

BERTScope™ **LTS**

Lightwave Test Set

Remote Control Guide

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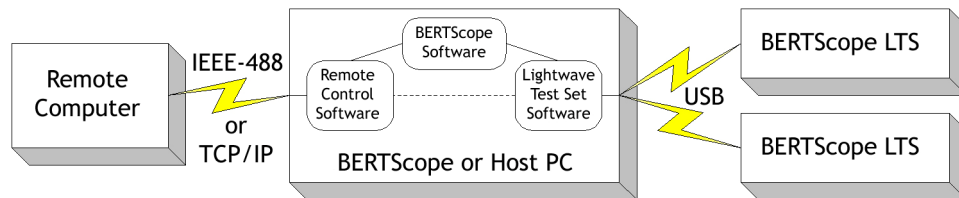
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BERTScope™ *LTS* Remote Control Overview

The BERTScope LTS can be controlled remotely via either an IEEE-488 or a TCP/IP communications connection. The BERTScope LTS remote control software runs on either a BERTScope, or a host PC running Microsoft Windows 2000 or XP operating systems.

The remote control software accepts text-oriented commands from a remote computer via either an IEEE-488 or TCP/IP connection. It then routes the commands to one or more BERTScope LTSs, connected to the BERTScope or host PC via USB.



If the local host is a BERTScope, then the BERTScope software gets a chance to handle the command first. BERTScope-specific commands are documented in a separate manual, the [*BERTScope Remote Control Guide*](#), part number 0150-703-06.28.

Any commands the BERTScope software doesn't understand are sent to the LTS software, which then controls the BERTScope LTS. The BERTScope LTS-specific commands are documented in this manual.

When a BERTScope LTS is connected to a BERTScope, you can inter-mix BERTScope and BERTScope LTS commands in the same script, program, or interactive session. If the host is just an ordinary PC, then the commands are routed to the Clock Recovery software directly. In this case, using the BERTScope-specific commands will result in an error.

For most applications, a single BERTScope LTS is connected to a BERTScope or host PC. In this case, the BERTScope LTS is automatically detected and connected when the remote control software is started, and automatically disconnected when the remote control software is stopped. There is no need in this case to use the **OPEN** or **CLOSE** commands described below.

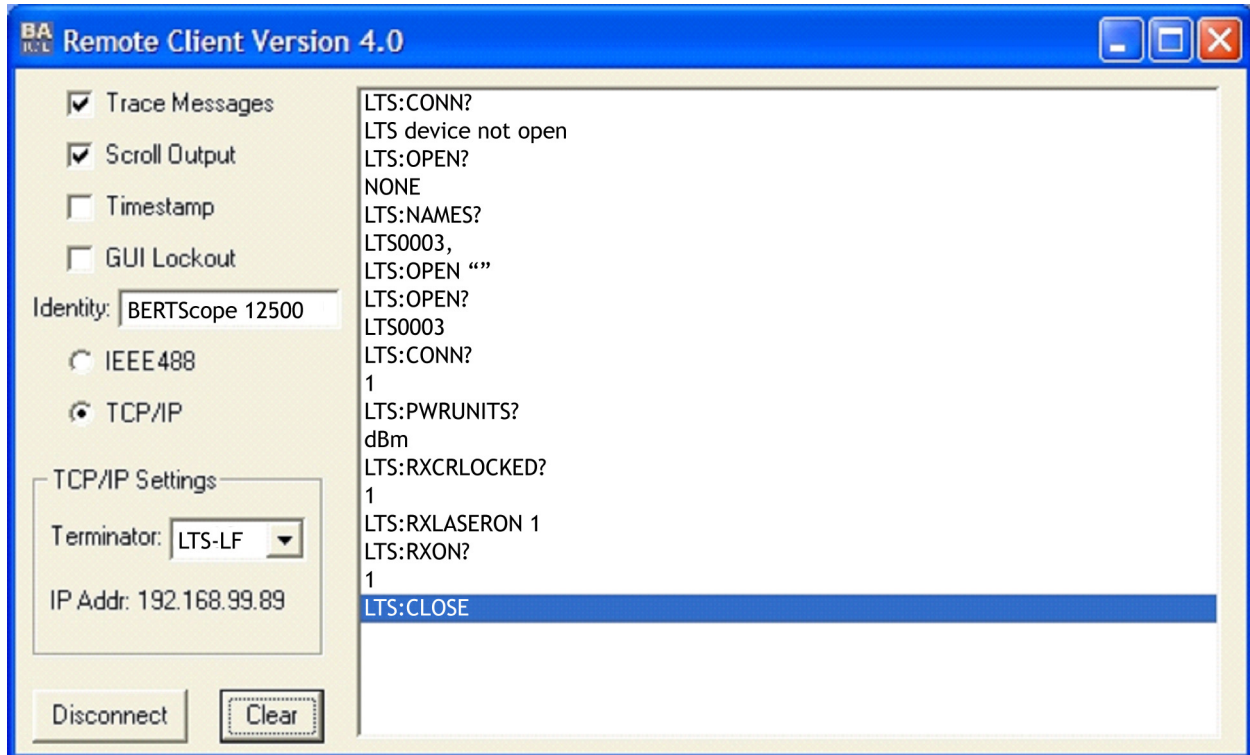
If more than one BERTScope LTS is connected to the BERTScope or host computer, the remote control software will not connect automatically. In this case, the Remote computer must issue a **NAMES?** query to discover the IDs of the connected BERTScope LTSs, and **OPEN** the one desired before issuing control commands. If the Remote computer needs to control multiple BERTScope LTSs, it would **OPEN**, control, then **CLOSE** one, then **OPEN**, control, and **CLOSE** another. The device that is **OPEN** is referred to as the 'current' device throughout this document.

Remote control is implemented using a text-oriented command protocol described in the following pages of this document. These commands enable you to set and query the system parameters of the BERTScope LTS, and to retrieve measurements made by the instrument.

Setting Up Remote Control

Before beginning a remote control session, it is necessary to start the Remote Client application, *BitAnalyzerRemoteClient.exe*, on the host computer.

If the host is a BERTScope, select the **Remote** button from the System View's **Tools** page. If the host computer is a normal PC, then just execute the *BitAnalyzerRemoteClient.exe* file.



The Remote Client application allows you to select either a TCP/IP or GPIB communication channel. Internally, the program handles routing of commands between the remote computer and the BERTScope LTS. Select the **Trace Messages** box to monitor the commands sent to the BERTScope LTS.

To test the Remote Client connection, use a TCP/IP terminal program like *telnet.exe* to interact with the BERTScope LTS directly. An example session is shown in the figure above.

Command Syntax

Remote Control Command Lines are defined as ASCII text strings ending with '\r' or '\n'.

The commands follow a basic three-part structure, consisting of one word identifying the feature of the BERTScope LTS being addressed, another word identifying a specific operation within that feature, and optional parameters. The feature and operation are separated by a colon, and the operation and parameter (if any), are separated by a space.

FEATURE:OPERATION PARAMETER

Commands and parameters are generally *case-insensitive*.

Most commands have a long form and a short form. For example,

LTS:CONNECTED?

can be typed out exactly as shown, or as

LTS:CONN? Or **lts:conn?**

The short form is convenient during interactive control (using a telnet session, for example). You might want to use the long form in scripts or programs, to increase code clarity.

FEATURES

The BERTScope LTS commands are divided into feature groups:

In the first group are commands that handle device discovery and connection. You can use these commands anytime, even if a 'current' device has not been selected yet (with the **OPEN** command). The **NAMES**, **OPEN**, and **CLOSE** commands are all part of this group.

A second group consists of commands for controlling and monitoring a particular BERTScope LTS. The 'current' device must have been specified (using the **LTS:OPEN** command) prior to using any commands in this group.

In addition to these feature groups, several miscellaneous features exist to manipulate the host computer display (**VIEW**, **PTFILE**, **GUILOCKOUT**), the run state (**RSTATE**, **RDURATION**), and the overall program configuration (**SCONFIGURATION**, **RCONFIGURATION**, **ISSTATUS**, **RSSTATUS**). These commands primarily implement the functionality provided by the GUI Console buttons.

OPERATIONS

Operations fall into three sub-categories:

Read-Only properties

Query a read-able property by appending a question mark after it.

For example,

LTS:DN?

returns the device name of the currently selected BERTScope LTS.

Read-Write Properties

Query a read-write property by appending a question mark after it.

Set a read-write property by adding an appropriate parameter.

For example,

LTS:OPEN "LTS_1234"

selects the BERTScope LTS with the device name **LTS_1234** as the current device, while

LTS:OPEN?

returns name of the device previously **OPENed**.

Write-Only operation

Question marks are illegal for write-only operation, and parameters may or may not be required, depending upon the particular operation.

For example,

LTS:CLOSE

requires no parameters, but

LTS:RCONFIGDISK "D:\BitAlyzer\Configurations\mycfg.lts"

requires the complete pathname of the BERTScope LTS configuration file.

PARAMETERS

A parameter can be Double or Integer numbers, Boolean (0 or 1), an Enumerated Data Type, or a String.

When a command uses a string as a parameter, the string is enclosed in double-quotes ("string").

Filenames always require the absolute path, enclosed within double-quotes.

Parameters are generally *case-insensitive*.

Command Status

The BERTScope LTS receives and operates on each command immediately.

The input values of commands are checked. If an input is received that is outside of the legal range, the input will be clipped and recorded in the status queue.

Command execution sets a status variable that may be queried by the user to determine if the previous command was successful.

You request the status of a command by sending:

SYSTem:ERRor? or **SYST:ERR?**

This command retrieves items listed in the error status queue in the format:

< n, "event/string" >

The status queue is first in, first out. It can contain up to 100 error messages. If the status queue overflows, the last error/event in the queue is replaced with Error -350, "Queue overflow". When all errors/events have been read from the queue, further error/event queries will return 0, "NO error".

To clear the status queue all at once, send:

***CLS**

Command Error Messages and Codes

ERROR MESSAGES

"TOO MANY PARAMETERS"
"UNRECOGNIZED COMMAND"
"WRONG PARAMETER TYPE"
"TOO LITTLE PARAMETERS"
"WRONG PARAMETER FORMAT"
"WRONG PARAMETER NUMBER"
"WRONG ACTION-ONLY"
"WRONG QUERY-ONLY"
"REQUESTED <QUERY PARAMETER> IS NOT SUPPORTED ON THE PLATFORM"

ERROR CODES

0 "NO ERROR"
-350 "Queue Overflow"
-10 File transfer error
-20 System error or event
-30 Command error, see list of error messages
-40 No software option

Tips

It is most useful to have an understanding of the basic principles of the BERTScope LTS before undertaking remote control programming. There is a high degree of similarity between the BERTScope's graphical user interface and the remote control command protocol.

For more technical assistance in programming your remote control applications, please contact SyntheSys Research, Inc. We are glad to help.

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LTS Remote Control Commands (Confidential)

Command Summary

Lifecycle commands (usable before OPEN)

Dynamic Read-Only Properties

TOTALDEVCOUNT **or** TDCT
ATTACHDEVCOUNT **or** ADCT
ATTACHDEVNAMES **or** NAMES

Read-Write Settings

OPEN

Write-Only Operations

CLOSE

(require prior OPEN)

Static Read-Only Identification and Capabilities

MODEL
SERIALNUM **or** SN
DEVICENAME **or** DN
SWREV **or** SW
HWREV **or** HW
FPGAREV **or** FPGA
EXPREV **or** EXP
NUMTAPS
INVALIDVALUE **or** IVALUE

Dynamic Read-Only Properties

CONNECTED **or** CONN
BUSY
RXPOWER
RXCRLOCKED

Read-Write Settings

OPTICALPOWERUNITS **or** PWRUNITS
TXOPMODE **or** TXMODE
TXLASERON **or** TXON
TXNOMFREQ **or** TXFREQ
TXISI
TXFILTER
TXPOWER
TXEXTINCTIONRATIO **or** TXER
RXLASERON **or** RXON
RXNOMFREQ **or** RXFREQ
RXWAVELENGTH **or** RXWL
RXFILTER

Write-Only Operations

SCONFIGDISK **or** SDISK
RCONFIGDISK **or** RDISK

Command Reference

LTS:AttachDevCount?

LTS:ADCT?

Retrieves the number of unique BERTScope LTSs (unique serial numbers) that are currently responding, whether or not the remote computer has OPENed a session to any of them.

Returns: < numeric >

LTS:attachdevNAMES?

LTS:NAMES?

Retrieves a comma-separated list of all BERTScope LTSs that are currently communicating with the Clock Recovery Service, whether or not the remote computer has OPENed a session to any of them.

Each BERTScope LTS is identified by its device name.

Returns: <string> Comma-separated list of BERTScopeLTSs found, or "" if none found.

LTS:BUSY?

Retrieves the busy status of the currently selected BERTScope LTS.

Returns: < 0 > Device is for available for communication
< 1 > Device is temporarily unavailable for communication.

LTS:CLOSE

Close the communication connection to the current BERTScope LTS.

Note that closing the "current" BERTScope LTS requires that a new current BERTScope LTS be selected (or opened) prior to issuing any more device-specific commands.

LTS:CONNected?

LTS:CONN?

Retrieves the connection status of the currently selected BERTScope LTS.

Returns: < 0 > Device is opened, but not found by the host computer.
< 1 > Device is opened and available for communication.

LTS:DeviceName?

LTS:DN?

Retrieves the device name of the currently selected BERTScope LTS.

A device name can be from 1 to 11 characters in length.

Returns: < string > Device Name of current device.

LTS:EXPrev?

LTS:EXP?

Retrieves the expansion board revision string of the currently selected BERTScope LTS.

Note that If no expansion board is installed in the BERTScope LTS, then "XXXX" is returned.

Returns: < string > Expansion board revision string.

LTS:FPGArev?**LTS:FPGA?**

Retrieves the FPGA revision string of the currently selected BERTScope LTS.

Returns: < string > FPGA revision string.

LTS:HWrev?**LTS:HW?**

Retrieves the hardware revision string of the currently selected BERTScope LTS.

Returns: < string > Hardware revision string.

LTS:invalidVALUE?**LTS:IVALUE?**

Retrieves the "magic number" returned if a BERTScope LTS measurement cannot be made.

Returns: < numeric > Invalid value.

LTS:MODEL?

Retrieves the model type of the currently selected BERTScope LTS.

Returns: < 8500A_TXRX > LTS contains both transmitter and receiver
< 8500A_TX > LTS contains only transmitter
< 8500A_RX > LTS contains only receiver

LTS:OPEN <string>**LTS:OPEN?**

Selects or Returns the device name of the "current" BERTScope LTS.

The user-assigned device name or serial number string may be passed to select a particular BERTScope LTS. An empty string may be passed to select the first (usually only) BERTScope LTS found. A BERTScope LTS can be opened by multiple clients. .

Params: < string > Serial Number, Device Name, or "".

Returns: < string > Current Device Name, or "NONE".

LTS:opticalPoWeRUNITS <enum>**LTS:opticalPoWeRUNITS?****LTS:PWRUNITS <enum>****LTS:PWRUNITS?**

Sets and Retrieves the units to use for the optical power settings and measurements

Params: < dBm > dB per milliWatt
< mW > milliWatt
< uW > microWatt

Returns: < dBm | mW | uW >

LTS:RconfigDISK <string>**LTS:RDISK <string>**

Restores the BERTScope LTS settings from a file. The complete path must be specified in the parameter string. The path must be accessible to the host computer or BERTScope running the remote control software. The file extension should be '.LTS'. Action only.

Example:

LTS:RCONFIGDISK "D:\BitAlyzer\Configurations\mycfg.LTS"

Params: < string > Pathname of the configuration file

LTS:RXCRLOCKED?

Retrieves the receiver's clock recovery hardware state in the currently selected BERTScope LTS. Query only.

Returns: < 0 > Device is NOT locked to the receiver's input signal.
< 1 > Device is locked to the receiver's input signal.

LTS:RXFILTER <enum>

LTS:RXFILTER?

Sets or Retrieves the receiver's Low Pass Filter setting.

Params: < Bypass> Bypasses this control
< 10GbE> Use internal filter, suitable for 10 Gbit Ethernet
< 8XFC > Use internal filter, suitable for 8x Fiber Channel
< 4XFC> Use internal filter, suitable for 4x Fiber Channel
< 2XFC> Use internal filter, suitable for 2x Fiber Channel

Returns: < Bypass | 10GbE | 8XFC | 4XFC | 2XFC >

LTS:RXlaserON <boolean>

LTS:RXlaserON?

LTS:RXON <boolean>

LTS:RXON?

Enables or Disables the receiver's optical to electrical transducer.

Params: < 0 > Laser transducer Disabled
< 1 > Laser transducer Enabled

Returns: <0 | 1 >

LTS:RXNOMFREQ?

LTS:RXNOMFREQ

Sets or retrieves the receiver input data rate, in Hz.

The LTS needs to know the receiver input data rate to select the proper calibration values.

NOTE: See **LTS:RXNOMFREQ**

Params: < numeric > Set the current data rate, in Hertz
150 MHz to 12.5 GHz

Returns: < numeric > Measured, or previously entered data rate, in Hertz

LTS:RXPOWER?

Retrieves the measured average power of the receiver's optical data input.

NOTE: See **LTS:opticalPoWeRUNITS**

Returns: < numeric > In dBm, mW, or uW, depending upon the current optical power units setting.

LTS:RXWaveLength < numeric >

LTS:RXWaveLength?

LTS:RXWL < numeric >

LTS:RXWL?

Sets or Retrieves the wavelength of the receiver's optical input, in nm.

Params: < numeric > 850, 1310, or 1550 nm. Only

Returns: < numeric > Current setting, in nm.

LTS:SconfigDISK <string>

LTS:SDISK <string>

Saves the current BERTScope LTS settings to a file. The complete path must be specified in the parameter string. The path must be accessible to the host computer or BERTScope running the remote control software. The file extension should be '.LTS'.

Example:

LTS:SCONFIGDISK "D:\BitAlyzer\Configurations\mycfg.LTS"

Params: < string > Pathname of the configuration file

LTS:SerialNum?

LTS:SNSN?

Retrieves the serial number string of the currently selected BERTScope LTS.

Returns: < string > Serial Number string of current device.

LTS:SWrev?

LTS:SW?

Retrieves the firmware revision string of the currently selected BERTScope LTS.

Returns: < string > Firmware revision string.

LTS:TotalDevCount?

LTS:TDCT?

Retrieves the total number of unique BERTScope LTSs (unique serial numbers) found.

Note that this number may include devices that are no longer connected to the host computer, or are powered off.

Returns: < numeric >

LTS:TExtinctionRatio < numeric >

LTS:TExtinctionRatio?

LTS:TXER < numeric >

LTS:TXER?

Sets or Retrieves the extinction ratio of the transmitter's optical output, in dB.

Params: < numeric > 2.0 dB to 6.0 dB.

Returns: < numeric > Current ER setting.

LTS:TXFILTER <enum>

LTS:TXFILTER?

Sets or Retrieves the transmitter's Low Pass Filter setting.

Params: < Bypass> Bypasses this control
< 10GbE> Use internal filter, suitable for 10 Gbit Ethernet
< External > Use external filter connected to the front of
the LTS unit.
Returns: < Bypass | 10GbE | External >

LTS:TXISI <enum>

LTS:TXISI?

Sets or Retrieves the transmitter's ISI setting.

Params: < Bypass > Bypasses this control
< 8XFC > Set suitable for 8x Fiber Channel
Returns: < Bypass | 8XFC >

LTS:TXlaserON <boolean>

LTS:TXlaserON?

LTS:TXON <boolean>

LTS:TXON?

Enables or Disables the transmitter's output laser.

Params: < 0 > Laser Disabled
< 1 > Laser Enabled
Returns: < 0 | 1 >

LTS:TXNOMFREQ?

LTS:TXNOMFREQ

Sets or retrieves the transmitter input data rate, in Hz.

The LTS needs to know the transmitter input data rate to select the proper calibration values.

NOTE: See **LTS:RXNOMFREQ**

Params: < numeric > Set the current data rate, in Hertz
150 MHz to 12.5 GHz
Returns: < numeric > Measured, or previously entered data rate, in
Hertz

LTS:TXOpMODE <enum>

LTS:TXOpMODE?

LTS:TXMODE <enum>

LTS:TXMODE?

Sets or Retrieves the operational mode of the currently selected BERTScope LTS.

When an operational mode is set, the transmitter's ISI, Filter, average Power, and Extinction Ratio are forced to settings appropriate for the mode.

If one of these settings is subsequently changed manually, then the operation mode will return to "Manual".

NOTE: See **LTS:TXISI**, **LTS:TXFILTER**, **LTS:TXPOWER**, and **LTS:TXEXTINCTIONRATIO**

Params: < Manual > Any settings allowed

< Reference > ISI = Bypass
 Filter = Bypass
 Avg. Power = 1.0 mW
 Extinction Ratio = 5.0 dB

< OMA_Cal > ISI = Bypass
 Filter = Bypass
 Avg. Power = 1.0 mW
 Extinction Ratio = 3.0 dB

< Filter > ISI = Bypass
 Filter = 10 Gbit Ethernet
 Avg. Power = 1.0 mW
 Extinction Ratio = 3.0 dB

Returns: < Manual | Reference | OMA_Cal | Filter >

LTS:TXPOWER < numeric >

LTS:TXPOWER?

Sets or Retrieves the average power of the transmitter's optical output, (in dBm, mW, or uW, depending upon the current optical power units setting).

NOTE: See **LTS:opticalPoWeRUNITS**

Params: < numeric > 0.1 mW to 1.2 mW, or equiv. in other units.

Returns: < numeric > In dBm, mW, or uW, depending upon the current optical power units setting.

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