Lucent Technologies
Bell Labs Innovations

# Stinger®

## Copper Loop Test (CLT) Module Guide

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# Contents

# Overview of the CLT Module and Copper Loop Testing

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The Stinger copper loop test (CLT) module allows the Stinger user to individually test all copper loop pairs terminated on Stinger line protection modules (LPMs). The built-in test head performs the necessary analog and digital tests to qualify and maintain copper loops. You can test each pair without disconnecting any cables. Copper loop testing can also be conducted through the use of an external head and a path selector module (PSM).

## Overview of CLT module capabilities

The CLT module has a built-in test head that can perform the following tests:

- Digital multimeter (DMM) tests—measure ac and dc voltage, dc delta, resistance, loop resistance, capacitance, and loop length.
- Line tests—measure wideband noise, impulse noise, load coil detection, loop resistance, insertion loss and signal to noise.
- Time-domain reflectometry (TDR) tests—locate bridgetaps, load coils, water-saturated cable sections, short circuits, and cable faults.
- Tone and signaling tests—measure send and receive tones and detect signals and voice.

Most tests supported are single ended and do not require equipment or termination at the customer premises equipment (CPE) end of the loop. The insertion loss, signal-to-noise and detap tests require the use of additional equipment at the CPE

end of the loop. The loop resistance test requires that the loop be shorted at the CPE end.

Testing by the built-in test head can be initiated through the TAOS command-line interface (CLI) or Simple Network Management Protocol (SNMP). Test results are reported through a TAOS profile or SNMP.

For physical specifications and pinouts, see Appendix A, "CLT Module Specifications."

# CLT module models

Current CLT module models use a test head with extended capabilities and supports up to 72 ports per LIM. The STGR-CLTE module can be used with both the Stinger FS and FS+ chassis. Only 48 ports are supported when it is used with the FS chassis. The STGRLS-CLTE-72 and STGRRT-CLTE-72 modules are designed for use the Stinger LS and RT respectively. They support testing with LIMs that have up to 72 ports.

Tests that are only supported by the STGR-CLTE, STGRLS-CLTE and STGRRT-CLTE models are so marked in this document. All other tests are supported by both the CLT and CLTE models.

# Metallic loop testing

Metallic loop testing is used to prequalify, install, and maintain xDSL loops. Various kinds of tests can be used to ensure that a particular loop can support the desired xDSL protocol. The CLT module has the capability to perform these tests.

Two methods of testing exist, single-ended and double-ended. Single-ended tests require test equipment at only the central office (CO) or digital loop carrier (DLC) end of the loop. Double-ended testing requires additional equipment and the presence of a technician at the customer premise equipment (CPE) end as well.

Prequalification testing is performed to determine if a particular loop can support an xDSL service before installation. Single-ended tests from the CO can provide up to a 95% confidence level that a loop will support xDSL services when installed.

Installation and maintenance tests are used to support existing xDSL installations. These tests are typically used to troubleshoot problems that suddenly occur on a particular loop. Most often, problems result from deterioration of or accidental breaks or splices in cables.

## Prequalification tests

All of the following prequalification tests are single ended.

### Line length measurement

The performance of xDSL signals is sensitive to the distance between the CO and the customer. A reasonable estimation of line length can be made using a single-ended capacitance measurement.

### Load coil detection

Load coils are inductors that have been added to subscriber loops of more than 18,000 feet (5486 meters) to improve voice quality. When present, load coils

completely block transmission of xDSL signals. Over the years, as old loops have been rearranged, many unneeded load coils have been left on existing copper loops.

Load coil detection determines the number of load coils and their distance from the CO. Since most coils are no longer needed, a technician can be dispatched to remove the coil and make the loop available for xDSL use.

### Noise measurement

Wideband and impulse noise measurement is useful for detection of signals and other transmissions in the same binder group. Analysis of the noise frequencies can help identify the exact source of the noise. Particular frequencies can adversely affect the performance of certain xDSL services.

### Metallic fault tests

Metallic fault tests include the measurement of dc and ac voltage, resistance, and capacitance. DC and AC Thevenin loop resistance tests are also available. Measurements can be made tip to ring, tip to ground, and ring to ground. In addition to the detection of such faults as foreign voltages, metallic testing can assess the balance of each line. Imbalance of tip-to-ground and ring-to-ground parameters can adversely affect xDSL performance.

### Bridge tap detection

A bridge tap is any unterminated part of a loop not in the direct path between the CPE and the CO. Bridge taps are typically abandoned connections that were previously used to provide additional services to a customer's premises. A very long bridge tap—more than 6000 feet (1830 meters)—can affect xDSL performance.

### Splitter detection

Splitters are used to separate the analog telephone service signal and the DSL signal. The presence of a splitter with dc blocking capacitors can sometimes cause inaccurate copper loop test results. Detection of splitters is a useful diagnostic tool.

### Splitter bypass

If a splitter with dc blocking capacitors is present in the loop circuit, dc voltage, isolation, and loop resistance testing cannot be performed. You can use this feature to set certain brands of splitters to bypass mode.

## Troubleshooting and maintenance support

Many of the prequalification tests can be used to troubleshoot xDSL loop failures. TDR testing can be used to detect cable faults including shorts, opens, and damaged sections.

# CLT module installation

The CLT module is installed in place of an line protection module (LPM) behind (Stinger FS or Stinger FS+) or next to (Stinger LS or Stinger RT) the slot chosen for an optional spare line interface module (LIM). With the Stinger FS or Stinger FS+, the slot in front of the CLT module must either be empty or used for a spare LIM.

With the Stinger LS or Stinger RT, the slot to the left of the CLT can still be used for an active LIM if desired. Individual ports on this LIM can be either active or redundant.

If no spare LIM is used, for the Stinger FS or Stinger FS+, testing can be performed in looking-out mode but not in bridging mode. Testing can be done in either mode for the Stinger LS or Stinger RT. All LIMs must use a line protection module (LPM) with port redundancy (LPM-RP). Table 1-1 shows the required modules for different test modes.

If an external test head is to be used, a port selector module (PSM) with the appropriate software license can be installed in place of the CLT. The PSM contains the necessary circuitry to select and connect the copper loop to be tested to external terminals on the PSM. See the section entitled "TEST PAIR connector" on page A-3. The external test head can then be connected to these terminals to complete the test circuit.

*Table 1-1. Modules required for different CLT test modes*

| Stinger chassis | Bridged mode | Looking out mode | Redundant mode |
|---|---|---|---|
| FS, FS+ | CLT or PSM, LPM-RP, redundant LIM | CLT or PSM, LPM-RP | CLT or PSM, LPM-RP, redundant LIM |
| LS, RT | CLT or PSM, LPM-RP | CLT or PSM, LPM-RP | CLT or PSM, LPM-RP, redundant LIM or LIM port. |

# System description

The CLT module consists of a PSM motherboard combined with a daughterboard containing the test head. Users wishing to perform tests with an external test head can use a PSM alone.

The CLT module or PSM is equipped to access any port on any LIM that is equipped with an LPM-RP. Most users equip all the LIMs in their system with LPM-RPs. Most users also have a redundant (spare) LIM plugged in front of or next to the CLT module.

LIMs and LPMs plug into the midplane in the Stinger chassis. The midplane contains trace pairs that can be accessed by both LIMs and LPMs. Both the CLT or PSM and the LPM-RPs behind each LIM contain relays that can be switched individually by means of software. Software commands entered directly from the TAOS command-line interface or generated by SNMP commands control the operation of the relays.

# System operation

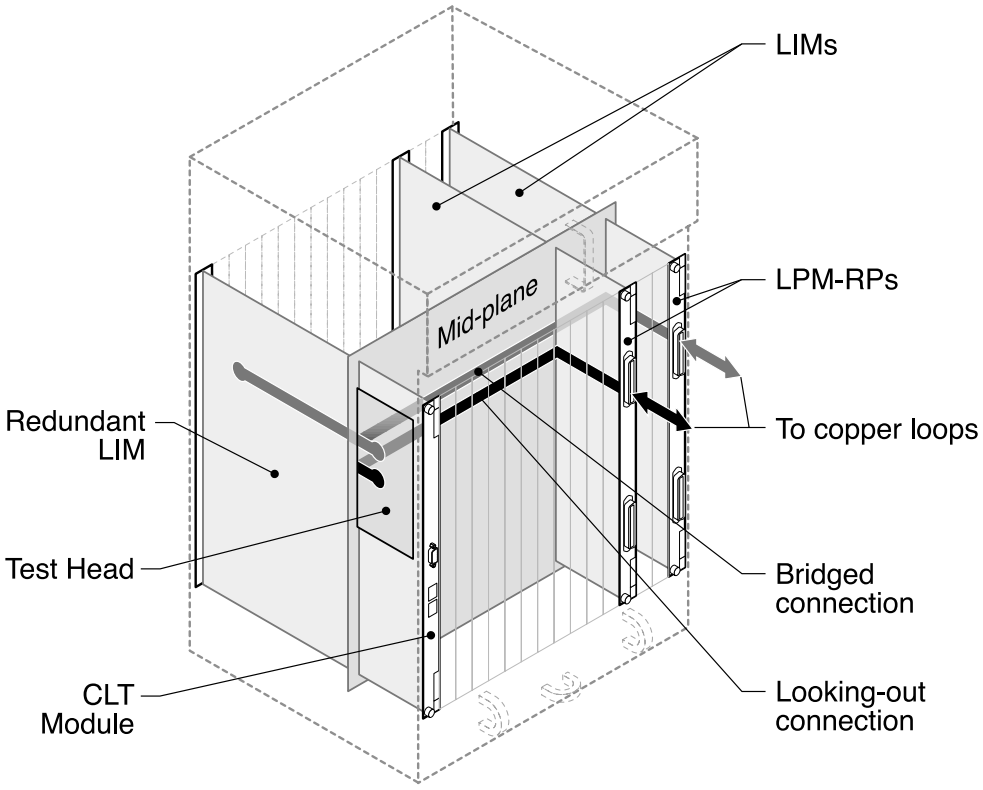
In normal operation, each loop connected to an LPM port is connected directly to the port on the LIM in front of or next to the LPM-RP. Using a software command, you can connect a particular loop to the input of the internal or external test head instead of the LIM. If a CLT is used, connection is usually made to the internal test head. When a PSM is installed, the loop is connected to the external terminals on the PSM.

Connections between a particular loop and the test head can be made in two ways. In *looking-out* mode, the loop is disconnected from its LIM and connected only to the test

head input. Looking-out mode is usually used to prequalify lines before they have been put in service. The black path in Figure 1-1 illustrates looking-out mode.

In *bridged* mode, the loop is connected to both the test head and the corresponding port on the LIM. For the Stinger FS or Stinger FS+, bridged mode can be used only if a redundant LIM of the same type is installed in front of the CLT module or PSM. For the Stinger LS or RT bridged mode can be used with active LIMs. The gray path in Figure 1-1 illustrates bridged mode.

*Figure 1-1. CLT system*



# Supported tests

The CLT module supports the following copper loop tests:

- Digital multimeter (DMM) tests
- Line tests
- Time-domain reflectometry (TDR) tests
- Additional functions and commands

## DMM tests

DMM tests include measurement of dc and ac voltage, resistance, and capacitance. All tests can be performed between tip and ring, tip and ground, and ring and ground.

### dc voltage

Measurement of dc voltage is used for unwanted (foreign) voltage detection. The measurement range is ±275 volts dc (Vdc).

### ac voltage

Measurement of ac voltage is used for foreign voltage detection. The measurements up to 200 volts ac root mean square (Vac rms) can be made.

### dc resistance

Measurement of dc resistance is used to detect shorts and leakage between tip and ring, tip and ground, and ring and ground. The measurement range is 1 ohm to 5 megohms (Mohms).

### Capacitance

Capacitance measurement is primarily used for loop length estimation. This test report both the actual capacitance and the estimated length. Length estimation is calculated using the ANSI estimation factor of 83 nanofarads (nF) per mile and is reported in feet or meters. The measurement range is 1nF to 1 microfarad (µF).

### Digital multimeter (DMM) dc delta measurement

This test measures loop resistance based on a dc Thevenin circuit. Tests are simultaneously made tip to ring (T-R), tip to shield (T-S), and ring to shield (R-S).

### DMM ac delta measurement (CLTE module only)

This test measures loop resistance and capacitance based on an ac Thevenin circuit. Tests are simultaneously made tip to ring (T-R), tip to shield (T-S), and ring to shield (R-S).

### DMM longitudinal balance (CLTE module only)

This test measures the longitudinal balance of the loop. This is a measure of how susceptible the line is to noise. Measurement of greater than 60dB indicate a good line.

### DMM capacitance equivalent measurement

This test measures loop capacitance tip to ring (T-R), tip to shield (T-S), and ring to shield (R-S) simultaneously.

### All-DMM measurement

This test makes tip to ring (T-R), tip to shield (T-S), and ring to shield (R-S) DMM measurements for a selected DMM function with one command.

## Line tests

Line tests include noise measurements, insertion loss, coil detection, loop resistance, bridge-tap measurement, first coil location, and short-circuit location. The following sections describe the available line tests.

### Wideband noise

The wideband noise test detects interferers from such sources as other digital services, AM radio or electrical equipment. The noise is measured using the Power Spectral Density (PSD) technique.

You test inactive lines after specifying the termination resistance to be placed on the received signal. Line termination can be set to either 100 or 135 ohms. A 100-ohm value is used for testing asymmetric digital subscriber (ADSL) lines, and 135 ohms is used for all other xDSL types.

Active lines are tested in a high-impedance mode that protects the live signal. When using high-impedance mode, you must set the termination mode to either Bridge 100 or Bridge 135. Bridge 100 is used for ADSL lines, and Bridge 135 is used for all other xDSL types. This setting allows the proper power levels to be computed from the received voltage.

Noise can be measured for four different frequency spectrums:

- PSD—measures the noise in the full ADSL discrete multitone (DMT)/CAP spectrum of 22 kilohertz (kHz) to 1.6 megahertz (MHz). Test results are available as 371 pairs of frequency and amplitude data points over the frequency range. Amplitude is specified in decibels referred to 1 milliwatt per hertz. (dBm/Hz).
- E—measures the aggregated noise in the ISDN Basic Rate Interface (BRI) spectrum at an impedance of 135 ohms. The frequency range is 1kHz to 50kHz. Test results are available as a single data point in dBm.
- F—measures the aggregated noise in the high-bit-rate DSL (HDSL) spectrum at an impedance of 135 ohms. The frequency range is 5kHz to 245kHz. Test results are available as a single data point in dBm.
- G—measures the aggregated noise in the ADSL spectrum at an impedance of 100 ohms. The frequency range is 20kHz to 1.1MHz. Test results are available as a single data point in dBm.

### Impulse noise

The impulse noise measurement determines whether a loop is susceptible to any spurious impulse-noise spikes during a long period of time. The measurement duration can be anywhere from a few minutes to a few days. The test detects impulse

noise spikes on the signal and keeps a running count of the number of events over time.

Impulse events are divided in three categories. The Low count tallies the number of spikes between Threshold and Threshold + Delta. The Mid count reports the number of spikes with a level between Threshold + Delta and Threshold + 2Delta. The High count reports the number of spikes exceeding a level of Threshold + 2Delta.

Threshold can be specified over a range of 50dBm to 102dBm. Delta can be specified over a range of 2dB to 6dB.

Three other parameters are specified for the impulse test.

- Max Count is the maximum number of impulse events that are counted during a single measurement. Max Count can be specified over a range of 1 to 9999.
- Dead Time is the measurement delay after the unit detects the initial impulse. Dead Time starts when the noise spike is detect. The impulse noise test resumes measuring events after the Dead Time period has elapsed. This prevents the noise test from counting the same spike multiple times.
- Timer specifies the duration of the impulse noise test. Timer can be specified over a range of 1 to 9999 minutes. You can specify a continuous test by setting the value of Timer to continuous.

### Coil detection

The load coil detection test detects the presence and number of load coils in the loop. Up to five load coils can be detected. The distance to the first detected load coil can then be measured using a TDR test. After the first coil has been located and physically removed with the help of TDR testing, the coil detection test must be repeated to detect any additional coils.

### First coil location

This test measures the distance to the first load coil in the loop.

### Short-circuit location

This test measures the distance to a short circuit in the loop.

### Bridge-tap measurement

This test detects the number of bridge taps, bridge-tap length, and location.

### Detaptor test (CLTE module only)

This is a two ended test to detect the longest bridge tap in the loop. The result show the length of the longest tap.

### Splitter detection

This test detects the presence of a splitter in the loop.

### Insertion loss

The insertion loss test is a “paired” test requiring both the CLT module at the CO end and a test unit at the CPE end of the loop. The unit at the CPE end *must* be a SunSet

xDSL model SS160 copper loop test unit manufactured by Sunrise Telcom of San Jose, CA.

The insertion loss test measures the loss characteristics over a range of 13kHz to 1.6MHz. This covers the entire ADSL band. Test results are available as 371 pairs of frequency and signal loss data points over the frequency range. Frequency is specified in kilohertz, and loss is specified in decibels.

### Signal-to-noise ratio (SNR)

The signal-to-noise ratio (SNR) test is also a paired test requiring both the CLT module at the CO end and a SunSet test unit at the CPE end of the loop. The test independently measures the best achievable signal-to-noise performance over the full range of frequencies used by DSL modems. The test results correlate to the SNR measurements used by DMT modems to adjust bit distribution and transmit power levels. It is particularly useful to identify frequencies that have low noise margins.

The SNR test measures noise in the 22kHz-to-1.6Mhz spectrum. Test results are available as 367 pairs of frequency and SNR data points over the frequency range. Frequency is specified in kilohertz, and SNR is specified in decibels.

The SNR test depends on an insertion loss measurement. An insertion loss test must be performed first, immediately followed by the SNR test.

### Loop resistance

The loop resistance test measures the resistance of the loop. You *must* short-circuit the loop at the CPE end to perform this measurement. You can short-circuit the loop manually or, if a SunSet test unit is available at the CPE end, you can enter commands to short-circuit the loop.

Loop resistance can be used to estimate loop length. Loop length is calculated based on cable gauge and temperature. The resistance measurement can also be used to verify that the circuit has an acceptable loop resistance.

You must specify the temperature before performing this test. Test results are reported in ohms, and estimated length in feet or centimeters. Length estimates are supplied for 22 American wire gauge (AWG), 24 AWG, and 26 AWG, or 0.6mm, 0.5mm, and 0.4mm wire sizes.

## TDR tests

Time-domain reflectometry (TDR) operates by sending a pulse of energy down the copper loop. It then measures any reflections or echoes that return to the receiver. These reflections are caused by faults or changes in impedance of the loop. By measuring the time it takes for the reflections to be received back, you can compute the distance to the fault.

For example, a load coil behaves like a large increase in impedance. Any major change in the loop's insulation or fill material (like water in the cable) also causes a detectable reflection.

In general, the TDR function of the CLT module can help you do the following:

- Locate bridge taps and indicate not only the presence of a bridge tap but the exact location and the length of the lateral.
- Determine the presence and location of load coils.

- Detect any other circuit faults, such as an open, short, or wet cable.

To perform these functions, you must use external software to analyze the data that the TDR function returns to you.

## TDR test parameters

Before you can perform a TDR test, you must select the parameters for the test using the `tdrset` command. Use Table 1-2 to help you determine TDR test parameters.

*Table 1-2. TDR test parameters*

| Parameter | Meaning | Valid values |
|---|---|---|
| `Unit` | Unit of measurement, either English or metric. | **English**<br>Metric |
| `Gauge` | Wire gauge. | English—22AWG, 24AWG, or 26AWG<br>Metric—0.6mm, 0.5mm, or 0.4mm |
| `VP` (velocity of propagation) | Speed that the signal travels down the cable. Use the $V_P$ values associated with your particular cable type. This information is available on the cable's specification sheet or from the manufacturer. | 40% to 90% of light speed. |
| `AVG (average)` | Number of times the test head must send the TDR pulse. If the value is set for greater than 1, the average value of the response to all pulses is used. Lucent recommends that AVG be set to 1 for all testing. | 1 through 5. |

## TDR test modes

TDR testing can be performed in either automatic or manual mode.

- Automatic—In automatic mode, the TDR test reports the location of the first fault. Distance and amplitude data point pairs are also reported around the location of the detected fault.
- Manual—In manual mode, you specify a starting length and measurement length to test a specific area of the cable. Starting length can be specified over a range of 15 to 20,000 feet (5 to 6096 meters). Measurement length is specified over a range of 100 to 20,000 feet (31 to 6096 meters). For efficient testing, Lucent recommends that measurement lengths of less than 2000 feet (610 meters) be used.

## Other functions and commands

Other functions and several maintenance commands are available from the test head. These include test tone sending and receiving, calibration, test head reset, and version reporting and download of test head software.

### Send Tone function

Tones of a specified frequency and level can be sent from the test head. Frequency can be specified over a range of 10 to 1600kHz. Levels can be set over a range of -10 to +26dBm.

### Send Control Tone function

This function sends control tones for ADSL and G.lite services. Either quiet or restore tones can be sent.

### Send Trace Tone function

This function sends trace tones tip to ring (T-R), tip to shield (T-S), and ring to shield (R-S). Power can be specified between -10dBm and 10dBm, with periods ranging from 1 minute to 120 minutes.

### Stop Tone function

This function stops the transmission of tones.

### Receive Tone function

The frequency and level of a tone on the loop can be measured. Frequency is reported in kilohertz, and level is reported in dBm. The level is measured for the highest power frequency.

### Detect Ringer function

This test detects the presence of the ringer signal.

### Detect ATU-R function

This test detects the presence of the ADSL transmission unit-remote (ATU-R) signal.

### Voice detection

This test detects the presence of voice signals in the loop.

### Voice signal detection (CLTE module only)

This test detects and measures various signals on the loop. The signal types include voice, DTMF, MF, tone, background noise and signal to noise.

### Send voice signal (CLTE module only)

This test sends voice and tone signals in various modes. The modes include tone, three tone, sweep, DTMF, and female voice.

### Dial tone testing and analysis (CLTE module only)

The test will draw, break and analyze the subscriber dial tone.

### Splitter bypass

This function controls the bypass mode on programmable splitters. Currently the Intelligent POTS Splitter (iPOTS) manufactured by mPhase Technologies is supported.

### Responder mode

This function sets the CLT module to responder mode. In responder mode, the CLT module can be used with a Sunset DSL test set at the CPE end of the loop to perform two-ended testing. Two- ended tests include insertion loss, loop resistance and signal-to-noise ratio measurements.

### Calibration command

The Calibration command internally calibrates the measurement circuitry of the test head. Lucent recommends that you perform calibration at the following times:

- Every 30 operation days
- After you enter the Reset command

### Reset command

The Reset command restarts the hardware circuitry of the test head.

### Version command

The Version command reports the software version of the test head.

### Download command

The Download command is used to upgrade the test head software.

**Caution** Use the Download command only if you are qualified Lucent service personnel or are working under their direction.

## How to perform tests

Testing can be initiated by means of either the TAOS command-line interface or SNMP. For more information, see Chapter 2, “Copper Loop Testing through the Command-Line Interface” or Chapter 3, “Copper Loop Testing through SNMP.”

Test results are obtained through the TAOS command-line interface, SNMP, or the TL1 interface.

To run a test, you perform the following three steps:

1. Using TAOS command-line interface commands or SNMP, select the copper loop to be tested and activate the test head. (If a PSM and an external test head are used for testing, this is the only step needed.)
2. Enter the commands and parameters or SNMP objects necessary to select and characterize the desired test.
3. After waiting for the test to finish, access the resulting data using the command-line interface or SNMP, and pass it to external software for analysis.

# Copper Loop Testing through the Command-Line Interface

# 2



The TAOS command-line interface (CLI) can be used to set the parameters for, initiate, and obtain the results of any available copper loop test.

## Using the command-line interface

You perform testing either by entering `clt` commands or by setting parameters in various `clt` profiles.

### Performing tests by entering clt commands

Tests are performed with `clt` commands as follows:

1 **Select the loop with the `cltactivate` command.**

See "Enabling test access with the cltActivate and cltDeactivate commands" on page 2-2.

2 **Select the test and its parameters with the `cltCmd` command.**

See "Selecting tests with the cltCmd command" on page 2-7.

The results of the tests are displayed on your terminal.

### Performing tests using clt profiles

Perform tests by setting the parameters of clt profiles as follows:

1 **Select the loop by using the `set` command to set the appropriate parameters in the Clt-Access profile.**

When all the parameters have been set, use the `write` command to store the parameters and activate loop access. See "Enabling test access through the CLT-Access profile" on page 2-3.

2 **Set the parameters for the desired test by using the `set` command.**

When all the parameters have been set use the `write` command to store the values. See "Selecting tests through the Clt-Command profile" on page 2-22.

3 **Use the `set` command to set the `test-operation` parameter to select the desired test.**

Use the `write` command to store the value and start the selected test. See "Selecting tests through the Clt-Command profile" on page 2-22.

4 **Monitor the value of the `test-result-status` parameter in the `clt-result` profile to determine when the test is completed.**

See "Determining test results" on page 2-31.

5 **Use the `list` command to list the `clt-result` profile and view the test results.**

# Enabling tester and copper loop access

The first step is to activate tester access by connecting the desired copper loop to the internal test head or to the external test terminals. Perform this step by means of commands or through the `clt-access` profile. If a path selector module (PSM) and an external test head are used, this is the only step needed.

## Enabling test access with the cltActivate and cltDeactivate commands

From the command line, you can enter the `cltactivate` and `cltdeactivate` commands.

### cltActivate command

Enter this command with the appropriate parameters to connect a copper loop in a LIM to an internal test head or external test terminals.

**Usage** `cltactivate slot port [cltslot][mode][terminal][loop]`

| Syntax element | Description |
|---|---|
| `slot` | Slot number of the LIM containing the copper loop to be tested. |
| `port` | Port number of the copper loop to be tested. |
| `cltslot` | Number of the slot where the CLT module or PSM doing the testing is installed. |
| `mode` | Connection configuration of the copper loop:<br>`bridged`—Copper loop is connected to the test head and the corresponding port of the spare LIM. This is the default value.<br>`looking-out`—Copper loop is connected only to test head. |
| `terminal` | Connection point of the copper loop:<br>`internal-tester-terminal`—Copper loop is connected to the internal test head of the CLT module. This is the default value.<br>`external-tester-terminal`—Copper loop is connected to the external test terminals of the CLT module or PSM.<br>`auxiliary-tester-terminal`—Copper loop is connected to the auxiliary test terminals of the CLT module or PSM. |

| Syntax element | Description |
|---|---|
| `loop` | Copper loop number of the T1 or EI port. This parameter applies only to copper loops connected to T1 or E1 LIMs and is ignored for all other LIMs.<br>1—Transmit copper loop.<br>2—Receive copper loop. |

**Example**

```
admin> cltactivate 2 32 15 bridged internal
LOG notice, Shelf 1, Slot 8, Time: 11:58:49--
LIM 15 IF 32 ACTIVATED as spare for IF 2
```

### cltActivate External-Loop command

Enter this command to set the CLT module as a test head for an external loop. This command does not have any parameters. The CLT slot is detected automatically, and the access mode is set to `looking-out`.

**Usage** `cltActivate external-loop`

The `cltActivate external-loop` command is used to allow a Stinger unit with a copper loop test (CLT) module to test copper loops connected to other Stinger units that are equipped with only a path selector module (PSM).

### cltDeactivate command

Enter this command without any parameters to deactivate the connection between a copper loop and an internal test head or external test terminals.

**Usage** `cltdeactivate`

**Example**

```
admin> cltdeactivate
LOG notice, Shelf 1, Slot 8, Time: 12:07:51--
LIM 15 IF 32 DEACTIVATED as spare for IF 2
```

## Enabling test access through the CLT-Access profile

Tester access can also be activated by means of the TAOS profile `clt-access`. Following are the `clt-access` profile parameters with their default values.

```
[in CLT-ACCESS]

cltm-slot = slot-16
access-slot = slot-16
access-port = 1
access-loop = 1
access-mode = looking-out
access-terminal = internal-tester-terminal
```

```
activate-access = no
access-result = idle
```

| Parameter | Specifies |
|---|---|
| cltm-slot | Slot number where the CLT module or PSM is installed. |
| access-slot | Slot number of the LIM containing the copper loop to be tested. |
| access-port | Port number of the copper loop to be tested. |
| access-loop | Copper loop number of the T1 or EI port. This parameter applies only to copper loops connected to T1 or E1 LIMs and is ignored for all other LIMs.<br>1—Transmit copper loop.<br>2—Receive copper loop. |
| access-mode | Connection configuration of the copper loop:<br>bridged—Copper loop is connected to the test head and the corresponding port of the spare LIM.<br>looking-out—Copper loop is connected only to the test head. This is the default value. |
| access-terminal | Connection point of the copper loop:<br>internal-tester-terminal—Copper loop is connected to the internal test head of the CLT module. This is the default value.<br>external-tester-terminal—Copper loop is connected to the external test terminals of the CLT module or PSM.<br>auxiliary-tester-terminal—Copper loop is connected to the auxiliary test terminals of the CLT module or PSM.<br>external-loop—Internal test head of CLT module is connected to the TEST PAIR connector of the CLT module. |
| activate-access | Activates tester connection to the copper loop.<br>yes—Copper loop is connected as specified.<br>no—Copper loop is disconnected from test head or test terminals |
| access-result | Result of tester connection to the copper loop. This value is updated by the system after changes to the profile have been written.<br>idle—Test head is inactive and no copper loops are connected.<br>access-activated—Test head is active and copper loop is connected as specified.<br>resource-busy—The resource to enable CLT module access is in use. Access failed. |

### Example using CLT-Access

In the following example, the administrator lists the `clt-access` profile, sets some of its parameters to new values to activate testing, and saves and lists the changes:

```
admin> read clt-access
CLT-ACCESS read

admin> list
[in CLT-ACCESS]

cltm-slot = slot-16
access-slot = slot-16
access-port = 1
access-mode = looking-out
access-terminal = internal-tester-terminal
activate-access = no
access-result = idle

admin> set cltm-slot = 15
admin> set access-slot = 2
admin> set access-port = 32
admin> set access-mode = bridged

admin> set activate-access = yes
admin> write

LOG notice, Shelf 1, Slot 8, Time: 15:54:08--
LIM 15 IF 32 ACTIVATED as spare for IF 2

admin> read clt-a
CLT-ACCESS read

admin> list

[in CLT-ACCESS]
cltm-slot = slot-15
access-slot = slot-2
access-port = 32
access-mode = bridged
access-terminal = internal-tester-terminal
activate-access = yes
access-result = access-activated
```

## Enabling loop testing with one CLT module and multiple Stinger units

Several PSM-equipped Stinger units can be served by one Stinger unit equipped with a CLT module. To use this method, connect the tip, ring, and ground connections of the TEST PAIR connectors on the PSMs to the TEST PAIR connector on the CLT module, using either a daisy-chain or star configuration.

Then, by using the `cltactivate` command or by modifying the `clt-access` profile for the appropriate Stinger unit, proceed as follows:

1. **Select the loop to be tested on the appropriate Stinger unit and set the access terminal on that unit to `external-tester-terminal`**
2. **Set the access terminal for the Stinger unit containing the CLT module to `external-loop`.**

See "Sample two-unit configuration" on page 2-6 for configuration examples.

### Sample two-unit configuration

A system is set up with two Stinger units. Stinger 1 is configured with a PSM in slot 12 and ADSL LIMs in slots 1 through 7. Stinger 2 is equipped with a CLT module in slot 16. You want to perform loop tests on the loop connected to port 7 of the ADSL LIM in slot 2 of Stinger 1.

#### *Example using the cltActivate command*

1. **Connect tip, ring, and ground connection of the TEST PAIR connector on the PSM in Stinger 1 to the respective tip, ring, and ground connections of the TEST PAIR connector on the CLT module in Stinger 2.**
2. **Enter the `cltactivate` command for Stinger 1 as follows:**

   ```
   admin> cltactivate 2 7 12 looking-out external-tester-terminal
   ```

3. **Enter the `cltactivate` command for Stinger 2 as follows:**

   ```
   admin> cltactivate external-loop
   ```

4. **Proceed with the desired test selection and result collection commands on Stinger 2.**

#### *Example using the Clt-Access profile*

1. **Connect the tip, ring, and ground connection of the TEST PAIR connector on the PSM in Stinger 1 to the respective tip, ring, and ground connections of the TEST PAIR connector on the CLT module in Stinger 2.**
2. **Write to the `clt-access` profile for Stinger 1 as follows:**

   ```
   admin> read clt-access
   CLT-ACCESS read

   admin> set cltm-slot = 12
   admin> set access-slot = 2
   admin> set access-port = 7
   admin> set access-terminal = external-tester-terminal
   admin> set activate-access = yes
   admin> write
   ```

3. **Write to the `clt-access` profile for Stinger 2 as follows:**

   ```
   admin> read clt-access
   CLT-ACCESS read

   admin> set access-terminal = external-loop
   admin> set activate-access = yes

   admin> write
   ```

4. **Configure the `clt-command` and `clt-results` profiles for the desired tests on Stinger 2.**

## Selecting a test

The next step is to select the desired copper loop test and specify its parameters. You can do so by using the `cltcmd` command or the `clt-command` profile.

## Selecting tests with the cltCmd command

From the command line, you enter the `cltcmd` command plus the appropriate parameter to activate a copper loop test.

Enter the `cltcmd` command and supply the test name and any relevant parameters.

**Usage** `cltcmd test [parameter 1] [parameter 2] [parameter n]`

| Syntax element | Description | |
|---|---|---|
| `test` | Type of copper loop test, test setup, or maintenance action to perform. The following are valid values: | |
| | `bgns` | Runs a background noise test. You must run the `calib` command before performing this test. |
| | `btap` | Detects the number of bridge taps, their length and location. |
| | `calib` | Internally calibrates the measurement circuitry of the test head. Use the `cltcmd calib` command after every 30 days of CLT module use and after entering the `cltcmd reset` command. |
| | `cldet` | Runs a coil detection test. |
| | `cpemdm` | Detects an ATU-R signal. |
| | `ctonesnd` | Sends a control tone of a specified type and service for DSL modems. |
| | `detaptor` | Detaptor test *(*applies to CLTE module only*).* |
| | `dnld` | Downloads software upgrades to the test head. |
| | `dmm` | Runs a digital multimeter (DMM) measurement test. |
| | `dmmacd` | Runs a DMM ac delta measurement test (applies to CLTE module only). |
| | `dmmall` | Runs the selected DMM test, tip to ring (T-R), tip to shield (T-S), and ring to shield (R-S) simultaneously. |
| | `dmmcap` | Runs a DMM capacitance equivalent test. |
| | `dmmdcd` | Runs a DMM dc delta measurement test. |
| | `dmmlbal` | Runs a DMM longitudinal balance test (applies to CLTE module only). |
| | `dta` | Draw, break and analyze subscriber dial tone (applies to CLTE module only). |
| | `fclloc` | Measures the distance to the first load coil. |
| | `impread` | Reads the impulse noise test result. |
| | `impstart` | Starts the impulse noise test. |
| | `impstop` | Stops the impulse noise test. |
| | `inls` | Runs an insertion loss test. This test requires the presence of an additional test set at the CPE end of the loop. |

| Syntax element | Description | |
|---|---|---|
| | `lpres` | Runs a loop resistance test. The CPE end must be shorted or connected to an xDSL test set. |
| | `measvoice` | Voice signal or narrow band tone detection *(*applies to CLTE module only). |
| | `reset` | Resets the test head module. |
| | `rngr` | Detects the presence of a ringer. |
| | `setbypass` | Places an mPhase iPOTS splitter in bypass mode. |
| | `setresp` | Places the CLT module in responder mode. |
| | `shortloc` | Measures the distance to a short circuit in the loop. |
| | `signs` | Runs a signal-to-noise test. This test requires the presence of an additional test set at the CPE end of the loop. |
| | `sndvoice` | Send voice signal (applies to CLTE module only). |
| | `splitter` | Detects the presence of a splitter in the loop circuit. |
| | `tdr` | Runs a TDR test. You must run the `tdrset` command before running this test. |
| | `tdrset` | Sets time-domain reflectometry (TDR) test parameters. |
| | `tonercv` | Measures the frequency (kilohertz) and level (dBm) of tones received on the copper loop. |
| | `tonesnd` | Sends a tone of the specified frequency (kilohertz) and level (dBm) from the test head. |
| | `tstop` | Stops sending of tones. |
| | `ttonesnd` | Sends a trace tone of 577.5Hz over selected pair at a specified power and duration. |
| | `vers` | Displays the version of the hardware and software running on the internal test head. |
| | `voicedet` | Detects the presence of voice signals on the loop. |
| parameter | See the following sections for any necessary parameters. | |

**Example** To measure tone frequency and level**:**

```
admin> cltcmd tonercv
Tone frequency 640KHz, Level -2  0.01dBm
```

To reset the test head:

```
admin> cltcmd reset
CLT module POST successful.
```

## cltcmd bgns

**Description** Runs a background noise test.

**Usage** `cltcmd bgns [psd|e|f|g] [term100|term135|bridge100|bridge135]`

| Option | Description |
|---|---|
| psd | Measures power spectral density in a 22kHz-to-1.6MHz range. |
| e | Reports one noise value at 135-ohm impedance for a 1kHz-to-50kHz range. Used for ISDN qualification. |
| f | Reports one value for a 5kHz-to-245kHz range. Used for HDSL qualification. |
| g | Reports one noise value at 100-ohm impedance for a 10kHz-to-1.1Mhz range. Used for ADSL qualification |
| term100 | Places a 100-ohm termination on the received signal. |
| term135 | Places a 135-ohm termination on the received signal. |
| bridge100 | Puts the receiver in high-impedence mode, and calculates the noise signal based on 100-ohm impedence. |
| bridge135 | Puts the receiver in high-impedence mode, and calculates the noise signal based on 135-ohm impedence. |

**Example**
```
admin> cltcmd bgns e term135
```

## cltcmd btap

**Description** Detects up to one bridge-taps, bridge-tap length, and location.

**Usage** `cltcmd btap start length`

| Option | Description |
|---|---|
| start | Starting location for bridge-tap search.<br>Range is 15 to 20000 feet if TDR units is set to ENGLISH.<br>Range is 5 to 6097 meters if TDR units is set to METRIC. |
| length | Loop length for bridge tap search.<br>Range is 100 to 20000 feet if TDR units is set to ENGLISH.<br>Range is 32 to 6097 meters if TDR units is set to METRIC. |

**Example**
```
admin> cltcmd btap 100 1000
Number of bridge taps = 0,Loop length = 284
CLT operation completed.
```

## cltcmd cpemdm

**Description** Detects an ATU-R signal (ADSL LIMs only).

**Usage** `cltcmd cpemdm`

**Example**

```
admin> cltcmd cpemdm
CPE detected: NO
CLT operation completed.
```

## cltcmd ctonesnd

**Description** Sends an xDSL control tone.

**Usage** `cltcmd ctonesnd adsl | glite quiet | restore`

| Option | Description |
|---|---|
| adsl | Set for ADSL service. |
| glite | Set for G.lite service. |
| quiet | Send quiet tone. |
| restore | Send restore tone. |

**Example**

```
admin> cltcmd ctonesnd adsl quiet
CLT operation completed.
```

## cltcmd detaptor

**Description** Runs a two ended test to detect the longest bridge tap in the copper loop (applies to CLTE module only).

**Usage** `cltcmd detaptor <metric|english> Vp ( 0 - 99 V)`

| Option | Description |
|---|---|
| metric | Set units for length to metric. |
| english | Set units for length to English. |
| vp | Set peak voltage. Range is from 0 to 99 volts |

**Example**

```
admin> cltcmd detaptor metric 50
admin>

No. of taps detected are 2 and tap length is 20000 in cm
CLT operation completed.
```

## cltcmd dmm

**Description** Runs a digital multimeter (DMM) measurement test.

**Usage** `cltcmd dmm [ohm|dcv|acv|cap] [t-r|t-s|r-s]`

| Option | Description |
|---|---|
| ohm | Resistance test |
| dcv | dc voltage test |
| acv | ac voltage test |
| cap | Capacitance test |
| t-r | Measure between tip and ring. |
| t-s | Measure between tip and sleeve (ground). |
| r-s | Measure between ring and sleeve (ground). |

**Example** admin> **cltcmd dmm dcv t-r**

## cltcmd ctonesnd

**Description** Sends an xDSL control tone.

**Usage** `cltcmd ctonesnd adsl | glite quiet | restore`

| Option | Description |
|---|---|
| adsl | Set for ADSL service. |
| glite | Set for G.lite service. |
| quiet | Send quiet tone. |
| restore | Send restore tone. |

**Example**

```
admin> cltcmd ctonesnd adsl quiet
CLT operation completed.
```

## cltcmd dmmacd

**Description** Runs a DMM ac delta test (applies to CLTE module only).

**Usage** `cltcmd dmmacd time voltage frequency`

| Option | Description |
|---|---|
| time | Settling time. Select 0 to 5 tenths (.1) of seconds. |
| voltage | Test voltage. Select 1 to 24 volts RMS. |
| frequency | Output frequency. Select output frequency from 20Hz to 2000Hz. |

**Example** admin> **cltcmd dmmacd 2 12 1200**
admin>
Capacitance (T-R) 368 (T-S) 210 (R-S) 197 pF
Resistance (T-R) 14534 (T-S) 188872 (R-S) 191260 Ohm

## cltcmd dmmall

**Description** Runs a selected DMM test on tip to ring (T-R), tip to shield (T-S), and ring to shield (R-S).

**Usage** **cltcmd dmmall type time input impedance**

| Option | Description |
|---|---|
| type | ohm—Resistance test |
| | dcv—dc voltage test |
| | acv—ac voltage test |
| | cap—Capacitance test |
| time | 0 to 5 tenths (0.1) second |
| input impedance | 100 or 1000 Kohm |

**Example**

admin> **cltcmd dmmall ohm 1 100**
Resistance (T-R) 123 (T-S) 74 (R-S) 340 Ohm
CLT operation completed.

## cltcmd dmmcap

**Description** Runs a DMM capacitance equivalent measurement.

**Usage** **cltcmd dmmcap time**

| Option | Description |
|---|---|
| time | 0 to 5 tenths (0.1) second |

**Example**

admin > **cltcmd dmmcap 1**
Capacitance (T-R) 150, (T-S) 64, (R-S) 64 pF
CLT operation completed.

## cltcmd dmmdcd

**Description** Runs a DMM dc delta measurement.

**Usage** `cltcmd dmmdcd time voltage output impedance`

| Option | Description |
|---|---|
| `time` | 0 to 5 tenths (0.1) second |
| `voltage` | -230 to 230 V |
| `output impedance` | 10 to 1000 Kohm |

**Example**

```
admin> cltcmd dmmdcd 1 10 10
Resistance (T-R) 123 (T-S) 123 (R-S) 123 Ohm
DC Voltage (T-S) 76 (R-S) 48 mV
CLT operation completed.
```

## cltcmd dmmlbal

**Description** Runs a DMM longitudinal balance test (applies to CLTE module only).

**Usage** `cltcmd dmmlbal time voltage frequency`

| Option | Description |
|---|---|
| `time` | Settling time. Select 0 to 5 tenths (.1) of seconds. |
| `voltage` | Test voltage. Select 1 to 24 volts RMS. |
| `frequency` | Output frequency. Select output frequency from 20Hz to 2000Hz. |

**Example**

```
admin> cltcmd dmmlbal 3 12 1900
admin>
Longitudinal Balance 29 in db
CLT operation completed
```

## cltcmd dta

**Description** Draw, break, and analyze subscriber dial tone (applies to CLTE module only).

**Usage** `cltcmd dta <term|dtmf>`

| Option | Description |
|---|---|
| `term` | Remove bridge to create dial tone break. |
| `dtmf` | Use DTMF tone to create dial tone break. |

**Example** admin> **cltcmd dta dtmf**
admin>
The Result Obtained is DTA: Cannot Draw
CLT operation completed.

## cltcmd fclloc

**Description** Runs a test to measure the distance to the first load coil in a copper loop.

**Usage** **cltcmd fclloc metric|english gauge**

| Option | Description |
|---|---|
| metric | Uses metric units for test parameters and results. |
| english | Uses English units for test parameters and results. |
| gauge | Gauge of the cable in the loop, one of the following<br>■ In English units, 22 AWG, 24 AWG, or 26 AWG<br>■ In metric units, 4, 5, or 6 tenths of a millimeter |

**Example** To measure the distance in centimeters to the first load coil in a 0.04mm loop:

admin> **cltcmd fclloc metric 4**
admin>
First Coil Location: 9750 cm.
CLT operation completed.

## cltcmd impread

**Description** Reads and displays the impulse noise test result.

**Usage** **cltcmd impread**

## cltcmd impstart

**Description** Starts the impulse noise test.

**Usage** **cltcmd impstart** ***threshold delta max-count dead-time timer***

| Option | Description |
|---|---|
| threshold | Threshold value of the smallest noise spike detected, a value within the range 50 through 100dBm. |
| delta | Delta—the number of decibels referred to 1mW (dBm) above the threshold—to measure for noise spike detection, a value within the range 2 through 6dBm. |
| max-count | Maximum number of impulse events to be counted during a single measurement, a value from 1 through 9999. |

| Option | Description |
|---|---|
| dead-time | Measurement delay after the unit detects the initial impulse, a value from 10 through 250 tenths (0.1) of a millisecond (ms). |
| time | Duration of noise measurement, a value from 1 through 9999 minutes. |

**Example** `admin> cltcmd impstart 70 4 5000 500 20`

## cltcmd impstop

**Description** Stops the impulse noise test.

**Usage** admin> `cltcmd impstop`

**Example** admin> **`cltcmd impstop`**
```
admin>
CLT operation completed.
```

## cltcmd inls

**Description** Runs the insertion loss test. An additional test set at the CPE end of the loop must be present.

**Usage** `cltcmd inls`

**Example** admin> **`CLTCMD INLS`**
```
admin>
Frequency 30 Khz, Loss 200 0.01dBm
Indicates out of range result

CLT operation completed.
```

## cltCmd lpres

**Description** Runs a loop resistance test. This test requires that the loop be shorted at the CPE end of the loop.

**Usage** `cltcmd lpres [english|metric] temp`

| Option | Description |
|---|---|
| english | Use English units for test parameters and results. |
| metric | Use metric units for test parameters and results. |
| temp | Temperature of the loop, a value within either of the following ranges:<br>■ In English units, from 0 through 200 degrees F<br>■ In metric units, from -178 through 933 degrees C, in tenths (0.1) of a degree |

## cltcmd measvoice

**Description** Detects and measures voice, tone or signal noise ratio on the copper loop (applies to CLTE module only).

**Usage** There are three available test methods:

**cltcmd measvoice *auto|dtmf|mf p***

| Option | Description |
|---|---|
| auto | Auto mode detects if voice signal is present on the loop. |
| dtmf | DTMF mode detects if DTMF tones exist on the loop. |
| mf | MF mode detects if MF tones exist on the loop. |
| p | Select a detection period between 1 and 20 seconds. |

**cltcmd measvoice *bgns cmsg|3kflat***

| Option | Description |
|---|---|
| bgns | Specifies background noise test. |
| cmsg | Specifies C-message filter for noise test. |
| 3kflat | Specifies 3-Kflat filter for noise test. |

**cltcmd measvoice *tone|sgns***

| Option | Description |
|---|---|
| tone | Specifies tone mode. Detects a single tone. |
| sgns | Specifies signal to noise mode. Measures signal to noise using a C-notch filter. |

**Example**
```
admin> cltcmd measvoice auto 1
Voice signal not detected

CLT operation completed.
```

## cltcmd reset

**Description** Resets the CLT test head.

**Usage** **cltcmd reset**

**Example**
```
admin> cltcmd reset
admin>
CLT module POST successful.
```

```
Software revision 106, Hardware revision 52

CLT operation completed.
```

## cltcmd rngr

**Description** Detects the presence of a ringer.

**Usage** `cltcmd rngr`

```
admin> cltcmd rngr
Ringer detected: NO
CLT operation completed.
```

## cltcmd setbypass

**Description** Toggles an mPhase iPOTS splitter in and out of bypass mode.

**Usage** `cltcmd setbypass`

**Example** `admin > cltcmd setbypass`

```
CLT operation completed
```

**Dependencies** Successive instances of this command toggle the splitter bypass mode from off to on and back.

## cltcmd setresp

**Description** Puts the CLT module in responder mode.

**Usage** `cltcmd setresp` ***on|off time***

| Option | Description |
|---|---|
| on | CLT responder mode is on. |
| off | CLT responder mode is off. |
| time | 1 to 999 minutes. Valid only when responder mode is on. |

**Example** `admin > setresp on 15`

## cltcmd shortloc

**Description** Runs a test to measure the distance to a short circuit in a copper loop.

**Usage** `cltcmd shortloc` ***metric|english gauge detect | nodetect***

| Option | Description |
|---|---|
| `metric` | Uses metric units for test parameters and results. |
| `english` | Uses English units for test parameters and results. |
| `gauge` | Gauge of the cable in the loop, one of the following<br>■ In English units, 22 AWG, 24 AWG, or 26 AWG<br>■ In metric units, 4, 5, or 6 tenths of a millimeter |
| `detect` | Detects the short with a DMM test and then measures its location. |
| `nodetect` | Measures the distance to a short circuit without a DMM test. |

**Example** To detect a short circuit in a 24AWG copper loop and measure the distance to it in feet:

```
admin> cltcmd shortloc english 24 detect
admin>
Short Location: 134117  0.01 ft.
CLT operation completed.
```

## cltcmd signs

**Description** Runs signal to noise test. This test requires the presence of an additional test set at the CPE end of the copper loop.

**Usage** `cltcmd signs`

## cltcmd sndvoice

**Description** Sends actual voice or tone signals on the copper loop in various modes (applies to CLTE module only).

**Usage** There are five different modes that can be used:

For tone mode: `cltcmd sndvoice` ***tone frequency level time***

| Option | Description |
|---|---|
| tone | Selects single tone mode. |
| `frequency` | Specify a tone frequency in a range of 300Hz to 4000Hz. |
| `level` | Specify a tone level in a range of -30dBm to 10dBm. |
| `time` | Specify the total duration of the tone in a range of 1 to 120 minutes. |

For 3 tone mode: **cltcmd sndvoice *3-tone level period time***

| Option | Description |
|---|---|
| 3-tone | Selects 3 tone mode. Three single frequency tones are sent at frequencies of 404Hz, 1004Hz, and 2804Hz. |
| level | Specify a tone level in a range of -30dBm to 10dBm. |
| period | Specify the length of each individual tone in a range of 1 to 10 seconds. |
| time | Specify a total duration in a range of 1 to 120 minutes. |

For sweep mode: **cltcmd sndvoice *sweep start end increment level period***

| Option | Description |
|---|---|
| sweep | Selects sweep mode. |
| start | Specify the starting frequency in a range of 300Hz to 20000Hz. |
| end | Specify the ending frequency in a range of 300Hz to 20000Hz. |
| increment | Specify the frequency increment for each successive tone in a range of 10Hz to 1000Hz. |
| level | Specify a tone level in a range of -30dBM to 10dBm. |
| period | Specify the length of each tone in a range of 1 to 10 seconds. |

For send voice mode: **cltcmd sndvoice *dtmf|mf string***

| Option | Description |
|---|---|
| dtmf | Specifies that DTMF tones are sent. |
| mf | Specifies that MF tones are sent |
| string | An ASCII string of up to 20 digits to be sent as tones. |

For digit mode: **cltcmd sndvoice *digit string***

| Option | Description |
|---|---|
| digit | Specifies digit mode where each digit is sent in a female voice. |
| string | An ASCII string of up to 20 digits with values from 0 to 9. |

**Example** admin> **cltcmd sndvoice tone 450 2 1**
admin>

## cltcmd splitter

**Description** Detects the presence of a splitter in the copper loop circuit.

**Usage** **cltcmd splitter**

**Example** admin > **cltcmd splitter**

```
Splitter detected : YES
CLT operation completed
```

## cltcmd tdr

**Description** Runs a TDR test

**Usage** **cltcmd tdr** ***[auto|manual] start length***

| Option | Description |
|---|---|
| auto | Runs the test automatically so that the first fault is automatically detected. |
| manual | Runs the test manually and requires a measurement range. |
| start | For manual mode, the distance at which to start TDR measurement, a value in one of the following ranges:<br>■ In English units, from 15 through 20,000 feet<br>■ In metric units, from 5 through 6097 meters |
| length | For manual mode, the total length of the measurement starting from *start*, a value in one of the following ranges:<br>■ In English units, from 100 through 20,000 feet. The sum of start and length must not exceed 20,000 feet.<br>■ In metric units, from 32 through 6097 meters. The sum of *start* and *length* must not exceed 6097 meters. |

**Example** admin> **cltcmd tdr manual 5000 12000**

## cltCmd tdrset

**Description** Sets time-domain reflectometry (TDR) test parameters.

**Usage** **cltcmd tdrset** ***metric|english gauge Vp tries***

| Option | Description |
|---|---|
| metric | Use metric units for test parameters and results. |
| english | Use English units for test parameters and results. |

| Option | Description |
|---|---|
| gauge | Gauge of the cable in the loop, one of the following values:<br>■ In English units, 22AWG, 24AWG, or 26AWG<br>■ In metric units, 4, 5, or 6 tenths of a millimeter. |
| Vp | Velocity of propagation for the cable under test, a value from 40% through 90% of the speed of light. |
| tries | Number of times the TDR pulse is sent, a value from 1 through 5 pulses. Results are averaged if more than one pulse is used. |

**Example** admin> **cltcmd tdrset metric 5 85 3**

## cltcmd tonesend

**Description** Sends a tone of the specified frequency (kilohertz), level (dBm), and period from the test head.

**Usage** **cltcmd tonesnd *frequency power period***

| Option | Description |
|---|---|
| frequency | Frequency of the tone sent, a value from 10 through 1600kHz. |
| power | Amplitude of the tone sent, a value from -10 through 10dBm. |
| period | 1 to 120 minutes (default is 60 minutes) |

**Example** admin> **cltcmd tonesnd 640 -2 75**

## cltcmd ttonesend

**Description** Sends a trace tone.

**Usage** **cltcmd ttonesend type power period**

| Option | Description |
|---|---|
| type | T-R—Send tip to ring.<br>T-S—Send tip to sleeve.<br>R-S—Send ring to sleeve. |
| power | -10dBm to 10 dBm |
| period | 1 to 120 minutes (default is 60 minutes) |

**Example**

admin> **cltcmd ttonesnd t-s 5 30**

CLT operation completed

### cltcmd tstop

**Description** Stops sending tones.

**Usage** `cltcmd tstop`

**Example**

```
admin> cltcmd tstop
CLT operation completed
```

### cltcmd vers

**Description** Displays the hardware and software version of the CLT test head.

**Usage** `cltcmd vers`

**Example**

```
admin> cltcmd vers
admin>
Software revision 106, Hardware revision 52
CLT operation completed.
```

### cltcmd voicedet

**Description** Runs a test to detect the presence of voice signals in a copper loop.

**Usage** `cltcmd voicedet`

**Example**

```
admin> cltcmd voicedet
admin>
Voice signal not detected
CLT operation completed.
```

## Selecting tests through the Clt-Command profile

Use the `clt-command` profile to select and set parameters for tests. Set the test parameters for the desired test using the `set` command. Use the `write` command to store the values you have set.

The type of test is defined by the `test-operation` parameter. Any change in this parameter initiates the test identified by the new value of this parameter. Be sure to set the value of the `test-operation` parameter *after* all the other parameter relevant to that test have been set.

Following are the `clt-command` parameters with their default values.

```
[in CLT-COMMAND]
cltm-slot = slot-16
test-time-stamp = 0
test-sequence = 0
test-operation = none
```

```
dmm-type = resistance
dmm-lead = tip-ring
background-noise-filter = psd
background-noise-termination = term100
loop-resistance-unit = metric
loop-resistance-temp = 0
impulse-noise-start-thresh = 50
impulse-noise-start-delta = 2
impulse-noise-start-max-count = 1
impulse-noise-start-dead-time = 1
impulse-noise-start-timer = 1
calibration-type = insertion-loss
tone-send-freq = 10
tone-send-level = 0
tone-send-period = 0
tdr-unit = metric
tdr-gauge = 0
tdr-vp = 0
tdr-avg = 1
tdr-get-type = automatic
tdr-start-distance = 0
tdr-measurement-length = 0
dmmdcd-period = 0
dmmdcd-voltage = 0
dmmdcd-impedance = 1
dmmcap-period = 0
dmmall-type = resistance
dmmall-period = 0
dmmall-input-imp = 0
ctone-type = adsl
ctone-tone = quiet
ttone-lead = tip-ring
ttone-level = 0
ttone-period = 0
btap-start-length = 0
btap-measure-length = 0
fclloc-unit = metric
fclloc-gauge = 0
shortloc-unit = metric
shortloc-gauge = 0
shortloc-type = detect
setresp-mode = on
setresp-mode-period = 0
dmmacd-period = 0
dmmacd-voltage = 0
dmmacd-frequency = 0
dmmlbal-period = 0
dmmlbal-voltage = 0
dmmlbal-frequency = 0
dmmsoak-voltage = 10
dmmsoak-configuration = t-s
dmmsoak-resistance = 1
```

```
dmmsoak-no-of-samples = 0
dmmsoak-interval = 0
sendvoice-op-mode = tone
sendvoice-frequency = 0
sendvoice-decibal-level = 0
sendvoice-time-duration = 0
sendvoice-tone-period = 0
sendvoice-start-freq = 0
sendvoice-end-freq = 0
sendvoice-freq-increase = 0
sendvoice-dtmf-mf-tone = ""
sendvoice-digit-string = 0
detap-unit = metric
detap-voltage = 0
measvoice-opmode = auto
measvoice-det-period = 0
measvoice-bgns-mode = cmsg
```

| Parameter | Setting |
|---|---|
| `cltm-slot` | Number of the slot where the CLT module or PSM is installed. |
| `test-time-stamp` | Value of the sysUpTime when the last test command was issued. This parameter is cleared when any of the test parameters are changed. |
| `test-sequence` | Sequence of the last issued test command. |
| `test-operation` | Type of test to run:<br>`none` No test.<br>`dmm-test`—Starts digital multimeter (DMM) tests.<br>`line-inls-test`—Starts an insertion loss test.<br>`line-bgns-test`—Starts a background noise test.<br>`line-signs-test`—Starts a signal-to-noise test.<br>`line-lpres-test`—Starts a loop resistance test.<br>`line-cldet-test`—Starts a load coil detection test.<br>`line-impstart-test`—Starts an impulse noise test.<br>`line-impread-test`—Reads the current result of an impulse noise test.<br>`line-impstop-test`—Stops an impulse noise test.<br>`calib-test`—Calibrates the internal test head.<br>`tonesnd-test`—Sends a test tone down the loop.<br>`tonercv-test`—Measures the amplitude and frequency of the tone.<br>`tdrset-test`—Sets TDR parameters.<br>`tdr-get`—Runs a TDR test.<br>`cltm-reset-test`—Resets test head electronics. |

| Parameter | Setting |
|---|---|
| `test-operation` (*continued*) | `cltm-version`—Reports version numbers of hardware and software.<br>`cltm-download`—Downloads CLT module code.<br>`dmm-dcdel-test`—Starts DMM dc delta test.<br>`dmm-cape-test`—Starts DMM equivalent capacitance test.<br>`dmm-all-test`—Starts DMM ALL test.<br>`tx-ctrl-tone-test`—Sends a control tone.<br>`tx-trace-tone-test`—Sends a trace tone.<br>`stop-tone-test`—Stops sending tones.<br>`det-ringer-test`—Starts a detect ringer test.<br>`det-atur-test`—Starts an ATU-R detection test. ADSL LIMs only.<br>`btap-test`—Starts a bridge tap detection test.<br>`voice-det-test`—Starts a voice signal detection test.<br>`line-fclloc-test`—Starts a first load coil detection test.<br>`line-shortloc-test`—Starts a short-circuit location test.<br>`set-responder-test` Places CLT module in or out of responder mode.<br>`set-bypass-test` Toggles splitter bypass.<br>`splitter-detect-test`—Tests for the presence of a splitter.<br>`dmm-acdel-test`—DMM ac delta test.<br>`dmm-lbal-test`—Longintudinal balance test.<br>`dmm-soak-test`—Soak measurement *not supported*.<br>`send-voice-test`—Send voice signal.<br>`meas-voice-test`—Voice signal detection.<br>`meas-dta-test`—Analyze subscriber dial tone.<br>`detaptor-test`—Detaptor test. |
| `dmm-type` | Type of DMM test to run:<br>`ohm`—Resistance test.<br>`dcv`—dc voltage test.<br>`acv`—ac voltage test.<br>`cap`—Capacitance test. |
| `dmm-lead` | Leads to use for DMM testing:<br>`t-r`—Measures between tip and ring.<br>`t-s`—Measures between tip and sleeve (ground).<br>`r-s`—Measures between ring and sleeve (ground). |

| Parameter | Setting |
|---|---|
| `background-noise-filter` | Filter to be used for background noise tests:<br>`PSD`—Measures power spectral density in a 22kHz-to-1.6Mhz range.<br>`E`—Reports one noise value at 135-ohm impedance for a 1KHz-to-50kHz range. Used for ISDN qualification.<br>`F`—Reports one value for a 5kHz-to-245kHz range. Used for HDSL qualification.<br>`G`—Reports one noise value at 100-ohm impedance for 20kHz-to-1.1MHz range. Used for ADSL qualification. |
| `background-noise-termination` | Receiver termination for a background noise test:<br>`term100`—Places a 100-ohm termination on the received signal.<br>`term135`—Places a 135-ohm termination on the received signal.<br>`bridge100`—Puts the receiver in high-impedance mode, and calculates the noise signal based on 100-ohm impedance.<br>`bridge135`—Puts the receiver in high-impedance mode, and calculates the noise signal based on 135-ohm impedance. |
| `loop-resistance-unit` | Units of measurement for a loop resistance test:<br>`english`—Uses English units for test parameters.<br>`metric`—Uses metric units for test parameters. |
| `loop-resistance-temp` | Temperature of the loop:<br>In English units, a value in the range 0 through 100 degrees F<br>In metric units, a value in the range -178 through 93.3 degrees C in tenths (0.1) of a degree |
| `impulse-noise-start-thresh` | Threshold value of the smallest noise spike detected, a value within the range 50dBm through 100dBm. |
| `impulse-noise-start-delta` | Delta—the number of decibels referred to 1mW (dBm) above the threshold—to measure for noise spike detection, a value within the range 2dBm through 6dBm. |
| `impulse-noise-start-max-count` | Maximum number of impulse events to be counted during a single measurement, a value within the range 1 through 9999 counts. |
| `impulse-noise-start-dead-time` | Measurement delay after the unit detects the initial impulse, a value within the range 10 through 2550 tenths (0.1) of a millisecond (ms). |
| `impulse-noise-start-timer` | Duration of impulse noise measurement, a value within the range 1 through 9999 minutes. |
| `calibration-type` | `insertion-loss`—Calibration type for insertion loss test.<br>`background-noise`—Calibration type for the background noise test. |
| `tone-send-frequency` | Frequency of the sent tone, a value within the range 10kHz through 1600kHz. |
| `tone-send-level` | Amplitude of the sent tone, a value within the range -10dBm through 10dBm. |

| Parameter | Setting |
|---|---|
| `tone-send-period` | Period for the `tonesnd` function<br>Range is 1 to 120 minutes with a default of 60 minutes. |
| `tdr-unit` | Units of measurement for TDR testing:<br>`english` English units are used for the measurement.<br>`metric`—Metric units are used for the measurement. |
| `tdr-gauge` | Gauge of the cable in the loop:<br>In English units, the value is 22, 24 or 26 AWG.<br>In metric units, the value is 4, 5, or 6 tenths of a millimeter. |
| `tdr-vp` | Velocity of propagation for the cable under test, a value within the range 40% through 99% of the speed of light. |
| `tdr-avg` | Number of times the TDR pulse is sent, a value within the range 1 through 5 pulses. Results are averaged if more than one pulse is used. |
| `tdr-get-type` | Mode of TDR test:<br>`auto`—First fault is automatically detected.<br>`manual`—You specify the measurement range. |
| `tdr-start-distance` | In manual mode, the distance at which to start the TDR measurement:<br>In English units, a value within the range 15 through 20,000 feet.<br>In metric units, a value within the range 5 through 6097 meters. |
| `tdr-measurement-length` | In manual mode, the total length of the TDR measurement, starting from `tdr-start-distance`:<br>In English units, a value within the range 100 through 20,000 feet. The sum of `tdr-start-distance` and `tdr-measurement-length` must not exceed 20,000 feet.<br>In metric units, a value within the range 32 through 6097 meters. The sum of `tdr-start-distance` and `tdr-measurement-length` must not exceed 6097 meters. |
| `Dmmdcd-Period` | Settling time for the dc delta measurement.<br>Values are 0 and 1 to 5 tenths (0.1) second. A zero (0) value sets the default maximum time. |
| `Dmmdcd-Voltage` | Test voltage for the dc delta measurement.<br>Range is -230 to 230 V. |
| `Dmmdcd-Impedance` | Output impedance for the dc delta measurement.<br>Range is 10 to 1000 Kohm. |
| `Dmmcap-period` | Settling time for the capacitance measurement.<br>Values are 0 and 1 to 5 tenths (0.1) second. A zero (0) value sets the default maximum time. |

| Parameter | Setting |
|---|---|
| Dmmall-Type | Type of DMM ALL test desired.<br>OHM—Resistance test.<br>DCV—DC voltage test.<br>ACV—AC voltage test.<br>CAP—Capacitance test. |
| Dmmall-Period | Settling time for the DMM ALL measurement.<br>Values are 0 and 1 to 5 tenths (0.1) second. A zero (0) value sets the default maximum time. |
| Dmmall-Input-Imp | Input impedance for the DMM ALL measurement.<br>Valid values are 100 or 1000 Kohm. |
| Ctone-Type | Type of DSL service for command tone.<br>ADSL<br>GLITE |
| Ctone-Tone | Type of command tone.<br>QUIET<br>RESTORE |
| Ttone-Lead | Leads to use for trace tone.<br>T-R—Tip to ring.<br>T-S—Tip to shield.<br>R-S—Ring to shield. |
| Ttone-Level | Power level of trace tone.<br>Range is -10dBm to 10dBm. |
| Ttone-Period | Period for trace tone. Range is 1 to 120 minutes, with a default of 60 minutes. |
| Btap-Start-Length | Starting location for bridge-tap search.<br>Range is 15 to 20000 feet if TDR units is set to ENGLISH.<br>Range is 5 to 6097 meters if TDR units is set to METRIC. |
| Btap-Measure-Length | Loop length for bridge tap search.<br>Range is 100 to 20000 feet if TDR units is set to ENGLISH.<br>Range is 32 to 6097 meters if TDR units is set to METRIC. |
| fc lloc-unit | Units of measurement for first coil location test:<br>english—English units are used for the measurement.<br>metric—Metric units are used for the measurement. |
| fclloc-gauge | Gauge of the cable in the loop:<br>In English units, the value is 22, 24 or 26 AWG.<br>In metric units, the value is 4, 5, or 6 tenths of a millimeter. |

| Parameter | Setting |
|---|---|
| shortloc-unit | Units of measurement for short-circuit location test.<br>english—English units are used for the measurement.<br>metric—Metric units are used for the measurement. |
| shortloc-gauge | Gauge of the cable in the loop:<br>In English units, the value is 22AWG, 24AWG or 26AWG.<br>In metric units, the value is 4, 5, or 6 tenths of a millimeter. |
| shortloc-type | Type of short-circuit test.<br>detect—Detects the short circuit with a DMM test and then measures its location.<br>nodet—Measures the distance to a short circuit without a DMM test. |
| setresp-mode | Enables or disables responder mode.<br>yes—Enables responder mode.<br>no—Disables responder mode. |
| setresp-mode-period | Sets the length of time the CLT remains in responder mode. Range is 1 to 999 minutes. This parameter is active only when setresp-mode is set to yes. |
| dmmacd-period | Amount of time the during which the dmmacd measurement is made. Specify a value from 1 to 5 tenths (.1) seconds. The default value is 0. |
| dmmacd-voltage | Voltage to use for the dmmacd test. Specify a value from 1Vrms to 24Vrms. The default value is 0. |
| dmmacd-frequency | Frequency of the dmmacd test voltage. Specify a value from 20 to 2000 Hz. The default value is 0. |
| dmmlbal-period | Amount the time the dmmlbal measurement is made. Specify a value from 1 to 5 tenths (.1) seconds. The default value is 0. |
| dmmlbal-voltage | Voltage to use for the dmmlbal test. Specify a value from 1Vrms to 24Vrms. The default value is 0. |
| dmmlbal-frequency | Frequency of the dmmlbal test voltage. Specify a value from 20Hz to 2000Hz. The default value is 0. |
| dmmsoak-voltage | *Not currently supported.* |
| dmmsoak-configuration | *Not currently supported.* |
| dmmsoak-resistance | *Not currently supported.* |
| dmmsoak-no-of-samples | *Not currently supported.* |
| dmmsoak-interval | *Not currently supported.* |

| Parameter | Setting |
|---|---|
| sendvoice-op-mode | Type of test used for sendvoice test. Specify on of the following values:<br>tone—Tone mode of operation for the sendvoice test.<br>3-tone—Three-tone mode of operation for the sendvoice test.<br>sweep—Sweep mode of operation for the sendvoice test.<br>dtmf—DTMF mode of operation for the sendvoice test.<br>mf—MF mode of operation for the sendvoice test.<br>digit—Digit mode of operation for the sendvoice test. |
| sendvoice-frequency | Frequency of operation for sendvoice test in tone mode. Specify a value from 300Hz to 4000Hz. Default value is 0. |
| sendvoice-decibal-level | Signal level for tone, 3-tone, and sweep modes of sendvoice test. Specify a value from -30dBm to 10dBm. The default is 0. |
| sendvoice-time-duration | Time duration for tone and 3-tone modes of sendvoice test. Specify a value from 1 to 120 minutes. |
| sendvoice-tone-period | Tone period for each tone in the 3-tone and sweep modes of the sendvoice test. Specify a value from 1 to 10 seconds. The default value is 0. |
| sendvoice-start-freq | Starting frequency for the sweep mode of the sendvoice test. Specify a value from 300Hz to 20000Hz. The default value is 0. |
| sendvoice-end-freq | Ending frequency for the sweep mode of the sendvoice test. Specify a value from 300Hz to 20000Hz. The default value is 0. |
| sendvoice-freq-increase | Amount of frequency increase for each successive tone for the sweep mode of the sendvoice test. Specify a value from 10Hz to 1000Hz. The default value is 0. |
| sendvoice-dtmf-mf-tone | List of digits to send as DTMF or MF digits. Specify an ASCII digit string of up to 20 characters. Default value is null. |
| sendvoice-digit-string | List of digits to send as individual voice announcements. Specify up to 20 digits from 0 to 9. The default value is 0. |
| detap-unit | Measurement system for detap test. Specify one of the following values:<br>english—Specifies English units.<br>metric—Specifies metric units. |
| detap-voltage | Voltage to use for the detap test. Specify a value from 0 to 99 volts. The default value is 0. |

| Parameter | Setting |
|---|---|
| measvoice-opmode | Specifies the mode of operation for the measvoice test. Select one of the following values:<br>auto—Auto mode of operation for measvoice test<br>dtmf—DTMF mode of operation for measvoice test<br>mf—MF mode of operation for measvoice test<br>tone—Tone mode of operation for measvoice test<br>bgns—Background noise mode of operation for measvoice test<br>sgns—Signal to noise ratio mode of operation for measvoice test |
| measvoice-det-period | The detection period of the measvoice test in the auto, dtmf and mf modes. Specify a value from 1 to 20 seconds. The default is zero. |
| measvoice-bgns-mode | Type of filter to use for the background noise test. Specify one of the following values:<br>cmsg—Use a C-message filter. This is the default value.<br>3kflat—Use a 3K-flat filter. |
| measdta-opmode | Test mode for the test subscriber dialtone test. Select one of the following values:<br>term—Break the dialtone by removing the bridge. This is the default.<br>dtmf—Break the dialtone by using a DTMF tone. |

# Determining test results

Test results are reported in the clt-result profile. The clt-result parameter values are set to zero or default at the start of each test. The test-result-status parameter is set to not-ready at the start of each test and is updated to valid or out-of-range at the end of each test. Use the list command to monitor the value of this parameter.

At the end of a test, the results corresponding to the test specified by the test-operation parameter in the clt-command profile are updated. Use the list command to display the parameter values associated with the test.

Following are the clt-result parameters, shown with sample values.

```
[in CLT-RESULT]
cltm-slot = slot-16
test-result-time-stamp = 0
test-result-sequence = 0
test-result-status = not-ready
dmm-result = 0
loop-resistance = 0
loop-resistance-length-1 = 0
loop-resistance-length-2 = 0
loop-resistance-length-3 = 0
coil-detection-coil-count = 0
impulse-noise-read-low-threshold = 0
```

```
impulse-noise-read-mid-threshold = 0
impulse-noise-read-high-threshold = 0
rcv-tone-frequency = 0
rcv-tone-level = 0
tdr-manual-sample-count = 0
tdr-automatic-fault-distance = 0
hardware-revision = 0
sofware-revision = 0
psd-frequency-level = [ { 0 0 } { 0 0 } { 0 0 } { 0 0 } { 0 0 } { 0 0 } { 0 }+
tdr-distance-level = [ { 0 0 } { 0 0 } { 0 0 } { 0 0 } { 0 0 } { 0 0 } { 0 } +
dc-delta-resistance-t-r = 0
dc-delta-resistance-t-s = 0
dc-delta-resistance-r-s = 0
dc-delta-voltage-t-s = 0
dc-delta-voltage-r-s = 0
cap-equivalent-t-r = 0
cap-equivalent-t-s = 0
cap-equivalent-r-s = 0
dmm-all-t-r = 0
dmm-all-t-s = 0
dmm-all-r-s = 0
ringer = 0
atu-r = 0
bridge-tap-number = 0
bridge-tap-length = 0
bridge-tap-table = [ { 0 0 0 } { 0 0 0 } { 0 0 0 } { 0 0 0 } { 0 0 0 } {0 +
voice-detection = 0
first-coil-location = 0
short-location = 0
splitter-det-result = 0
ac-delta-capacitance-t-r = 0
ac-delta-capacitance-t-s = 0
ac-delta-capacitance-r-s = 0
ac-delta-resistance-t-r = 0
ac-delta-resistance-t-s = 0
ac-delta-resistance-r-s = 0
soak-resistance-t-s = 0
soak-resistance-r-s = 0
dmm-lbal-output-db = 0
detaptor-num-taps = 0
detaptor-tap-length = 0
measvoice-auto-result = 0
measvoice-dtmf-mf-status = 0
measvoice-tone-freq = 0
measvoice-tone-level = 0
measvoice-bgns-result = 0
measvoice-sgns-result = 0
```

```
measdta-test-result = none
```

| Parameter | Indicates |
|---|---|
| cltm-slot | Number of the slot where the CLT module or PSM is installed. |
| test-result-time-stamp | Value of the sysUpTime when the test result was obtained. |
| test-result-sequence | Sequence of the last test result. |
| test-result-status | Status of the test:<br>not-ready—Test result not ready.<br>not-valid—Test result not valid.<br>over-range—Test result over range.<br>valid—Test result valid. |
| dmm-result | Results of a DMM test:<br>Volts ac and volts dc are reported in millivolts (mV).<br>Resistance is reported in ohms.<br>Capacitance is reported in nanofarads (nF). |
| loop-resistance | Loop resistance is reported in ohms. |
| loop-resistance-length-1 | If units are set to english, length-1 reports the estimated length in hundredths (0.01) of a foot, on the basis of a 22-AWG cable size.<br>If units are set to metric, length-1 reports the estimated length in centimeters, on the basis of a 0.644mm cable size. |
| loop-resistance-length-2 | If units are set to english, length-2 reports the estimated length in hundredths (0.01) of a foot, on the basis of a 24-AWG cable size.<br>If units are set to metric, length-2 reports the estimated length in centimeters, on the basis of a 0.511mm cable size. |
| loop-resistance-length-3 | If units are set to english, length-3 reports the estimated length in hundredths (0.01) of a foot, on the basis of a 26-AWG cable size.<br>If units are set to metric, length-3 reports the estimated length in centimeters, on the basis of a 0.405mm cable size. |
| coil-detection-coil-count | Number of load coils detected. |
| impulse-noise-read-low-threshold | Number of impulse noise events with levels between the threshold value and the threshold-plus-delta value. |

| Parameter | Indicates |
|---|---|
| `impulse-noise-read-mid-threshold` | Number of impulse events with levels between the threshold-plus-delta value and the threshold-plus-2delta value. |
| `impulse-noise-read-high-threshold` | Number of impulse events with levels exceeding the threshold-plus-2delta value. |
| `rcv-tone-frequency` | Receive tone frequency in hertz. |
| `rcv-tone-level` | Receive tone level in hundredths (0.01) of a dBm. |
| `tdr-manual-sample-count` | Number of detected sample pairs via manual TDR test. If the TDR test is performed in `auto` mode and no faults are found, `tdr-manual-sample-count` is set to 0. |
| `tdr-automatic-fault-distance` | Distance to the first detected fault, reported in hundredths (0.01) of a foot for English units or centimeters for metric units. This value is generated only for TDR tests in `automatic` mode. |
| `hardware-revision` | Revision level for test head hardware. |
| `software-revision` | Revision level for test head software. |
| `psd-frequency-level` | *For background noise tests in PSD mode*. Reports 371 pairs of power spectral density (PSD) test data. The first number in each pair is the test frequency in kilohertz. The second number in each pair is the noise level in dBm per hertz.<br><br>*For background noise tests in E, F, or G mode*. Reports a single value representing aggregated noise in hundredths (0.01) of a dBm.<br><br>*For insertion loss tests*. Reports 371 pairs of test data. The first number in each pair is the test frequency in kilohertz. The second number in each pair is the loss in hundredths (0.01) of a decibel.<br><br>*For signal-to-noise tests*. Reports 371 pairs of test data. The first number in each pair is the test frequency in kilohertz. The second number in each pair is the signal-to-noise ratio in hundredths (0.01) of a decibel. |
| `tdr-distance-level` | `tdr-sample-count` pairs of TDR test data. The first number in each pair is the distance in hundredths (0.01) of a foot for English units, or in centimeters for metric units. The second number in each pair is the level-axis raw data in units. |
| `Dc-delta-resistance-t-r` | Tip-to-ring delta resistance in ohms. The value 99999999 indicates that the measurement is over range. |
| `Dc-delta-resistance-t-s` | Tip-to-shield delta resistance in ohms. The value 99999999 indicates that the measurement is over range. |

| Parameter | Indicates |
|---|---|
| `Dc-delta-resistance-r-s` | Ring-to-shield delta resistance in ohms. The value 99999999 indicates that the measurement is over range. |
| `Dc-delta-potential-t-s` | Tip-to-shield voltage in millivolts. |
| `Dc-delta-potential-r-s` | Ring-to-shield voltage in millivolts. |
| `Cap-equivalent-t-r` | Tip-to-ring equivalent capacitance in picofarads. |
| `Cap-equivalent-t-s` | Tip-to-shield equivalent capacitance in picofarads. |
| `Cap-equivalent-r-s` | Ring-to-shield equivalent capacitance in picofarads. |
| `Dmmall-t-r` | Tip-to-ring measurement data. Volts dc and volts ac are in millivolts. Resistance is in ohms. Capacitance is in picofarads. |
| `Dmmall-t-s` | Tip-to-shield measurement data. Volts dc and volts ac are in millivolts. Resistance is in ohms. Capacitance is in picofarads. |
| `Dmmall-r-s` | Ring-to-shield measurement data. Volts dc and volts ac are in millivolts. Resistance is in ohms. Capacitance is in picofarads. |
| `Ringer` | Ringer detection. Value is `NO` or `YES`. |
| `Atu-r` | ATU-R detection. Value is `NO` or `YES`. Test is for ADSL LIMs only. |
| `Bridge-tap-number` | Number of bridge taps. |
| `Bridge-tap-length` | Loop length. This value is reported in feet if `TDR units` is set to `ENGLISH`, or in meters if `TDR units` is set to `METRIC`. |
| `Bridge-tap-table` | Sets of three values. One set of values is reported for each bridge tap detected. The current hardware supports only the following single set of bridge-tap data:<br>Bridge-tap distance in feet or meters.<br>Bridge-tap length in feet or meters.<br>Confidence level in percentage. Valid values are 33 or 50%. |
| `voice-detection` | Numeric value indicating the result of the test.<br>1—A voice signal was not detected.<br>2—A voice signal was detected.<br>3—A steady state indicated possible data traffic.<br>4—An interrupted tone of 60 or 120 impulses per minute (IPM) was detected. |

| Parameter | Indicates |
|---|---|
| `first-coil-location` | Distance to the first load coil detected. Distance is reported in centimeters if units are set to `metric`. Distance is reported in hundredths of feet if units are set to `english`. A value of 0 indicates no load coil was detected. |
| `short-location` | Distance to the short circuit detected. Distance is reported in centimeters if units are set to `metric`. Distance is reported in hundredths of feet if units are set to `english`. A value of 0 indicates that no short circuit was detected. |
| `splitter-det-result` | Indicates if a splitter has been detected.<br>1—Splitter not detected.<br>2—Splitter detected. |
| `ac-delta-capacitance-t-r` | Tip-ring ac delta capacitance in picofarads. A value above 2µf indicates an overrange. |
| `ac-delta-capacitance-t-s` | Tip-shield ac delta capacitance in picofarads. A value above 2µf indicates an overrange. |
| `ac-delta-capacitance-r-s` | Ring-shield ac delta capacitance in picofarads. A value above 2µf indicates an overrange. |
| `ac-delta-resistance-t-r` | Tip-ring ac delta resistance in ohms. A value above 5mohms indicates an overrange. |
| `ac-delta-resistance-t-s` | Tip-shield ac delta resistance in ohms. A value above 5mohms indicates an overrange. |
| `ac-delta-resistance-r-s` | Ring-shield ac delta resistance in ohms. A value above 5mohms indicates an overrange. |
| `soak-resistance-t-s` | *Not supported.* |
| `soak-resistance-r-s` | *Not supported.* |
| `dmm-lbal-output-db` | Longitudinal balance in dB. |
| `detaptor-num-taps` | Number of bridge taps detected. |
| `detaptor-tap-length` | Bridge tap length in hundredths (.01) feet for `english` units or in centimeters for `metric` units. |
| `measvoice-auto-result` | Results of `measvoice` test for `auto` mode. Possible results are:<br>1—Voice signal not detected.<br>2—Voice signal detected.<br>3—Steady state - possible data traffic.<br>4—Interrupted tone detected - 60 or 120 IPM. |
| `measvoice-dtmf-mf-status` | Results of measvoice test for `dtmf-mf` mode. Possible results are:<br>1—No DTMF or MF tone detected.<br>2—DTMF or MF tone detected. |

| Parameter | Indicates |
|---|---|
| `measvoice-tone-freq` | Frequency of detected tone in `tone` mode. Results are reported in hundredths (.01) Hz. |
| `measvoice-tone-level` | Level of detected tone in `tone` mode. Results are reported in hundredths (.01) dBm. |
| `measvoice-bgns-result` | Background noise level reported in hundredths (.01) dBm. |
| `measvoice-sgns-result` | Signal to noise ratio reported in hundreths (.01) dBm. |
| `measdta-test-result` | Results of subscriber dialtone test. Possible values are:<br>`none`—No result.<br>`draw-break`—Draw and break dial tone.<br>`draw-no-break`—Draw dial tone but no break.<br>`slow-break`—Slow dialtone draw and break.<br>`slow-no-break`—Slow dialtone with no break.<br>`cannot-draw`— Cannot draw dial tone.<br>`noisy`—Noisy line. |

# Copper Loop Testing through SNMP

3



You can use SNMP objects to access the copper loop, specify tests, and obtain test results.

## Ascend-CLTM-MIB groups

Three MIB groups are used to sequence copper loop testing: the `cltmAccess` group, the `cltmCmd` group, and the `cltmRslt` group. In addition to these three groups, two additional objects are common to all groups. `CltmScaleSystemType` is an integer that defines the measurement units, and `CltmSlotID` is an integer that defines the Stinger slot number.

## CLT module access group—cltmAccess

The access group is used specify the copper loop to be tested and the type of connection to be made between the test head and the copper loop. You must specify values for the seven objects defined in Table 3-1 to select the loop and its connection method. If you use a path selector module (PSM) and an external test head for testing, this is the only action needed.

*Table 3-1. CLT module access group object definitions (page 1 of 2)*

| Object name | Variable type | Specifies |
|---|---|---|
| `cltmAccessSlot` | `CltmSlotID` | Number of the slot where the CLT module or PSM is installed. |
| `cltmAccessTestSlot` | `CltmSlotID` | Slot number of LIM containing the copper loop to be tested. |
| `cltmAccessTestPort` | `Integer32` | Port number of the copper loop to be tested. |

*Table 3-1. CLT module access group object definitions (page 2 of 2)*

| Object name | Variable type | Specifies |
|---|---|---|
| cltmAccessAccessMode | Integer | Connection configuration of the copper loop. Value (*n*) specifies either of the following:<br>looking-out (1) Copper loop is connected only to the test head.<br>bridged (2) Copper loop is connected to the test head and the corresponding port of the spare LIM. |
| cltmAccessAccessTerminal | Integer | Connection point of the copper loop. Value (*n*) specifies one of the following:<br>internal-tester-terminal (1) Copper loop is connected to the internal test head of the CLT module.<br>external-tester-terminal (2) Copper loop is connected to the external test terminals of the CLT module or PSM.<br>auxiliary-tester-terminal (3) Copper loop is connected to the auxiliary test terminals of the CLT module or PSM<br>external-loop (4) Internal test head of the CLT module is connected to external terminals. |
| cltmAccessActivateAccess | Integer | Activates or deactivates CLT module access. Value (*n*) specifies either of the following:<br>no (1) Copper loop is disconnected from the test head or test terminals.<br>yes (2) Copper loop is connected as specified. |
| cltmAccessAccessResult | Integer | The result of activating the copper loop access. Value (*n*) specifies one of the following:<br>idle (1) Test head is inactive, and no copper loops are connected.<br>access-activated (2) Test head is active, and a copper loop is connected as specified.<br>resource-busy (3) Resource is busy. |
| cltmAccessAccessTestLoop | Integer | Copper loop number of the T1 or EI port. This parameter applies only to copper loops connected to T1 or E1 LIMs and is ignored for all other LIMs.<br>copper-loop-one (1) Connect to transmit copper loop.<br>copper-loop-two (2) Connect to receive copper loop. |

# CLT module command group—cltmCmd

Use the command group to specify the test to be performed. See Table 3-2.

*Table 3-2. CLT module command group object definitions (page 1 of 11)*

| Object name | Variable type | Specifies |
|---|---|---|
| `cltmCmdSlot` | `CltmSlotID` | Slot number where the CLT module or PSM is installed. |
| `cltmCmdTestTimeStamp` | `TimeTicks` | Time elapsed after startup (`sysUpTime`) when the last test specified by `cltmCmdTestOperation` was run. The time stamp is computed on the basis of the startup time of the module. A write operation to any object in `CltmCmdEntry` resets this value to 0. |
| `cltmCmdTestSequence` | `Counter32` | CLT module test sequence number. |
| `cltmCmdTestOperation` | `Integer` | Type of test desired. Value (*n*) specifies one of the following:<br>`none (1)` No test is activated. Setting this value to none stops the test procedure.<br>`dmm (2)` Digital multimeter (DMM) tests.<br>`line-insertion-loss (3)` Insertion loss test.<br>`line-background-noise(4)` Background noise test.<br>`line-signal-to-noise (5)` Signal-to-noise ratio test.<br>`line-loop-resistance (6)` Loop resistance test.<br>`line-coil-detection (7)` Coil detection test.<br>`line-impulse-noise-start (8)` Impulse noise test start.<br>`line-impulse-noise-stop (9)` Impulse noise test stop.<br>`line-impulse-noise-read (10)` Impulse noise test reading.<br>`calibration (11)` Calibrate.<br>`tone-send (12)` Send tone.<br>`tone-recv (13)` Receive tone.<br>`tdr-set (14)` TDR test start. |

*Table 3-2. CLT module command group object definitions (page 2 of 11)*

| Object name | Variable type | Specifies |
|---|---|---|
| `cltmCmdTestOperation` (cont.) | Integer | `tdr-get (15)` TDR test result reading.<br>`cltm-reset (16)` Reset CLT module.<br>`version (17)` Report version number of CLT module.<br>`download (18)` Download tester operation code.<br>`dmm-dc-delta (19)` Digital multimeter (DMM) dc delta measurement.<br>`dmm-capacitance-equivalent(20)` DMM capacitance equivalent measurement.<br>`dmm-all (21)` DMM all leads pair test.<br>`send-control-tone (22)` Send control tone function.<br>`stop-tone (24)` Stop tone function.<br>`ringer-detect (25)` Detect ringer function.<br>`cpe-detect (26)` Detect ATU-R function. ADSL LIMs only.<br>`bridge-tap-detect (27)` Bridge-tap measurement.<br>`voice-detection (28)` Voice signal detection test.<br>`line-first-coil-location (29)` Measures the distance to first load coil in the copper loop.<br>`line-short-location (30)` Measures the distance to short in loop.<br>`set-responder (31)` Puts the CLT module in responder mode.<br>`set-bypass (32)` Toggles splitter bypass.<br>`splitter-detect (33)`Detects the presence or absence of a splitter.<br>`dmm-ac-delta` (34) DMM ac delta measurement.<br>`dmm-long-balance` (35) DMM longitudinal balance measurement.<br>`dmm-soak` (36) *Not supported.* |

*Table 3-2. CLT module command group object definitions (page 3 of 11)*

| Object name | Variable type | Specifies |
|---|---|---|
| `cltmCmdTestOperation` (cont.) | | `send-voice` (37) Send voice signal test.<br>`meas-voice` (38) Measure voice and tone signals on lines.<br>`meas-dta` (39) Draw and break dialtone test.<br>`detaptor` (40) Bridge tap length measurement. |
| `cltmCmdDmmType` | `Integer` | Type of DMM test. Value *(n)* specifies one of the following:<br>`resistance (1)` Resistance test.<br>`dcVoltage (2)` dc voltage test.<br>`acVoltage (3)` ac voltage test.<br>`capacitance (4)` Capacitance test. |
| `cltCmdDmmLeads` | `Integer` | `Leads to use for DMM testing.` Value *(n)* specifies one of the following:<br>`tip-ring (1)` Measure between tip and ring.<br>`tip-sleeve (2)` Measure between tip and shield (ground).<br>`ring-sleeve (3)` Measure between ring and shield (ground). |
| `cltCmdBackgroundNoiseFilter` | `Integer` | `Filter to be used for background noise tests.` Value *(n)* specifies one of the following:<br>`psd (1)` Power spectral density (PSD) measurement 22kHz to 1.6MHz.<br>`e (2)` Reports one noise value at 135-ohm impedance for a 1kHz-to-50kHz range. Used for ISDN qualification.<br>`f (3)` Reports one value for 5kHz-to-245kHz range. Used for HDSL qualification.<br>`g (4)` Reports one noise value at 100-ohm impedance for a 20kHz-to-1.1Mhz range. Used for ADSL qualification. |

*Table 3-2. CLT module command group object definitions (page 4 of 11)*

| Object name | Variable type | Specifies |
|---|---|---|
| cltCmdBackgroundNoiseTerm | Integer | Sets the receiver termination for the background noise test. Value (*n)* specifies one of the following:<br>term100 (1) Places a 100-ohm termination on the received signal.<br>term135 (2) Places a 135-ohm termination on the received signal.<br>bridge100 (3) Puts receiver in high impedance mode, and calculates a noise signal based on 100-ohm impedance.<br>bridge 135 (4) Puts receiver in high impedance mode, and calculates a noise signal based on 135-ohm impedance. |
| cltCmdLoopResistanceUnit | CltmScale SystemType | Units of measurement for loop resistance test:<br>CltmScaleSystemType (1) Metric.<br>CltmScaleSystemType (2) English. |
| cltCmdLoopResistanceTemp | Integer 32 | Line temperature for loop resistance test:<br>In English units, a value in the range 0 through 100 degrees F<br>In metric units, a value in the range -178 through 93.3 degrees C in tenths (0.1) of a degree [ |
| cltCmdImpulseNoiseStartThresh | Integer | Threshold for the smallest noise spike detected, a value in the range 50dBm through 100dBm. |
| cltCmdImpulseNoiseStartDelta | Integer | Delta—the number of decibels referred to 1mW (dBm) above the threshold—for noise spike detection, a value in the range 2dBm through 6dBm. |
| cltCmdImpulseNoiseStartMaxCount | Integer | Maximum number of impulse events to be counted during a single measurement, a value in the range 1 through 9999 counts. |
| cltCmdImpulseNoiseStartDeadTime | Integer | Measurement delay after the unit detects the initial impulse, a value in the range 10 through 2550 tenths (0.1) of a millisecond (ms). |
| cltCmdImpulseNoiseStartTimer | Integer | Duration of impulse noise measurement, a value in the range 1 through 9999 minutes. |

*Table 3-2. CLT module command group object definitions (page 5 of 11)*

| Object name | Variable type | Specifies |
|---|---|---|
| cltCmdCalibrationType | Integer | insertion-loss Calibration type for insertion loss test.<br>background-noise Calibration type for the background noise test. |
| cltCmdToneSendFreq | Integer | Frequency of the sent tone, a value in the range 10kHz through 1600kHz. |
| cltCmdToneSendLevel | Integer | Amplitude of the sent tone, a value in the range -10dBm through 10dBm. |
| cltCmdTdrUnit | CltmScale SystemType | Units of measurement for TDR testing.Value *(n)* specifies one of the following:<br>CltmScaleSystemType (2) English.<br>CltmScaleSystemType (1) metric. |
| cltCmdTdrGauge | Integer 32 | Gauge of the cable in the loop:<br>In English units, the value is 22 AWG, 24 AWG. or 26 AWG.<br>In metric units, the value is 4, 5, or 6 tenths of millimeter. |
| cltCmdTdrVp | Integer | Velocity of propagation for the cable under test, a value in the range 40% through 99% of the speed of light. |
| cltCmdTdrAvg | Integer | Number of times the TDR pulse is sent, a value in the range 1 through 5 pulses. Results are averaged if more than one pulse is used. |
| cltCmdTdrGetType | Integer | Mode of TDR test. Value *(n)* specifies either of the following:<br>automatic (1) First fault is automatically detected.<br>manual (2) You specify the measurement range.<br>If this object is set to automatic, cltCMdTdrStartLen and cltCmdTdrMeasureLen do not have to be set. |

*Table 3-2. CLT module command group object definitions (page 6 of 11)*

| Object name | Variable type | Specifies |
|---|---|---|
| cltCmdTdrStartLen | Integer 32 | Distance at which to start the TDR measurement in manual mode:<br>In English units, a value within the range 15 feet through 20,000 feet.<br>In metric units, a value within the range 5 meters through 6097 meters. |
| cltCmdTdrMeasureLen | Integer 32 | Total length of the TDR measurement in manual mode starting from cltCmdTdrStartLen.<br>In English units, a value within the range is 100 feet through 20,000 feet. The sum of cltCmdTdrStartLen and cltCmdTdrMeasureLen must not exceed 20,000 feet.<br>In metric units, a value within the range 32 meters through 6097 meters. The sum of cltCmdTdrStartLen and cltCmdTdrMeasureLen must not exceed 6097 meters. |
| cltmCmdDmmDcDeltaPeriod | Integer32 | Settling time for the measurement.<br>Values are 0 and 1 to 5 tenths (0.1) second. A zero (0) value sets the default maximum time. |
| cltmCmdDmmDcDeltaVoltage | Integer32 | Test voltage.<br>Range is -230 to 230 volts. |
| cltmCmdDmmDcDeltaImpedence | Integer32 | Output impedance for the test.<br>Range is 10 to 1000 Kohm. |
| cltmCmdDmmCapacitancePeriod | Integer32 | Settling time for the capacitance measurement.<br>Values are 0 and 1 to 5 tenths (0.1) second. A zero (0) value sets the default maximum time. |
| cltmCmdDmmAllType | Cltm DmmType | Type of DMM test desired.<br>OHM—Resistance test.<br>DCV—DC voltage test.<br>ACV—AC voltage test.<br>CAP—Capacitance test. |

*Table 3-2. CLT module command group object definitions (page 7 of 11)*

| Object name | Variable type | Specifies |
|---|---|---|
| cltmCmdDmmAll Period | Integer32 | Settling time for the measurement.<br>Values are 0 and 1 to 5 tenths (0.1) second. A zero (0) value sets the default maximum time. |
| cltmCmdDmmAllInputImp | Integer32 | Input impedance for the test.<br>Valid values are 100 or 1000 Kohm. |
| cltmCmdControlToneDslType | INTEGER | Type of DSL service.<br>ADSL (1)<br>GLITE (2) |
| cltmCmdControlToneDslTone | INTEGER | Type of tone.<br>QUIET<br>RESTORE |
| cltmCmdTraceToneLead | CltmDmm LeadType | Leads to use for trace tone.<br>T-R—Tip to ring.<br>T-S—Tip to shield.<br>R-S—Ring to shield. |
| cltmCmdTraceToneLevel | Integer32 | Power level of trace tone.<br>Range is -10dBm to 10dBm. |
| cltmCmdTraceTonePeriod | Integer32 | Range is 1 to 120 minutes, with a default of 60 minutes. |
| cltmCmdBridgeTapStart | Integer32 | Starting location for bridge-tap search.<br>Range is 15 to 20000 feet if TDR units is set to ENGLISH.<br>Range is 5 to 6097 meters if TDR units is set to METRIC. |
| cltmCmdBridgeTapMeasureLen | Integer32 | Loop length for bridge-tap search.<br>Range is 100 to 20000 feet if TDR units is set to ENGLISH.<br>Range is 32 to 6097 meters if TDR units is set to METRIC. |

*Table 3-2. CLT module command group object definitions (page 8 of 11)*

| Object name | Variable type | Specifies |
|---|---|---|
| cltmCmdFirstCoilLocUnit | Integer | Units of measurement for first coil location test.<br>metric (1) Metric units are used for the measurement.<br>english (2) English units are used for the measurement. |
| cltmCmdFirstCoilLocGauge | Integer32 | Gauge of the cable in the loop:<br>In English units, the value is 22, 24 or 26 AWG.<br>In metric units, the value is 4, 5, or 6 tenths of a millimeter. |
| cltmCmdShortlLocUnit | Integer | Units of measurement for short-circuit location test.<br>english (1) English units are used for the measurement.<br>metric (2) Metric units are used for the measurement. |
| cltmCmdShortLocGauge | Integer32 | Gauge of the cable in the copper loop:<br>In metric units, the value is 4, 5, or 6 tenths of a millimeter.<br>In English units, the value is 22, 24 or 26 AWG. |
| cltmCmdShortLocType | Integer | Type of short-circuit test.<br>detect (1) Detects the short circuit with a DMM test and then measures its location.<br>nodet (2) Measures the distance to a short circuit without a DMM test. |
| cltmCmdSetRespOpMode | Integer | Enables or disables responder mode.<br>yes (1) Enables responder mode.<br>no (0) Disables responder mode. |
| cltlmCmdSetRespPeriod | Integer32 | Sets the length of time the CLT module remains in responder mode. Range is 1 to 999 minutes. This parameter is active only when cltmCmdSetRespOpMode is set to yes. |

*Table 3-2. CLT module command group object definitions (page 9 of 11)*

| Object name | Variable type | Specifies |
|---|---|---|
| cltmCmdDmmAcDeltaPeriod | Integer32 | Amount of time during which the dmmacd measurement is made. Specify a value from 1 to 5 tenths (.1) seconds. The default value is 0. |
| cltmCmdDmmAcDeltaVoltage | Integer32 | Voltage to use for the dmmacd test. Specify a value from 1Vrms to 24Vrms. The default value is 0. |
| cltmCmdDmmAcDeltaFrequency | Integer32 | Frequency of the dmmacd test voltage. Specify a value from 20Hz to 2000Hz. The default value is 0. |
| cltmCmdDmmLongBalPeriod | Integer32 | Amount the time the dmmlbal measurement is made. Specify a value from 1 to 5 tenths (.1) seconds. The default value is 0. |
| cltmCmdDmmLongBalVoltage | Integer32 | Voltage to use for the dmmlbal test. Specify a value from 1Vrms to 24Vrms. The default value is 0. |
| cltmCmdDmmLongBalFrequency | Integer32 | Frequency of the dmmlbal test voltage. Specify a value from 20Hz to 2000Hz. The default value is 0. |
| cltmCmdSendVoiceOpMode | Integer | Type of test used for sendvoice test. Specify on of the following numerical values:<br>tone (1)—Tone mode of operation for the sendvoice test.<br>3-tone (2)—Three-tone mode of operation for the sendvoice test.<br>sweep (3)—Sweep mode of operation for the sendvoice test.<br>dtmf (4)—DTMF mode of operation for the sendvoice test.<br>mf (5)—MF mode of operation for the sendvoice test.<br>digit (6)—Digit mode of operation for the sendvoice test. |
| cltmCmdSendVoiceFreq | Integer32 | Frequency of operation for sendvoice test in tone mode. Specify a value from 300Hz to 4000Hz. Default value is 0. |

*Table 3-2. CLT module command group object definitions (page 10 of 11)*

| Object name | Variable type | Specifies |
|---|---|---|
| cltmCmdSendVoiceLevel | Integer32 | Signal level for tone, 3-tone, and sweep modes of sendvoice test. Specify a value from -30dBm to 10dBm. The default is 0. |
| cltmCmdSendVoiceTime | Integer32 | Time duration for tone and 3-tone modes of sendvoice test. Specify a value from 1 to 120 minutes. |
| cltmCmdSendVoiceTonePeriod | Integer32 | Tone period for each tone in the 3-tone and sweep modes of the sendvoice test. Specify a value from 1 to 10 seconds. The default value is 0. |
| cltmCmdSendVoiceStartFreq | Integer32 | Starting frequency for the sweep mode of the sendvoice test. Specify a value from 300Hz to 20000Hz. The default value is 0. |
| cltmCmdSendVoiceEndFreq | Integer32 | Ending frequency for the sweep mode of the sendvoice test. Specify a value from 300Hz to 20000Hz. The default value is 0 |
| cltmCmdSendVoiceFreqIncr | Integer32 | Amount of frequency increase for each successive tone for the sweep mode of the sendvoice test. Specify a value from 10Hz to 1000Hz. The default value is 0. |
| cltmCmdSendVoiceDtmfMfTone | SnmpAdminString | List of digits to send as DTMF or MF digits. Specify an ASCII digit string of up to 20 characters. Default value is null. |
| cltmCmdSendVoiceDigitString | Integer32 | List of digits to send as individual voice announcements. Specify up to 20 digits from 0 to 9. The default value is 0. |
| cltmCmdDetapUnit | Integer | Measurement system for detap test. Specify one of the following numeric values:<br>english (1)—Specifies English units.<br>metric (2)—Specifies metric units. |
| cltmCmdDetapVolt | Integer32 | Voltage to use for the detap test. Specify a value from 0 to 99 volts. The default value is 0. |

*Table 3-2. CLT module command group object definitions (page 11 of 11)*

| Object name | Variable type | Specifies |
|---|---|---|
| cltmCmdVoiceSigOpMode | Integer | Specifies the mode of operation for the measvoice test. Value *(n)* specifies one of the following:<br>auto (1)—Auto mode of operation for measvoice test<br>dtmf (2)—DTMF mode of operation for measvoice test<br>mf (3)—MF mode of operation for measvoice test<br>tone (4)—Tone mode of operation for measvoice test<br>bgns (5)—Background noise mode of operation for measvoice test<br>sgns (6)—Signal to noise ratio mode of operation for measvoice test |
| cltmCmdVoiceSigDetPeriod | Integer32 | The detection period of the measvoice test in the auto, dtmf and mf modes. Specify a value from 1 to 20 seconds. The default is zero. |
| cltmCmdVoiceSigBgnsMode | Integer | Type of filter to use for the background noise test. Value *(n)* specifies one of the following<br>cmsg (1)—Use a C-message filter. This is the default value.<br>3kflat (2)—Use a 3K-flat filter. |
| cltmCmdMeasDtaOpMode | Integer | Test mode for the test subscriber dialtone test. Value *(n)* specifies one of the following:<br>term (1)—Break the dialtone by removing the bridge. This is the default.<br>dtmf (2)—Break the dialtone by using a DTMF tone. |

# CLT module results group—cltmRslt

The results group is used to obtain the data associated with a test specified through the command group. Many of the objects in the group return a single value. Table 3-3 defines these single-value objects.

*Table 3-3. CLT module results group single-value object definitions (page 1 of 4)*

| Object name | Variable type | Specifies |
|---|---|---|
| `cltmRsltSlot` | `CltmSlotID` | Slot number where the CLT module or PSM is installed. |
| `cltmRsltTestResultTimeStamp` | `TimeTicks` | Time elapsed after startup (`sysUpTime`) when the last result was obtained. The time stamp is computed on the basis of the startup time of the module. |
| `cltmRsltTestResultsSequence` | `Counter32` | Sequence number of the current test result. This value matches the sequence number of the CLT module test that caused this result. |
| `cltmRsltTestResultStatus` | `Integer` | Value *(n)* specifies one of the following:<br>`not-ready (1)` Result is not ready.<br>`not-valid (2)` Result is not valid.<br>`over-range (3)` Result is out of range.<br>`valid (4)` Result is valid. |
| `cltmRsltDmmResult` | `Integer32` | Results of a DMM test:<br>Volts ac and volts dc are reported in millivolts (mV).<br>Resistance is reported in ohms.<br>Capacitance is reported in nanofarads (nF). |
| `cltmRsltLoopResistance` | `Integer32` | Loop resistance is reported in ohms. |
| `cltmRsltLoopResistanceLenAwg22` | `Integer32` | If units are set to English, the value of this object is the estimated length in hundredths (0.01) of a foot, based on a 22-AWG cable size.<br>If units are set to metric, the value is the estimated length in centimeters, based on a 0.644mm cable size. |

*Table 3-3. CLT module results group single-value object definitions (page 2 of 4)*

| Object name | Variable type | Specifies |
|---|---|---|
| cltmRsltLoopResistanceLenAwg24 | Integer32 | If units are set to English, the value of this object is the estimated length in hundredths (0.01) of a foot, based on a 24-AWG cable.<br>If units are set to metric, this value is the estimated length in centimeters, based on a 0.511mm cable size. |
| cltmRsltLoopResistanceLenAwg26 | Integer32 | If units are set to English, the value of this object is the estimated length in hundredths (0.01) of a foot, based on a 26-AWG cable size.<br>If units are set to metric, this value is the estimated length in centimeters, based on a 0.405mm cable size. |
| cltmRsltCoilDetectionNumCoil | Integer32 | Number of load coils detected. |
| cltRsltImpulseNoiseReadLowThresh | Integer32 | Number of impulse events with levels between threshold and threshold-plus-delta. |
| cltRsltImpulseNoiseReadMidThresh | Integer32 | Number of impulse events with levels between threshold-plus-delta and threshold-plus-2delta. |
| cltRsltImpulseNoiseReadHighThresh | Integer32 | Number of impulse events with levels exceeding threshold-plus-2delta. |
| cltRsltRcvToneFreq | Integer32 | Receive tone frequency in hertz. |
| cltRsltRcvToneLev | Integer32 | Receive tone level in hundredths (0.01) of a dBm. |
| cltRsltGetSampleCount | Integer32 | Number of distance or level data points returned for a TDR test. If the TDR test is performed in `auto` mode and no faults are found, this value is set to 0. |
| cltRsltGetTdrAutomaticFaultDist | Integer32 | Distance to first detected fault, reported in hundredths (0.01) of a foot for English units, or centimeters for metric units. This value is generated only for TDR tests in `automatic` mode. |
| cltRsltHwRevision | Integer32 | Revision level for test head hardware. |
| cltRsltSwRevision | Integer32 | Revision level for test head software. |

*Table 3-3. CLT module results group single-value object definitions (page 3 of 4)*

| Object name | Variable type | Specifies |
|---|---|---|
| cltmRsltDmmDcDeltaResistanceTR | **Integer32** | Tip-to-ring delta resistance in ohms. The value 99999999 indicates that the measurement is over range. |
| vvcltmRsltDmmDcDeltaResistanceTS | Integer32 | Tip-to-shield delta resistance in ohms. The value 99999999 indicates that the measurement is over range. |
| cltmRsltDmmDcDeltaResistanceRS | Integer32 | Ring-to-shield delta resistance in ohms. The value 99999999 indicates that the measurement is over range. |
| cltmRsltDmmDcDeltaVoltageTS | Integer32 | Tip-to-shield voltage in millivolts. |
| cltmRsltDmmDcDeltaVoltageRS | Integer32 | Ring-to-shield voltage in millivolts. |
| cltmRsltDmmCapacitanceTR | Integer32 | Tip-to-ring equivalent capacitance in picofarads. |
| cltmRsltDmmCapacitanceTS | Integer32 | Tip-to-shield equivalent capacitance in picofarads. |
| cltmRsltDmmCapacitanceRS | Integer32 | Ring-to-shield equivalent capacitance in picofarads. |
| cltmRsltDmmallTR | Integer32 | Tip-to-ring measurement data. Volts dc and volts ac are in millivolts. Resistance is in ohms. Capacitance is in picofarads. |
| cltmRsltDmmallTS | Integer32 | Tip-to-shield measurement data. Volts dc and volts ac are in millivolts. Resistance is in ohms. Capacitance is in picofarads. |
| cltmRsltDmmallRS | Integer32 | Ring-to-shield measurement data. Volts dc and volts ac are in millivolts. Resistance is in ohms. Capacitance is in picofarads. |
| cltmRsltRingerDetect | INTEGER | ringer-not-detected (1)—Ringer not detected.<br>ringer-detected(2)—Ringer detected. |
| cltmRsltCpeDetect | INTEGER | cpe-not-detected (1)—CPE not detected.<br>cpe-detected(2)—CPE detected. |
| cltmRsltBridgeTapNumber | Integer32 | Number of bridge taps. |

*Table 3-3. CLT module results group single-value object definitions (page 4 of 4)*

| Object name | Variable type | Specifies |
|---|---|---|
| cltmRsltBridgeTapLoopLen | Integer32 | Loop length. This value is reported in feet if TDR units is set to ENGLISH, or in meters if TDR units is set to METRIC. |
| cltmRsltVoiceDetection | INTEGER | Numeric value indicating the result of the test.<br>1—A voice signal was not detected.<br>2—A voice signal was detected.<br>3—A steady state indicated possible data traffic.<br>4—An interrupted tone of 60 or 120 impulses per minute (IPM) was detected. |
| cltmRsltFirstCoilLocation | Integer32 | Distance to the first load coil detected. Distance is reported in centimeters if units are set to metric. Distance is reported in hundredths of feet if units are set to english. A value of 0 indicates that no load coil was detected. |
| cltmRsltShortLocation | Integer32 | Distance to the short circuit detected. Distance is reported in centimeters if units are set to metric. Distance is reported in hundredths of feet if units are set to english. A value of 0 indicates that no short circuit was detected. |

Results from a TDR test are returned as multiple values in the cltmRsltDistLevTable. Results from background noise, insertion loss, and signal-to-noise tests are returned in a shared table cltmRsltFreqDbTable. Results from bridge-tap tests are returned in the cltmRsltBridgeTapTable. Table 3-4 defines these objects.cltmRsltDmmAcDeltaResistanceRScltmRsltMeasVoiceAutoMode

*Table 3-4. CLT module results group, table type objects (page 1 of 4)*

| Object name | Variable type | Specifies |
|---|---|---|
| cltmRsltDistLevSlot | CltmSlotID | Number of the slot containing the CLT module performing a TDR test. |
| cltmRsltDistLevIndex | Integer32 | Index to the result array of TDR distance and level data. The result array contains cltRsltGetTdrNum number of data points. |

*Table 3-4. CLT module results group, table type objects (page 2 of 4)*

| Object name | Variable type | Specifies |
|---|---|---|
| cltmRsltDistLevDistance | Integer32 | Distance in hundredths (0.01) of a foot for English units, or centimeters for metric units. |
| cltmRsltDistLevLevel | Integer32 | Level-axis raw data in units. |
| cltmRsltFreqDbSlot | CltmSlotID | Number of the slot containing the CLT module performing a background noise, insertion loss, or signal-to-noise test. |
| cltmRsltFreqDbIndex | Integer32 | Index to the result array of a test:<br>For a background noise test in power spectral density (PSD) mode, 367 sets of data results.<br>For E, F, or G filter tests, one value is reported.<br>For insertion loss or signal-to-noise tests, 367 sets of data results. |
| cltmRsltFreqDbFreq | Integer32 | For a background noise test in PSD mode, the test frequency in kilohertz.<br>For background noise test, the E, F, or G frequency value is 0.<br>For insertion loss and signal-to-noise tests, the test frequency in kilohertz. |
| cltmRsltFreqDbDbLevel | Integer32 | For a background noise test in PSD mode, the test result in hundredths (0.01) of a dBm per hertz.<br>For a background noise test in E, F, or G mode, a single test value in hundredths (0.01) of a dBm.<br>For insertion loss tests, the test result in hundredths (0.01) of a decibel loss.<br>For a signal-to-noise test, the signal-to-noise ratio in hundredths (0.01) of a decibel. |
| cltmRsltBridgeTapSlot | **CltmSlotID** | Slot number of the CLT module performing the bridge-tap test. |
| cltmRsltBridgeTapIndex | Integer32 | Index to the result array holding the bridge-tap data. |
| cltmRsltBridgeTapDistance | Integer32 | Bridge-tap distance, in feet if TDR units is set to ENGLISH, or in meters if TDR units is set to METRIC. |
| cltmRsltBridgeTapLength | Integer32 | Bridge tap length. This value is reported in feet if TDR units is set to ENGLISH, or in meters if TDR units is set to METRIC. |

*Table 3-4. CLT module results group, table type objects (page 3 of 4)*

| Object name | Variable type | Specifies |
|---|---|---|
| cltmRsltBridgeTapConfidence | Integer32 | Confidence level in percentage. Valid values are 33 or 50%. |
| cltmRsltSplitterRslt | Integer32 | Indicates if a splitter has been detected.<br>1—Splitter not detected.<br>2—Splitter detected. |
| cltmRsltDmmAcDeltaCapacitanceTR | Integer32 | Tip-ring ac delta capacitance in picofarads. A value above 2µf indicates an overrange. |
| cltmRsltDmmAcDeltaCapacitanceTS | Integer32 | Tip-shield ac delta capacitance in picofarads. A value above 2µf indicates an overrange. |
| cltmRsltDmmAcDeltaCapacitanceRS | Integer32 | Ring-shield ac delta capacitance in picofarads. A value above 2µf indicates an overrange. |
| cltmRsltDmmAcDeltaResistanceTR | Integer32 | Tip-ring ac delta resistance in ohms. A value above 5mohms indicates an overrange. |
| cltmRsltDmmAcDeltaResistanceTS | Integer32 | Tip-shield ac delta resistance in ohms. A value above 5mohms indicates an overrange. |
| cltmRsltDmmAcDeltaResistanceRS | Integer32 | Ring-shield ac delta resistance in ohms. A value above 5mohms indicates an overrange. |
| cltmRsltDmmLbalOutputDb | Integer32 | Longitudinal balance in dB. |
| cltmRsltDetapNumTaps | Integer32 | Number of bridge taps detected. |
| cltmRsltDetapTapLength | Integer32 | Bridge tap length in hundreths (.01) feet for `english` units or in centimeters for `metric` units. |
| cltmRsltMeasVoiceAutoMode | Integer | Results of `measvoice` test for `auto` mode. Possible results are:<br>1—Voice signal not detected.<br>2—Voice signal detected.<br>3—Steady state - possible data traffic.<br>4—Interrupted tone detected - 60 or 120 IPM. |
| cltmRsltDtmfMfStatus | Integer32 | Results of measvoice test for `dtmf-mf` mode. Possible results are:<br>1—No DTMF or MF tone detected.<br>2—DTMF or MF tone detected. |

*Table 3-4. CLT module results group, table type objects (page 4 of 4)*

| Object name | Variable type | Specifies |
|---|---|---|
| cltmRsltMeasVoiceToneFreq | Integer32 | Frequency of detected tone in tone mode. Results are reported in hundredths (.01) Hz. |
| cltmRsltMeasVoiceToneLevel | Integer32 | Level of detected tone in tone mode. Results are reported in hundredths (.01) dBm. |
| cltmRsltMeasVoiceBgnsRslt | Integer32 | Background noise level reported in hundredths (.01) dBm. |
| cltmRsltMeasVoiceSgnsRslt | Integer32 | Signal to noise ratio reported in hundredths (.01) dBm |
| cltmRsltMeasDtaTestRslt | Integer | Results of subscriber dialtone test. Possible values are:<br>1—Draw and break dial tone.<br>2—Draw dial tone but no break.<br>3—Slow dialtone draw and break.<br>4—Slow dialtone with no break.<br>5— Cannot draw dial tone.<br>6—Noisy line. |

# CLT Module Specifications

A



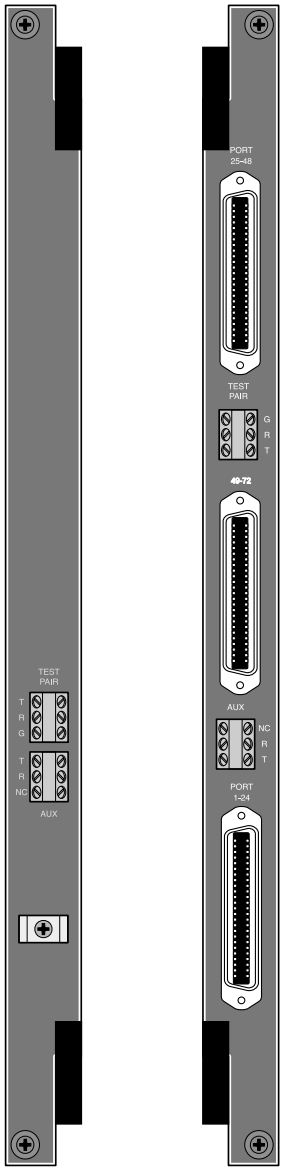
## Physical specifications

Table A-1 shows the CLT module physical specifications. Figure A-1 shows the front panel of the module.

*Table A-1. CLT module physical specifications*

| Characteristic | Specification |
|---|---|
| Physical dimensions | Height: 15 inches (38.1cm)<br>Width: 1.06 inches (2.69cm)<br>Depth:<br>FS version: 5 inches (12.7cm)<br>LS version: 9 inches (22.8cm)<br>Weight:<br>FS version: 2.0 pounds (0.90kg)<br>LS version: 3.2 pounds (1.45kg) |
| Power requirements | 9.6W |
| Temperature range | 32° to 131°F (0° to 55° C) |

*Figure A-1. CLTE module front panels. Left: Stinger FS version. Right: Stinger LS/RT version*




# Connector pinouts and specifications

Following are the pinouts and specifications for the SERIAL connector, TEST PAIR connector, and AUX connector on the CLTE module. The version for the Stinger LS also has two PORT connectors.

## SERIAL connector

The serial port uses a standard DE-9F female connector that conforms to the EIA RS-232 standard for serial interfaces. Table A-2 shows the pinout for the SERIAL connector.

The serial port parameters are 9600 baud, 8 bits, and no parity.

*Table A-2. Serial port (TL1 interface) pinout*

| DE-9F pin number | RS-232 signal name | Function | I/O |
|---|---|---|---|
| 2 | RD | Serial Receive Data | O |
| 3 | SD | Serial Transmit Data | I |
| 5 | GND | Signal Ground | |

## TEST PAIR connector

The TEST PAIR connector provides access to the copper loop when the `access-terminal` terminal is set to `external`. The connector is a screw compression, three-position terminal block. Table A-3 and Table A-4 show the pinouts for the Stinger FS and Stinger LS versions.

*Table A-3. TEST PAIR connector for Stinger FS version*

| Pin number | Name | Function |
|---|---|---|
| 1 | T | Tip connection of copper loop. |
| 2 | R | Ring connection of copper loop. |
| 3 | G | Shield connection of copper loop. |

*Table A-4. TEST PAIR connector for Stinger LS version*

| Pin number | Name | Function |
|---|---|---|
| 1 | G | Shield connection of copper loop. |
| 2 | R | Ring connection of copper loop. |
| 3 | T | Tip connection of copper loop. |

## AUX connector

The AUX connector provides access to the copper loop when the `access-terminal` parameter is set to `auxiliary`. The connector is a screw compression, three-position

terminal block. Table A-5 and Table A-6 show the pinouts for the Stinger FS and Stinger LS versions.

*Table A-5. AUX connector for Stinger FS version*

| Pin number | Name | Function |
|---|---|---|
| 1 | T | Tip connection of copper loop. |
| 2 | R | Ring connection of copper loop. |
| 3 | NC | Not used. |

*Table A-6. AUX connector for Stinger LS version*

| Pin number | Name | Function |
|---|---|---|
| 1 | NC | Not used. |
| 2 | R | Ring connection of copper loop. |
| 3 | T | Tip connection of copper loop. |

## Port connector

The PORT connectors are used to connect incoming DSL lines to the LIM to the right of the CLT module. These connectors are present on only the LS and RT version of the CLTE module. A USOC RJ-21X 50-pin telephone company connector is used for each PORT connection. Table A-7 , Table A-8 and Table A-9 show these pinouts.

*Table A-7. Cable pinouts for PORT 1-24—Stinger LS/RT only (page 1 of 2)*

| Pin | Signal | Color code | Pin | Signal | Color code |
|---|---|---|---|---|---|
| 1 | 1R (line 1 ring) | Blue/white | 26 | 1T (line 1 tip) | White/blue |
| 2 | 2R | Orange/white | 27 | 2T | White/Orange |
| 3 | 3R | Green/white | 28 | 3T | White/green |
| 4 | 4R | Brown/white | 29 | 4T | White/brown |
| 5 | 5R | Slate/white | 30 | 5T | White/slate |
| 6 | 6R | Blue/red | 31 | 6T | Red/blue |
| 7 | 7R | Orange/red | 32 | 7T | Red/orange |

*Table A-7. Cable pinouts for PORT 1-24—Stinger LS/RT only (page 2 of 2)*

| Pin | Signal | Color code | Pin | Signal | Color code |
|---|---|---|---|---|---|
| 8 | 8R | Green/red | 33 | 8T | Red/green |
| 9 | 9R | Brown/red | 34 | 9T | Red/brown |
| 10 | 10R | Slate/rejd | 35 | 10T | Red/slate |
| 11 | 11R | Blue/black | 36 | 11T | Black/blue |
| 12 | 12R | Orange/black | 37 | 12T | Black/orange |
| 13 | 13R | Green/black | 38 | 13T | Black/green |
| 14 | 14R | Brown/black | 39 | 14T | Black/brown |
| 15 | 15R | Slate/black | 40 | 15T | Black/slate |
| 16 | 16R | Blue/yellow | 41 | 16T | Yellow/blue |
| 17 | 17R | Orange/yellow | 42 | 17T | Yellow/orang e |
| 18 | 18R | Green/yellow | 43 | 18T | Yellow/green |
| 19 | 19R | Brown/yellow | 44 | 19T | Yellow/brown |
| 20 | 20R | Slate/yellow | 45 | 20T | Yellow/slate |
| 21 | 21R | Blue/violet | 46 | 21T | Violet/blue |
| 22 | 22R | Orange/violet | 47 | 22T | Violet/orange |
| 23 | 23R | Green/violet | 48 | 23T | Violet/green |
| 24 | 24R | Brown/violet | 49 | 24T | Violet/brown |
| 25 | Not used | N/A | 50 | Not used | N/A |

*Table A-8. Cable pinouts for PORT 25-48—Stinger LS/RT only (page 1 of 2)*

| Pin | Signal | Color code | Pin | Signal | Color code |
|---|---|---|---|---|---|
| 1 | 25R (channel 1 ring) | Blue/white | 26 | 25T (channel 1 tip) | White/blue |
| 2 | 26R | Orange/white | 27 | 26T | White/Orange |
| 3 | 27R | Green/white | 28 | 27T | White/green |

*Table A-8. Cable pinouts for PORT 25-48—Stinger LS/RT only (page 2 of 2)*

| Pin | Signal | Color code | Pin | Signal | Color code |
|---|---|---|---|---|---|
| 4 | 28R | Brown/white | 29 | 28T | White/brown |
| 5 | 29R | Slate/white | 30 | 29T | White/slate |
| 6 | 30R | Blue/red | 31 | 30T | Red/blue |
| 7 | 31R | Orange/red | 32 | 31T | Red/orange |
| 8 | 32R | Green/red | 33 | 32T | Red/green |
| 9 | 33R | Brown/red | 34 | 33T | Red/brown |
| 10 | 34R | Slate/red | 35 | 34T | Red/slate |
| 11 | 35R | Blue/black | 36 | 35T | Black/blue |
| 12 | 36R | Orange/black | 37 | 36T | Black/orange |
| 13 | 37R | Green/black | 38 | 37T | Black/green |
| 14 | 38R | Brown/black | 39 | 38T | Black/brown |
| 15 | 39R | Slate/black | 40 | 39T | Black/slate |
| 16 | 40R | Blue/yellow | 41 | 40T | Yellow/blue |
| 17 | 41R | Orange/yellow | 42 | 41T | Yellow/orange |
| 18 | 42R | Green/yellow | 43 | 42T | Yellow/green |
| 19 | 43R | Brown/yellow | 44 | 43T | Yellow/brown |
| 20 | 33R | Slate/yellow | 45 | 33T | Yellow/slate |
| 21 | 45R | Blue/violet | 46 | 45T | Violet/blue |
| 22 | 46R | Orange/violet | 47 | 46T | Violet/orange |
| 23 | 47R | Green/violet | 48 | 47T | Violet/green |
| 24 | 48R | Brown/violet | 49 | 48T | Violet/brown |
| 25 | Not used | N/A | 50 | Not used | N/A |

*Table A-9. Cable pinouts for PORT 49-72 Stinger LS/RT only (page 1 of 2)*

| Pin | Signal | Color code | Pin | Signal | Color code |
|---|---|---|---|---|---|
| 1 | 1R (line 1 ring) | Blue/white | 26 | 1T (line 1 tip) | White/blue |
| 2 | 2R | Orange/white | 27 | 2T | White/Orange |
| 3 | 3R | Green/white | 28 | 3T | White/green |
| 4 | 4R | Brown/white | 29 | 4T | White/brown |
| 5 | 5R | Slate/white | 30 | 5T | White/slate |
| 6 | 6R | Blue/red | 31 | 6T | Red/blue |
| 7 | 7R | Orange/red | 32 | 7T | Red/orange |
| 8 | 8R | Green/red | 33 | 8T | Red/green |
| 9 | 9R | Brown/red | 34 | 9T | Red/brown |
| 10 | 10R | Slate/red | 35 | 10T | Red/slate |
| 11 | 11R | Blue/black | 36 | 11T | Black/blue |
| 12 | 12R | Orange/black | 37 | 12T | Black/orange |
| 13 | 13R | Green/black | 38 | 13T | Black/green |
| 14 | 14R | Brown/black | 39 | 14T | Black/brown |
| 15 | 15R | Slate/black | 40 | 15T | Black/slate |
| 16 | 16R | Blue/yellow | 41 | 16T | Yellow/blue |
| 17 | 17R | Orange/yellow | 42 | 17T | Yellow/orange |
| 18 | 18R | Green/yellow | 43 | 18T | Yellow/green |
| 19 | 19R | Brown/yellow | 44 | 19T | Yellow/brown |
| 20 | 20R | Slate/yellow | 45 | 20T | Yellow/slate |
| 21 | 21R | Blue/violet | 46 | 21T | Violet/blue |
| 22 | 22R | Orange/violet | 47 | 22T | Violet/orange |
| 23 | 23R | Green/violet | 48 | 23T | Violet/green |

*Table A-9. Cable pinouts for PORT 49-72 Stinger LS/RT only (page 2 of 2)*

| Pin | Signal | Color code | Pin | Signal | Color code |
|---|---|---|---|---|---|
| 24 | 24R | Brown/violet | 49 | 24T | Violet/brown |
| 25 | Not used | N/A | 50 | Not used | N/A |

# Index

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## B



## C

## D



## E



## F



## H



## I

## L



## M



## N



## P



## R



## S

## T



## U

## V



## W