

ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Find the *Newport / ILX Lightwave LTS-9300* at our website: *Click HERE*



CHAPTER 2

SYSTEM SOFTWARE

The System Software chapter provides general information about the LTS-9300 software. Instructions about installing and configuring the system software are provided with descriptions of the windows and options that are available.

System Software Overview

The LTS-9300 system software allows the user to fully configure, run, record, and control burn-in and life tests using a standard PC with a simple Windows® based user interface.

The software has two modes: Control and Monitor. The Control mode allows the user to configure the LTS-9300 for long-term or short-term tests. The Monitor mode performs data recording and measurement reporting for the user to verify DUT operation.

The user may configure and run each installed drawer in the LTS-9300 individually or all of the drawers simultaneously. Each drawer may be configured to run all 16 DUT with individual set points or all 16 DUT with the same configuration.

Using the LTS-9300 System Software

Double click the LTS-9300 shortcut on the desktop or click **Start>Programs>ILX Lightwave>Life-test & Burn-in>LTS-9300** to launch the System Software.

The first displayed dialog box of the system software is the central dialog for managing the LTS-9300.

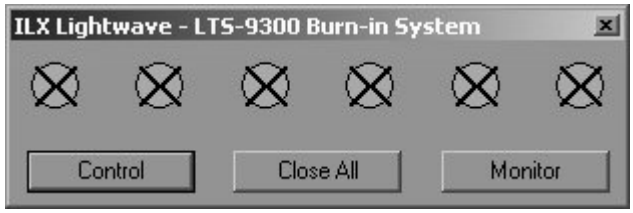


Figure 2.1 Initial Software Dialog

From this dialog box, the user may Control the LTS-9300, Monitor the LTS-9300, or view the update status or each drawer. Clicking on **Control** enters Control mode, clicking on **Monitor** enters Monitor mode.

LTS-9300 System Software Control Mode

The system software control mode allows the user to manage the configuration of the LTS-9300 before initiating communication with the LTS-9300. The configuration is arranged into a set of configuration files stored on the PC. Configuration of the LTS-9300 is not real-time operation and thus the user may make modifications while the LTS-9300 is performing tests. Any modification made in Control mode only changes the configuration files. When the new configuration is ready, the configuration may be uploaded to the LTS-9300 and the new test begins.

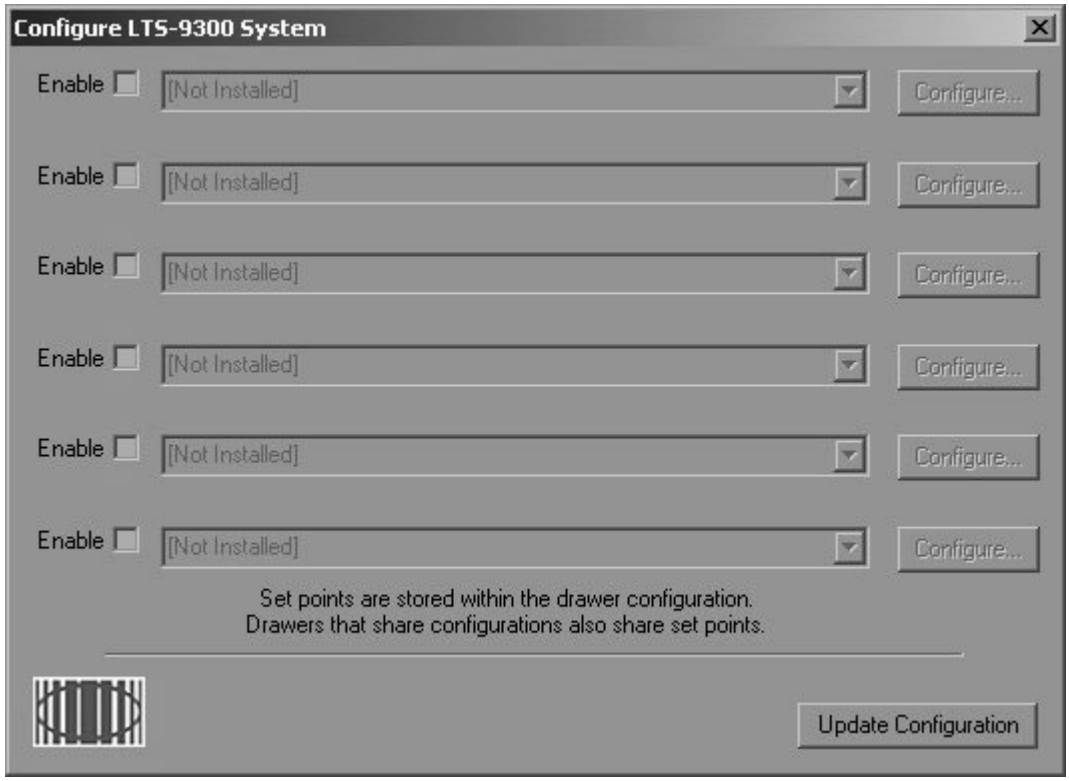


Figure 2.2 Initial LTS-9300 Configuration Dialog Box

The figure above shows an LTS-9300 configuration where every drawer is offline.

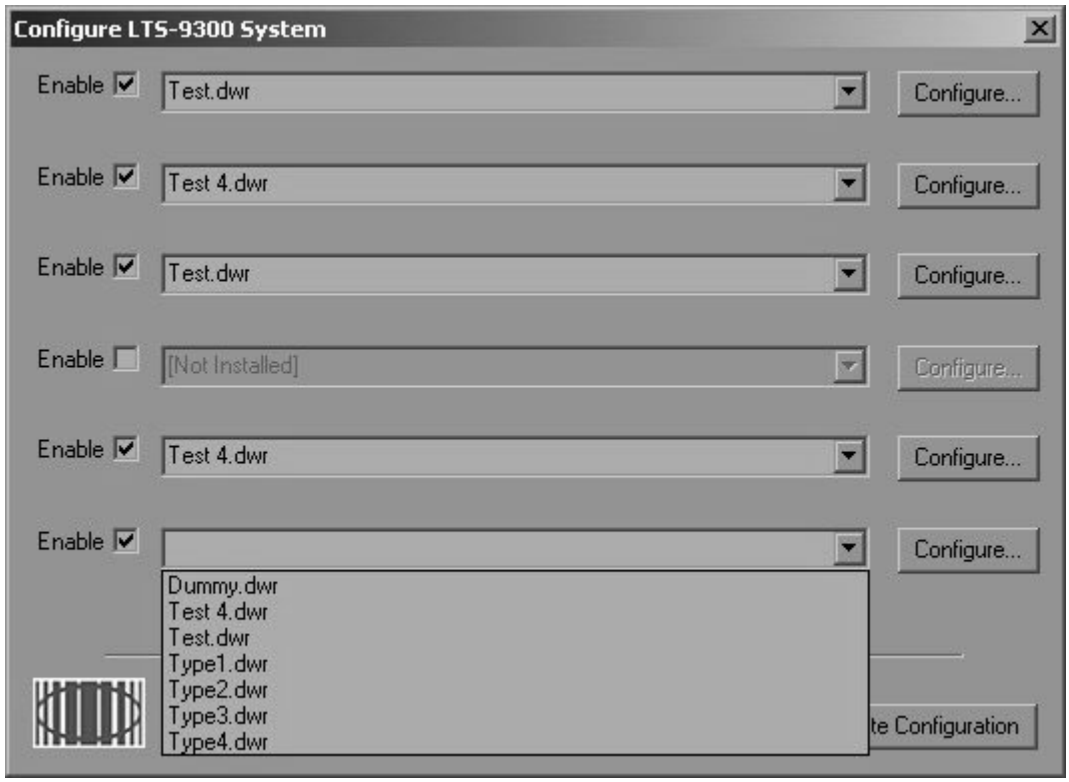


Figure 2.3 Configured LTS-9300 Dialog Box

The figure above shows an LTS-9300 configuration where Drawers One and Three are configured to run the same test, “Test.dwr”. Drawers Two and Five are configured to run a test named **Test 4.dwr**. The drop-down combo box is expanded for Drawer Six, showing a list of available drawer configurations.

Pressing the **Configure** button opens the Drawer Configuration dialog box for the corresponding drawer.

The Drawer Configuration Dialog Box

The Drawer Configuration dialog box is used to configure the operation of the DUT within the corresponding drawer. Parameters such as the DUT types, Current Source (CS) set points and temperature set points are available from this dialog box. It is important to remember that all configuration dialog boxes in Control mode only modify the configuration files.

The configuration file modified by the Drawer Configuration dialog box is noted in the **File Name:** combo box, referenced in the figure below. Changing a drawer

configuration file that is used for more than one drawer will change the configuration of each drawer that uses the configuration file.

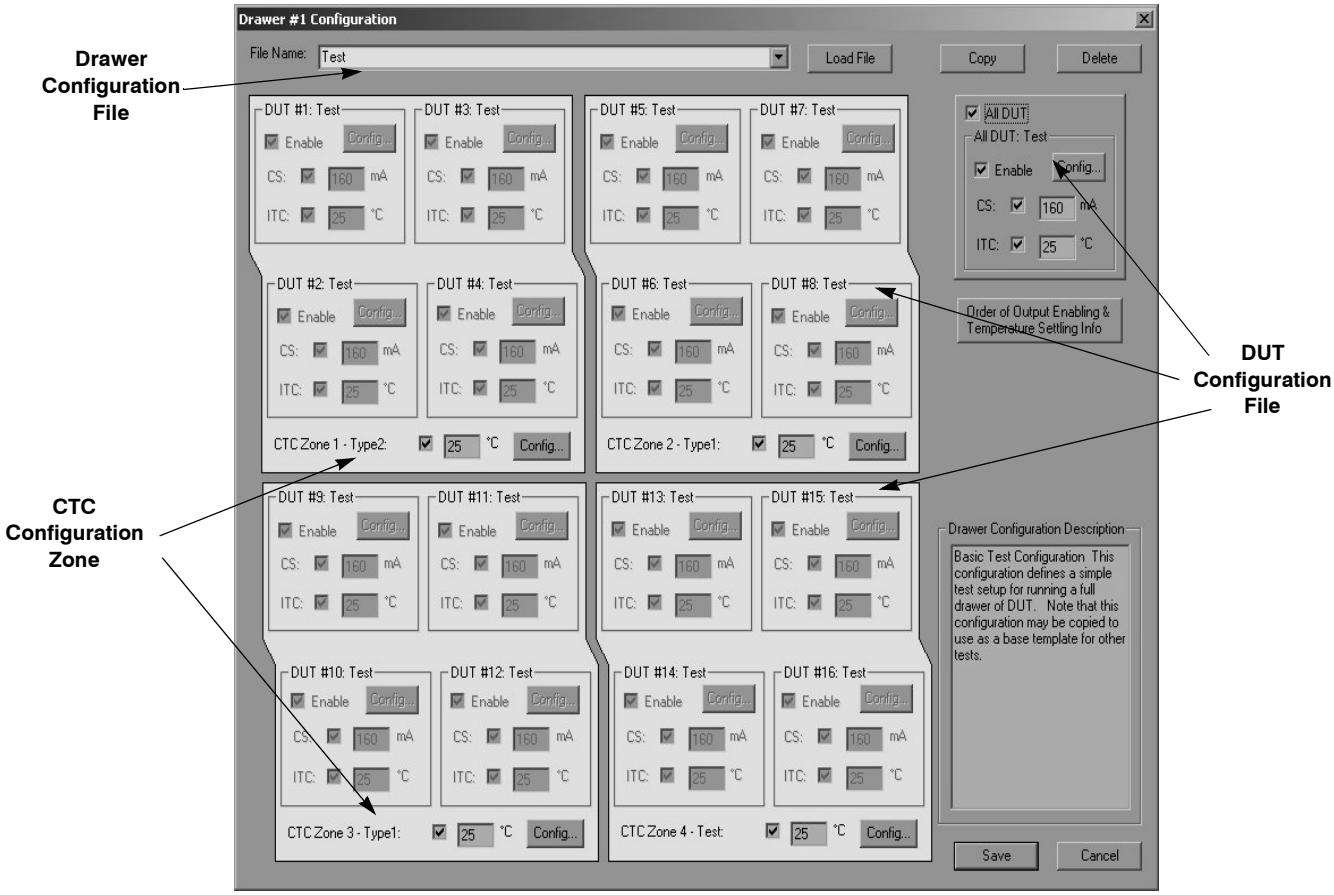


Figure 2.4 Drawer Configuration Dialog Box

In Figure 2.4, the drawer configuration has all of the DUT operating with exactly the same configuration. Some of the Case Temperature Controller (CTC) zones show different configuration files, yet each is set to the same temperature set point of 25^{o} C.

The All DUT configuration area allows for simultaneous configuration of every DUT defined in the drawer configuration file.

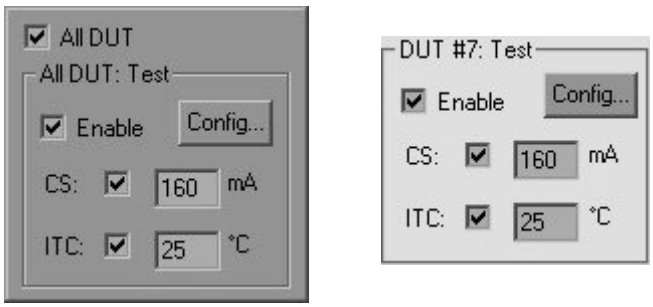


Figure 2.5 All DUT Configuration Area versus Individual DUT Configuration

The **All DUT** checkbox toggles the configuration of all DUT control or individual DUT control. The same controls are available for All DUT configuration as are available for individual DUT configuration. The following list defines the control options for any or all DUT.

Table 2.1 DUT Control Options

Control Option	Description
Enable Checkbox	Enables or disables the control and monitoring of this DUT.
Config. Button	Opens the DUT Configuration dialog box to define the DUT configuration file.
CS Checkbox	Enables or disables the Current Source (CS) output for this DUT.
CS Edit Box	Specifies the current source current set point. In constant current mode, the set point is specified in mA. In constant monitor photodiode feedback, the set point is specified in μA.
ITC Checkbox	Enables or disables the Internal Temperature Controller (ITC) output for this DUT.
ITC Edit Box	Specifies the internal temperature controller temperature set point in degrees C.

These parameters for each DUT are stored in the drawer configuration file defined in Figure 2.4 as “Test”.

The DUT Configuration Dialog Box

The DUT Configuration dialog box allows for user specification of DUT limits and capabilities. The DUT Configuration dialog box modifies the DUT configuration file noted on the dialog box as the **File Name**. It is important to remember that changing a DUT configuration file will change the values for every DUT in the entire LTS-9300 that is defined by that file.

.

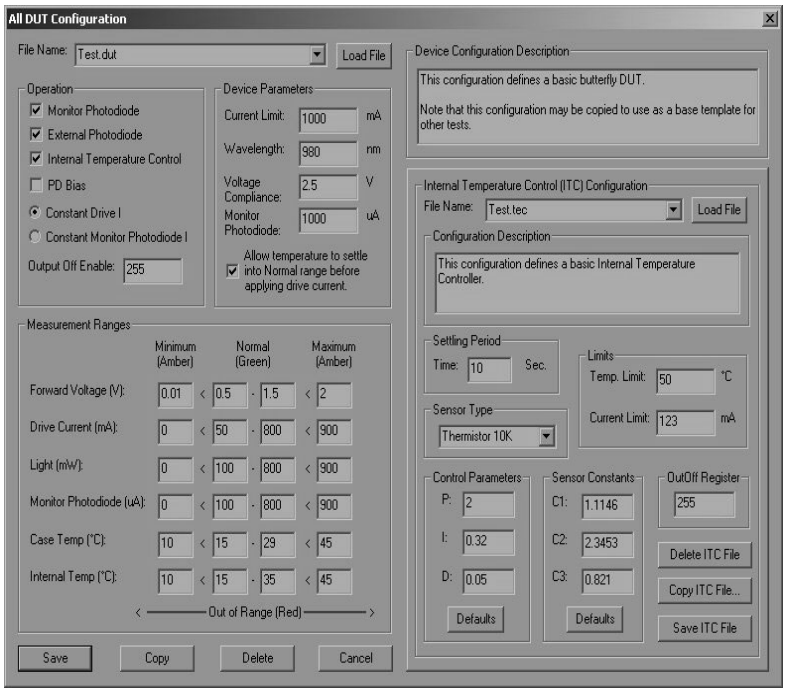


Figure 2.6 DUT Configuration Dialog Box*

** The configuration settings specified in the DUT Configuration dialog box or others noted in this manual are not recommended for use with actual lasers.*

The DUT Configuration dialog box contains many sections such as Operation, Measurement Ranges, or Internal Temperature Control Configuration. The parameters in each section are outlined below.

DUT Configuration - Operation Section

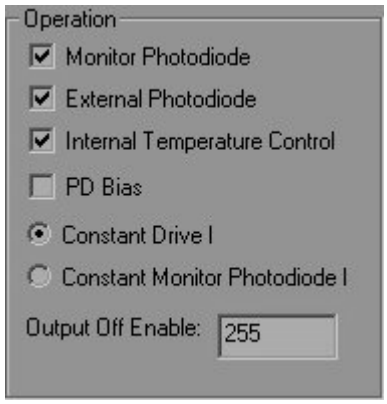


Table 2.2 DUT Configuration Options

Configuration Option	Description
Monitor Photodiode Checkbox	Enables or disables the monitor photodiode measurement for this DUT configuration.
External Photodiode Checkbox	Enables or disables the external photodiode measurement for this DUT configuration.
Internal Temperature Control Checkbox	Enables or disables the internal temperature control for this DUT configuration.
PD Bias Checkbox	Enables or disables the PD bias for this DUT configuration.
Constant Drive I Radio Button	Selects the constant drive current operation for this DUT configuration.
Constant Monitor Photodiode I Radio Button	Selects the constant monitor photodiode current feedback operation for this DUT configuration.
Output Off Enable Edit Box	Defines the Output Off Enable Register for the current source (CS) of this DUT. Valid values for this edit box are 0 through 512. The Output Off Enable Register allows the user to define conditions within the system that force the current source to shut off. The conditions are selected by specifying the corresponding bit in the Output Off Enable Register.

Table 2.3 Output Off Enable Register Conditions

Bit	Name	Condition
0	Output is Off, should be On	Turns the output off if the output should be on, yet the current source is not outputting current.
1	In Current Limit	Turns the output off when the current source output is in current limit.
2	Internal Photodiode Current Limit	Turns the output off when the internal PD is in current limit.
3	Internal Photodiode Power Limit	Turns the output off when the internal PD is in power limit; the power limit is not user selectable.
4	External Photodiode Current Limit	Turns the output off when the external PD is in current limit.
5	External Photodiode Power Limit	Turns the output off when the external PD is in power limit; the power limit is not user selectable.
6	CTC Over Temperature	Turns the output off when the CTC is above the CTC temperature limit.
7	ITC Over Temperature	Turns the output off when the ITC is above the ITC temperature limit.
8	CS Output Open	Turns the output off when the current source is open-circuited.

DUT Configuration - Device Parameters Section

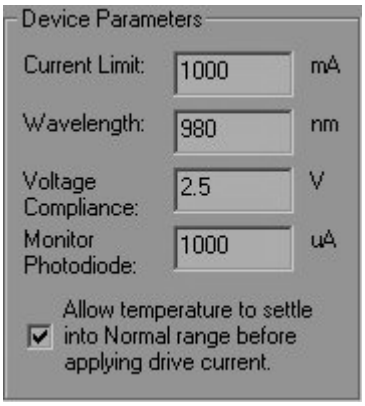


Table 2.4 DUT Configuration Parameters

Parameter	Description
Current Limit Edit Box	Specifies the maximum current limit for this DUT.
Wavelength Edit Box	Specifies the approximate wavelength for this DUT; this value is not used by the software or the LTS-9300; it exists only as another parameter stored with this DUT.
Voltage Compliance Edit Box	Specifies the voltage compliance for this DUT.
Monitor Photodiode Edit Box	Specifies the maximum monitor photodiode current limit.
Allow Temperature to Settle Checkbox	Enables or disables the turn on sequencing of the ITC, CTC and CS: if a DUT is not configured to wait for the temperature settle, then the ITC, CTC and CS are all powered on at the same time (if they are respectively configured to turn on): if a DUT is configured to wait for the temperatures to settle before applying laser drive current (CS), then the order is as follows: • The ITC powers on and settles to temperature if it is available and set to turn on • The CTC powers on and settles to temperature if it is set to turn on • The CS powers on If no temperature control is configured to turn on, the laser drive current DOES NOT turn on. Note that this sequence is also followed when only the ITC and the CTC are configured to turn on (even when the CS should remain off). The CTC zones must all be powered on at the same time, therefore more than 50% of the ITCs in the drawer must be temperature settled before the CTC powers on. If 50% or more of the ITCs in the drawer cannot settle to temperature, then NONE of the DUT in the drawer will power on. To contend with this, these ITCs may then be disabled or the temperature stability range may be adjusted for these DUT.

DUT Configuration - Measurement Ranges Section

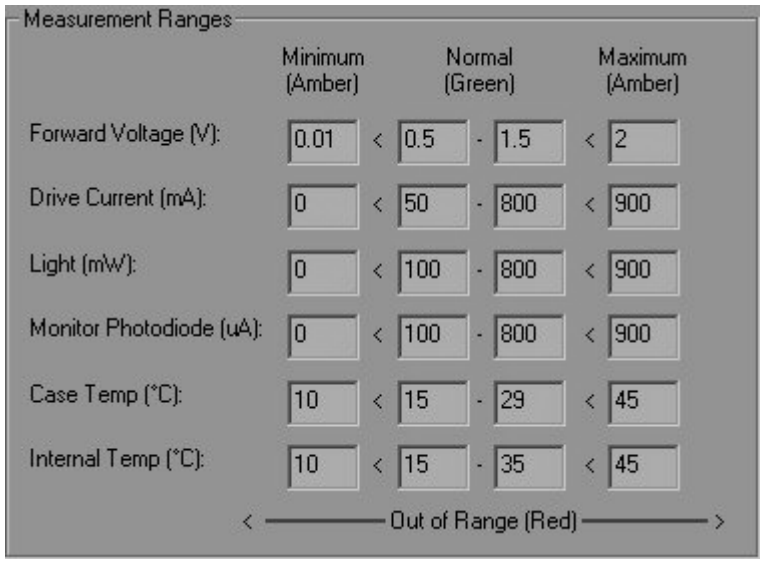


Figure 2.7 Measurement Ranges Window

The Measurement Ranges section contains range values for each measurement available on the DUT. The ranges are used to display the measurements in Monitor mode in red, amber or green on the screen to quickly indicate problems with the DUT.

DUT Configuration - Internal Temperature Controller

The Internal Temperature Control Configuration section contains all of the parameters for the internal temperature controller (ITC). These parameters are also contained within a configuration file to facilitate common use between different DUT types.

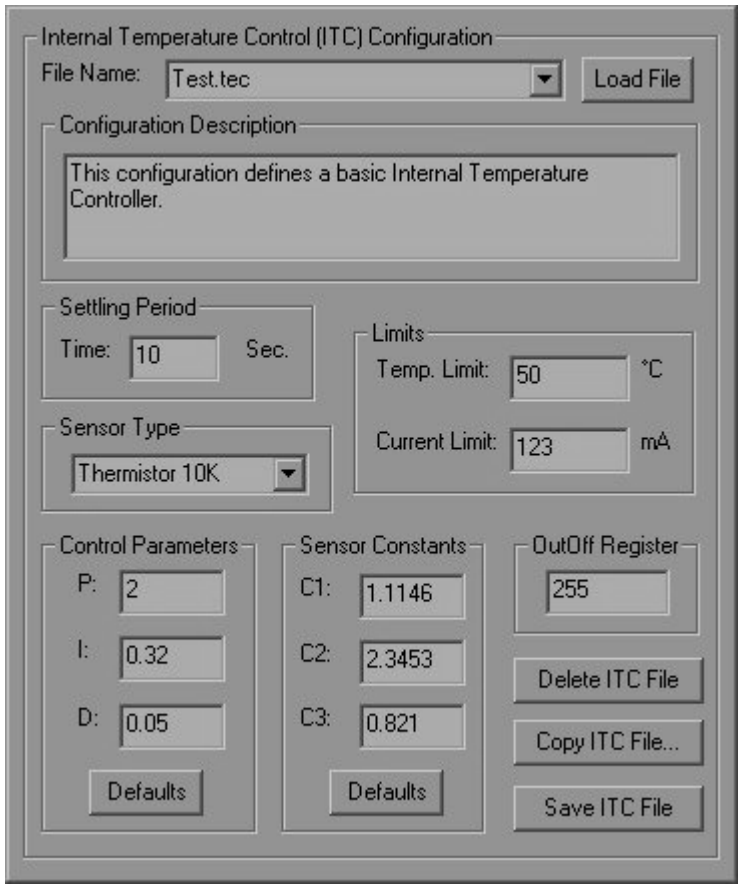


Figure 2.8 Internal Temperature Controller Window

Table 2.5 Internal Temperature Controller Parameters

Parameter	Description
Settling Period Edit Box	Specifies the time in seconds to wait while the internal temperature is within the internal temperature normal measurement range (green) before declaring that the internal temperature controller is “settled”.
Sensor Type Combo Box	Defines the type of temperature sensor employed by the internal temperature controller.
Temperature Limit Edit Box	Defines the maximum temperature limit for the internal temperature controller.
Current Limit Edit Box	Defines the maximum current limit for the output of the internal temperature controller.
Control Parameters	Proportional, Integral and Derivative terms used in the PID control loop of the internal temperature controller.
Sensor Constants	Steinhart-Hart temperature sensor constants used for converting the measured resistance to a measured temperature.
OutOff Register Edit Box	Used to designate conditions that should turn the ITC output off.

Table 2.6 OutOff Register Conditions

Bit	Name	Condition
0	Internal Use	Internal use; do not set this bit.
1	ITC Temperature Limit	Turns the output off when the measured ITC temperature is above the temperature limit.
2	ITC Short Circuit	Turns the output off when one of the zone output stages appears to be shorted.
3	ITC Output Problem	Turns the output off when one of the zone output stages appears to be different from the others.
4	ITC Sensor Open	Turns the output off if the temperature sensor appears to be open-circuited.
5	ITC Sensor Short	Turns the output off if the temperature sensor appears to be short-circuited.
6	Interlock Not Enabled	Turns the output off if the interlock signal for the ITC is not available.
7	ITC Current Limit	Turns the output off if the ITC current output is in limit.

CTC Zone Configuration Dialog Box

The CTC Zone Configuration dialog box allows the user to define the operational parameters for each CTC Zone within a drawer. The CTC Zone Configuration dialog box modifies the zone configuration file defined in the **File Name** combo box. Changing a zone configuration file will change the values for every zone in the entire LTS-9300 that is defined by that file.

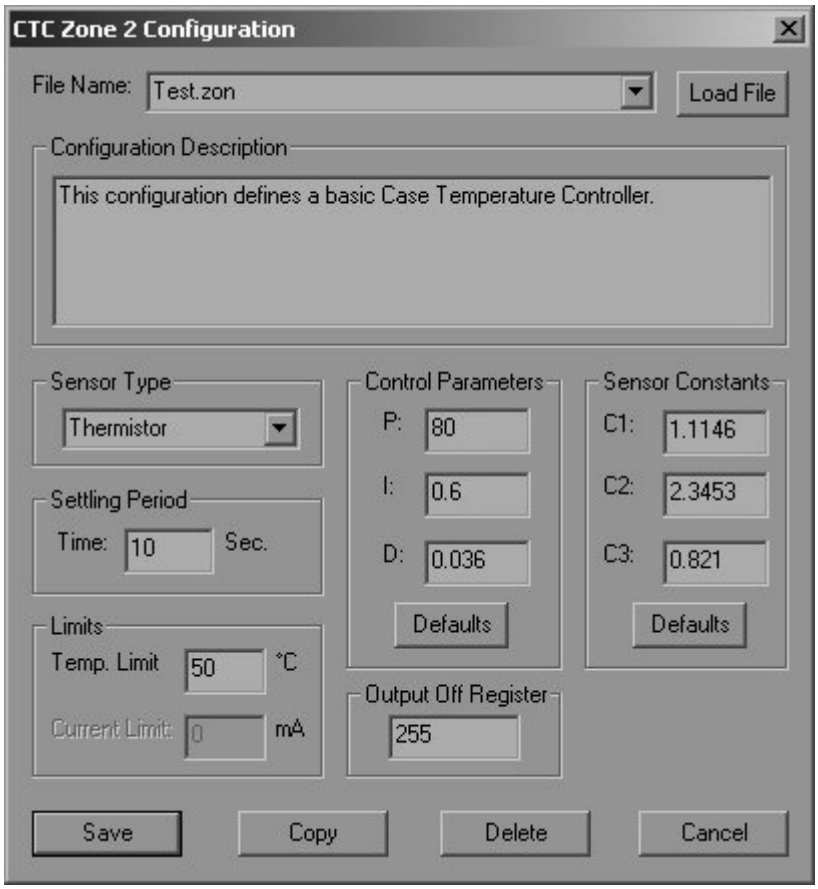


Figure 2.9 CTC Zone Configuration Dialog Box

Table 2.7 CTC Zone Parameters

Parameter	Description
Sensor Type Combo Box	Defines the type of temperature sensor employed by the case temperature controller zone.
Settling Period Edit Box	Specifies the time (in seconds) to wait while the case temperature is within the case temperature normal measurement range (green) before declaring that the case temperature controller is “settled”.
Temperature Limit Edit Box	Defines the maximum temperature limit for the case temperature controller zone.
Control Parameters	Proportional, Integral and Derivative terms used in the PID control loop of the case temperature controller zone.
Sensor Constants	Steinhart-Hart temperature sensor constants used for converting the measured resistance to a measured temperature.
OutOff Register Edit Box	Used to designate conditions that should turn the CTC output off.

Table 2.8 OutOff Register Conditions

Bit	Name	Condition
0	Internal Use	Internal use; do not set this bit.
1	CTC Temperature Limit	Turns the output off when the measured CTC temperature is above the temperature limit.
2	CTC Short Circuit	Turns the output off when one of the zone output stages appears to be shorted.
3	CTC Output Problem	Turns the output off when one of the zone output stages appears to be different from the others.
4	CTC Sensor Open	Turns the output off if the temperature sensor appears to be open-circuited.
5	CTC Sensor Short	Turns the output off if the temperature sensor appears to be short-circuited.
6	Interlock Not Enabled	Turns the output off if the interlock signal for the CTC is not available.
7	CTC Current Limit	Turns the output off if the CTC current output is in limit.

Save, Copy and Delete

Every configuration dialog in the software Control mode contains a **Save** button, a **Copy** button and a **Delete** button. These buttons perform the indicated action on the configuration file specified in the dialog box.

The Save and Cancel Buttons

After adjusting any of the configuration files using the configuration dialogs, press the **Save** button to save the new changes to the file. Press the **Cancel** button to disregard the changes and revert to the original.

The Copy Button

Press the **Copy** button to create a copy of the currently selected configuration file. Note the copy must still retain the file extension and must remain in the same directory.

The Delete Button

Press the **Delete** button to completely remove the currently selected configuration file. This action deletes the configuration file from the PC hard drive and may not be undone. The file will not be “recycled” and cannot be retrieved from the **Recycle Bin.**

File Format

The configuration files are stored in ASCII text and may be edited with a simple Notepad®-like text editor. *External modification of the configuration files while in Control mode may result in file corruption or software execution problems.*

Updating the Configuration to the LTS-9300

After selecting and adjusting to a desired configuration for the LTS-9300, the configuration may be updated in the LTS-9300.

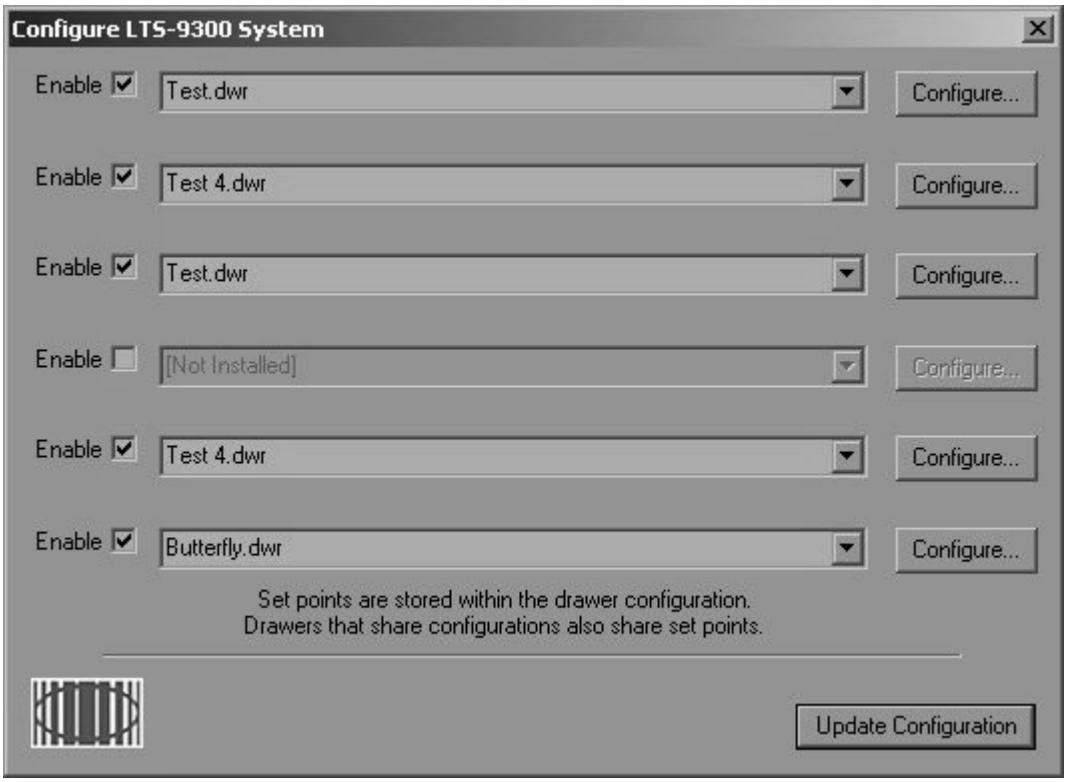


Figure 2.10 Configuration Window

The **Update Configuration** button initiates the update to the LTS-9300. The Monitor mode window will appear and connect to the LTS-9300 instrument. Please refer to the **Select an LTS-9300 Dialog Box** section for more information

As the new configuration is uploaded to the LTS-9300, the Drawer Update Status Indicators will change from yellow to green as the corresponding drawer is updated. The indicator will remain grey and crossed out if the drawer is not installed.

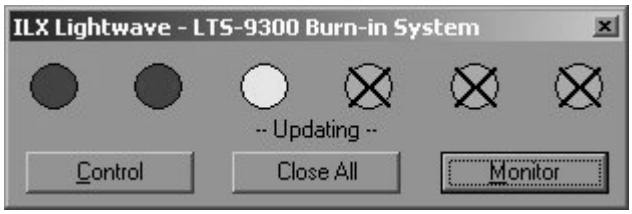


Figure 2.11 Updating the Configuration

After the configuration has been updated for every drawer, the Status Indicators for the installed drawers are shown as green. The Status Indicators for drawers that are not installed are shown as grey and are crossed out.

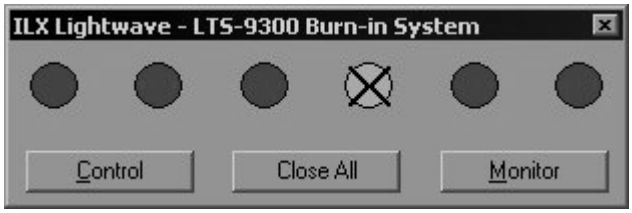


Figure 2.12 Configuration Updated

LTS-9300 System Software Monitor Mode

The system software Monitor mode allows the user to record and monitor measurements sampled by the LTS-9300. The monitor mode communicates to the LTS-9300 over GPIB.

System Views Overview

The system software has three main windows or *views*. The System View window is the main system view and allows the user to see the status of all the DUT in the system. The Drawer View window displays information about DUT in a specific drawer. The DUT View window is used to graphically view information about individual DUT.

Navigating the Views

The software defaults to the System View at startup. Double clicking any of the drawers opens the Drawer View. The Drawer View is also accessible by clicking the Drawer View icon on the Navigation bar. In Drawer view, click an individual DUT to go to the DUT view, or click the DUT view icon on the navigation bar. Each view has different icons available; see each view section for information about available navigation bar icons.

System View

The System View window is the main system view. It allows the user to quickly view the status of all the DUT in the LTS-9300 system.

Configurable colored spheres indicate the DUT status. Different colors indicate the quality of light power from a DUT.

Access the System View window by clicking the System View icon from the Navigation Bar or selecting System View from the View menu.

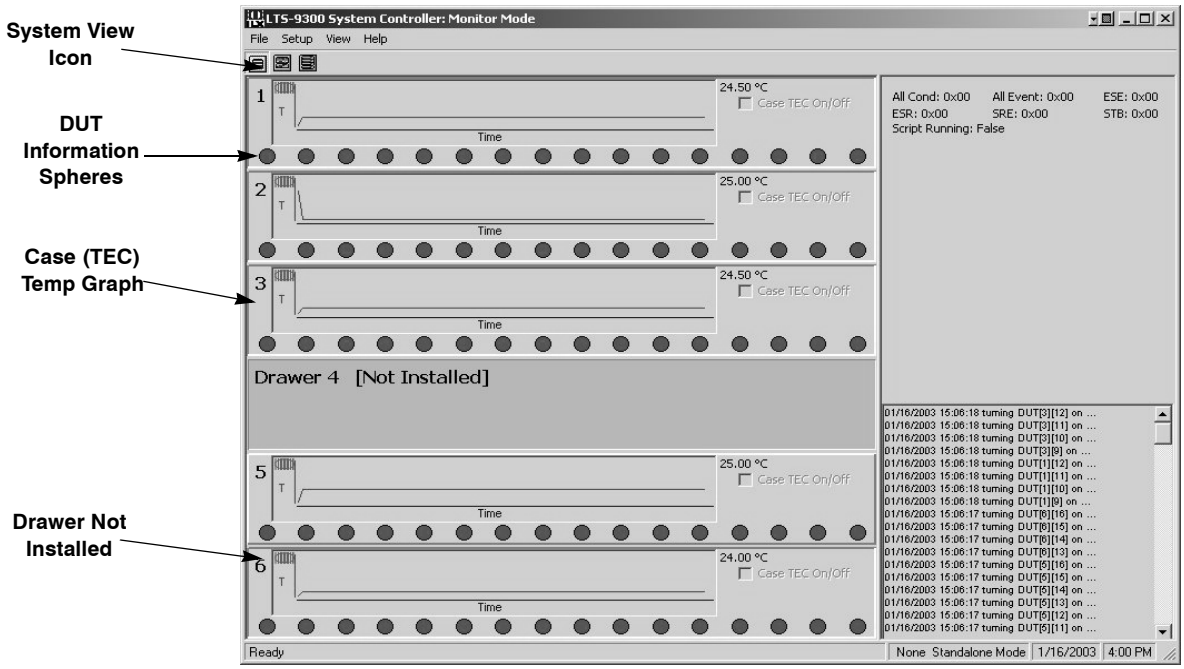


Figure 2.13 System View Window

Table 2.9 System View Window Components

Field Name	**Description**
DUT information spheres	Each sphere represents a DUT in the drawer. The color of the sphere indicates a configurable operating range (see *DUT Properties Dialog* on page *19*). A green sphere indicates a DUT that is operating within its configured light power range, an amber sphere indicates a DUT that is outside of the optimal operating light power range, and a red sphere indicates a DUT that is outside its operating light power range.
Case TEC graph	Displays the average case temperature as a function of time.

System View Icons

In System View, three menu icons are available that allow the user to quickly jump to one of the other views.

Table 2.10 System View Icons

Icon	Description
 System View Icon	Displays the System View window
 Drawer View Icon	Displays the Drawer View window
 DUT View Icon	Displays the DUT View window

System View Menu Descriptions

Each of the three System View windows have the same menu bar selections available: File, Setup, View, and Help. The contents of each menu are different for each view.

Table 2.11 System View Menu Descriptions

Menu Item	Description
File>Exit	Exits the software.
Setup	
Communications	Opens the **Select an LTS-9300** dialog box. This item is available only in System view.
LIV Option	Opens the **LIV Option** dialog box. Use the **LIV Option** dialog box to configure and run the Light (L), Current (I), and Voltage (V) sweep.
Data Recording	Opens the **Data Recording** dialog box. This item is available only in System view.
View	
System View	Changes to the System View (currently selected).
Drawer View	Changes window to Drawer View.
DUT View	Changes window to DUT View
Help>About	Displays information about the software.
Help	
Hot Key List	Displays the actions associated with each key stroke
About	Displays information about the software

Select an LTS-9300 Dialog Box

Selecting **Setup>Communications** opens the **Select an LTS-9300** dialog box. Use the **Select an LTS-9300** dialog box to connect to the system. This dialog is displayed at start up automatically when a new LTS-9300 is connected to the PC. Once opened, the system automatically looks for the previously selected LTS-9300.

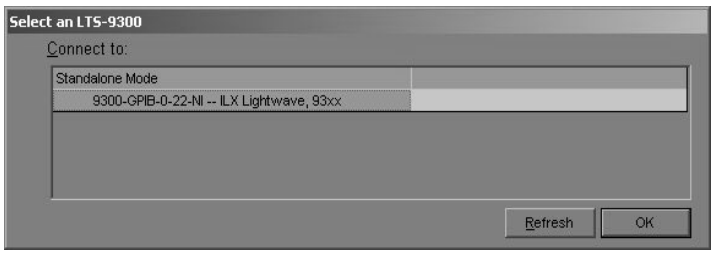


Figure 2.14 Select an LTS-9300 Dialog

LIV Option Dialog

Use the **LIV Option** dialog box to configure and run the Light (L), Current (I), and Voltage (V) sweep. The sweep results in a data file that allows the user to plot a graph relating the light, current, and voltage of a laser diode. Once an LIV sweep is run, the data file is placed in the file C:\LTS-9300\Results\ and is identified by the drawer and DUT (for example, C:\LTS-9300\Results\LIV_Drawer1_DUT1.log). The graph provides information about laser performance.

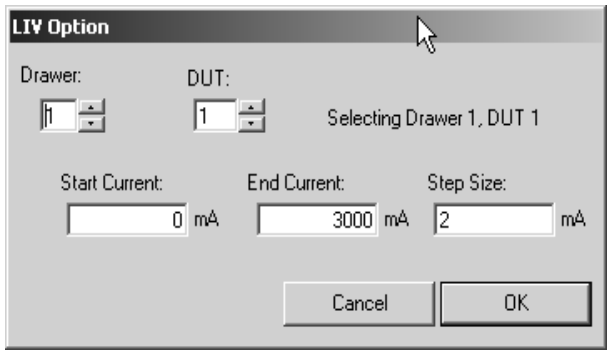


Figure 2.15 LIV Option Dialog

Table 2.12 LIV Option Dialog Box Components

Field Name	Description
Drawer	Selects the drawer containing the desired DUT for analysis.
DUT	Selects which DUT is tested. Click the arrow buttons or enter the desired DUT number.
Start Current	Defines the starting current for the LIV sweep.
End Current	Defines the final current value at the end of the LIV sweep.
Step Size	Selects the current step size. At each step, a light, current, and voltage measurement is taken. Fewer steps take less time, but result in less precision. Conversely, smaller steps provide more data points, but require more time to complete the sweep.
OK button	Saves the current configuration and starts the LIV sweep.
Cancel button	Closes the **LIV Option** dialog and cancels any pending changes.

Data Recording Dialog

Use the **Data Recording** dialog to specify the file, delimiter type, and storage interval for data recording.

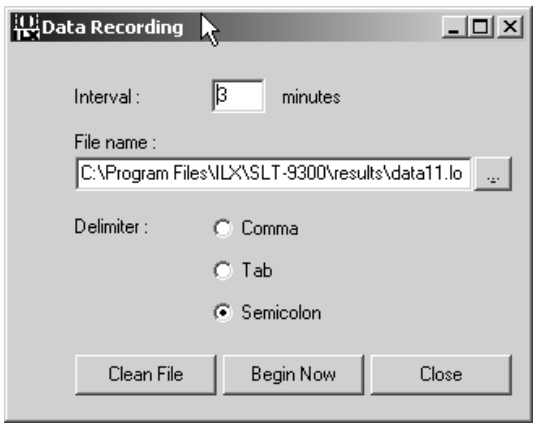


Figure 2.16 Data Recording Dialog

Table 2.13 Data Recording Dialog Components

Field Name	Description
Interval	Defines the desired timing interval, in minutes. Once data recording has begun, each DUT appends its data to the named file. If the file does not exist, it is created a given a header to tell the reader what each column represents.
File Name	Displays the name of the data file. The data file must be selected on a mapped drive. UNC (Universal Naming Conventionality) network path names are not supported. The file created is a text file that is read using Microsoft® Word® and/or Excel®.
Delimiter	Selects the delimiter between datum of information within the data file.
Clean File	Removes the data file.
Begin/Stop Now	Initiates or stops the data recording
Close	Saves any changes and closes the **Data Recording** dialog

Drawer View

The Drawer View window is used to get detailed information about DUT in a specific drawer. There are color coded numeric values for each DUT in a drawer. The drawer temperature is also shown.

Access the Drawer View window by clicking the Drawer View icon on the menu, select Drawer View from the View menu, or double click the drawer in System view.

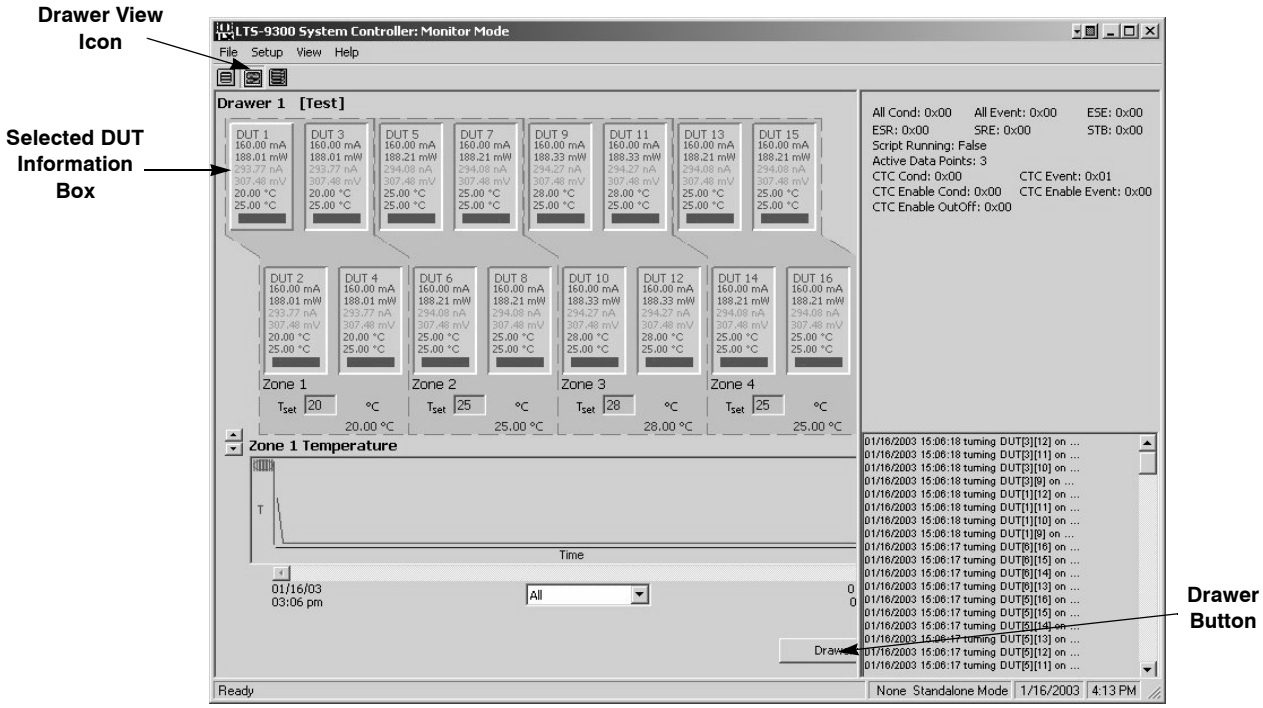


Figure 2.17 Drawer View Window

Table 2.14 Drawer View Window Components

Component	Description
Drawer buttons	Switches to view different drawers.
DUT information boxes	Each DUT information box provides general information about the DUTs in the drawer. The color of each line of information indicates if it is within its operating light power range (see *DUT Properties Dialog* on page *19*). The selected DUT has a raised box; selecting the DUT allows the user to turn on the current source and specify DUT information for that specific DUT.
DUT Information	Information about the selected DUT is displayed. Double click the information to open the DUT Information/Serial Number dialog box (see *Serial Number Dialog Field Descriptions* on page *35*).
Case TEC graph	Displays the case temperature as a function of time.
Time Scale drop down list	Changes the time function of the Case TEC graph.

Drawer View Icons

In System View, three menu icons are available that allow the user to quickly jump to one of the other views.

Table 2.15 System View Icons

Icon	Description
 System View Icon	Displays the System View window
 Drawer View Icon	Displays the Drawer View window
 DUT View Icon	Displays the DUT View window

DUT View

Use the DUT View window to graphically view individual DUT information as a function of time. Current (I), light power (L) or external photo detector current (Pdi), photodiode current (Ipd), voltage (V) and, Temperature are displayed for the DUT.

Access the DUT View window by clicking the DUT View icon on the menu, select DUT View from the View menu, or double click a DUT in Drawer view.

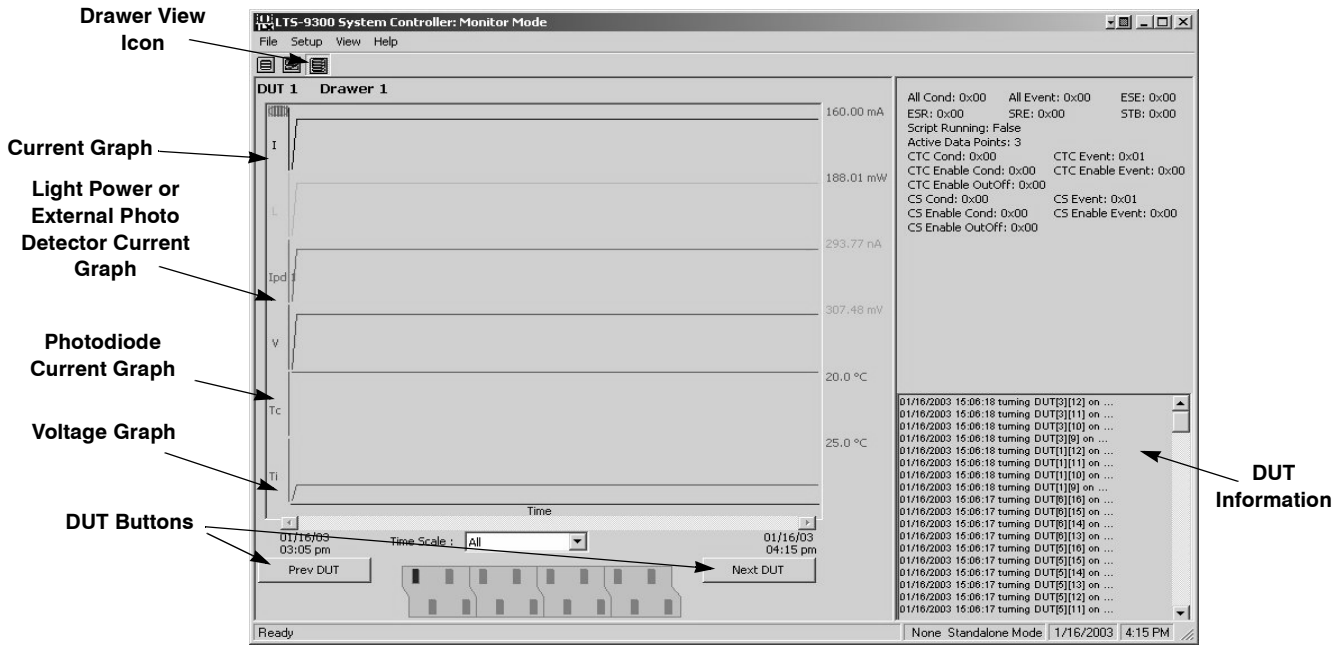


Figure 2.18 DUT View Window

Table 2.16 DUT View Window Components

Component	Description
Current (I) graph	Displays current in amps as a function of time.
Light Power (L) or Photodiode Current (Pdi) graph	Displays light power in watts or photodiode current in amps as a function of time.
Photodiode Current (Ipd) graph	Displays photodiode current in amps.
Voltage graph	Displays the voltage as a function of time.
Time Scale drop down list	Changes the time function of the graphs.
DUT Information	Information about the selected DUT is displayed. Double click the information to open the Serial Number dialog box (see *Serial Number Dialog Field Descriptions* on page *35*).

DUT View Icons

In System View, three menu icons are available that allow the user to quickly jump to one of the other views.

Table 2.17 System View Icons

Icon	Description
 System View Icon	Displays the System View window
 Drawer View Icon	Displays the Drawer View window
 DUT View Icon	Displays the DUT View window

Serial Number Dialog Field Descriptions

The **Serial Number** dialog allows the user to record information about a specific DUT.

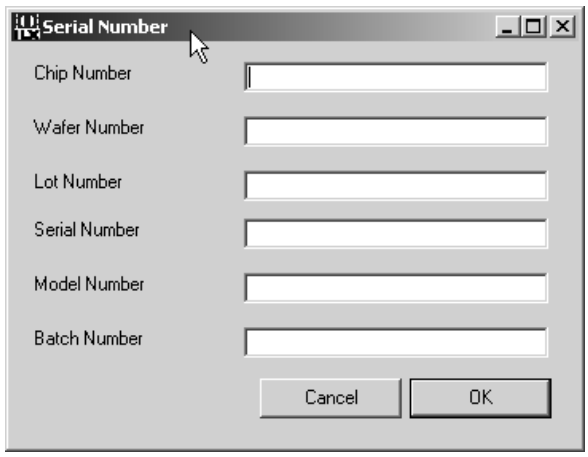


Figure 2.19 Serial Number Dialog Box

Table 2.18 Serial Number Field Descriptions

Field Name	Description
Chip Number	The user-defined chip number identifies each specific DUT being tested (not required).
Wafer Number	Used to indicate the wafer from which the chip was produced (user defined, not required).
Lot Number	User defined, not required
Serial Number	User defined, not required
Model Number	User defined, not required
Batch Number	User defined, not required

CHAPTER 3

SYSTEM CONFIGURATION AND OPERATION

This chapter introduces you to the operation of the LTS-9300. It offers instructions for applying power to the system, loading the drawers, and controlling the system with ILX Lightwave software.

This chapter also provides a description of the LTS-9300 Menu Structure and has instructions about selecting each menu and performing the operations relevant to the menu selected.

Applying Power to the LTS-9300

To turn on the LTS-9300, turn the key on the Power section of the front panel. This locks the drawer and initiates the Power-on sequence. If the LTS-9300 does not appear to turn on, verify that it is connected to line power.

Power On Sequence

When power is applied to the LTS-9300, the following takes place:

- All indicators illuminate and the seven-segment GPIB address displays.
- A self-test is performed to ensure that the mainframe processor is communicating with the shelf processors. After this test, the system is ready to operate.

Power On State

The LTS-9300 returns to the default configuration when power is applied. The default configuration information for each command is available in Chapter 5, Command Reference.

The set points for current source, CTC, and ITC output are returned to default values for power-up or reset.

Front Panel Indicators

The status of the laser, TEC, and CTC outputs are indicated with LED status indicators. The LTS-9300 main power is indicated by the power on LED located on the front panel.

The status of DUT control and drawer temperature information is displayed with LED status indicators on the front panel of each drawer.

GPIB Address

This GPIB default address is 01. Press the **ADDR SELECT** button to display the GPIB address for two seconds.

Changing the GPIB Address

Every device on the GPIB bus must have a unique address.

1. Press the **ADDR SELECT** key once to display the GPIB address.
2. Press and hold the **ADDR SELECT** key to increment the GPIB address. The address increments every 1.5 seconds.
3. Release the ADDR SELECT button when the desired GPIB address is displayed. The new GPIB address is then stored in non-volatile memory.

   The allowable address range is 0-30 for primary GPIB addressing. Extended GPIB addressing is not implemented on the LTS-9300.

Drawer Panel Indicators

The status of DUT control and drawer temperature information is displayed with LED status indicators on the front panel of each drawer.

Table 3.1 Drawer Panel LED Descriptions

Indicator	Purpose
Laser Output On	Indicates that the laser ouput is turned on.
Laser Status	The Laser Status indicator turns on (in a user defined color: green, red, orange) or off when a user-defined condition is met. See *LASSTATLED* on page *97* for information about configuring the illumination color.
Temperature Control On	Indicates that the case temperature controller is turned on.
Temperature Status	The Temperature Status indicator turns on (in a user defined color: green, red, orange) or off when a user-defined condition is met. See the command *TEMPSTATLED* on page *101* for information about configuring the illumination color.
Temperature Limit	Indicates that the case temperature has exceeded the user-defined temperature limit.

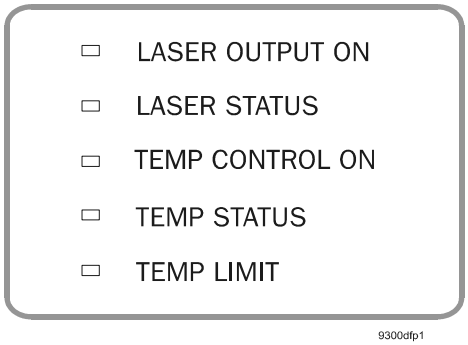


Figure 3.1 Drawer Indicators

Loading the Drawer (Butterfly Fixture)

This section provides instructions for loading a drawer with DUTs. The DUT tray can be removed from the drawer for easier DUT fixturing.

1. Turn the enable key to the off position for the desired drawer.
2. Pull both shelf release levers and slide open the drawer.
3. Open the DUT cover to expose the removable DUT fixture.
4. Loosen the four thumb screws to release the DUT fixture from the drawer.

CAUTION

ILX Lightwave recommends observing proper ESD precautions whenever a drawer is open and when a DUT tray is handled.

5. Carefully lift and remove DUT fixture and set it on a static safe surface.

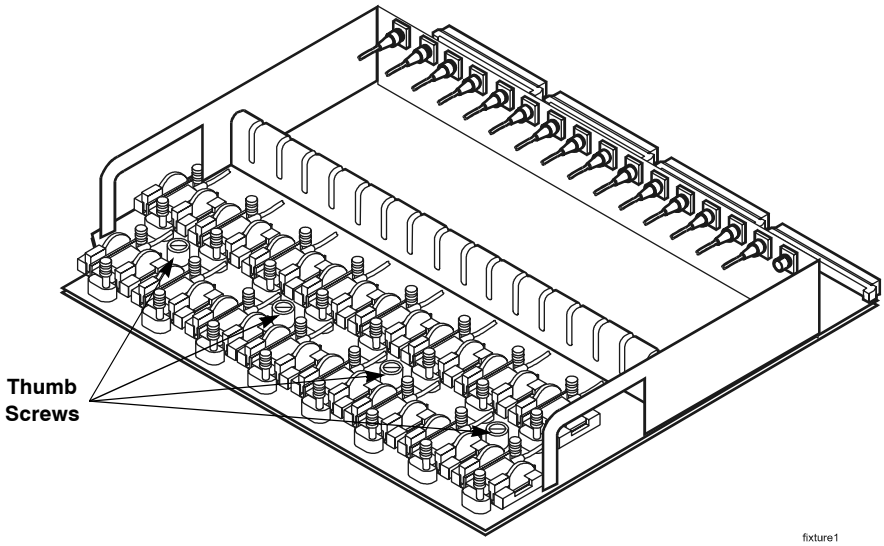


Figure 3.2 Removing the DUT Fixture (Butterfly)

6 Install the lasers.

6a Beginning with mount 1, open the DUT clamps (see Figure 3.5).

6b Release the hold down clips on each mount and open the lead clamps. Press down the lead clamps while opening the hold down clips to avoid damaging the clamps.

Note: With the connector side of the DUT fixture facing away from you, the first mount is top-most mount on the left side. Mount 2 is below and to the right of mount 1; while mount 3 is above and to the right of mount 2, and so on.

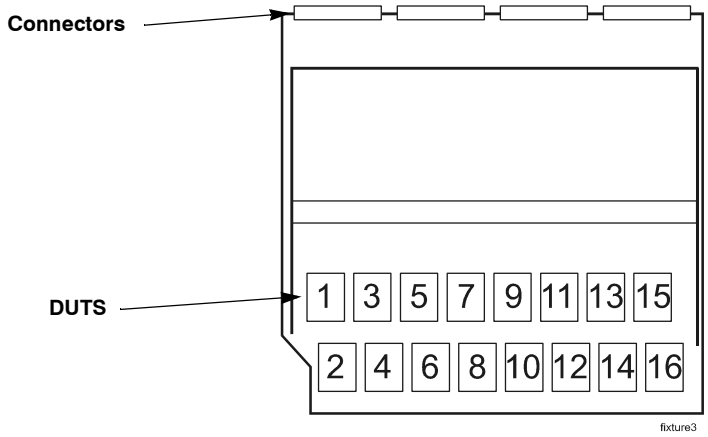


Figure 3.3 DUT Mount Position (Butterfly)

6c With the fiber pigtails toward the fiber management bulkhead, align the laser leads with the appropriate contacts and insert the laser.

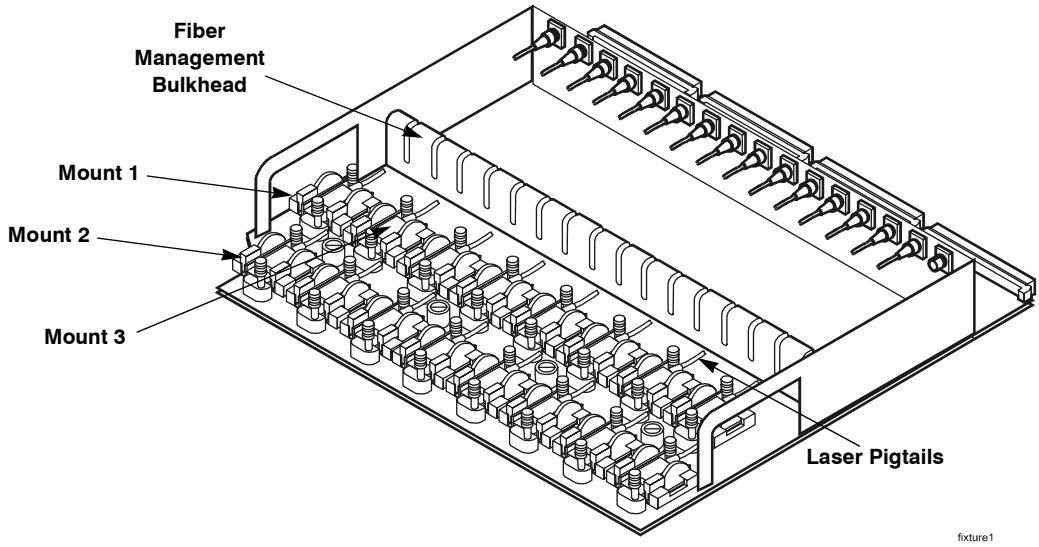


Figure 3.4 Inserting Lasers (Butterfly)

7 Route the fibers through the fiber management bulkhead, into the fiber management compartment.

7a Secure each laser to the DUT fixture by closing the lead clamps, securing with the hold-down clips, and closing the DUT clamps over the end flanges on the DUT.

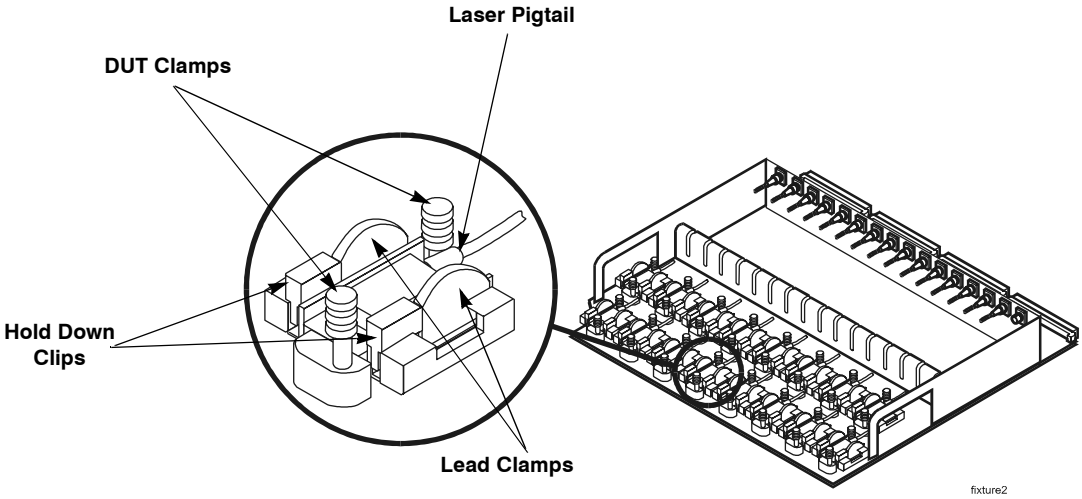


Figure 3.5 Laser Mount (Butterfly)

Note: For greater clamping force, 4 #2-56 screws may be used to secure the DUT to the mount.

8 Place DUT fixture into drawer and tighten the four thumb screws.

9 Close the drawer and seat the connectors by gently closing the handles.

10 Turn the enable key switch to On to enable the drawer.

Loading the Drawer (Mini-DIL)

This section provides instructions for loading a drawer with DUTs. The DUT tray can be removed from the drawer for easier DUT fixturing.

1. Turn the enable key to the off position for the desired drawer.
2. Pull both shelf release levers and slide open the drawer.
3. Open the DUT cover to expose the removable DUT fixture.
4. Loosen the four thumb screws to release the DUT fixture from the drawer.

CAUTION

ILX Lightwave recommends observing proper ESD precautions whenever a drawer is open and when a DUT tray is handled.

5. Carefully lift and remove DUT fixture and set it on a static safe surface.

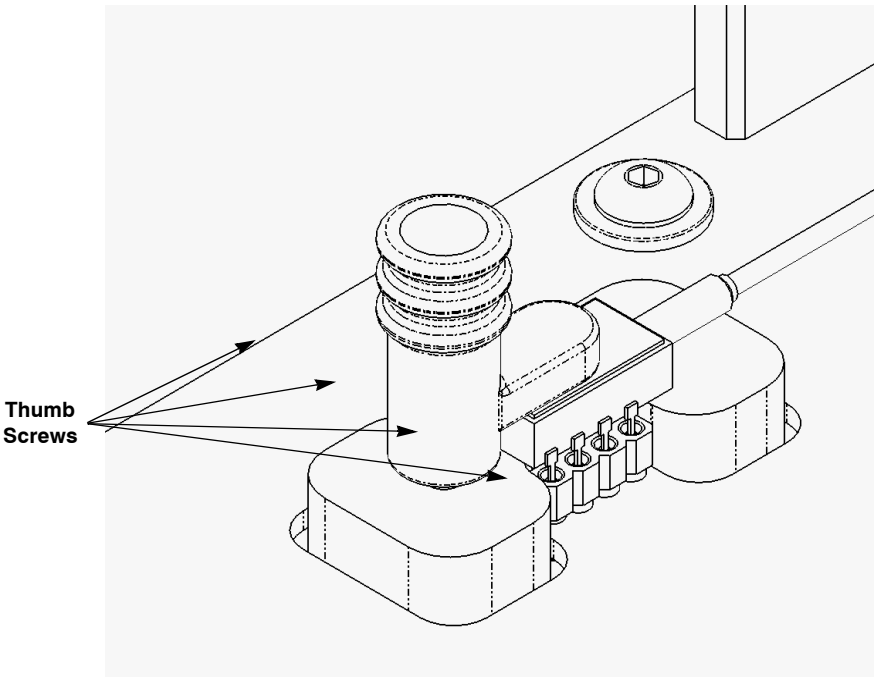


Figure 3.6 Removing the DUT Fixture (Mini-DIL)

6 Install the lasers.

6a Beginning with mount 1, open the DUT clamps (see Figure 3.5).

Note: With the connector side of the DUT fixture facing away from you, the first mount is top-most mount on the left side. Mount 2 is below and to the right of mount 1; while mount 3 is above and to the right of mount 2, and so on.

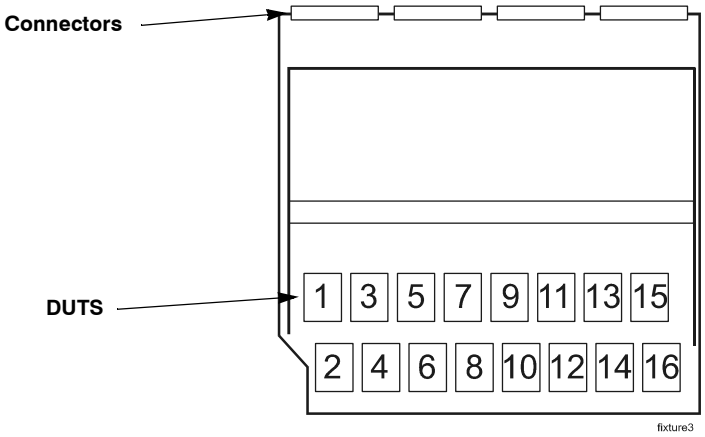


Figure 3.7 DUT Mount Position (Mini-DIL)

6b With the fiber pigtails toward the fiber management bulkhead, align the laser heads with the appropriate socket contacts and insert the laser..

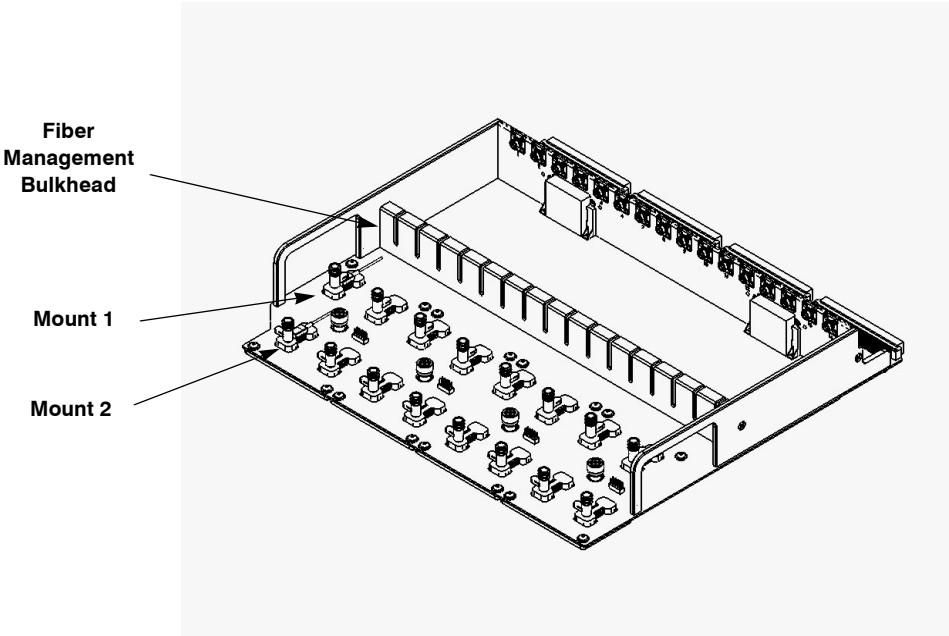


Figure 3.8 Inserting Lasers (Mini-DIL)

7 Route the fibers through the fiber management bulkhead, into the fiber management compartment.

7a Secure each laser to the DUT fixture by closing the DUT clamps, securing with the DUT clamp screw.

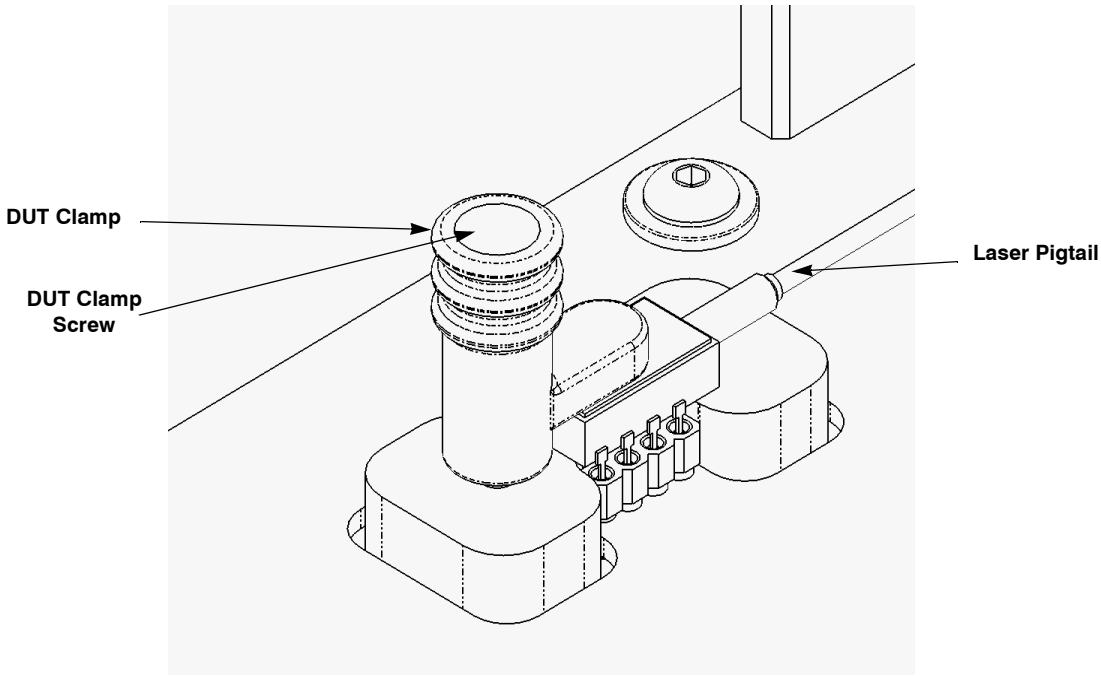


Figure 3.9 Laser Mount (Mini-DIL)

8 Place DUT fixture into drawer and tighten the four thumb screws.

9 Close the drawer and seat the connectors by gently closing the handles.

10 Turn the enable key switch to On to enable the drawer.

System Guidelines

The System Guidelines section provides general information and usage guidelines about lasers, case temperature control, and internal temperature control

Guidelines for Laser Operation

The Guidelines for Laser Operation section provides a resource for general information about using lasers current sources and the intended purpose of their design.

Control Modes

Lasers installed in the LTS-9300 operate in constant current mode (ACC) or constant power mode (APC).

In constant current mode, the laser current source circuitry uses a closed-loop feedback circuit to maintain the laser drive current at the set point specified.

In constant power mode, the control feedback loop is based on the monitor photodiode current; the laser drive current is adjusted as necessary to maintain the photodiode current at the set point specified.

In constant current and constant power modes, it is critical to set the laser current limit before you operate the laser. The current limit keeps the laser from being over-driven. This is especially critical when you operate the laser in constant power mode since the control loop drives the level of current necessary to maintain the constant photodiode current.

Four-Wire Voltage Sense

The LTS-9300 has a 4-wire voltage sense feature. The laser voltage is sensed through a pair of connections that is separate from the laser current drive connections. This allows for an accurate laser voltage reading for the voltage limit feature.

Photodiode Connections

Many laser diodes contain an internal photodiode that monitors the back-facet emission of the laser.

The photodiode and laser connections to the LTS-9300 are electrically isolated from ground and each other.

Photodiode Reverse Bias

The system operates with a 5 V reverse bias that is applied to the back facet monitor photodiode.

Output Status

The LTS-9300 main power status of the laser, TEC, and CTC outputs are indicated with LED status indicators on the front panel of each drawer.

Guidelines for CTC Operation

Each shelf has a temperature controller to control the DUT case temperature inside the drawer. This drawer-level temperature controller is called the Case Temperature Controller (CTC). Each CTC has four zones, each with its own temperature sensor. Each zone is controlled by an independent control loop, but all zones are controlled to the same CTC temperature setpoint.

Control Mode

The CTC measures temperature using negative temperature coefficient (NTC) thermistors. An NTC thermistor is a device whose resistance decreases as its temperature increases. The sense-current that the controller provides through the thermistor results in a voltage across the thermistor. This voltage is used as a feedback signal by the CTC control loop to maintain a constant temperature.

The CTC converts the temperature setpoint to a thermistor resistance setpoint. The system uses the Steinhart-Hart equation to convert a temperature to a resistance. This equation describes the non-linear resistance-versus-temperature characteristics of typical thermistors. Calibrating a thermistor consists of measuring its resistance at various temperatures, and fitting these measured data to the Steinhart-Hart equation. The resulting coefficients C1, C2, and C3 effectively describe the thermistor. More information about the Steinhart-Hart equation is contained in ILX Application Note #4. Contact ILX Customer Service (see page *xii* for contact information) or www.ilxlightwave.com/library/index.html.

Calibrated thermistors are used in the LTS-9300 drawers. The constants can be entered into the system at calibration.

ITC Operations

The ITC Operations section provides a resource for general information about using lasers with internal temperature control (ITC).

ITC Grounding Considerations

The TEC outputs of the LTS-9300 are isolated from chassis ground. The thermistor's Sensor (-) terminal and the TEC (-) terminals are internally connected.

Guidelines for ITC Operation

This section presents some guidelines to assist in selecting the optimal settings for an application.

Control Modes

The LTS-9300 measures temperature using a negative temperature coefficient (NTC) thermistor. An NTC thermistor is a device whose resistance decreases as its temperature increases. The sense-current that the controller provides through the thermistor results in a voltage drop across the thermistor. This voltage is used as a feedback signal by the LTS-9300 control loop to maintain a constant temperature.

The system uses the Steinhart-Hart equation to convert a temperature to a resistance. The equation describes the nonlinear resistance-versus-temperature characteristics of typical thermistors. Calibrating a thermistor consists of measuring its resistance at various temperatures, and fitting these measured data to the Steinhart-Hart equation. The resulting coefficients C1, C2, and C3 effectively describe the thermistor. More information about the Steinhart-Hart equation is contained in ILX Application Note #4. Contact ILX Customer Service (see page *xii* for contact information) or www.ilxlightwave.com/library/index.html.

To measure the precise temperature of a DUT, you must use a calibrated thermistor and enter its Steinhart-Hart coefficients C1, C2, and C3 through the software. If the exact temperature is not crucial (within ±1.5 °C) and you are using a 10 kΩ thermistor, use the default constants provided. However, the temperature accuracy specifications apply only to a calibrated thermistor with C1, C2, and C3 entered. For more information about calibrating your thermistor, go to www.ilxlightwave.com/support/index.html and click Technical Solutions.

Setting PID

The temperature control circuitry uses a software Proportional-Integrating-Derivative (PID) algorithm to quickly settle the temperature with minimum

temperature overshoot. The PID constants for case temperature control system are set at the factory, but can be adjusted using the system software.

The PID control loop uses three different control signal contributions to control the peltier junctions. Each control signal contributor tracks a slight different aspects of the system thermal performance, and all work together to reduce the difference between the temperature set point and the actual temperature. This difference is also know as the *temperature error*.

Proportional Constant

The proportional contribution adjust the control signal in direct proportion to the temperature error; as the temperature error is reduced, the proportional contribution is also reduced.

Integrating Term

The integrating contribution dynamically narrows the width of the proportional control band. As the temperature error is reduced, the integrating constant focuses on the remaining temperature error and adjusts the proportional contribution to eliminate the error.

Derivative Constant

The derivative contribution controls the rate of the temperature change. If the temperature error changes very quickly, then the derivative circuit reduces its contribution to prevent temperature overshoot.

Tuning the PID Controller

The three PID contributions work together. Changing one affects the performance of the others. The LTS-9300 is pre-programmed with PID values that give optimal performance.

Sensor Currents

Thermistor resistance changes with temperature. The system supplies constant current, either 10 μA or 100 μA, through the thermistor so that a temperature change results in a voltage change across the thermistor. This voltage change is sensed by the system and fed back to the control loop. The supply current depends on the thermistor operating temperature range and the required temperature resolution. A general rule of thumb for a 10 kΩ thermistor is to use the 10 μA range for temperatures between –30 °C and +30 °C, and the 100 μA range for temperatures between 10 °C to 70 °C.

Selecting a Sensor Current

Select the thermistor sense current of 10 μA or 100 μA through the system software. Using 10 μA as the sense current allows you to use a maximum thermistor resistance of approximately 500 kΩ. The 100 μA setting allows approximately 50 kΩ maximum.

To ensure proper current and thermistor selection, certain principles must be considered:

- To ensure measurement accuracy, the voltage across the thermistor must not exceed 4.5 V.
- To improve control responsiveness and accuracy, the thermistor voltage variations that result when the load temperature deviates from the setpoint must be as large as possible.

  The importance of maximizing voltage variation is shown in Figure 3.10, which shows resistance as a function of temperature for a thermistor. The values shown were selected for simplicity in this example, and may not reflect real thermistor values.

In the example shown in Figure 3.10, the thermistor resistance is 25 kΩ at 20 °C. Deviations of 1 °C from 20 °C cause resistance variations of about 2 kΩ. If using the 10 μA setting, there is 20 mV of feedback to the control circuit. Using the 100 μA setting provides 200 mV of feedback. The larger feedback signal means that the temperature is more precisely controlled.

Notice also that the lower slope of the curve at the higher temperatures results in a smaller feedback signal. It may be necessary, if you are controlling to higher temperatures, to use a thermistor with a different curve.

If you cannot select a thermistor and its resistance is less than 50 kΩ (at operating temperature), use the 100 µA setting. Use the 10 µA setting in all other cases.

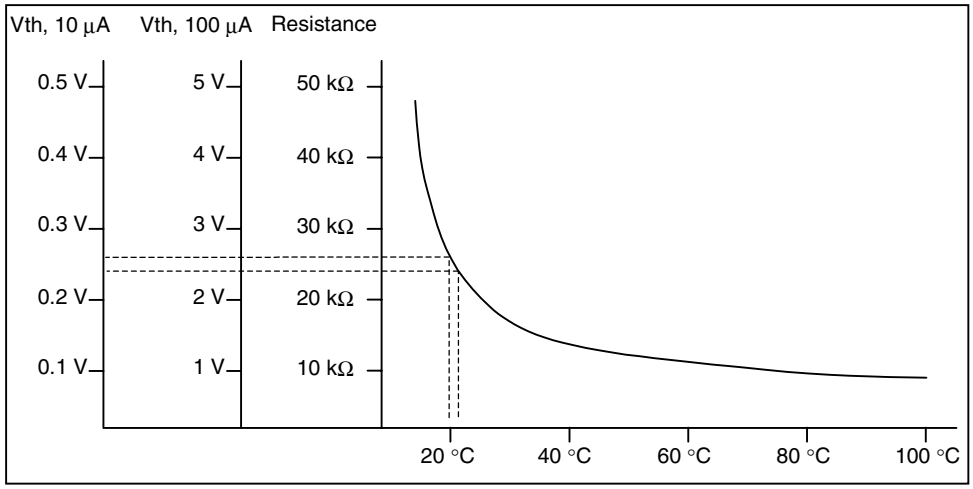


Figure 3.10 Example Thermistor Resistance vs. Temperature

Setting Safety Limits

The laser internal TEC can be damaged by excessive current; manufacturers typically specify a maximum safe operating current. The system provides a current limit feature (ILim) that allows you to set the maximum current that the controller supplies.

It is normal for the LTS-9300 to operate at the current limit, especially when the load temperature is far from the setpoint.

If the heatsink is too small for the application, the heatsink eventually becomes heat saturated—a condition where heat is being transferred to the heatsink faster than the heatsink can dissipate the heat. When the heatsink becomes saturated, the TEC current increases in an attempt to cool the load; this additional current creates more heat than can be dissipated and subsequently, more TEC current is applied. This situation is sometimes referred to as *thermal runaway*, and can cause a load and TEC to become damaged.

To help avoid thermal runaway damage, the LTS-9300 provides a high-temperature limit setting. The system can be configured to turn off the laser current and internal TEC current if the temperature limit setting is reached. See *CS:ENABLE:OUTOFF* on page *70* for more information.

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP