

ETTA

Ethernet Transport

Tester

User's Guide

Revised May 2, 2019

Firmware Version 1.3

Certifications

FCC Statement

This device complies with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules.

This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual may cause harmful interference to radio communications.

Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at the user's own expense.

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TABLE OF CONTENTS

Certifications.....	i
FCC Statement.....	i
Chapter 1 Introduction.....	5
Overview.....	5
Package Contents.....	5
ETTA Features and Test Functions.....	6
Ping, Including Ping Flood Tests.....	6
Modbus/TCP Ethernet Polling Host... ..	6
Jitter Tests.....	6
Firmware Upgrades.....	6
Ethernet Performance.....	6
Single-unit or dual-unit operation.....	6
Self Calibrating.....	6
Software Requirements.....	7
Indicators and Connectors.....	8
Front Panel.....	8
Touch Screen.....	8
USB memory status.....	8
Battery Status Indicator Icon.....	8
Battery Status Indicator LED.....	8
Top Panel Connections.....	9
Power Supply.....	9
Ethernet Connector.....	9
USB A Connector.....	9
ON-OFF switch.....	9
Chapter 2 Quick-start Guide.....	10
Overview.....	10
Screen Navigation.....	10
Quick Start.....	10
Quick Start Details.....	10
Connect the Ethernet Cable.....	10
Power up the unit.....	11
Verify the IP Address Configuration	11
Select a Test to Run.....	11
Enter Configuration Values.....	11
Run the Test.....	12
Notes.....	12
Chapter 3 Operation.....	13
Common Uses – Overview.....	13
Test # 1 Simple Ping.....	13

Test # 2 Ping Flood.....	13
Test # 3 Verify Path Suitability for TDMoE.....	14
Test # 4 Verify Path Suitability for ROIP / VOIP..	14
Test # 5 Long Term Monitoring a Link.....	14
Test # 6 Logging Path Characteristics for Future Use.....	14
Test # 7 Future Tests.....	15
Application Notes on the Web.....	16
Checking the Local Network Prior to ETTA Tests	16

Chapter 4 Category Overview Screens.....17

Main Menu Screen.....	17
Overview.....	17
Sub-categories linked on this screen.....	17
Settings.....	17
Performance Tests.....	17
Protocol Tests.....	17
Monitor.....	17
Tools.....	17
Settings Category.....	18
Fields.....	18
Notes.....	18
Network Settings Category.....	19
Fields.....	19
Notes.....	19
System Settings Category.....	20
Fields.....	20
Notes.....	20
Time and Logging Category.....	21
Fields.....	21
Notes.....	21
Set Clock.....	22
Fields.....	22
Notes.....	22
Configure sNTP.....	23
Fields.....	23
Notes.....	23
Performance Tests Category.....	24
Fields.....	24
Notes.....	24
Test Category – Ping Tests.....	25
Fields.....	25
Notes.....	25
Test Category – Bandwidth Tests.....	26
Fields.....	26
Notes.....	26
Test Category – Jitter Tests.....	27
Fields.....	27

Notes.....	27
Protocol Tests Category.....	28
Fields.....	28
Notes.....	28
SCADA Tests Category.....	29
Fields.....	29
Notes.....	29
Monitor Category.....	30
Fields.....	30
Notes.....	30
Tools Category.....	30
Fields.....	30
Notes.....	31
Reference Tools Category.....	32
Fields.....	32
Notes.....	32
Chapter 5 Configuration and Test Screens.....	33
Overview.....	33
Standard Ping Test.....	34
Fields.....	34
Notes.....	34
Ping Flood Test.....	35
Fields.....	35
Notes.....	36
Ping Monitor Test.....	37
Fields.....	37
Notes.....	37
Bandwidth Transmit Test.....	38
Fields.....	38
Notes.....	38
Bandwidth Receive Test.....	39
Fields.....	39
Notes.....	39
Echo Test.....	40
Fields.....	40
Notes.....	40
Jitter Test.....	41
Fields.....	41
Notes.....	41
Modbus/TCP Poll Test.....	42
Fields.....	42
Fields on the extended screen “>>”. .	42
Notes.....	43
Reference Tool: IPv4 Calculator.....	44
Fields.....	44
Notes.....	44

Chapter 6 Firmware Updates.....	45
Overview.....	45
Step by Step Instructions.....	45
Notes.....	46
Chapter 7 Test Result Log and Analysis.....	47
Overview.....	47
Step by Step Instructions.....	47
Configure Logging.....	47
USB Logging Configuration Screen.....	47
Start Logging.....	48
Log File Directory Structure.....	48
Log File Formats.....	48
Summary File.....	48
Test Interval File.....	50
Notes.....	50
Chapter 8 Troubleshooting.....	51
Overview.....	51
Power LED is Off.....	51
Battery Charge is Critically Low.....	51
No Packets Are Transmitted After a Test is Started.....	51
Appendix A Specifications.....	52
ETTA.....	52
Appendix B Warranty.....	53
DCB Product Two Year Limited Warranty.....	53

Chapter 1

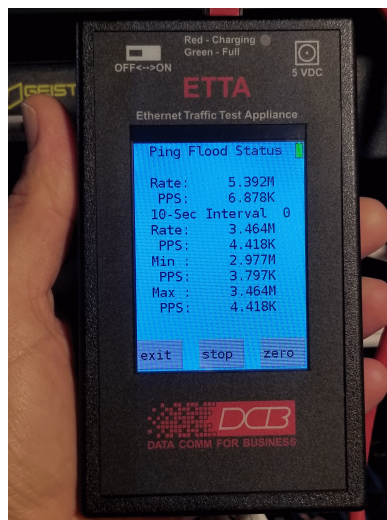
Introduction

This chapter provides an overview of ETTA, the Ethernet Transport Tester Appliance, features and capabilities.

Overview

The ETTA Ethernet Traffic Test Appliance is a lightweight hand-held Ethernet test set. ETTA is designed to test Ethernet 10/100 Ethernet link performance up to the full 100 Mbps data rate and up to 70,000 packets per second.

ETTA is especially useful for testing pseudo-wire/TDMoE circuits prior to install and for testing Service Level Agreements up to 100 Mbits/second. Pseudo-wire circuits are quite sensitive to packet loss, out of order packets, jitter, and propagation delay. ETTA provides an inexpensive and easy method of insuring a circuit path meets the required criteria.



ETTA – Ethernet Transport Test Appliance

Package Contents

You should find the following items packaged with your ETTA:

- The ETTA unit
- 120VAC Power supply and cable
- This User's Guide along with current Applications Notes on a USB memory stick.
- Protective Carrying case
- Super Flex flexible 3' Cat6ethernet cable
- Any optional accessories purchased

ETTA Features and Test Functions

Bandwidth Tests, Including Transmit, Receive, and Echo Tests

ETTA bandwidth tests measure the bandwidth of an ethernet path. It can measure asymmetry, dropped packets, out-of-order packets, packet-per-second rates, and jitter. Rates are displayed with minimum, maximum, and average values. Test methods are available for Transmit, Receive, and Echo (round trip) tests. These values with per-test and summary results determine the suitability of a path for TDMoE or Pseudowire operation.

Ping, Including Ping Flood Tests

Ping tests include the standard ping to another IP address with configurable packet size, inter-packet delay, and number of pings. The ping can be configured for a one-shot, a defined number of pings, or continuous.

Ping Flood tests allow for preloading the path to test for maximum bandwidth and tests path buffering to check for dropped packets due to over subscription.

Modbus/TCP Ethernet Polling Host

Utilities often use Modbus/TCP to monitor and control ancillary equipment, but rarely have a Modbus test set available. The Modbus tests allow ETTA to function as a test polling host that can poll a Modbus RTU and monitor the responding register poll result values.

Jitter Tests

The ETTA jitter tests determine minimum, maximum, and average jitter on the circuit. The peer report also contains the number of packets received, lost, and out of order by comparing them to the packets sent.

Firmware Upgrades

Firmware upgrades may be automatically installed using the "Upgrade Firmware" menu option. This menu option instructs the ETTA to automatically contact a DCB firmware server and install any requested firmware version with the press of a button.

Ethernet Performance

The ETTA has transmit and receive test capability of up to 100 Mbps and 70,000 packets per second. The ethernet interface is capable of MDI/MDIX operation in full or half duplex.

Test Logging

The ETTA will log all tests to an external USB memory stick for transfer to a PC. Once configured to log tests, individual test results and a summary of the test run is stored on the USB memory in .CSV format for detailed analysis and reporting. Multiple tests can be run and logged for long-term analysis.

Single-unit or dual-unit operation

Using an ETTA at each end of the path under test provides the full compliment of tests and best accuracy. However for a quick, less accurate test, the ETTA can be used alone with any device at the remote end for standard PING tests. Note that few ethernet devices are able to keep up with the ETTA's throughput and PPS capability, so those tests will suffer in accuracy.

Self Calibrating

No calibration is required. However, the clock accuracy of the ETTA can be self tested. To self test the clock accuracy and insure the timing results are valid, the following process can be used.

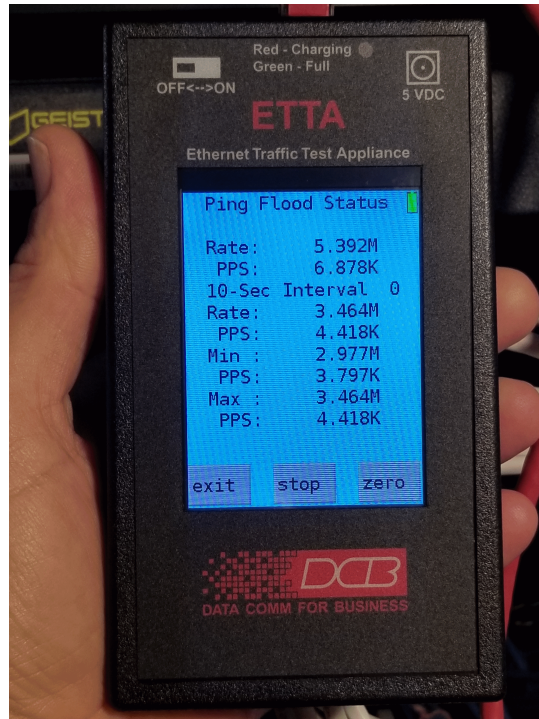
When set for "Refresh" mode, ETTA indicates if the time drift between the internal clock and the NTP server exceeds +/-50ppm. This status will be shown on the sNTP configuration screen. Since the time refresh is every 60 minutes, no status will be displayed until ETTA has performed its second update. The number indicates the hours. If the drift exceeds +/- 50 ppm, a message saying so is displayed.

Software Requirements

ETTA requires no additional software. However, the test results may be downloaded to a USB memory stick and transferred to a PC for detailed analysis and historical records. The transfer file is in the commonly used .CSV format and may be imported into any common spread sheet software.

Indicators and Connectors

Front Panel



ET TA Top View

Touch Screen

All ET TA functions (other than on-off) are controlled through the touch screen. There are also two icons at the top of the screen.

USB memory status

The one on the left indicates USB memory status. Once a USB has been inserted, it will indicate the status of USB memory. Valid memory also shows a green check mark. If there is an error with the flash drive, the icon shows an “X” overlay.

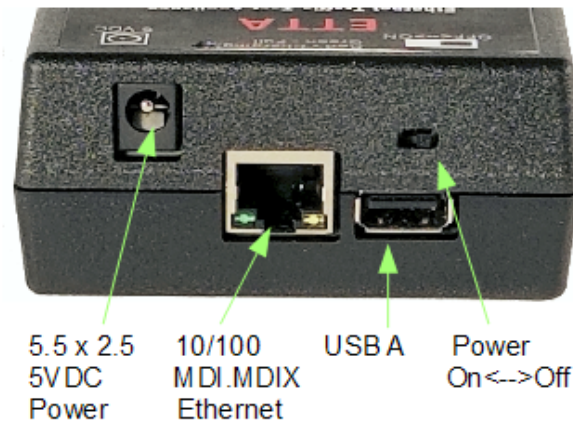
Battery Status Indicator Icon

The icon on the right indicates battery and charger status showing Red, Yellow, or Green. If it’s Red, immediately plug into external power. If yellow, plug into external power soon. If external power is applied, there’s a lightning bolt on top of the battery icon.

Battery Status Indicator LED

This indicates the status of the internal battery and incoming power. When powered and charging, the LED indicates Red. When powered and fully charged it indicates green.

Top Panel Connections



Power Supply

The ETTA contains an internal Lithium battery capable of powering the unit for several hours. It is supplied external power through a 5.5 x 2.5 mm coaxial jack and a provided 5 VDC output 120VAC, 2.5 amp power adapter. **The ETTA may consume 1700 ma when charging and should not be powered via a PC USB connector.** An optional power plug to USB adapter cable is available to power the unit from any of the commonly available USB external battery pack capable of supplying 1700 ma. The Power LED and battery icons show the external power status.

Ethernet Connector

The ethernet connector is 10/100BaseT, MDI/MDIX, and capable of half or full duplex. If not using the supplied super-flex cable, insure that the after-market cable in use is fully capable of 100 Mbps.

The 100BaseT connector status LEDs should be lit for a valid link to a switch. The yellow LED is lit for 100Mbps, off to indicate 10Mbps. The green LED flashes with LAN interface activity and is lit in the idle state.

USB A Connector

Any common USB memory stick may be inserted into the USB connector and if test logging is enabled, will receive test details and a summary file for each test run. The USB memory should be preformatted to FAT-32 on a PC. Memory that is formatted NTFS can not be used and must be reformatted. See the logging section for more details. This connector should not be used to provide USB power for other devices.

ON-OFF switch

On-off slide switch.

Chapter 2

Quick-start Guide

This Chapter outlines configuration and use of ETTA in a quick-start format that will allow some testing within a minute or two of opening the box. More detailed operation information is available under specific test sections.

Overview

The ETTA is functional out of the box using auto negotiate ethernet mode (10/100MBps, Full/Half duplex), and DHCP. Quick start instructions are in this section. You can be up testing a path in just a few minutes.

Screen Navigation

The “buttons” on all screens are hyperlinks to other menu screens or commands. Simply press on a screen button to bring up the next window. Most screens have a “Back” or “Exit” that moves you back on the path to the main menu. Click on the “Back” or “Exit” button to return to the prior screen.

Entries are always tested for valid values. However, there are many “valid” values that are not appropriate for any given configuration. So, “appropriateness” is tested where possible. For example, an IP address of 300.400.500.256 will not be accepted, but the field will accept an IP address that is not appropriate for *your* installation.

Screens that accept value entries contain an area with a field name and entry value field. Press the entry field to move to a screen that allows the entry of that value. For example, Pressing on “IPv4” opens a screen that allows the entry of IPv4 Mode (either DHCP Static). Pressing on the value part of that screen (the default display value is DHCP) opens a screen that lets you change that mode (DHCP or Static).

Entry screens that have field names also contain a link to context sensitive help screens. Pressing on the field name displays a help screen that describes the field. If the help screen exceeds the length of the display, scroll the text by dragging it much as you would on a cell phone or tablet display.

Resetting to factory default is simple. If you mess up configuration values or simply want a clean restart, simply click on “Settings”, “Restore Defaults”, and “OK”. The unit re-configures to factory defaults in a second or so.

Multi-window screens, “>>”. Some items require more space than the display allows. To scroll between multi-window screens, press the “>>” icon.

Quick Start

Extra fast quick start for the impatient: Plug it in, turn it on, and start exploring the ETTA’s screens. If your network supplies a DHCP address to the ETTA, the simple PING test will ping any other device on the ethernet network simply by entering the destination address and pressing start. Other tests require more configuration and a second ETTA. The quick-start procedure follows.

Quick Start Details

Connect the Ethernet Cable

Connect a LAN cable from your hub or switch to the Ethernet Port

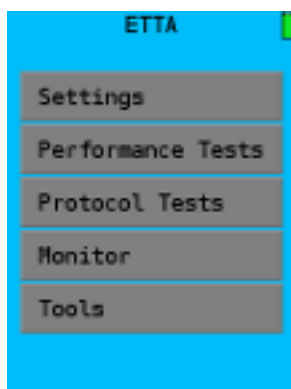
Power up the unit

Connect the AC power supply. The Charging LED should light (either red or green) if power is applied. Turn on the switch.

Verify the IP Address Configuration

If DHCP is appropriate for your network, ETTA will obtain an IP address automatically. If there is no DHCP server available or you need to use a specific address, you must enter an IPv4 address using the IPv4 screen. See the IPv4 configuration screen section for details.

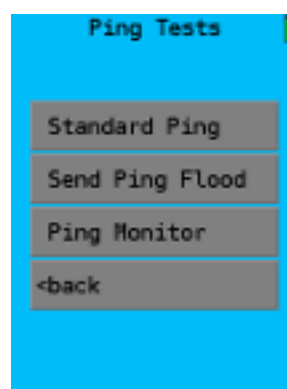
Select a Test to Run



Main Screen



Performance Tests

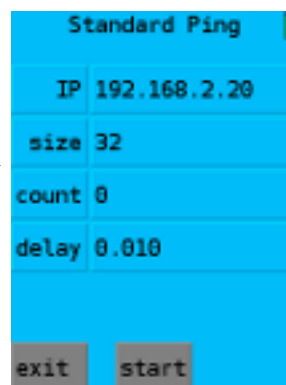


Ping Tests

For a quick example, select the “Performance Tests” by pressing on that button. Then, select “Ping Tests” on the next window. From the “Ping Tests” menu, select “Standard Ping”.

Enter Configuration Values

Enter the IP address of the unit to ping on the “Standard Ping” configuration screen. Press the field value to display the configuration entry screen for the Target IP. Enter the destination address, and just accept the default values for size, count and delay with no change. If you need assistance entering the field values, read the paragraph on that subject. After the IP address is entered, the “standard Ping” screen returns.



Standard Ping Configuration

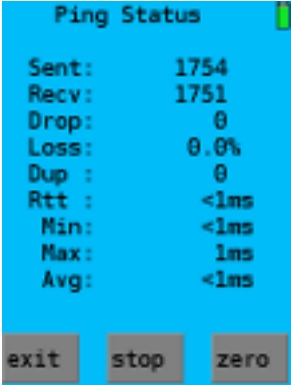
Run the Test

Press “start” to begin the test.

The “Ping Status” screen will display running results until you press “Stop” or “Exit”.

When you press “Stop”, the test summary results will be displayed.

If you press “exit”, the summary results are skipped and the “Ping Tests” selection menu is displayed.



The screenshot shows a terminal window titled "Ping Status" with a green cursor at the top right. The screen displays the following test results:

Sent:	1754
Recv:	1751
Drop:	0
Loss:	0.0%
Dup :	0
Rtt :	<1ms
Min:	<1ms
Max:	1ms
Avg:	<1ms

At the bottom of the screen, there are three buttons: "exit", "stop", and "zero".

Ping Status Screen

That's it.

You've now powered up the new ETTA and run a quick test. Now, explore some other tests.

Notes

If something doesn't work right, perhaps someone changed ETTA's default values. Reset the unit to factory default and try again. From the main screen, press “settings” and “Restore Defaults”. Then verify that selection.

Chapter 3

Operation

This Chapter explains how to use ETTA in some real-world applications.

Common Uses – Overview

These are some of the most commonly used tests, and why they are most often used. The ETTA operator needs to know the specific results that are important in any given installation. ETTA will tell you the results, but you should know what's acceptable and what values indicate a problem circuit.

Test # 1 Simple Ping

There are several Ping tests available that accomplish different measurement goals.

The first, "simple ping" is the ICMP Echo Ping we all use with other network hardware, but with more detailed results. ETTA will perform this test stand-alone with some other network device or between pairs of ETTA units.

Ping verifies that a remote node is reachable, and if run continuously, for more than a one-shot test will verify that the link is stable. To obtain a better understanding of the link characteristics, use the Ping Flood test below as well.

Results are all the normal things... number of sent, received, dropped and duplicate packets; percentage loss; along with minimum, maximum, and average return trip times.

The configuration values for the ping test are packet size, number of pings (or continuous), and time interval between sending pings. Pings not returned by the time-out time are considered to be dropped by the intervening networks.

More information can be gathered when using a remote ETTA as a ping responder. The remote ETTA will display the rate, packets per second (PPS), and interval statistics for average PPS, minimum and maximum PPS. This method provides circuit information details in each direction of transmission.

Again, to get a better understanding of the link characteristics, use the Ping Flood test below.

Test # 2 Ping Flood

After running the simple ping test above, it is sometimes useful to run the ping flood test. This test preloads the sending unit with a buffer full of packets and will send them all out before waiting for a response packet. This allows the sending ETTA to stream packets utilizing maximum bandwidth and provides a way to test the buffering within the network path.

If the preloaded packet stream exceeds the buffering capability of the path, it will result in dropped packets. This is a useful metric for paths that might drop packets due to packet-per-second limits or over subscription.

There is also a rate limiter in the ethernet controller with a resolution of 250 Kbps. When configured, the ethernet controller pauses the sending of ethernet packets limiting the bandwidth used to the specified rate. This allows more intuitive analysis of the results when there is packet grooming or bandwidth limits in use by the network provider. Using a configured interval also allows a more detailed view of the data and shows results that might be lost in a larger sample size. There may some deviation between the selected rate and the actual rate, especially for small sized packets, but it's normally quite small.

With the Report Interval configured, ETTA averages the test results over an interval period and compares those results to those of previous interval periods. This approach allows short-duration events to be captured that might otherwise be lost due to long-term averaging. The interval period is in seconds.

Test # 3 Verify Path Suitability for TDMoE

Ping Flood or Bandwidth Echo are two tests that will simulate the TDMoE traffic. TDMoE traffic is symmetrical, has a fixed packet size and is sent at a very precise rate. Using the rate limiter and the packet size option, you can generate traffic flow that will model the TDMoE traffic. Some TDMoE products will display both the rate and the required payload size when you configure a bundle. Due to the resolution of ETTA's rate limiter, you can't exactly match the TDMoE rate, but you can round up slightly. And a little margin is good to have. Ping Flood or Bandwidth Echo will verify if the link can achieve the needed rate. Bandwidth Echo will provide jitter information needed to configure the TDMoE's jitter buffer.

Test # 4 Verify Path Suitability for ROIP / VOIP

Modeling radio dispatch ROIP traffic is a common use for the "Jitter Test". Telex ROIP traffic is generated at 50 packets per second and will have a payload of 40 bytes, 80 bytes, or 160 bytes, depending on the codec in use. By setting the delay time to ".02" seconds and selecting a payload size, the user can simulate a single audio stream. The jitter result will help in programming the Telex "delay-before-playback" setting. Other ROIP products have similar settings. The packet loss results will indicate if the link can handle the rate.

Bandwidth Transmit and Bandwidth Receive can also be used to model multiple ROIP audio streams. It's similar in concept to the TDMoE traffic, except that it is uni-directional. The user calculates the needed rate, based on the number of audio channels and codec. However, the payload should be the payload for a single audio channel, 40, 80, or 160 bytes. Look at the results to verify the actual throughput results meet the needed throughput results. The jitter result can be used to help set the "delay-before-playback" setting in some ROIP controllers or to determine if there is too much jitter for a valid link.

Test # 5 Long Term Monitoring a Link

The Jitter Test is also used for long term monitoring of a link. This is used at DCB between a remote site and an ETTA at the office to monitor a VM server. The Jitter Test is actually a more detailed ping test, and the remote ETTA is measuring the time between packets and calculating the variance. It then returns those results to the local ETTA. So it's a type of ping test, except instead of echoing a packet, it returns some measurements. For our VM test, ETTA was sending a packet once per minute. The remote site connection is a wireless broadband provider. It was interesting to see the variation in the jitter and the occasional lost packet even though the VM tunnel link did not detect a loss of connection.

This test could be used to verify QOS settings in a switch. A pair of ETTAs could be placed on a VLAN with a high priority QOS. There should be little variation in the jitter result. The user then could load down a second VLAN with lower priority. If the QOS is working correctly, they should see no change to the jitter result on the high priority VLAN.

Test # 6 Logging Path Characteristics for Future Use

The ETTA will log all tests to an external USB memory stick for transfer to a PC. Once configured to log tests, individual test results and a summary of the test runs are stored on the USB memory in .CSV format for detailed analysis and reporting. Multiple tests can be run and logged for long-term analysis.

It's advisable to log all tests, even if you eventually delete the log files. That way, any anomalies can be investigated.

Test # 7 Future Tests

New tests are being developed as we gain have more field experience with ETTA. As new tests are added to ETTA, they are automatically added to your unit by using the Main menu System button and Update Software function. See that manual section for details.

Application Notes on the Web

There are application examples and app notes available on the Data Comm for Business Web site. These may be downloaded from the product data sheets at <http://www.dcbnet.com>

Checking the Local Network Prior to ETTA Tests

Some higher quality ethernet switches have packet grooming, throughput shaping, and throttling capability, so it's necessary to confirm these functions aren't in play before running live tests. Some lower quality ethernet switches don't perform to their published specifications. Package claims of a 100BaseT interface don't guarantee that the unit will actually pass packets at that speed.

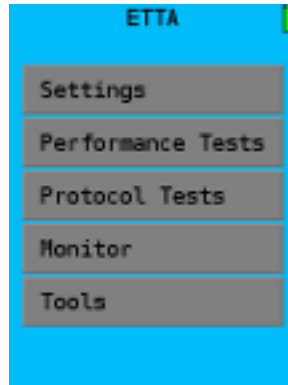
Always verify that the local network is not a bottleneck for planned tests. Run the ETTA tests through a local switch to insure that your local network is fully capable of the operation you desire.

Chapter 4

Category Overview Screens

This Chapter discusses the Category or Overview Screens. This goes down at least one additional menu level for most screen fields.

Main Menu Screen



Main Menu Screen

Overview

The main screen has links to major categories menu screens and is displayed upon power-up. All menu screens lead back to here.

Sub-categories linked on this screen

Settings

The Settings Category has sub-menus for various ETTA settings such as Network, System, Time and Logging, and Restore Defaults.

Performance Tests

The Performance Tests category links to sub-menus Ping Tests, Bandwidth Tests, and Jitter Tests.

Protocol Tests

The Protocol Tests category links to a sub-menu for SCADA Tests.

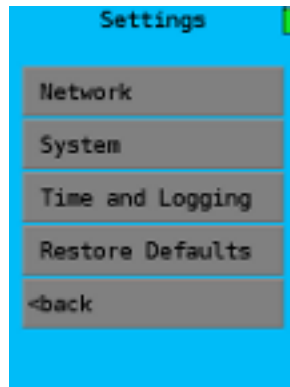
Monitor

The Monitor sub-menu is a placeholder for a future Monitoring sub-menu.

Tools

The Tools category links to sub-menus for Reference tools such as an Ipv4 address calculator, and IP information.

Settings Category



Settings Category Screen

The Settings screen leads you to configuration screens for network information, system values, time settings (including SNTP), and logging. It also allows you to reset the unit to factory defaults.

Fields

- Network
A submenu that links to the Ethernet settings for ethernet modes... 10 Mbps, 100 Mbps, Full or Half Duplex, Fixed or Negotiated.
- System
A submenu that displays ETTA device information and allows you to update ETTA software or reboot the unit.
- Time and Logging
This menu function includes setting the ETTA clock (or configuring SNTP), and logging to the USB memory drive.
- Restore Defaults
Restores factory defaults to the ETTA.

Notes

Network Settings Category



Network Settings Category Screen

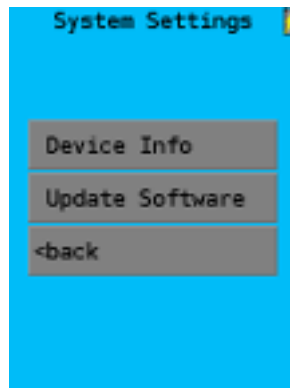
The System Settings screen leads you to configuration screens for network information, system values, time settings (including SNTP), and logging. It also allows you to reset the unit to factory defaults.

Fields

- Ethernet
A Submenu that links to the Ethernet settings for ethernet modes... 10 Mbps, 100Mbps, Full or Half Duplex, Fixed or Negotiated.
- IPv4
A submenu that enables IPv4 settings. From this screen you can configure DHCP or static address information.
- Network Status
A status screen that provides current ETTA settings for the ethernet Link status, IPv4 information, and DHCP server information. There are no configuration entries on this menu path.

Notes

System Settings Category



System Settings Category Screen

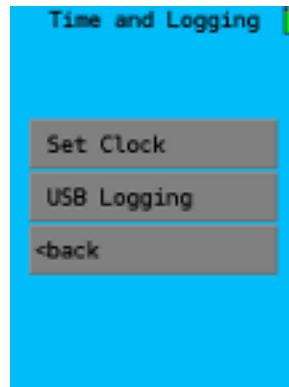
The System Settings screen leads you to screens for that display device information and configuration screens to perform software updates.

Fields

- Device Info
A display screen that shows the model, software, release date and MAC address for this unit.
- Update Software
A submenu screen that allows you to update the ETTA with the latest software via the internet. See the chapter on software update for more details.

Notes

Time and Logging Category



Time and Logging Category Screen

The Time and Logging screen allows configuration of the system clock (including sNTP) and logging test results to an external USB memory drive.

Fields

- Set Clock
This submenu allows setting the internal clock directly or configuration for a sNTP server.
- USB Logging
A submenu that enables the mode and root directory for USB memory drive logging.

Notes

Set Clock

A screenshot of a 'Set Clock' configuration screen. The screen has a blue background. At the top, it says 'Set Clock' in black text. Below that, the current date and time are displayed as '01-01-2017 00:03:17'. In the center, there are six light blue buttons arranged in a 3x2 grid. The buttons are labeled 'Month', 'Hour', 'Day', 'Min', 'Year', and 'Sec'. At the bottom of the screen, there are two grey buttons: 'exit' on the left and 'sNTP' on the right.

Set Clock Configuration Screen

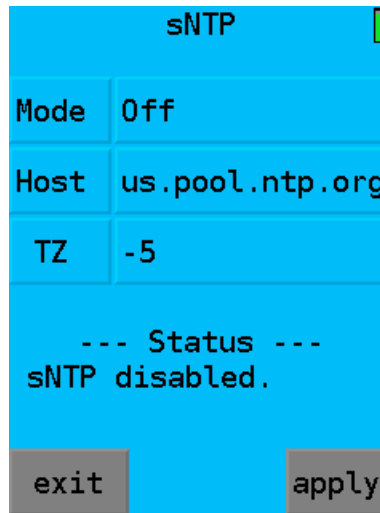
The Time and Logging screen allows configuration of the system clock or using sNTP.

Fields

- Month
The current month entry.
- Day
The current day entry.
- Year
The current year entry.
- sNTP
Enter the sNTP configuration screen.

Notes

Configure sNTP

The image shows a terminal window titled 'sNTP' with a green battery icon in the top right corner. The screen displays configuration settings for sNTP: 'Mode' is set to 'Off', 'Host' is 'us.pool.ntp.org', and 'TZ' is '-5'. Below these settings, it shows the status: '--- Status ---' followed by 'sNTP disabled.'. At the bottom, there are two buttons: 'exit' on the left and 'apply' on the right.

sNTP	
Mode	Off
Host	us.pool.ntp.org
TZ	-5
--- Status --- sNTP disabled.	
exit	apply

sNTP Configuration Screen

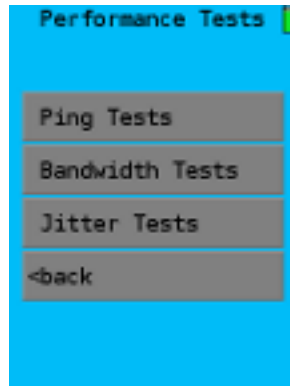
The sNTP configuration screen allows the use of sNTP and its configuration. This screen also shows the status of the sNTP server connection and if the internal clock drifts more than 50 ppm, it displays a warning. You should use a high accuracy sNTP server for this feature to be accurate.

Fields

- **Mode**
Enable or disable sNTP
- **Host**
The IP address of a preferred sNTP server.
- **TZ**
The time zone offset for this location.
- **STATUS**
Displays sNTP Enabled or Disabled. After the clock has run long enough for at least two updates from the sNTP server, it will display a clock drift error message. Refresh mode must be enabled to display this information.

Notes

Performance Tests Category



Performance Tests Category Screen

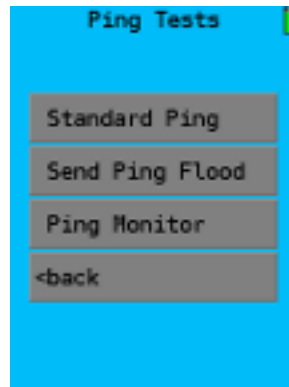
These are the real heart of ETTA. This category provides links to sub-menus covering all ETTA tests.

Fields

- Ping Tests
There are three Ping tests ranging from a simple echo ping to complicated Ping Flood tests. Ping Monitor allows the “receiving” end of a Ping test to provide additional information.
- Bandwidth Tests
There are three bandwidth tests, the Transmit Test, Receive Test, and Echo Test. Each is useful in determining path characteristics
- Jitter Tests
Currently there is only one Jitter Test submenu. Jitter is quite important in most every time-sensitive protocol application.

Notes

Test Category – Ping Tests



Ping Tests Category Screen

There are three Ping tests ranging from a simple echo ping to complicated Ping Flood tests. Ping Monitor allows the “receiving” end of a Ping test to provide additional information. Select the desired Ping Test from this menu.

Fields

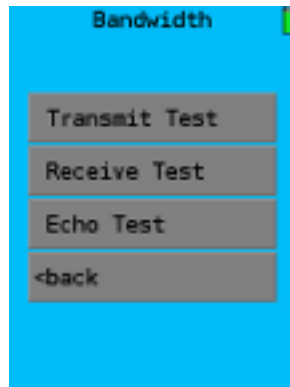
Test Configuration

- **Standard Ping**
This is the standard echo ping used everywhere. ETTA provides extensive options including data frame size, packet count, and a unique combination delay/timeout value.
- **Send Ping Flood**
Use this ping test to characterize the network path packet shaping, over-subscription, PPS limits, etc.
- **Ping Monitor**
This test runs on the “remote” ping responder ETTA. It allows you to see average, maximum, and minimum rate and packet per second values that help characterize one-way link problems.

Notes

While simple standard ping tests are common. The additional information provided by the Ping Flood test and the Ping Monitor are quite useful in determining asymmetric path problems.

Test Category – Bandwidth Tests



Bandwidth Tests Category Screen

Bandwidth Tests are the heart of ETTA testing.

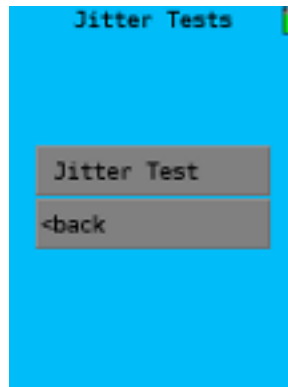
Fields

- **Transmit Test**
This is the sending ETTA of a bandwidth test. The responding IP address, payload size, preload value, rate limiting, and transmit interval can be configured
- **Receive Test**
This is the receiving ETTA unit of a bandwidth test. Similar to the Transmit Test, the same parameters may be configured
- **Echo Test**
This test is similar to a comprehensive ping test with additional parameters and measurement values.

Notes

Taken together, these three tests can characterize the actual useful bandwidth available of the path and determine any asymmetrical components. They report the number of packets dropped, received out of order, delta time between packets as well as minimum, average, and maximum values for PPS and jitter.

Test Category – Jitter Tests



Jitter Tests Category Screen

Currently there is only one Jitter Test. When additional jitter tests are added, they will be linked from this screen.

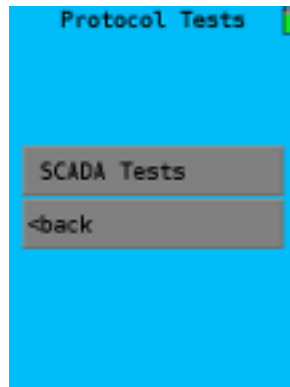
Fields

- Jitter Test
Select this button for the Jitter Test configuration screen.

Notes

Jitter is the variability in time delivery of packets. It's quite important in time sensitive applications such as streaming voice (VOIP and ROIP), as well as TDMoE and Pseudowire connections. Many common network tools totally ignore jitter, but it's often the characteristic that prevents successful implementation of streaming protocols.

Protocol Tests Category



Protocol Tests Category Screen

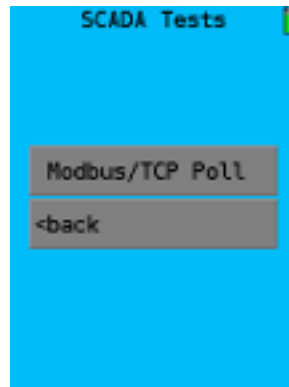
This is the submenu that will link to protocol specific tests. Currently the only protocol test in the ETTA is for the commonly used SCADA protocol, Modbus/TCP.

Fields

- SCADA Tests
Currently the only protocol test in the ETTA is for the commonly used SCADA protocol, Modbus/TCP.

Notes

SCADA Tests Category



SCADA Tests Category Screen

This is the submenu that will link to SCADA protocol specific tests. Currently the only protocol test in the ETTA is for the commonly used SCADA protocol, Modbus/TCP.

Fields

- Modbus/TCP Poll
ETTA can be configured to function as a Modbus/TCP polling host. See the Modbus/TCP Poll test for details.

Notes

Monitor Category



Monitor Category Screen

This is a placeholder for future monitoring tests.

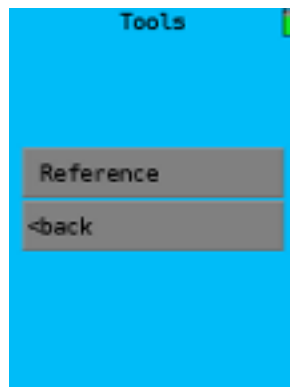
Fields

- Back
Return to the previous menu.

Notes

As tests are added to ETTA, they will be included with software updates.

Tools Category



Tools Category Screen

This screen will link to useful tools. As additional tools are developed, they will be added to this screen with software updates.

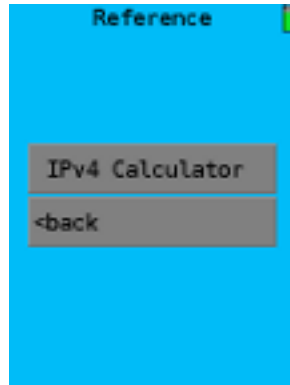
Fields

- Reference
Reference tools such as IPv4 Calculator, Important Port Numbers, etc.

Notes

As tools are added to ETTA, they will be included with software updates.

Reference Tools Category



Reference Tools Screen

This screen links to reference information and useful tools.

Fields

- IPv4 Calculator
Links to an IPv4 subnet calculator tool.

Notes

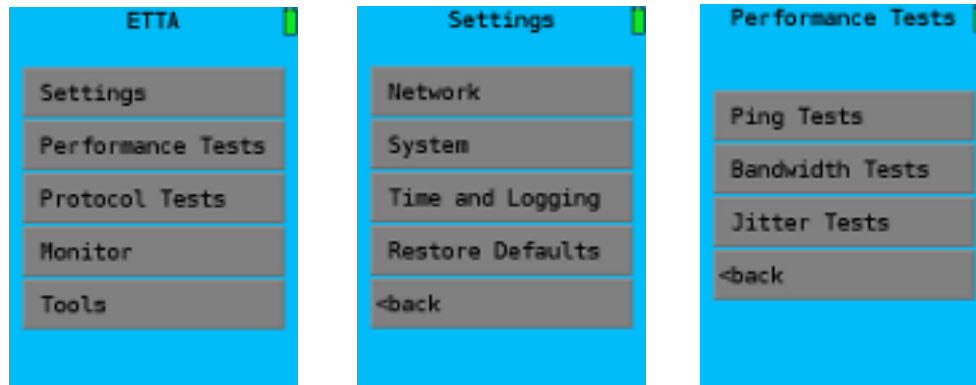
When they become available, additional tools will be placed here by the update process.

Chapter 5

Configuration and Test Screens

This Chapter describes all screens and entry fields for test and configuration screens.

Overview



Main Menu

Settings Category

Tests Category

All individual tests and configuration operations are linked to Main Menu Screen. Some are one or more layers deep on one of the category screens.

Standard Ping Test

Standard Ping	
IP	192.168.2.20
size	32
count	0
delay	0.010
exit start	

Ping Test Configuration

Ping Status	
Sent:	1754
Recv:	1751
Drop:	0
Loss:	0.0%
Dup :	0
Rtt :	<1ms
Min:	<1ms
Max:	1ms
Avg:	<1ms
exit stop zero	

Ping Test Results

This is the ICMP Echo Ping we all use with other network hardware, but with more detailed results. ETTA will perform this test stand-alone with some other network device or between pairs of ETTA units.

Ping verifies that a remote node is reachable, and if run continuously, will verify that the link is stable. To obtain a better understanding of the link characteristics, also use the Ping Flood test below.

Results are all the normal things... number of sent, received, dropped and duplicate packets; percentage loss; along with minimum, maximum, and average return trip times.

More information can be gathered when using a remote ETTA as a ping responder. The remote ETTA will display the rate, packets per second (PPS), and interval statistics for average PPS, minimum and maximum PPS. This method provides circuit information details in each direction of transmission. The “Echo Receive Test” is used for this function.

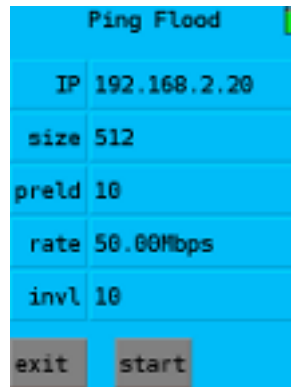
Fields

- **IP**
The IP address of the target device. This may be any device that responds to ICMP echo packets.
- **Size**
The size of the ping packet payload. This does not include the packet protocol headers. Payloads larger than 1472 bytes will exceed the ethernet MTU, resulting in IP fragmentation.
- **Count**
The maximum number of ping requests to send before automatically terminating the test. A value of 0 disables this, and provides for continuous pings.
- **Delay**
The delay time between subsequent ping requests in seconds. This also doubles as the ping response timeout. Responses not received within the delay time are counted as dropped.

Notes

Pings not returned by the time-out time are considered to be dropped by the intervening networks.

Ping Flood Test

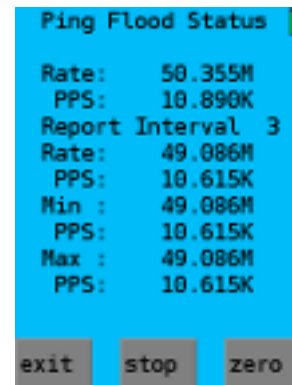


Ping Flood

IP	192.168.2.20
size	512
preld	10
rate	50.00Mbps
invl	10

exit start

Ping Flood Test Configuration



Ping Flood Status

Rate:	50.355M
PPS:	10.890K
Report Interval	3
Rate:	49.086M
PPS:	10.615K
Min :	49.086M
PPS:	10.615K
Max :	49.086M
PPS:	10.615K

exit stop zero

Ping Flood Test Results

After running the simple ping test, it is sometimes useful to run the ping flood test. This test preloads the sending unit with a buffer full of packets and will send them all out before waiting for a response packet. This allows the sending ETNA to stream packets utilizing maximum bandwidth and provides a way to test the buffering within the network path.

If the preloaded packet stream exceeds the buffering capability of the path, it will result in dropped packets. This is a useful metric for paths that might drop packets due to packet-per-second limits or over subscription.

There is also a rate limiter in the ethernet controller with a resolution of 250 Kbps. When configured, the ethernet controller pauses the sending of ethernet packets limiting the bandwidth used to the specified rate. This allows more intuitive analysis of the results when there is packet grooming or bandwidth limits in use by the network provider. Using a configured interval also allows a more detailed view of the data and shows results that might be lost in a larger sample size. There may some deviation between the selected rate and the actual rate, especially for small sized packets, but it's normally quite small.

Fields

- **IP**
The IP address of the target device. This may be any device that responds to ICMP echo packets.
- **Size**
The size of the ping packet payload. This does not include the packet protocol headers. Payloads larger than 1472 bytes will exceed the ethernet MTU, resulting in IP fragmentation.
- **Preload**
The maximum number of ping packets that will be sent before waiting for a response or a timeout. This allows the sender to stream packets and utilize maximum bandwidth. It also provides a way to test buffering in the network path. If the preload exceeds the buffering capability of the path, it will result in dropped packets. A preload of 20 packets is sufficient for lower latency links. However, to test a 100Mbps link with 40 ms RTT, a preload of at least 400 is necessary. Maximum value is 4000.
- **Rate**
This enables a hardware transmit packet rate limiter in the ethernet controller. The resolution is in 250 Kbps steps. When configured, the ethernet controller will pace sending of ethernet packets, limiting the bandwidth used to the specified rate
- **Interval**
ETNA averages the test results over an interval period and compares those results to those of previous

interval periods. This approach allows short-duration events to be captured that might be lost otherwise due to long-term averaging. The interval period unit is seconds.

Notes

Configuring the transmit rate is useful if all the packets are the same size, the interval between packets is very precise, allowing for accurate jitter measurements.

There may be some deviation between the selected rate and the actual rate, especially for small sized packets. This is usually very small and doesn't affect long term measurements.

For multiple test runs, the test can be stopped and values returned to zero for a new test run.

To see the results of multiple test runs, use the ETTA's logging feature.

Ping Monitor Test

```
Ping Monitor
Rate:      3.984K
PPS:       4
Report Interval 0
Rate:      4.893K
PPS:       5
Min:       4.893K
PPS:       5
Max:       4.893K
PPS:       5
exit      stop      zero
```

Ping Monitor Test

This is the remote receive portion of the Ping and Ping Flood tests. The statistics show the packet receive rate, and packets per second along with minimum, maximum values received from an ET TA at the other end of the path.

Fields

- No configuration fields

Notes

Bandwidth Transmit Test

Bandwidth		Transmit Test		Transmit Test	
IP	192.168.2.220	Rate:	50.336M	--Peer Report--	
size	512	PPS:	10.886K	Recv:	389303
preld	10	Report Interval	3	Drop:	0
rate	50.00Mbps	Rate:	50.341M	Order:	0
invl	10	PPS:	10.887K	Delta:	<1ms
		Min :	49.081M	Jitter	
		PPS:	10.614K	avg:	<1ms
		Max :	50.341M	max:	1ms
		PPS:	10.887K		
exit	start	exit	stop zero >>	exit	stop zero >>

Transmit Test Configuration

Transmit Test Status Page 1

Transmit Test Status Page 2

The Bandwidth Transmit Test sends UDP/IP packets to the remote ETTA, to determine link characteristics. This is a one-way test. The remote ETTA reports back the results from packets it receives once the test starts. Run the Bandwidth Receive Test to test the link path in the other direction, or use the Bandwidth Echo Test to see two-way combined results. Results status pages are shown as soon as the test starts.

Fields

- IP
The IP address of the target ETTA. This test must be used with a remote ETTA.
- Size
The size of the packet payload. This does not include the packet protocol headers. Payloads larger than 1472 bytes will exceed the ethernet MTU, resulting in IP fragmentation.
- Preload
The maximum number of packets that will be sent before waiting for a response or a timeout. This allows the sender to stream packets and utilize maximum bandwidth. It also provides a way to test buffering in the network path. If the preload exceeds the buffering capability of the path, it will result in dropped packets.
- Rate
This enables a hardware transmit packet rate limiter in the ethernet controller. The resolution is in 250 Kbps steps. When configured, the ethernet controller will pace sending of ethernet packets, limiting the bandwidth used to the specified rate. If set to 0.0, then rate limiting is disabled.
- Interval
ETTA averages the test results over an interval period and compares those results to those of previous interval periods. This approach allows short-duration events to be captured that might be lost otherwise due to long-term averaging. The interval period unit is seconds.

Notes

Delta is the averaged inter-packet delay, the time period between packets. Unless the network slows it down, this is derived from the rate and packet size.

Bandwidth Receive Test

Bandwidth	
IP	192.168.2.220
size	512
preld	10
rate	50.00Mbps
invl	10
<div>exit start</div>	

Receive Test Configuration

Receive Test	
Recv:	318606
Drop:	0
Order:	0
Delta:	<1ms
Jitter	
avg:	<1ms
max:	1ms
<div>exit stop zero >></div>	

Receive Test Status Page 1

Receive Test	
Rate:	50.346M
PPS:	10.888K
Report Interval	7
Rate:	50.351M
PPS:	10.889K
Min :	49.091M
PPS:	10.616K
Max :	50.351M
PPS:	10.889K
<div>exit stop zero >></div>	

Receive Test Status Page 2

A Complement to the Bandwidth Transmit Test, the Bandwidth Receive Test sends UDP/IP packets from the remote ETTA to the local ETTA to determine link characteristics. This is a one-way test that compliments the Bandwidth Transmit Test. The local ETTA reports results from packets it receives once the test starts. Run the Bandwidth Receive Test to test the link path in the incoming direction, or use the Bandwidth Echo Test to see two-way combined results. Results status pages are shown as soon as the test starts.

Configuration values entered on this configuration screen are transmitted to the remote ETTA which then begins the test.

Fields

- **IP**
The IP address of the target ETTA. This test must be used with a remote ETTA.
- **Size**
The size of the packet payload. This does not include the packet protocol headers. Payloads larger than 1472 bytes will exceed the ethernet MTU, resulting in IP fragmentation.
- **Preload**
The maximum number of packets that will be sent before waiting for a response or a timeout. This allows the sender to stream packets and utilize maximum bandwidth. It also provides a way to test buffering in the network path. If the preload exceeds the buffering capability of the path, it will result in dropped packets.
- **Rate**
This enables a hardware transmit packet rate limiter in the ethernet controller. The resolution is in 250 Kbps steps. When configured, the ethernet controller will pace sending of ethernet packets, limiting the bandwidth used to the specified rate. If set to 0.0, then rate limiting is disabled.
- **Interval**
ETTA averages the test results over an interval period and compares those results to those of previous interval periods. This approach allows short-duration events to be captured that might be lost otherwise due to long-term averaging. The interval period unit is seconds.

Notes

- Delta is the averaged inter-packet delay, the time period between packets. Unless the network slows it down, this is derived from the rate and packet size.

Echo Test

Bandwidth	
IP	192.168.2.220
size	512
preld	10
rate	50.00Mbps
invl	10
exit	start

Echo Test	
Sent:	321005
Recv:	321327
Drop:	0
Order:	0
Delta:	<1ms
Jitter	
avg:	<1ms
max:	1ms
exit	stop zero >>

Echo Test	
Sent:	321005
Recv:	321327
Drop:	0
Order:	0
Delta:	<1ms
Jitter	
avg:	<1ms
max:	1ms
exit	stop zero >>

Echo Test Configuration

Echo Test Status Page 1

Echo Test Status Page 2

The Bandwidth Echo Test sends UDP/IP packets to the remote ETTA, to determine link characteristics. This is a two-way test. The remote ETTA echos packets back and the results are shown on the originating ETTA once the test starts. Run the Bandwidth Echo Test to see two-way combined results. Results status pages are shown as soon as the test starts.

Fields

- IP
The IP address of the target ETTA. This test must be used with a remote ETTA.
- Size
The size of the packet payload. This does not include the packet protocol headers. Payloads larger than 1472 bytes will exceed the ethernet MTU, resulting in IP fragmentation.
- Preload
The maximum number of packets that will be sent before waiting for a response or a timeout. This allows the sender to stream packets and utilize maximum bandwidth. It also provides a way to test buffering in the network path. If the preload exceeds the buffering capability of the path, it will result in dropped packets.
- Rate
This enables a hardware transmit packet rate limiter in the ethernet controller. The resolution is in 250 Kbps steps. When configured, the ethernet controller will pace sending of ethernet packets, limiting the bandwidth used to the specified rate. If set to 0.0, then rate limiting is disabled.
- Interval
ETTA averages the test results over an interval period and compares those results to those of previous interval periods. This approach allows short-duration events to be captured that might be lost otherwise due to long-term averaging. The interval period unit is seconds.

Notes

Delta is the averaged inter-packet delay, the time period between packets. Unless the network slows it down, this is derived from the rate and packet size.

Jitter Test

Jitter Test	
IP	192.168.2.220
size	512
count	0
delay	0.010

exit start

Jitter Test Configuration

Jitter Test Status	
Sent:	701
Peer Report	
Recv:	701
Loss:	0
Ordr:	0
Jitter-	
Max:	1ms
Avg:	<1ms

exit stop

Jitter Test Status

The ETTA jitter tests determine minimum, maximum, and average jitter on the circuit. The peer report also contains the number of packets received, lost, and out of order by comparing them to the packets sent. Modeling TDMoE or radio dispatch ROIP traffic is a common use for the "Jitter Test".

Fields

- **IP**
The IP address of the target device. This may be any device that responds to ICMP echo packets.
- **Size**
The size of the ping packet payload. This does not include the packet protocol headers. Payloads larger than 1472 bytes will exceed the ethernet MTU, resulting in IP fragmentation.
- **Count**
The maximum number of ping requests to send before automatically terminating the test. A value of 0 disables this, and provides for continuous pings.
- **Delay**
The delay time between subsequent ping requests in seconds. This also doubles as the ping response timeout. Responses not received within the delay time are counted as dropped.

Notes

Packets not returned by the time-out time are considered to be dropped by the intervening networks.

Modeling radio dispatch ROIP traffic is a common use for the "Jitter Test". Telex ROIP traffic is generated at 50 packets per second and will have a payload of 40 bytes, 80 bytes, or 160 bytes, depending on the codec in use. By setting the delay time to ".02" seconds and selecting a payload size, the user can simulate a single audio stream. The jitter result will help in programming the Telex "delay-before-playback" setting. Other ROIP products have similar settings. The packet loss results will indicate if the link can handle the rate.

Modbus/TCP Poll Test

Modbus/TCP Poll		Modbus/TCP Poll		Modbus/TCP Status		Modbus/TCP Status	
IP	192.168.1.124	uID	1	Resp:	17	Resp:	17
Port	502	func	Read Coil(1)	Excp:	0	Excp:	0
count	0	addr	0	Last Exception Code none		Last Exception Code none	
delay	1.000	r_len	10	-- Response Data -- 1 1 0 0 0 0 0 0 0 0		-- Response Data -- 1 1 0 0 0 0 0 0 0 0	
exit start >>		exit start >>		exit stop zero >>		exit stop zero >>	

Configuration Screen 1

Configuration Screen 2

Results Screen 1

Results Screen 2

Configure and run the Modbus/TCP poll test from this screen. ETTA functions as a Modbus/TCP polling host polling a specific IP address and port number with a configured number of polls having a configured time-out.

Fields

- IP
IP address of the target Modbus/TCP device.
- Port
TCP port number to poll. The standard Modbus/TCP port and default is port 502.
- Count
The number of polls to send. The test will terminate once it has sent this number of polls. 0 sends zero polls.

Fields on the extended screen ">>"

- UID
The Unit ID. This sets the Modbus header unit ID field. This is usually configured to be 00 or 255. When polling through a Modbus gateway, this should be the device address of the Modbus serial device behind the gateway.
- Func
Function code to be sent. This selects the Modbus operation function code. Only read functions are currently supported.
- Addr
The starting address of a register, coil, or input. Addresses are zero-based and may range from 0-65535. Modbus documentation for registers is often one-based, so register 1 is entered as zero and so on.
- r_len
The number of registers (points) to read. The read length may range from 1 to 127. ETTA will only display the number of registers (points) that fit on the ETTA screen.

- Start and exit buttons

Once the test is started buttons for Exit, Stop, and Zero replace the Start button. The zero button zeros the counters.

Notes

Once the test is started, a Modbus/TCP Status screen is displayed. That screen shows the poll number, number of responses and drops, percentage loss, number of errors, and minimum, maximum and average round trip times. The extended screen also shows the response code, number of exceptions, and if one is returned, the last exception code received.

Reference Tool: IPv4 Calculator

IPv4 Calculator	
IP	192.168.1.223
Mask	255.255.255.240
Bits	28
Net: 192.168.1.208	
First: 192.168.1.209	
Last: 192.168.1.222	
Bcast: 192.168.1.223	
exit	

IPv4 Calculator Tool

This tool calculates the base subnet address and address range for a given IP address and subnet mask. The subnet mask may be entered in dot format or as a bit count.

Fields

- IP address
Enter the base IP address in dot-decimal format. Example: 192.168.1.1
- Mask
Enter the subnet mask in dot-decimal or bit format. Example: 255.255.255.0 for a "class C" 24 bit mask. Entering the mask automatically calculates the Bits format entry.
- Bits
Enter the subnet mask in bits format. An entry here overrides the Mask entry. Example: 24 (for the above example)
- Result fields
The Net address, First, Last, and Broadcast addresses are displayed.
- Exit

Notes

Chapter 6

Firmware Updates

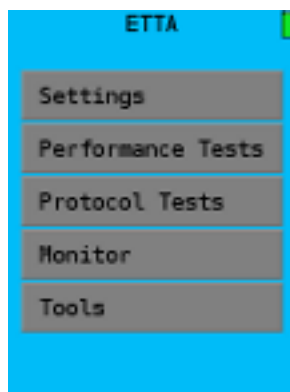
This chapter outlines the procedure used to update ETTA firmware. There is a convenient method to update units in the field when new tests are added to the firmware.

Overview

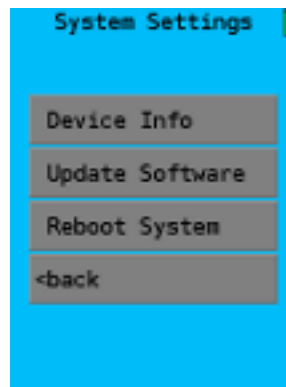
ETTA has a built-in easy-to-use update feature. Whenever new firmware is released, it's made available for download via the Internet from a DCB server. Update requires an Internet connection.

You can also display the current software version on the “Device Info” screen, accessible from the “System Settings” screen.

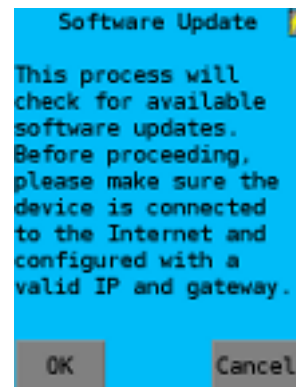
Step by Step Instructions



Main Menu Screen



System Settings Screen



Software Update Screen

From the main screen, press “Settings”.

From the Settings screen, press “System”.

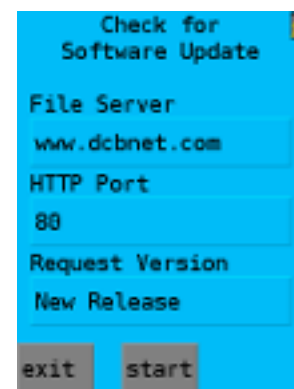
On the System Settings screen, press “Update Software”.

On the Software Update screen, press “OK” and the “Check for Software Update” screen is displayed.

To obtain the latest firmware, there is no need to change any values in this screen. Press “start”.

If you wish to use any other version of software, enter the version number. The HTTP Port should remain configured to port 80.

Press “Start”

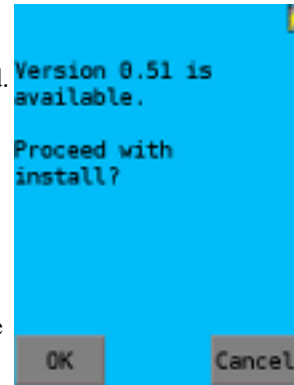


The unit will display the “Checking..” screen and connect to the firmware server to download the firmware image. This screen may only display for a second or two.

After downloading the image, the unit will check that an update is needed. If so, it will load the new firmware and restart.

During the download process if you decide not to complete the update, press the “abort” key.

Once the image is downloaded, you can cancel the operation or install the software. If you accept the install, ETTA will update itself and restart.



Notes

Previous versions of Etta firmware download files are also available from the update site. If you want to downgrade to a prior version or obtain a custom version, enter the requested version number prior to pressing “start”.

If the requested firmware version isn’t available or the update server can’t be reached, an error screen is displayed, along with a return path to the System Settings screen.

Chapter 7

Test Result Log and Analysis

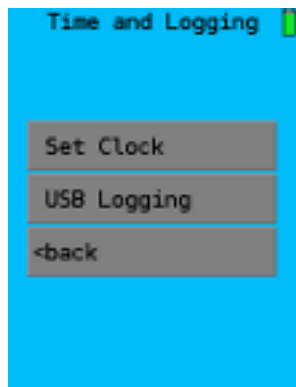
This chapter outlines the procedure used to transfer test results to a PC for additional analysis. Saving the test results to a PC provides for comparison of future tests results to historical values.

Overview

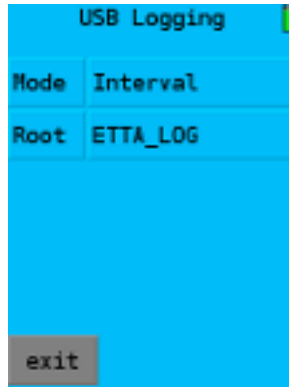
The ETТА will log all tests to an external USB memory stick for transfer to a PC. Once configured to log tests, individual test results and a summary of the test runs are stored on the USB memory in .CSV format for detailed analysis and reporting. Multiple tests can be run and logged for long-term analysis.

It's advisable to log all tests, even if you eventually delete the log files. That way, any anomalies can be investigated.

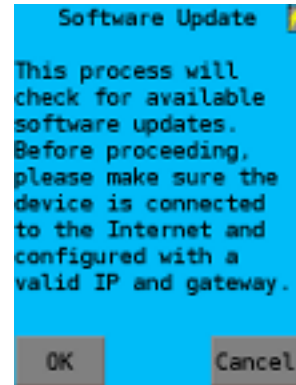
Step by Step Instructions



Time and Logging Screen



USB Logging Screen



USB Logging Mode Screen

Configure Logging

From the main screen, press “Settings”, then “Time and Logging” to display the “Time and Logging Screen”.

From the Time and Logging Settings screen, press “USB Logging”.

The USB Logging Screen contains only two fields, “Mode” and “Root”.

USB Logging Configuration Screen

There are only two fields on the USB Logging screen, “Mode” and “Root”.

Mode

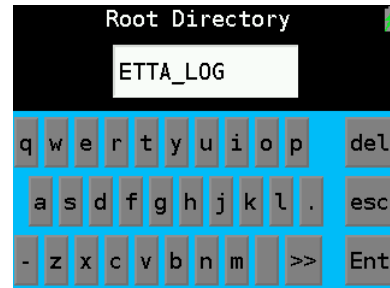
Mode determines the level of logging to the USB drive. “Summary” mode saves the results of each test to a summary file. “Interval” mode saves the results to a summary file and also saves the test interval results to a



separate .csv file. The .csv file can be imported to any spread sheet program for detailed analysis. You can disable logging with the “Disabled” setting.

Root

This sets the name of the directory where logging results will be saved on the USB memory drive. The USB drive must be FAT32 formatted (by a PC). The directory name may be one to eight characters. Valid characters are limited to digits, numbers, and the underscore.



Start Logging

Once a logging mode is selected (either Interval or Summay), all test runs will be logged to the USB memory drive. If a properly formatted memory drive is inserted the USB icon at the upper left of the screens will show a green check mark. An improperly formatted drive, or no drive inserted is indicated by a red “X” on the icon.

Log File Directory Structure

Under the root file defined above will be multiple files, with one file per test run along with a single summary text file.. These are labeled Log_xxx.csv, and SUMMARY.TXT.

Log File Formats

Summary File

The summary file is saved in both logging modes. This is a text file with a standard format that describes the results of each test, but not the intermediate test results. The example shows a single test summary. Additional test summaries will be appended to this file, so if there are numerous tests run without cleaning them off the USB drive, you may have difficulty finding the appropriate test run information.

```
Test: Ping Flood
--Configuration--
  Target IP: 192.183.82.94
  Size: 1020 bytes
  Preload: 20 packets
  Tx Rate Limit: off
Report Interval: 5 seconds-
  Interval Log: /ETTA_LOG/LOGS_000/log_000.csv
--Results--
Start/Zero Time: 2018-08-02, 12:39:10
  End Time: 2018-08-02, 12:41:16
Interval Count: 25
  Min Rate: 3.318Mbps
  Min PPS: 381
  Max Rate: 3.906Mbps
  Max PPS: 449
```

Example Ping Flood Test Summary File

Test Interval File

The Interval files are the individual test results. These are .csv files that may be imported into any spreadsheet program. The first line in the file always includes column titles.

There is one interval file created for each test run typically named log_001.csv , etc.

```
Interval, Date, Time, Packets, Bytes, Rate-bps, PPS
1, 2018-08-02, 12:39:15,1964,2132904,3318403,381
2, 2018-08-02, 12:39:20,2193,2381598,3810557,438
3, 2018-08-02, 12:39:25,2172,2358792,3774067,434
4, 2018-08-02, 12:39:30,2116,2297976,3676761,423
5, 2018-08-02, 12:39:35,2154,2339244,3742790,430
6, 2018-08-02, 12:39:40,2093,2272998,3636797,418
7, 2018-08-02, 12:39:45,2172,2358792,3774067,434
8, 2018-08-02, 12:39:50,2113,2294718,3671548,422
9, 2018-08-02, 12:39:55,2132,2315352,3704563,426
10, 2018-08-02, 12:40:00,2152,2337072,3739315,430
11, 2018-08-02, 12:40:05,2128,2311008,3697612,425
12, 2018-08-02, 12:40:10,2248,2441328,3906124,449
```

Example Test Interval File

Notes

Previous versions of Etta firmware download files are also available from the update site. If you want to downgrade to a prior version or obtain a custom version, enter the requested version number prior to pressing “start”.

Chapter 8

Troubleshooting

This chapter outlines the procedure used to diagnose problems with your ETTA.

Overview

The ETTA operation is straight forward, and there are very few things that can go wrong. Here are some of the most likely problems.

Power LED is Off

Whenever power is applied to the unit, the power led is lit. It shows green for fully charged, and red for charging. This LED is functions even if the power switch is turned off.

Battery Charge is Critically Low

This indicated by the battery icon displaying red. Immediately plug into AC power.

No Packets Are Transmitted After a Test is Started

There are several possible causes for this condition.

Are the 100BaseT connection LEDS lit or flashing?

If the 100BaseT connection LEDS are, then the network subsystem is running and the problem is probably an invalid or non-configured IP address.

Does ETTA have a valid IP address? If set for DHCP, is there a DHCP server available. Check this with the “Network Status” display screen accessible from the “Network” menu screen.

If the 100BaseT connection LEDS aren’t lit or flashing, the ethernet controller is possibly hung. Power cycle the ETTA to correct this. This condition could be reached due to timing issues with the network ethernet controller. ETTA normally detects this condition and prompts the user to reboot the unit.

Does the ETTA match the switch it’s connected with? Some switches auto negotiate when first connected and freeze those parameters until the ethernet cable is unplugged. If you’re changing parameters on the ETTA, you may need to unplug and reinsert the ethernet cable to trigger the switch to re-negotiate.

100BaseT connector LED Status:

Green Yellow

Solid Solid Link UP, 100MBps, half or full duplex

Solid Off Link UP, 10 Mbps, half or full duplex

Flashing - The Green LED flashes with activity on the LAN interface and is lit for an idle condition.

Appendix A

Specifications

ETTA

- Size: 3" W x 5.5" H x 1 ¾" D
- Copper 10/100BaseT Interface, MDI/MDIX, full or half duplex
- 2.75" x 2" LCD color touch screen
- Internal Lithium battery, run time approximately 2 hours
- Accessory USB-A connector for memory transfer
- Operating Temperature 0 to 35 C
- Power requirements: 5 VDC, 1.7 A; 100-240 VAC, 4 watt adapter supplied with unit
- Weight: 1 pound with AC adapter

Appendix B

Warranty

DCB Product Two Year Limited Warranty

DCB products are warranted to be free of defects in materials and workmanship for two years. Data Comm for Business, Inc. will repair or replace any equipment proven to be defective within the warranty period. All warranty work is F.O.B. Dewey, IL. This warranty is exclusive of abuse, misuse, accidental damage, acts of God or consequential damages, etc. DCB liability shall not exceed the original purchase price.

All equipment returned for repair must be accompanied by a Returned Material Authorization (RMA) number. To receive an RMA number, call (217) 897-6600 between the hours of 8 AM and 5 PM central time. Equipment must be shipped prepaid to DCB and will be returned at DCB's expense.

Ship returned items to:

Data Comm for Business
2949 County Road 1000E
Dewey, IL 61840
ATTN: RMA#