect to the device or system under test.
- Select and configure the physical ports the VQT will use.
- Configure, place, and answer a call to set up the test circuit.
- Run the Tone Generator to verify connectivity.
- Terminate the call.
- Examine and save the log file that is automatically created during the test run.

To begin this test scenario, you need to have set up and powered on the Agilent Advisor, launched the Telegra®VQT Application, and configured the Server Setup tool. See chapter 2 for more information.

**Note**

Connecting, placing the call, and running measurements or tools are the most fundamental of VQT processes. You can adapt this example to your unique testing needs.

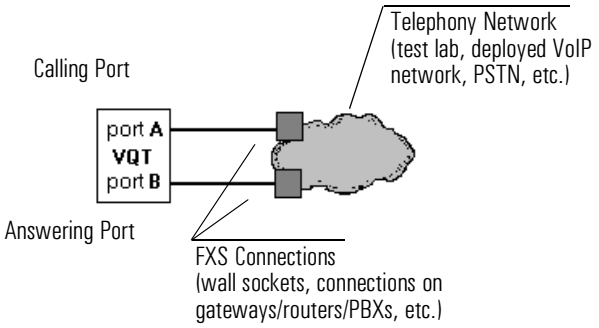
① **In the TaskList Navigator, select the TaskList called 'Connectivity Test'. The list shown below will be loaded and the Port Setup tool (the first item in the list) will be opened.**
Note: each step of this test is shown in the TaskList. To go to each measurement or tool, simply click on each 'task' in the order shown.

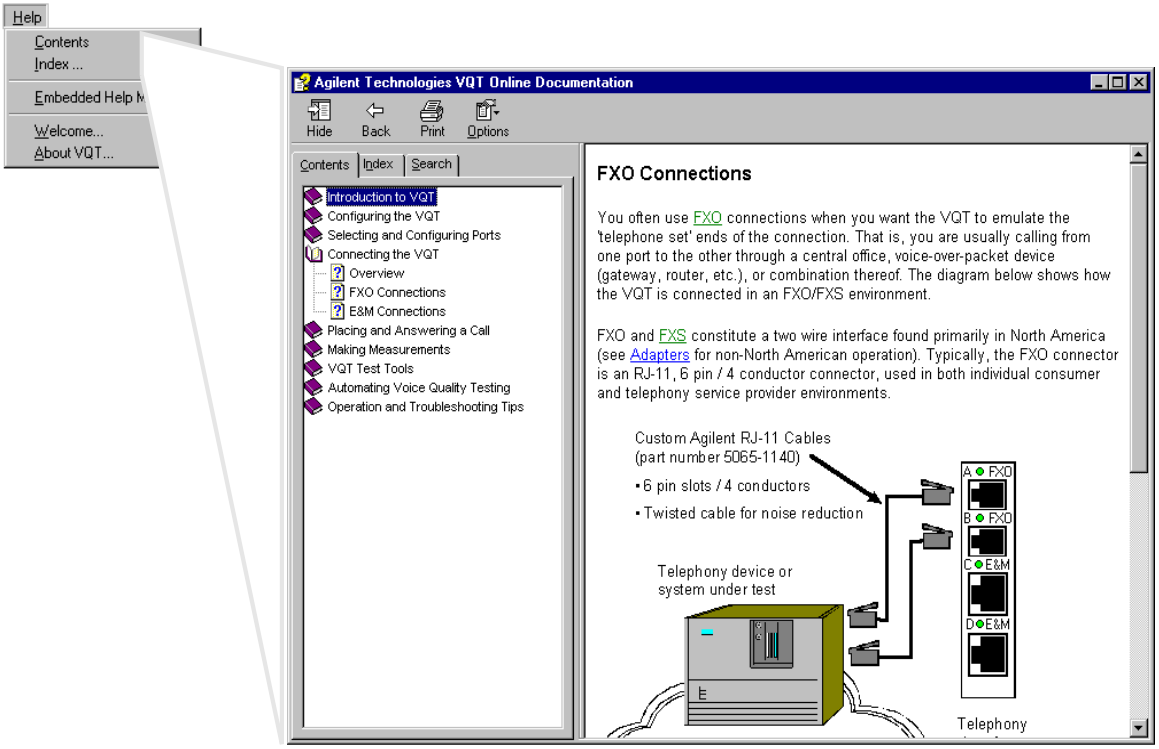



Notice that Ports A and B are selected (the FXO ports). Also note that you can configure the electrical characteristics of the ports. For this example, these selections and default configurations can be left as they are.

The embedded online Help provides setup information and access to other related online documentation. Note: all of the VQT's windows contain embedded Help to assist you in performing your testing tasks.

② **Look in the online Help for connection diagrams. The connection you use depends on whether you are testing an individual device or a system. For this example, you will need a connection that allows the VQT to place a call from one port and answer it on the other.**



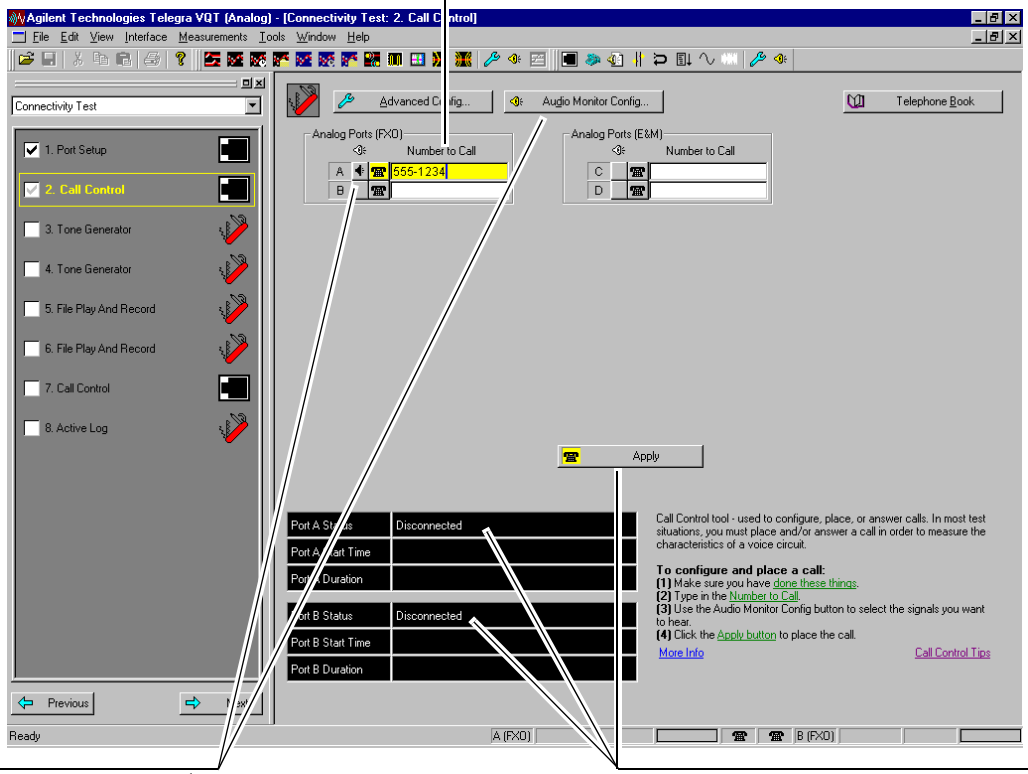




Note: you can open this Help topic from a link in the embedded Help of the Port Setup tool.

You can also access FXO cable wiring and pinout diagrams from this Help topic.

### ③ Open the Call Control tool to set up and place the call through the circuit you intend to test.

Type the telephone number you want to call into the box associated with the port that will place the call. In this example, Port A is placing the call. Remember, the number you type in is the one to which Port B is connected.

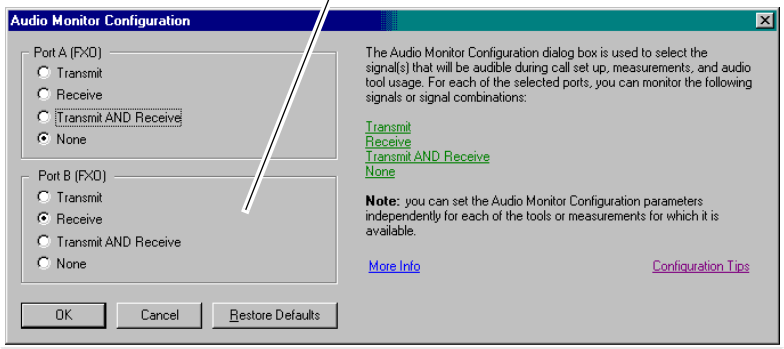



Select the port you want to monitor (in this case Port A). Then click the Audio Monitor Config button and set the parameter to 'Transmit AND Receive'. These two settings allow you to hear the dial tone, the DTMF dialing, and ringing.

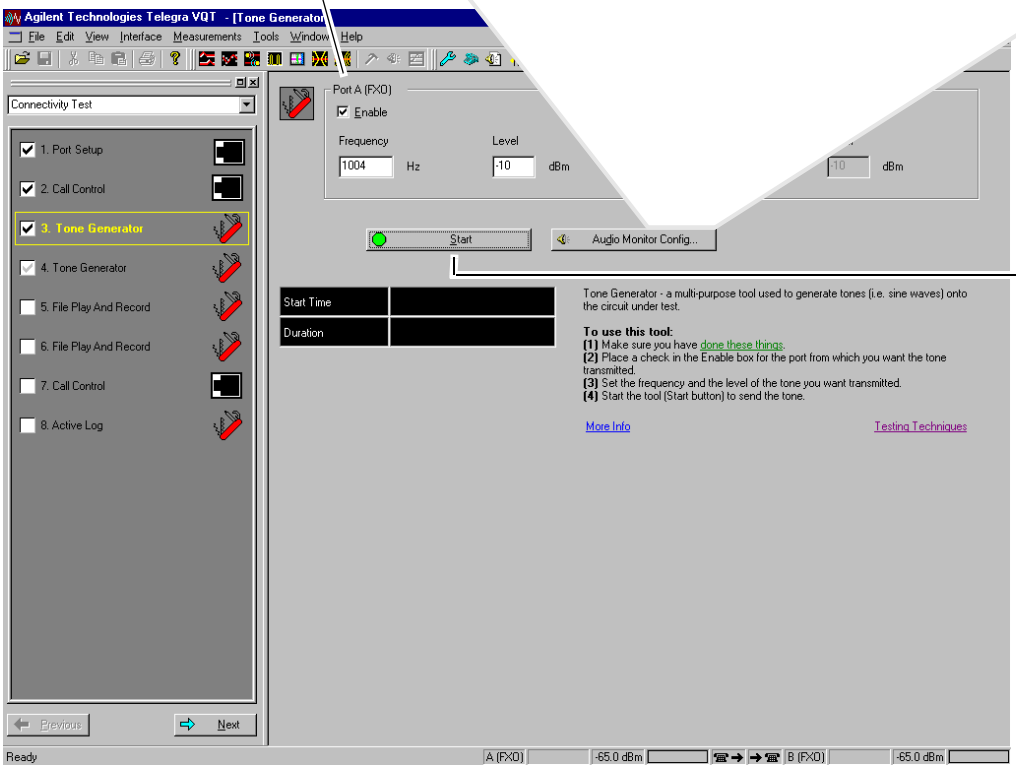
Click the Apply button to place the call from Port A to Port B. Once the call is connected, the telephone icons in the Analog Ports portion of the Call Control tool will go 'off-hook', and the call status will be shown in the status indicators.

④ **Select the next task in the TaskList (Tone Generator). You will use this tool to verify that you have connectivity from port A to port B.**

Set the Audio Monitor for Port A 'None' and Port B 'Receive'. This is so you will hear only the tone received at Port B.

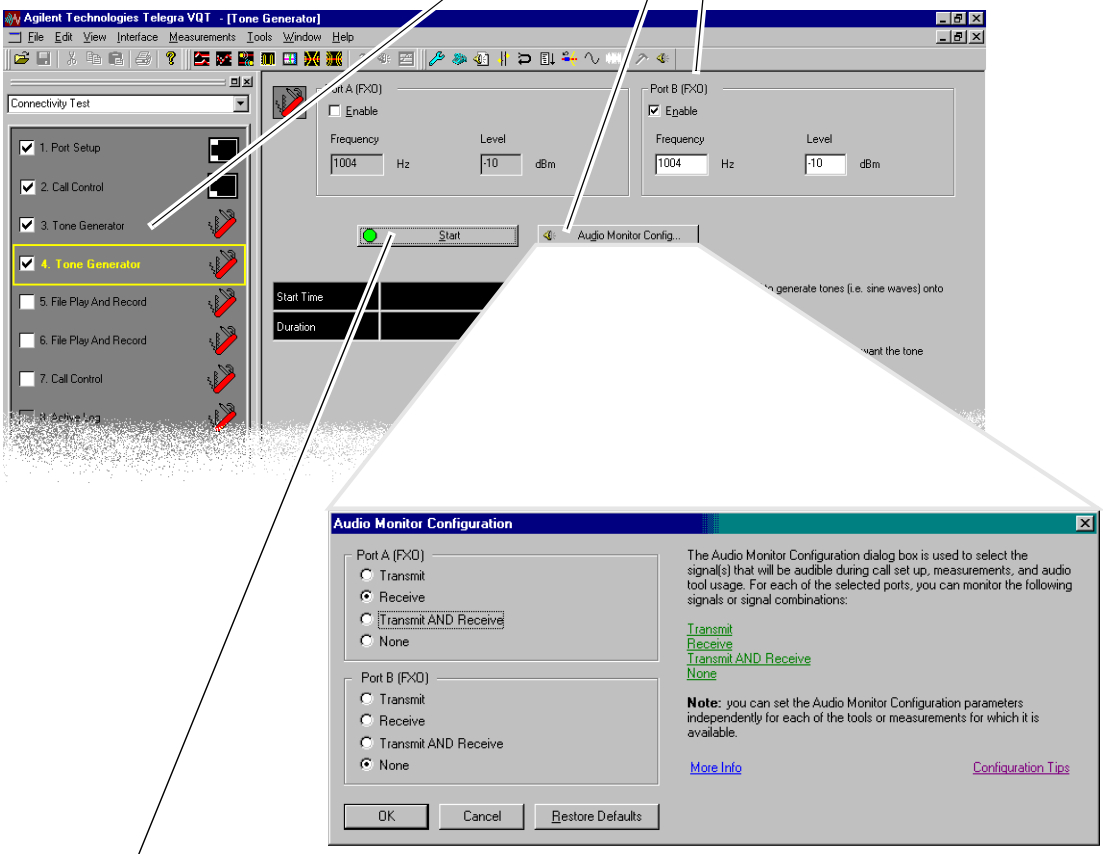



Enable Tone Generator for port A, and set tone configuration parameters.




Start transmitting the tone onto the selected port. When you hear the tone, you know that Port B is receiving it because of the way you configured the Audio Monitor.

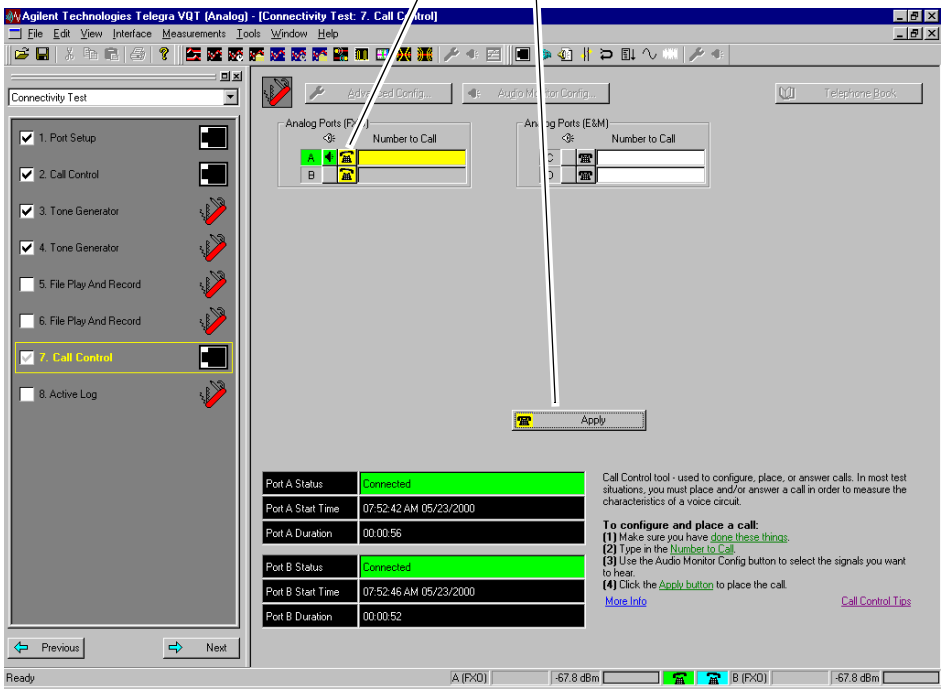
⑤ **Select the fourth task in the TaskList (the second Tone Generator), disable Port A and enable Port B. Similar to the last set of steps,** set the Audio Monitor for Port A to 'Receive' and Port B to 'None'. This is so you will hear only the tone received at Port A.




Start transmitting the tone from Port B. When you hear the tone, you will know that you have connectivity between Port B and Port A because of the way the Audio Monitor is configured.

Up to this point, you have placed a call between Ports A and B, and used the Tone Generator to verify a good connection in both directions between these ports. You could now run a series of measurements to test aspects of this voice circuit. However, the next several steps show you how to disconnect the call, and how to view and save a log of this session. The remainder of this chapter provides examples of setting up and running measurements.

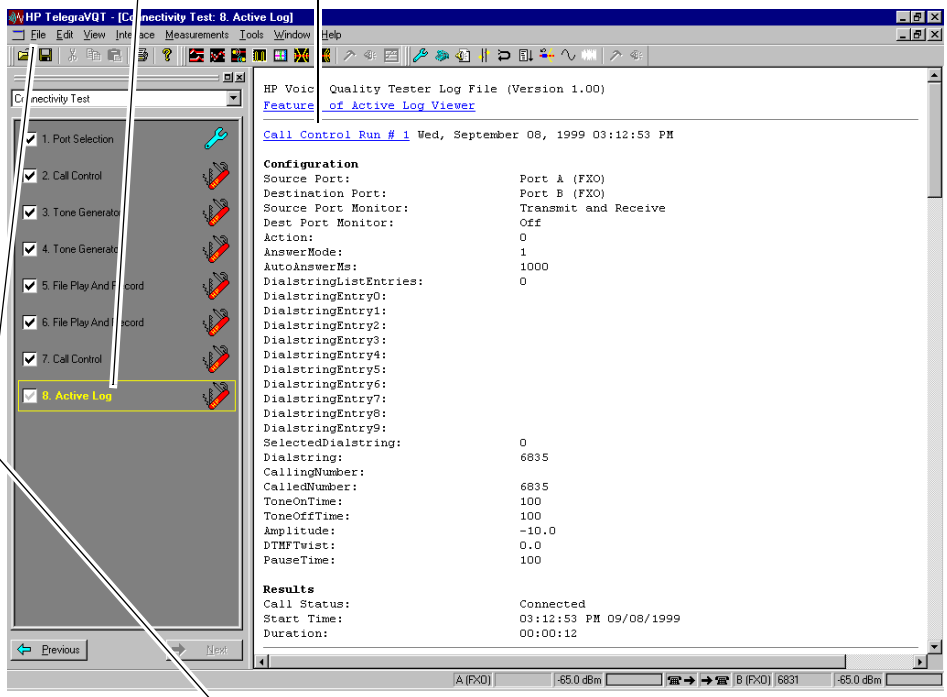
6 To disconnect the call, go to the second Call Control tool in the TaskList Navigator. Click each of the telephone icons to select them for hang-up. Notice that the handsets are 'off-hook' indicating that the call is still in progress, but the background color turns yellow. Click the Apply button to hang up both ends of the connection.



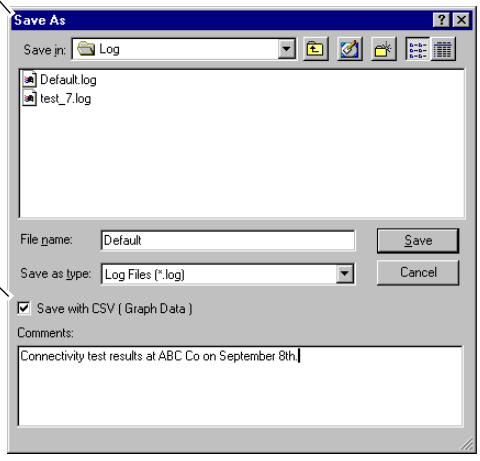

Once you have finished testing, you can review a log of all the set up, call, measurement, and tool tasks performed during this session. This is covered on the next page.

⑦ **Open the Active Log viewer by selecting it in the TaskList Navigator.**

You can scroll through the log to see setup and measurement results. You can also click on the hypertext to open the measurement or tool so that it shows the configuration and data that was recorded in the log.




Save the log using the Save Log option in the File menu. The Save As dialog will be displayed.

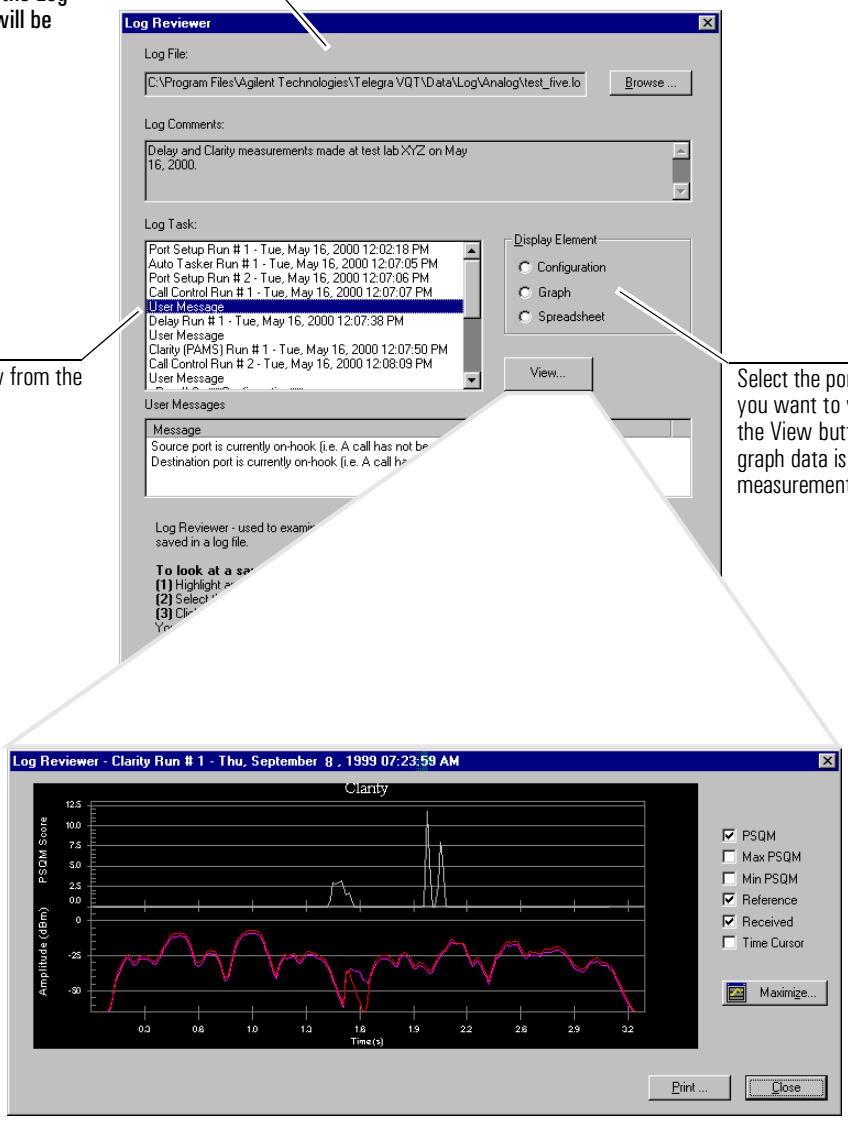



Make sure the Save with CSV option is checked so that graph data will be available when you view the log file later.

⑧ To open a saved log file, use the File menu. Once you select the log file and click the Open button, the Log Reviewer dialog will be displayed.

Select a task to view from the saved test session.

Select the portion of the task you want to view and click the View button. Note: graph data is available for measurements only.



# Measuring Delay and Clarity

This example builds on the last by showing you how to use the Delay and Clarity measurements to gather basic voice quality information about the device or system under test. These are the kinds of measurements you would use to evaluate individual voice-over-packet devices or to test the quality exhibited by an individual call within a larger system. Specifically, this sample test will:

- Show you how to measure the end-to-end delay of the system under test.
- Show you how to measure the voice clarity (using PSQM) of the system under test.

Delay and Clarity are important voice quality metrics in voice-over-packet environments and, therefore, are used in many testing situations.

For the purposes of this example, assume that you need to measure the delay and clarity of a specific voice channel as shown at the beginning of the example on page 3-3. You will place a call from one port to the other through a telephony network or device, and transmit test signals end-to-end.

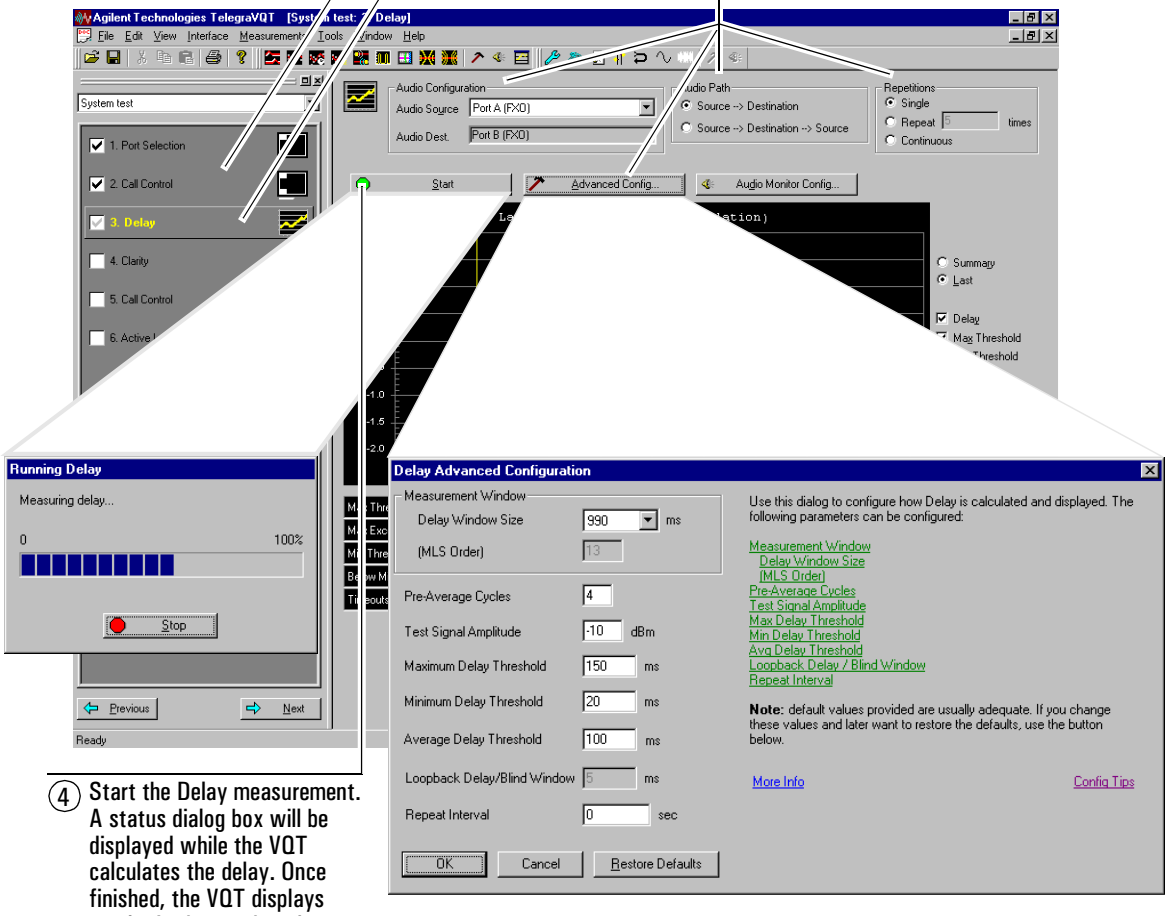
**Note**

Please use the online Help to learn more about Clarity and Delay, general voice quality test concepts and techniques, and the other measurements and tools provided by the VQT.

① Load the TaskList called 'System Test' and then select and configure ports, connect to the system under test, and place a call from port A to port B, as shown in the Sample Test on page 3-3.

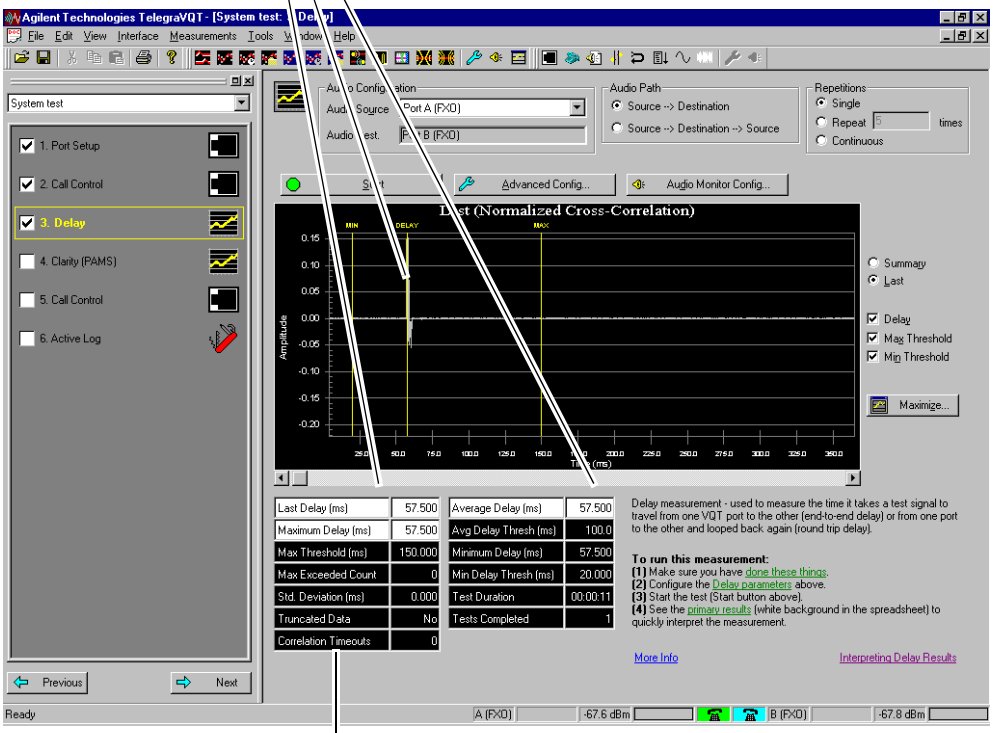
② Open the Delay measurement (shown here).

③ Configure the measurement so that the test signal will pass from port A to port B, the measurement will be end-to-end, and only one measurement will be run. **Also:** open the Advanced Configuration dialog to set measurement thresholds consistent with your test criteria.




④ Start the Delay measurement. A status dialog box will be displayed while the VQT calculates the delay. Once finished, the VQT displays results in the graph and spreadsheet (shown on the next page).

Note that in both the graph and in the spreadsheet, the measured delay is just over 57 milliseconds. This value is well below that which is perceptible to listeners. Also note that no user defined thresholds were exceeded.

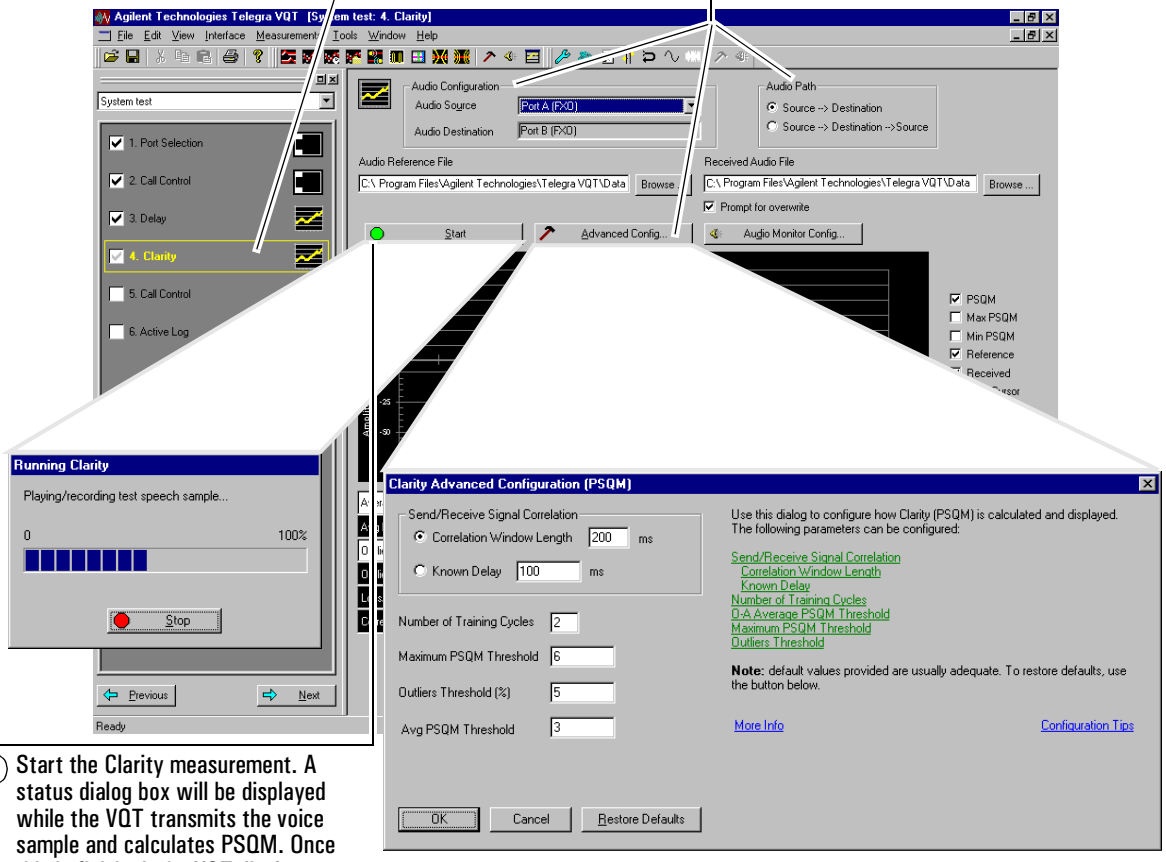



One very important parameter to look at when evaluating measurement results is the Correlate Timeout parameter. If this field is red, it is highly likely that measurement results are invalid. Correlation Timeouts can occur when excessive noise is present on the line or when the call is unexpectedly disconnected. In the example above, the measurement did not timeout.

With the call still connected, you could re-configure the Delay measurement to test the delay in the other direction (Port B to Port A), or for multiple automated runs to gather statistically valid averages. It is often a good idea to run several Delay measurements to thoroughly characterize the behavior of the device or system you are testing.

⑤ Open the Clarity measurement from the TaskList.

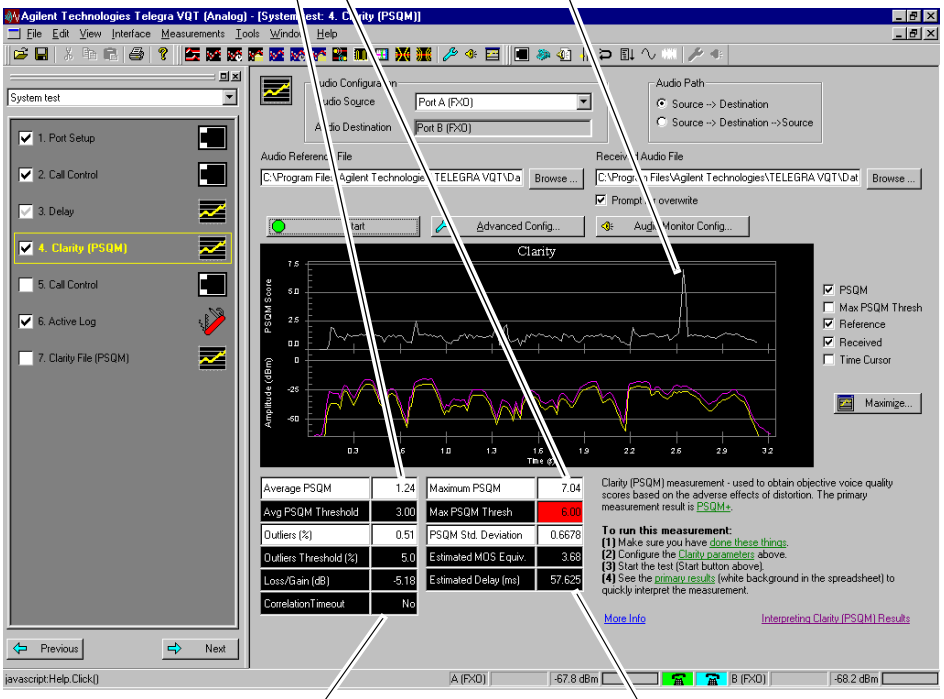
⑥ Configure the measurement so that the test signal will pass from port A to port B and the measurement will be end-to-end.
**Also:** open the Advanced Configuration dialog to set measurement thresholds consistent with your test criteria.




⑦ Start the Clarity measurement. A status dialog box will be displayed while the VQT transmits the voice sample and calculates PSQM. Once this is finished, the VQT displays results in the graph and the spreadsheet (shown on the next page).

Notice that, while the user configured Maximum PSQM Threshold was exceeded and the Maximum PSQM was 7.04 (generally not very good), the Average PSQM was just above 1.2. This probably indicates a good quality voice signal with short periods of perceptible distortion.

The large but narrow PSQM spike might indicate packet loss or some other isolated noise burst that distorted the voice signal for a short period of time.




Notice that the Correlation Timeout parameter shows 'No'. This indicates that the Clarity measurement received the distorted test signal and was able to correlate it with the original test signal.

Notice the delay value of just over 57 milliseconds. This is consistent with the Delay measurement result earlier in this test sequence. This indicates, at first glance, a relatively stable system.

Again, with the call still connected, you could re-configure the measurement to test clarity from Port B to Port A, or you could use the Clarity Trend measurement to run repeated tests to see how clarity varies over time.

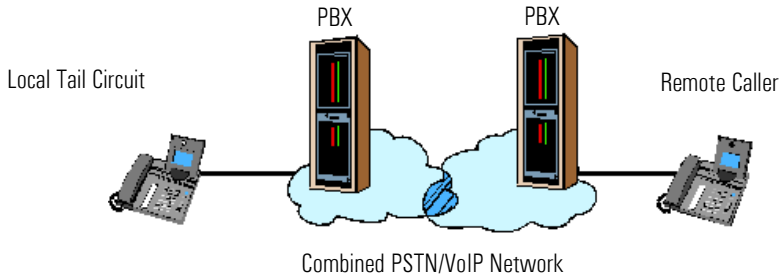
**(8) When you finish testing, hang up the call as shown in the Sample Test that starts on page 3-3. You can also view and save a log of the measurement run (also described in the last Sample Test).**

# Measuring Echo and Verifying Echo Cancellation

This example demonstrates how to use the Echo-PACE measurement to characterize echo on an existing telephony tail circuit. This example describes one of two important test capabilities provided by the Echo-PACE measurement. The other test capability, which involves testing echo canceller performance directly with controllable simulated echo, is described briefly at the end of this example. Specifically, this sample test will:

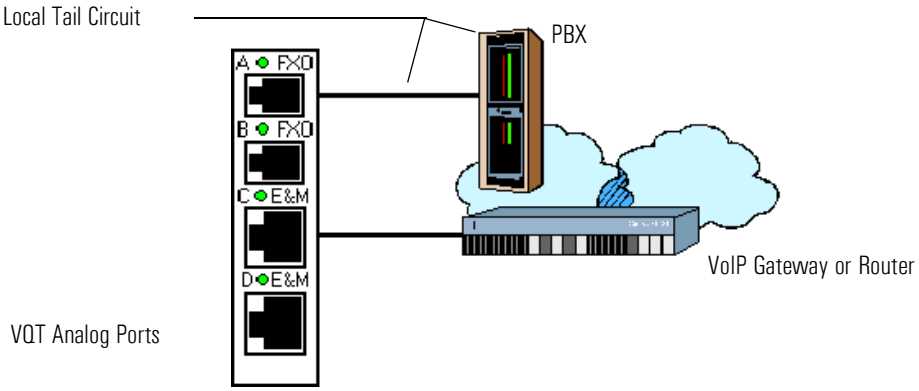
- Briefly describe an environment in which this measurement can be used.
- Show how to set up the VQT to measure existing echo.
- Describe how to read and interpret measurement results.

To set the stage for this example, consider the following illustration. A telephone call can be made between two telephones separated by some type of combined Public Switched Telephone Network (PSTN) and Voice-over-IP (VoIP) network. The only detail of the network that is important to this example is that there is an analog component and a VoIP component.




The 'remote caller' has complained of excessive echo when she calls telephones on a particular local loop. Because of known characteristics of traditional PSTN circuits and how VoIP circuits interact with them, it can be assumed that the echo experienced by the remote caller originates from the local tail circuit. In particular, echo is often caused when a four-wire interface such as E&M is converted to a two-wire interface such as FXO. (Refer to the online Help for more information on this subject.) Using the Echo-PACE measurement, you can measure this echo and obtain objective metrics related to just how annoying or disruptive it is.

The following illustration shows conceptually how you would connect the VQT to measure the echo produced by the local tail circuit and experienced by the remote caller.



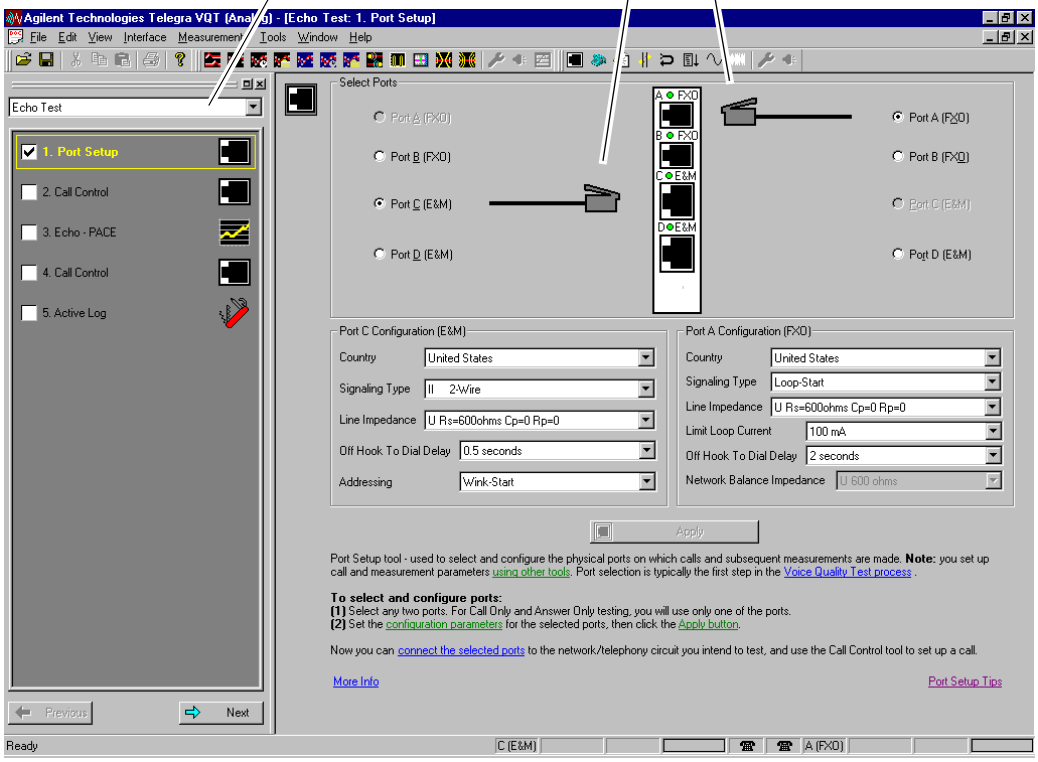

Port C (E&M) is connected to a gateway, router, or PBX that provides calling access to the local tail circuit. The end of the local tail circuit is connected to Port A (FXO). This connection scheme is important because the port what will detect the echo needs to be connected such that echo potentially originating between the gateway or router and the port does not dominate the measurement. Once you make the physical connection shown above, you will place a call from one port to the other to establish the circuit under test.

**Note**

Please refer to the VQT's online Help for more detail on echo, echo cancellation, and the Echo-PACE and Echo-DTalk measurements.

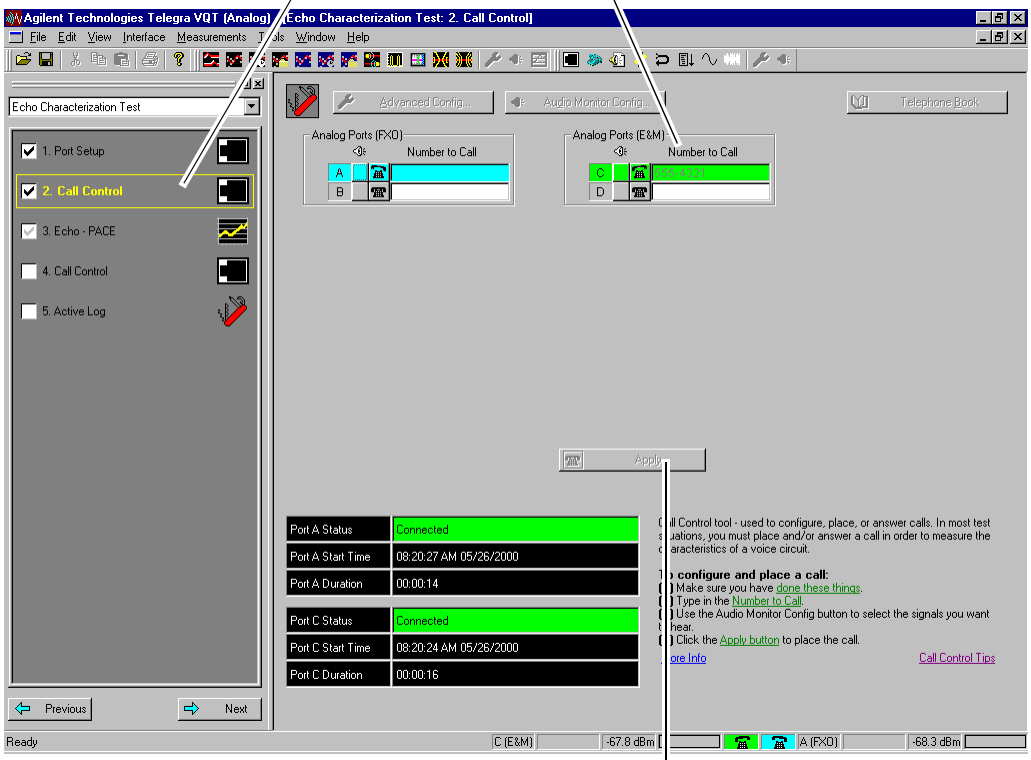
① Load the TaskList called 'Echo Test'. This TaskList is designed to evaluate echo and echo canceller performance. However, Echo-PACE can be part of a more comprehensive TaskList containing Clarity, Delay, or any of the other VQT measurements.

Notice the configuration in the Port Setup tool: Port C (E&M) and Port A (FXO) are selected. You will use Port C as the Audio Source port in the Echo-PACE measurement because this minimizes the chance of near-end echo. Near-end echo can prevent you from analyzing the echo produced by the far-end tail circuit.



② Open the Call Control tool so that you can establish the call between Port C and Port A.

In the Number to Dial box next to Port C, type in the telephone number associated with Port A's FXO connection. Notice that the telephone icon turns yellow indicating that Port C has been selected to place a call. **Note:** do not select Port A to answer - the VQT will answer the incoming call on Port A automatically.



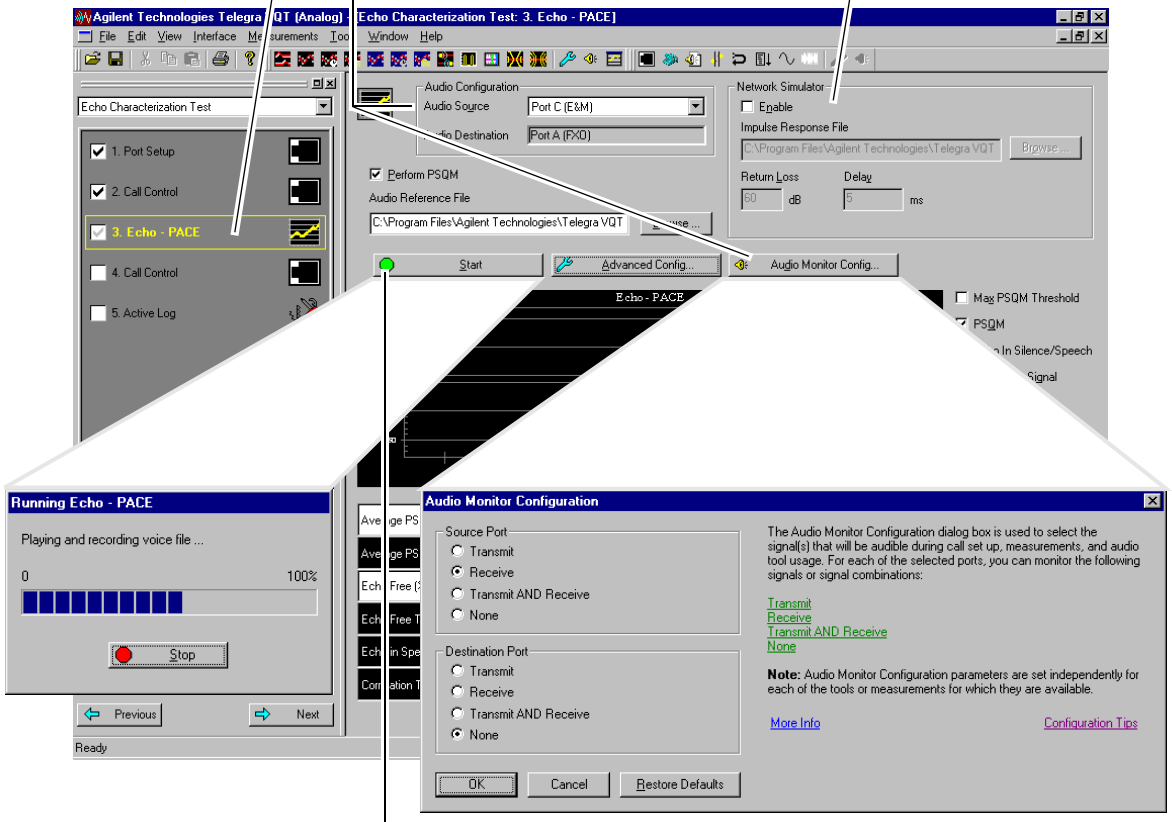

Remember to configure the Audio Monitor as described in the sample test that begins on page 3-3.

③ Click the Apply button to place the call from Port C to Port A. Once the call is connected, the background colors of Ports A and C will turn blue and green respectively and the call status will be shown in the Status Indicators. **Note:** you could also call from Port A to Port C to establish the circuit.

④ Open and configure the Echo-PACE measurement.

Select Port C as the Audio Source port. Port A is automatically selected as the Audio Destination port because of the Port Setup configuration shown in Step 1. Also, configure the Audio Monitor so that you can hear the received signal on the Audio Source port (Port C). This will allow you to hear returning echo if it exists.

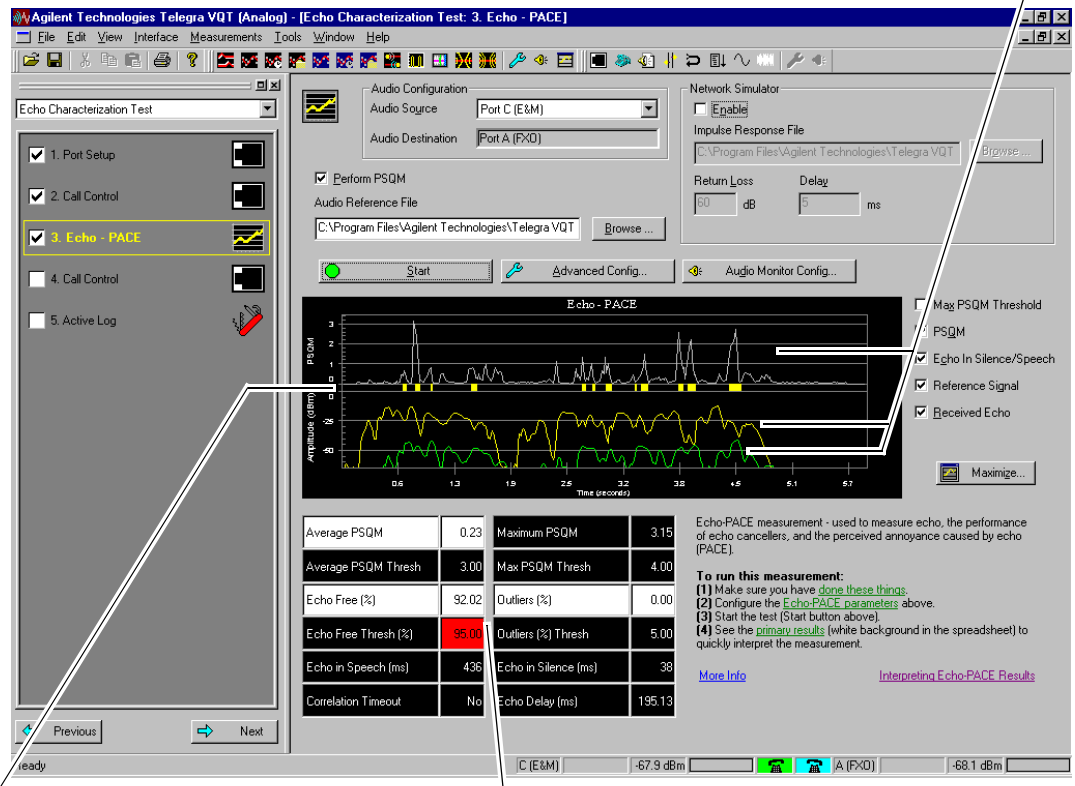
Make sure the Network Simulator is disabled so that the VQT **does not** create and transmit simulated echo from Port A.




⑤ Start the Echo-PACE measurement. Test signals will be transmitted from the Audio Source port, and if or when echo returns, it will be analyzed and results will be displayed in the spreadsheet and the graph. Two examples of measurement results you might see are shown on the next two pages.

⑥ View Echo-PACE results:
This example shows returning echo that has been attenuated by about 20 dB and delayed by just under 200 milliseconds from the original test signal.

In the graph, you can see the original test signal, the attenuated and delayed echo signal, and the corresponding PSQM scores. Notice that PSQM values increase dramatically when the echo signal is strong enough to be considered 'Echo in Speech'.




This band shows where the VQT reports periods of Echo in Speech and Echo in Silence. Echo in Speech and Echo in Silence results depend on user-defined thresholds that determine absolute signal levels and levels relative to the original test signal.

The results in the spreadsheet and graph show that the Average PSQM is very low with a few isolated spikes. And while the Echo in Speech threshold was exceeded, most of the test signal (92%) was not interfered with by echo. These measurement results can be explained by either a strong echo return loss in the tail circuit or an echo canceller that is performing well. In either case, echo of this magnitude would probably not cause much annoyance to a caller.

⑦ View Echo-PACE results:
This example shows a returning echo signal that has been attenuated by only a few dB and is delayed by about 150 milliseconds.

Notice that, in this case, the echo signal's level is much closer to the original test signal.


The VQT reports much more Echo in Speech and Echo in Silence when the returning echo's level is not attenuated much in relation to the test signal. Also notice that sharp increases in PSQM are more prevalent.

The Average PSQM is higher than in the example on the previous page, and a larger percentage of the test signal was interfered with by the echo signal. The higher PSQM scores and larger Echo in Speech values indicate that a caller is likely to consider this echo annoying and disruptive. Inadequate echo return loss or a malfunctioning echo canceller could be the cause.

Once you finish testing, you can hang up the call and view logged measurement results as described in previous sample tests. The next page describes other echo measurement options the VQT provides.

## Other Echo Measurement Strategies

The previous example showed how to measure existing echo and how to interpret Echo-PACE results when echo characterization is the goal. The VQT provides other echo measurement options:

- When you need to test an echo canceller directly (either in a lab or other tightly controlled environment), you can introduce simulated echo using the Echo-PACE measurement's Network Simulator. In this case, you would use E&M connections at both ends of the call so that the possibility of 'naturally' occurring echo is minimized. One of the VQT's ports (the Audio Destination port) acts as an analog tail circuit such that a simulated echo signal constructed from the original test signal is looped back towards the Audio Source port. The echo canceller located closest to the destination port attempts to cancel the echo. Echo that is not cancelled arrives at the Source port and is analyzed as shown in the previous example. You can control the echo delay and level of the simulated echo to verify echo canceller performance and thresholds.
- Echo cancellation in the presence of double-talk (interrupting voice signals originating from the same tail circuit as the echo) is a potential failure mode for echo cancellers. The Echo-DTalk measurement can be used similar to the example above to inject interrupting vocal phrases while the echo canceller is attempting to eliminate legitimate echo. This test option is best performed in a lab or other tightly controlled test environment.

Please refer to the VQT's online Help for more information about these two echo measurement options.

# A

# Specifications/Operating Conditions

# Specifications/Operating Conditions

## FXO/E&M Card Specifications

### FXO Ports

Guaranteed accuracy of transmission or reception of a sine wave is plus or minus 1 dBm across the following conditions:

300 Hz to 3200 Hz
-3 dBm to -50 dBm
USA 600 ohms impedance, USA 900 ohms impedance.

Typical accuracy is plus or minus 0.3 dBm from 500 Hz to 3000 Hz.

### E&M Ports

Guaranteed accuracy of transmission or reception of a sine wave is plus or minus 1 dBm across the following conditions:

300 Hz to 3200 Hz
-3 dBm to -45 dBm
Standard 600 ohms impedance, Standard 900 ohms impedance.

Typical accuracy is plus or minus 0.3 dBm from 500 Hz to 3000 Hz.

**FCC Part 68 Disclaimer**

This equipment must not be connected to the telephone network unless it is connected through protective circuitry that is registered pursuant to Part 68 of the Federal Communications Commission rules.

# Operating Conditions

| | | |
|---|---|---|
| **Temperature** | Operating<br>Non-operating | +5°C to +40°C (+41°F to +104°F)<br>-40°C to +70°C (-40°F to +158°F) |
| **Humidity** | Operating | 5% to 93% relative humidity, non-condensing |
| | Non-Operating | 5% to 93% relative humidity, non-condensing |
| **Altitude** | Operating<br>Non-Operating | -305 to 4570 meters (-1000 to 15,000 feet)<br>-460 to 12,200 meters (-1500 to 40,000 ft) |
| **Power Requirements** | External: | 115/230 V~, 50-60 Hz, 4/2 A |

# B

# Declaration of Conformity

# Declaration of Conformity

## DECLARATION OF CONFORMITY

According to ISO/IEC Guide 22 and CEN/CENELEC EN 45014

**Manufacturer's Name**: Agilent Technologies, Inc.

**Manufacturer's Address:** Network Systems Test Division (NSTD)
Colorado Springs, CO 80919-2497
USA

Declares that the product:

**Product Name:** VQT undercradle for Agilent Advisor

**Model Number:** J4630A

**Product Options:** This declaration covers all options of the above product.

Conforms to the following product standards:

EMC:

| Standard | Limit |
|---|---|
| CISPR 11:1990 / EN 55011-1991 | Group 1, Class A |
| EN 50082-1:1992 | |
| IEC 801-2:1991 | 4 kV CD, 8 kV AD |
| IEC 801-3:1984 | 3 V/m, 80 - 1000 MHz |
| IEC 801-4:1988 | 0.5 kV sig. lines, 1 kV power lines |

Safety: IEC 1010-1:1990 + A1 + A2 / EN 61010:1993

**Conformity / Supplementary Information:**

The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC and carries the CE-marking accordingly.

Colorado Springs, CO, USA 15 September, 2000

Hamish Gray, Quality Manager

# C

# Software Recovery

# Software Recovery

In some cases, it may be necessary to re-install the application onto the Agilent Advisor. For example, if important system files have been accidentally deleted or have become corrupted, the VQT Undercradle will not operate correctly and the only solution is to re-install the software. Make sure to use Agilent Advisor software, Version 11.5 or higher.

This appendix provides installation and configuration instructions to recover the VQT application. Please call your technical support representative if you have problems with this process.

## Re-install the Application

1 Attach a CD-ROM drive to the Agilent Advisor.

2 Insert the Application CD into the CD-ROM drive.

3 Click the Start button in the Windows desktop, and select Run.

4 In the Open box, type: `D:\setup.exe` and click the OK button. The drive letter may be something other than 'D'. Use Windows Explorer to determine the drive letter if necessary.

5 It is recommended that you accept all defaults in the dialogs that are displayed during the installation process.

6 When the installation process is complete, remove the CD from the drive and restart the computer.

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