ACTS - Advanced Communication Test System Software

OPERATION MANUAL

TRILITHIC
INNOVATIVE ENGINEERING

Trilithic Company Profile

Trilithic is a privately held manufacturer founded in 1986 as an engineering and assembly company that built and designed customer-directed products for telecommunications, military and industrial customers. From its modest beginnings as a two-man engineering team, Trilithic grew over the years and broadened its offerings of RF and microwave components by adding broadband solutions to its product line. This was accomplished with the acquisition of components manufacturer Cir-Q-Tel and instruments manufacturer Texscan.

Today, Trilithic is an industry leader providing telecommunications solutions for major broadband, RF and microwave markets around the world. As an ISO 9000:2001 certified company with over 40 years of collective expertise in engineering and custom assembly, Trilithic is dedicated to providing quality products, services and communications solutions that exceed customer expectations.

Trilithic is comprised of five major divisions:

- **Broadband Instruments and Systems**
  Offers test, analysis, and quality management solutions for the major cable television systems worldwide.

- **Telecom Solutions**
  Offers affordable, easy-to-use instruments for testing and measurement of Telecom networks.

- **RF Microwave Components**
  Provides components and custom subsystems for companies specializing in cellular, military, and other wireless applications.

- **Emergency Alert Systems**
  Leading supplier of government-mandated emergency alert systems used by broadcast TV, cable TV, IPTV, DBS, and radio stations.

- **XFTP**
  Offers a specialty line of field technical products for cable operators and technicians, as well as a line of products for installing electronics in the home of the future.providers.

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1. <u>General Information</u>

Helpful Website

The following website contains general information which may be of interest to you:

http://www.trilithic.com

Trilithic's website contains product specifications and information, tips, release information, marketing information, Frequently Asked Questions (FAQs), bulletins and other technical information. You can also check this website for product updates.

Where to Get Technical Support

Trilithic technical support is available Monday through Friday from 8:00AM to 5:00PM EST. Callers in North America can dial 1-317-895-3600 or 1-800-344-2412 (toll free). International callers should dial 1-317-895-3600 or fax questions to 1-317-895-3613. You can also e-mail technical support at *techsupport@trilithic.com*.

For quicker support response when calling or sending e-mail, please provide the following information:

- Your name and your company name

- The technical point of contact (name, phone number, e-mail)

- The version of Windows you are using (including any Service Packs and Patches)

- A detailed description of the problem you are having, including any error or information messages

How this Manual is Organized

This manual is divided into the following chapters:

- Chapter 1, "General Information" provides Trilithic contact information and describes how this Operation Manual is structured.

- Chapter 2, "Introduction" describes how to and introduces what the ACTS software is and what it does.

- Chapter 3, "ACTS Software Installation & Configuration" describes how to install and configure the ACTS software.

- Chapter 4, "860 DSPi Configuration & Operation" describes how to setup the 860 DSPi to communicate with the ACTS software.

- Chapter 5, "Specifications" shows the technical specifications of the ACTS software.

Conventions Used in this Manual

This manual has several standard conventions for presenting information.

- Connections, Menus, menu options, and user entered text and commands appear in **bold**.

- Section names, Web and email addresses appear in *italics*.

Note: A note is information that will be of assistance to you related to the current step or procedure.

CAUTION: A caution alerts you to any condition that could cause a mechanical failure or potential loss of data.
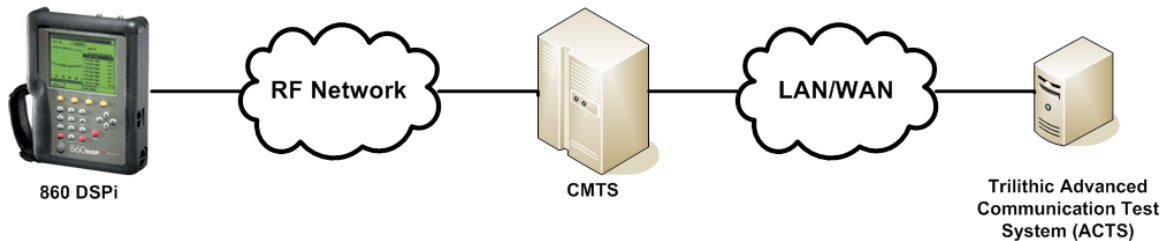
WARNING: A warning alerts you to any condition that could cause personal injury.

2. <u>Introduction</u>

Overview

The Advanced Communication Test System (ACTS) software is used to provide VoIP and High Speed Throughput test support for the 860 DSPi. The following diagram shows a typical connection between an 860 DSPi and the ACTS software.

Features

The following features are provided when using the ACTS software with the 860 DSPi :

<u>VoIP Test Support</u>

The **VoIP** Mode of the 860 DSPi tests the various measurable parameters that impact call quality, and provides measurement results to test proximity to potential failure. The 860 DSPi connects to the server using TCP port 24007. The 860 DSPi and the ACTS software synchronize their clocks as well as negotiate the test parameters specified in the **INSTRUMENT SETUP** Mode of the 860 DSPi. The ACTS software and the 860 DSPi then communicate using RTP over the UDP protocol on Port 24009. Once all of the packets are transmitted and received by both the ACTS software and the 860 DSPi, the results are calculated and compared to the pre-configured test limits.

<u>HTTP Test Support</u>

The HTTP test on the 860 DSPi allows the user to test upstream data paths up to about 8 Mbps and downstream data paths up to about 5 Mbps. The test uses the TCP port selected by the user (default = 80). The measured throughput speed is limited for the HTTP throughput test by the network layer level acknowledge packets that the TCP protocol requires.

TFTP Test Support

The TFTP test on the 860 DSPi allows the user to test upstream and downstream data paths up to about 5 Mbps. The test uses the UDP port selected by the user (default = 69). The measured throughput speed is limited for the TFTP throughput test by the application layer level acknowledge packets that the TFTP protocol requires. Because the acknowledge packets are processed at the application layer, TFTP transfers are generally slower than HTTP transfers.

High Speed Throughput Test Support

The **THRU PUT** Mode on the 860 DSPi allows the user to test upstream data paths up to 100 Mbps and downstream data paths up to 150 Mbps. The 860 DSPi connects to the server using the UDP port selected by the user (default = 28657). The packet contains test parameters and security information to ensure that only 860 DSPi's can initiate a test. Once the test packet is verified as authentic, the throughput test packets are transmitted or received using the 860 DSPi's UDP source port. This is a valuable tool for verifying provisioning as well as bandwidth availability at customer homes or at key test points in the system. The **Ethernet Communications Option (CI-4 or CI-5)**, is required for throughput speeds greater than 10 Mbps.

Increased Security

By using the ACTS software, you can greatly increase the security of your network.

- No files are created or destroyed. Other HTTP and TFTP server applications create files on the server or fetch files from the server. The ACTS software fills its transmitted test packets with random data and discards any data received from test packets.

- Customizable Ports. By allowing the user to not use well known internet ports like Port 80 and Port 69 which expose the servers to hackers, the ACTS software can be made difficult to find by the hacker community.

3. <u>ACTS Software Installation & Configuration</u>

System Requirements

Once you have made sure that your system meets the following minimum requirements, you're ready to install the ACTS software.

- 1 GHz Pentium-IV or upward compatible CPU

- 1 GB RAM

- 100 MB free disk space

- Windows 2003 Professional or Server or Windows XP

- 10/100/1000 Network Interface Card

> **Note:** Be sure to check the CD for release notes that may affect the installation and configuration process!

Because the 860 DSPi High Speed Throughput test uses a proprietary protocol, the ACTS software is required to properly utilize this test on the 860 DSPi. Because the ACTS software may need to send multiple high speed data streams simultaneously, best results will be achieved when the ACTS software is placed on a high speed connection (1 Gbps recommended) to the CMTS.

Once the ACTS software is properly installed, it runs as an automatically started service when the system boots. The ACTS software services are time sensitive, so the ACTS software requires and takes priority over other server traffic. The ACTS software should be installed either stand alone on the server or it can be installed on any server in the system that does not run other time sensitive services.

The IP address of the server that the ACTS software is installed on must be within the range of the 860 DSPi that is performing the test, if not, then the server must have a routable IP address. Once the IP address for the server is determined and configured, the 860 DSPi that will be performing the test using the ACTS software must be configured to test at that IP Address.

Installation Instructions

To install the ACTS software, perform the following steps:

1. Depending on the operating system you are installing the ACTS software on, you may need to log on as the local administrator.

    > **Note:** Check with your network or systems administrator if you're not sure about your current login account permissions.

2. Insert the ACTS software CD in the appropriate drive.

3. If you have Autorun enabled for the CD-ROM drive, the ACTS software setup program will start automatically. Otherwise, select the **Start** button then select **Run**, and type [*drive*]:\TrilithicACTSSetup.exe, then select the **OK** button. (Substitute the appropriate drive path in the command.)

4. The "Welcome to the InstallShield Wizard for Trilithic Advanced Communication Test System (ACTS)" screen appears, select the **Next >** button to proceed to the next step of the installation wizard.
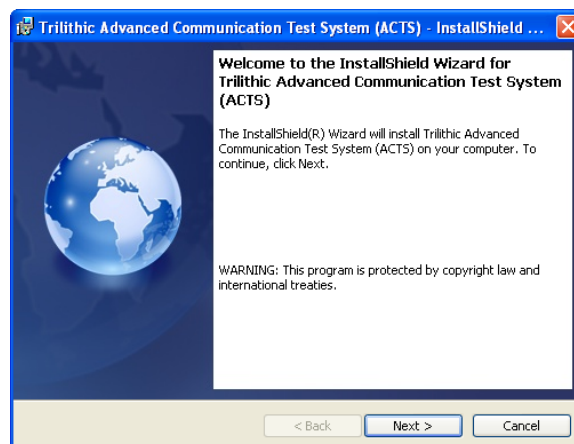
> **Note:** To cancel the installation of the ACTS software at any time during the installation, select the **Cancel** button.

5. The "Ready to Install the Program" screen appears. Select the **Install** button to start the software installation.
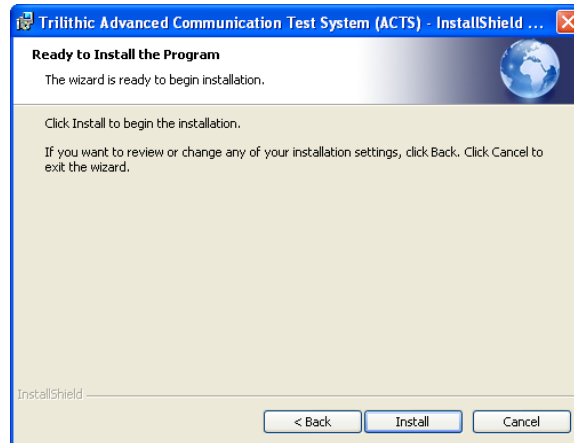
6. The "Installing Trilithic Advanced Communication Test System (ACTS)" screen will appear momentarily to indicate the status of the software installation.
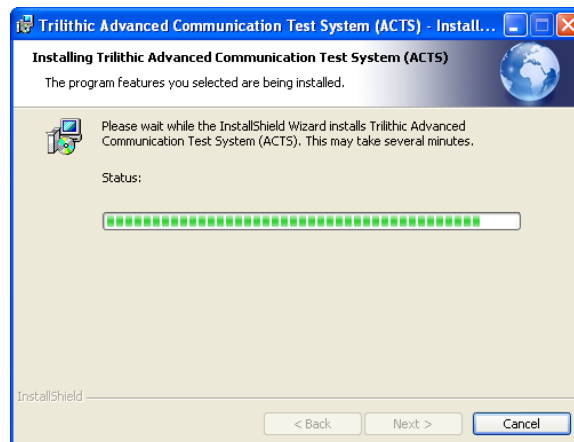

7. The "InstallShield Wizard Completed" screen will appear. To start the ACTS software upon exiting the installation wizard, select the **Launch the Trilithic ACTS Configurator** checkbox, and then select the **Finish** button to exit. The ACTS software is now installed.

Software Activation

Once you have installed the ACTS software, start the software by selecting the **Start** button, hover over "All Programs" and then "Trilithic", and then select the **ACTS Configurator** software icon.

Once the ACTS Configurator software starts, the window shown to the right will be displayed. The ACTS software must be activated with Trilithic within 30 days after initial installation, otherwise the software will no longer function. To activate the ACTS software, perform the following steps:

1. Select the **Activate Now** link. The "Trilithic Product Activation" screen will appear.

2. Enter the **Product Key** that is located on the back of the CD case in which your product was shipped, or was provided to you at the time of download.

3. Obtain your **Registration Key** by calling Trilithic at 1-800-344-2412 (toll free).

4. Enter your **Registration Key** and then select the **OK** button.

5. Your ACTS software should now be activated.
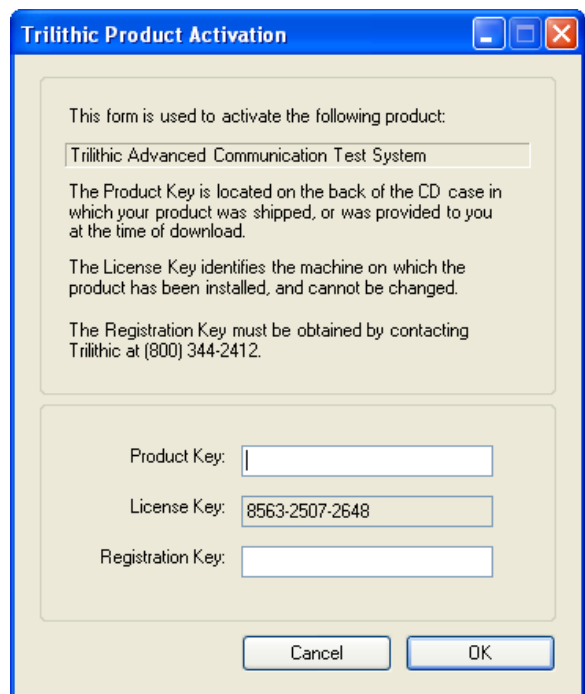
Server Configuration

The configuration of the ACTS software is a simple process that consists of enabling and disabling the individual test servers as well as setting the corresponding communication port. To enable or disable the individual test servers, select the corresponding checkbox.

You should adjust the communication ports associated with each test server so that you prevent any conflicts with other services running on the same server and to provide additional security against hackers using well known internet ports like Port 80 and Port 69.

> **Note:** Since the 860 DSPi is configured to perform the VoIP test on Port Number 24007, the default VoIP Server Port Number is 24007 and it cannot be changed. The Port Number of the VoIP server is provided so you can properly configure your firewall settings in the next section.
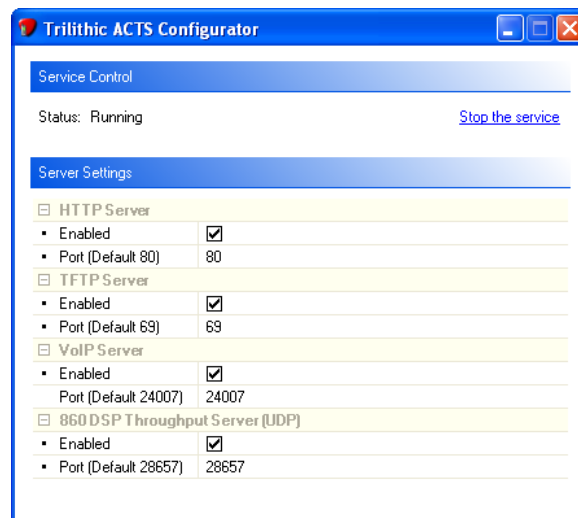
Once you have finished making configuration changes, you must select the **Apply changes and re-start the service** link before the changes will take affect. The **Status:** field will momentarily indicate **StartPending** and then change to **Running**.

Since the ACTS software runs as an automatically started service when the system boots, you may manually disable all servers by selecting the **Stop the service** link. The **Status:** field will momentarily indicate **StopPending** and then change to **Stopped**.

To re-enable all of the servers, simply select the **Start the service** link. The **Status:** field will momentarily indicate **StartPending** and then change to **Running**.

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Firewall Configuration

If you are using a Windows Firewall on your server, you will need to allow communication through the TCP and UDP ports that correspond to your ACTS software configuration.

> **Note:** Windows Firewall is used for illustration purposes only. The same configuration settings will apply to any other firewall software, though the configuration steps may be different.

To adjust your Windows Firewall settings, perform the following steps:

1. Press the **Start** button and select the **Control Panel** icon. The "Control Panel" screen will appear.

2. Select the **Windows Firewall** icon. The "Windows Firewall" screen will appear.

3. Select the **Exceptions** tab as shown in the figure to the right.

4. Enter a name to describe the exception, the port number that corresponds to your ACTS software configuration, and the type of port you are making an exception for. The following are the default port setting, some of which can be changed in the ACTS software:

   • HTTP Server: TCP port 80

   • TFTP Server: UDP port 69

   • VoIP Server: TCP port 24007, UDP port 24009

   • 860 DSP Throughput Server: UDP port 28657

5. Select the **OK** button to save you changes, or select the **Cancel** button to exit without saving your changes.

6. Repeat this process for each type of server that you enabled in the ACTS software.
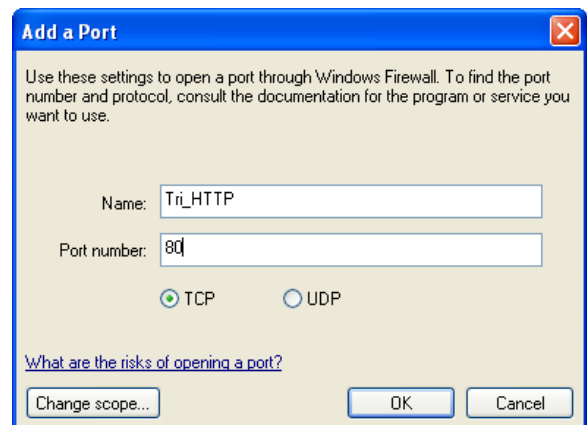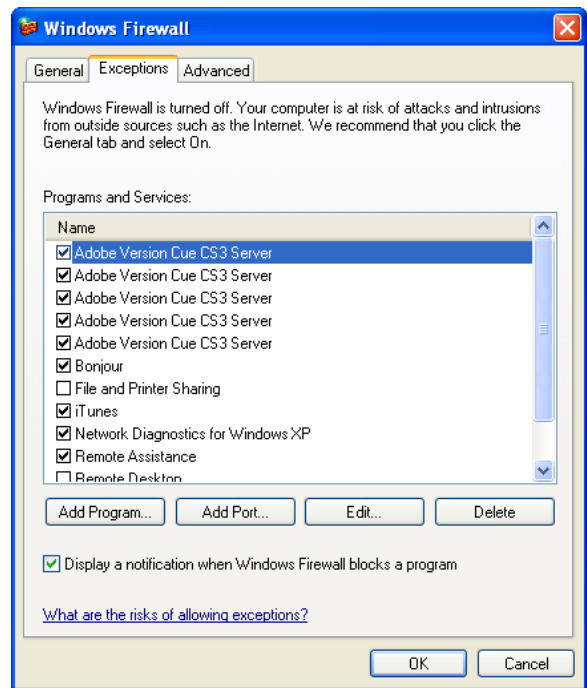
4. 860 DSPi Configuration & Operation

Overview

The 860 DSPi performs all of its communication with the ACTS software using the **VoIP** and **THRU PUT** Modes and these modes communicate with the following servers:

- VoIP Mode: VoIP Server

- THRU PUT Mode: HTTP, TFTP, and 860 DSP Throughput Servers

The following sections will explain how to use the 860 DSPi modes listed above to communicate with the ACTS software.

VoIP Mode

The **VoIP** Mode of the 860 DSPi tests the various measurable parameters that impact call quality, and provides measurement results to test proximity to potential failure. The test utilizes the TCP protocol to establish a connection to the ACTS software on Port 24007. The 860 DSPi and the ACTS software synchronize their clocks as well as negotiate the test parameters specified in the **INSTRUMENT SETUP** Mode of the 860 DSPi. The ACTS software and the 860 DSPi then communicate using RTP over the UDP protocol on a Port 24009. Once all of the packets are transmitted and received by both the ACTS software and the 860 DSPi, the results are calculated and compared to the pre-configured test limits.

To use the VoIP test, perform the following steps:

1. Enter the IP address of the server that the ACTS software is installed on in the **Server IP** field.

2. To begin the VoIP test, select the ⬚ Start ⬚ softkey.

3. The 860 DSPi will display the progress of the VoIP test on the bar graph.

When the test is complete, the 860 DSPi will display the upstream and downstream results for Latency, Jitter, and MOS. The "P" or "F" next to the upstream and downstream results indicates the Pass or Fail status of the test.
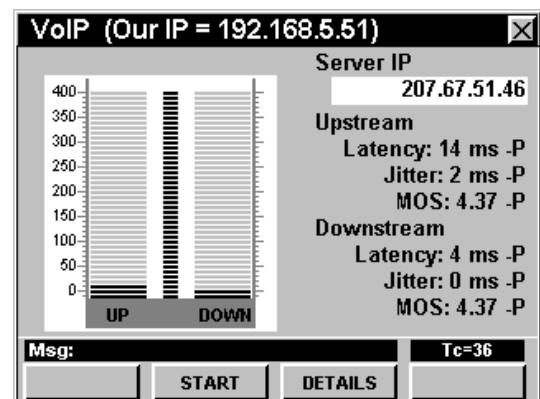
To view detailed results of the VoIP test, press the Details softkey. The **RESULTS** Window will be displayed as shown in the figure to the right.

If you are using the Unsolicited Grant Service (UGS), and you wish to declare the test connection as a high priority test channel to provide a high priority service flow for the duration of the test, press the (Fn) button, use the (▲) (▼) buttons to highlight **High Priority On/Off**, and then press the (Ent) button. You may also select **High Priority On/Off** by pressing (5).
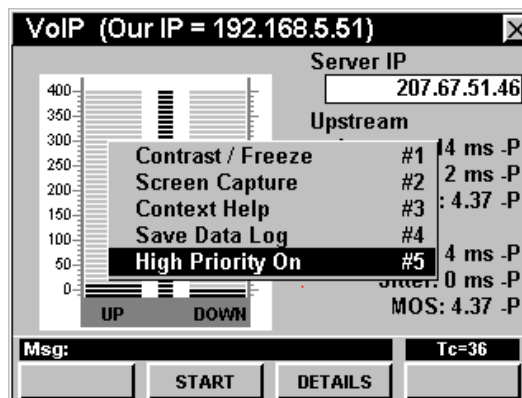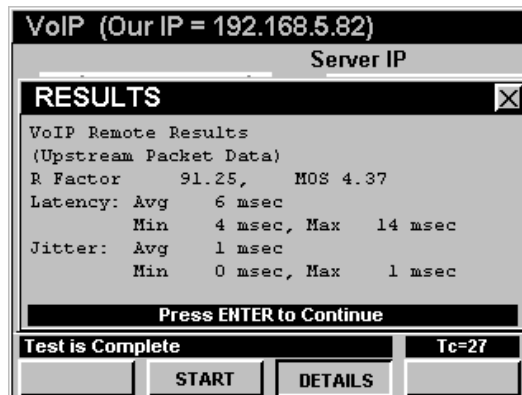
THRU PUT Mode

The **THRU PUT** Mode on the 860 DSPi allows the user to test upstream data paths up to 100 Mbps and downstream data paths up to 150 Mbps. This is a valuable tool for verifying provisioning as well as bandwidth availability at customer homes or at key test points in the system. The basis for this test is the **Ethernet Communications Option (CI-4 or CI-5)**.

The menus of the 860 DSPi automatically adapts to user options and installed hardware. The following configurations are available on the 860 DSPi.

- If you do not have the high speed throughput option, then you will only be allowed to run the HTTP and TFTP tests.

- If you have the high speed throughput option and the **Ethernet Communications Option (CI-1, CI-2, or CI-3)**, then you will be allowed to run the HTTP, TFTP, and UDP tests, but at a restricted rate of 10 Mbps.

- If you have the high speed throughput option and the **Ethernet Communications Option (CI-4 or CI-5)**, then you will be allowed to run all of the tests at all possible rates.

To determine which Ethernet Communications Option (CI-1, CI-2, CI-3, CI-4, or CI-5) is installed in your 860 DSPi and whether you have the high speed throughput option installed, perform the following steps:

1. Go to the **SETUP** Menu of the 860 DSPi and select the **INSTRUMENT INFORMATION** Mode.

2. From the **INSTRUMENT INFORMATION** Mode, highlight **NET Option Info**. The screen shown to the right will be displayed.

3. The **Ethernet Communications Option** will be shown on the first line. If this displays **YES (CI-4)** or **YES (CI-5)** you can perform all tests at all possible rates. If this displays any other options you will be limited to the test modes and rates listed above.

4. The high speed throughput option will be shown on the last line. If this displays **YES**, then this option has been installed.
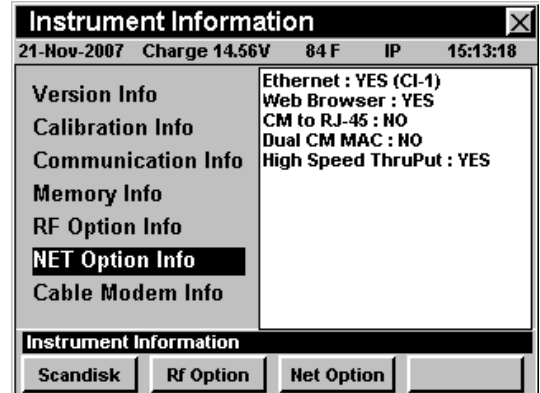
> **Note:** For more information on how to obtain hardware upgrades and install options, see the 860 DSP & 860 DSPi Operation Manual.

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To use the high speed throughput test, perform the following steps:

1. Enter the IP address of the server that the ACTS software is installed on in the **Server IP** field.

2. To set the HTTP, TFTP, or UDP port number, press the (Fn) button, use the (▲) (▼) buttons to highlight **Change XXXX Port** (where XXXX is HTTP, TFTP, or UDP), and then press the (Ent) button.

3. The **Function** Menu will close and the **Change XXXX Port** Window will open. Enter the port number that was entered when configuring the ACTS software using the alphanumeric keypad, and then press the (Ent) button.

4. Repeat Steps 2 and 3 until you have configured all of your desired communication ports.

5. To run an upstream or downstream test, select the corresponding softkey, use the (▲) (▼) buttons to highlight the desired test, and then press the (Ent) button.

As the test progresses, the status will be displayed on the bar graph.

Once the test is complete, the upstream or downstream rate will be displayed at the bottom of the screen.
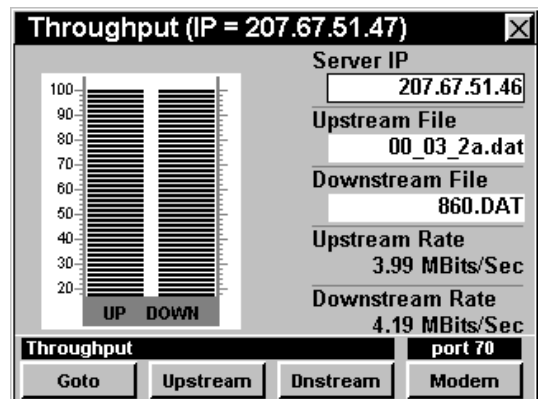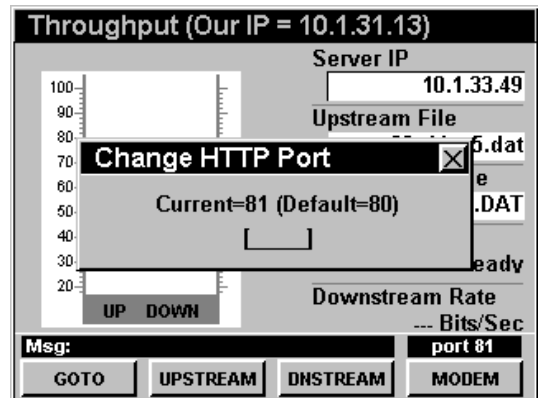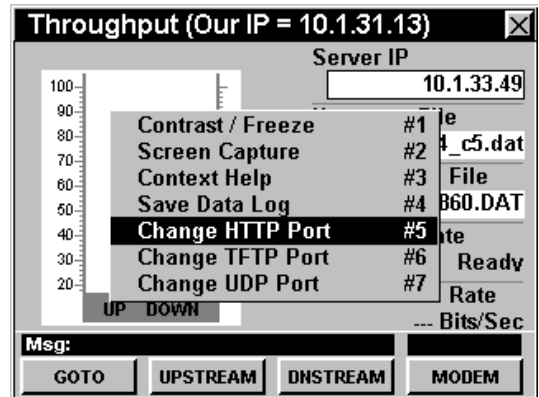
5. <u>Specifications</u>

Supported Test Modes

The ACTS software supports the following modes:

- VoIP RTP Test (with and without UGS)
- Throughput TFTP Upstream and Downstream
- Throughput HTTP Upstream and Downstream
- Throughput UDP Upstream and Downstream
- Throughput UDP High Speed Upstream

Maximum Supported Connection Speeds

The following connection speeds apply to ACTS software Version 2.1.1.0 or greater.

<u>Upstream</u>

Connection Type	TFTP	HTTP	UDP 10 Mbps	UDP 100 Mbps
RJ-45	5.5 Mbps	7.43 Mbps	9.62 Mbps	N/A
DOCSIS 2.0 Cable Modem	1.64 Mbps	7.43 Mbps	8.51 Mbps	N/A
DOCSIS 3.0 Cable Modem with 4 Bonded Channels	1.64 Mbps	7.43 Mbps	8.51 Mbps	93.56 Mbps
Wi-Fi with Router in DMZ Mode	2.4 Mbps	5.47 Mbps	7.37 Mbps	N/A

Note 1: If the CI-1, CI-2, or CI-3 communication interface is installed in the 860 DSPi, the maximum speed is limited to 10 Mbps.

Note 2: If the CI-4 or CI-5 communication interface is installed in the 860 DSPi, the maximum speed is limited to 100 Mbps. The speed of the CI-4 or CI-5 can also be limited to a maximum 10 Mbps through the Setup Mode of the 860 DSPi.

Note 3: Speeds above 100 Mbps can only be obtained when using and 860 DSPi with a DOCSIS 3.0 Modem.

Note 4: Wi-Fi connection speeds are limited to a maximum of 10 Mbps in hardware for all CI-X communication interfaces.

Downstream

Connection Type	TFTP	HTTP	UDP 5 Mbps	UDP 10 Mbps	UDP 15 Mbps	UDP 30 Mbps	UDP 40 Mbps	UDP 100 Mbps	UDP 150 Mbps
RJ-45	4.99 Mbps	4.96 Mbps	4.98 Mbps	9.96 Mbps	14.91 Mbps	29.83 Mbps	39.77 Mbps	96.93 Mbps	N/A
DOCSIS 2.0 Cable Modem	2.37 Mbps	3.56 Mbps	4.97 Mbps	9.90 Mbps	14.91 Mbps	29.82 Mbps	35.26 Mbps	N/A	N/A
DOCSIS 3.0 Cable Modem with 4 Bonded Channels	2.37 Mbps	3.56 Mbps	4.97 Mbps	9.90 Mbps	14.89 Mbps	29.82 Mbps	39.60 Mbps	99.5 Mbps	146.83 Mbps
Wi-Fi with Router in DMZ Mode	2.47 Mbps	4.97 Mbps	4.97 Mbps	8.84 Mbps	N/A	N/A	N/A	N/A	N/A

Note 1: If the CI-1, CI-2, or CI-3 communication interface is installed in the 860 DSPi, the maximum speed is limited to 10 Mbps.

Note 2: If the CI-4 or CI-5 communication interface is installed in the 860 DSPi, the maximum speed is limited to 100 Mbps. The speed of the CI-4 or CI-5 can also be limited to a maximum 10 Mbps through the Setup Mode of the 860 DSPi.

Note 3: Speeds above 100 Mbps can only be obtained when using and 860 DSPi with a DOCSIS 3.0 Modem.

Note 4: Wi-Fi connection speeds are limited to a maximum of 10 Mbps in hardware for all CI-X communication interfaces.

Note 5: 8 MHz (Euro) modems have a slightly higher maximum speed due to wider channel bandwidth.

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